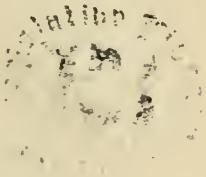
Canada Parliament
Senate Pubs

SESSIONAL PAPERS



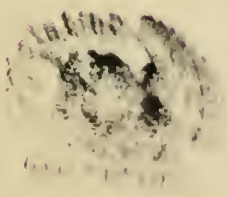
VOLUME 21

SIXTH SESSION OF THE TWELFTH PARLIAMENT

OF THE

DOMINION OF CANADA

SESSION 1916



VOLUME LI.

ALPHABETICAL INDEX

TO THE

SESSIONAL PAPERS

OF THE

PARLIAMENT OF CANADA

SIXTH SESSION, TWELFTH PARLIAMENT, 1916.

A

Auditor General's Report, Vol. I, Pts. a, b, and A to L; Vol. II. Pts. M to V; Vol. III, Pts. V to Z Vol. IV, Pt. ZZ.. 1
Agriculture, Report of Minister of, for year March 31, 1915.. 15
Agricultural Instruction Act, 1914-1916.. 15c
Acadia Coal Co. *re* granting of a Conciliation Board to employers of.. 99
Allen Enemy prisoners, escapes, etc., from detention camps at Banff, Alta.. 268
Allen Enemy prisoners, escapes, etc., from camp at Amherst, N.S.. 220
Amalgamated Dry Dock and Engineering Co. *re* construction of dry dock at North Vancouver.. 258
Amethyst, SS., correspondence *re* subsidy to, in years 1910-11, and 1911-12..
Appointments to Inside and Outside Service, in County of Wright.. 93
Archives—Report of works for year 1914. 29a
Astronomer—Report of Chief, year 1912. 25a

B

Bait Freezer at White Head., N.S.—Report of Engineer *re*.. 274
Bauman, W. F., an alien enemy—Correspondence *re* passport of.. 242
Bear River, N.S.—Documents *re* purchase of site for P.O. building at.. 142
Belzile, Louis de Gonzaque, *re* investigation respecting loss of horse by, during 1915.. 127
Bonds and Securities in Department of Secretary of State, since last return.. 69
Board of Conciliation—Documents *re* creation of, regarding Nova Scotia Steel Co., 1915.. 196
Bounty under Deep Sea Fisheries Act *re* County of Guysborough, N.S. 88
Bridge, construction of, between Ile Perrot and St. Anne de Bellevue, and Ile Perrot and Vaudreuil.. 168

B

Breakwater at North Lake, P.E.I—*re* construction of, at.. 164
Branch line of I.C.Ry. in Guysborough, N.S., *re* total expenditure connected with, since 1911.. 133
Burleigh Falls Water-power—*re* lease of by Government to J. A. Culverwell.. 280
British Columbia Hydrographic Surveys.. 25e

C

Campagnie de Navigation—*re* cancellation of subsidy contract to.. 223
Canadian Pacific Railway Company:—
Lands sold by during year 1915.. .. 54
Canadian Northern Railway Co.—Financial Statement of, etc.. 282
Canadian Northern Railway Co.—Copies of Mortgage Deed of Trust of, etc.. .. 282b
Canadian Officers employed in Canadian Pay and Records Office, London.. 207
Censors, names, etc., of employed by Government at Louisburg and North Sydney, N.S.. 195
Censors and decoders—List of employed at Halifax, since beginning of war.. .. 283
Civil Service, Inside, *re* questions asked of candidates for, since May, 1912.. 247
Civil Service List of Canada for 1915.. 30
Civil Service Commission—Report of for year 1915.. 31
Commandeering of Wheat—Documents relating to, etc.. 162
Commandeering of Wheat—Documents relating to, etc. 162a
Companies—List of at Halifax in Department of Militia and Defence *re* tenders for supplies 294
Commissions:—
Order in Council appointing Commission of inquiry *re* fire in Parliament Buildings.. 72

C

Commissions—*Concluded.*
Number of, etc., appointed since 1911.. 210
Order in Council appointing Commission to inquire into Shell Contracts.. 228
Re evidence taken respecting damages claimed against Militia Department by town of Sydney, N.S.. 239
Conciliation, Boards of—Report of Registrar of for 1915.. .. .. 36*a*
Conference of Local Governments held in Ottawa, October, 1915.. 86
Criminal Statistics, year ending 1914 .. 17
Cumming, J. S. W.—*re* action against by Government, etc.. 227
Customs Department at North Sydney—*re* renting of rooms for purposes of.. 114
Customs Station at Vicars, Quebec—Opening of at Frontier and closing at Vicars, etc.. 118
Customs Department—Number of clerks in paid from Outside Service vote who are in Inside Service.. 287
Customs, Report of Department of, for year 1915.. 35

D

Dairy and Cold Storage Commissioner—Report of for year ending March 31, 1915.. .. .. 15*a*
Dam, construction of at Grand'Mère, Co. of Champlain, Quebec.. 230
Decorations, list of awarded to members of Canadian Forces to March 17, 1915. 259*a*
Decorations, list of those in Canadian Expeditionary Forces receiving such.. 259
Desjardins, Auguste, of St. Denis, Kamouraska—Documents *re* appointment as Customs officer.. 68
Destructive Insect and Pest Act—Regulations under.. 46
Dionne, J. P., case of against the King in Exchequer Court.. 212
Dionne, J. P., Supplementary Returns *re* Exchequer Court.. .. .. 212*a*
Disallowance of Act of Legislature of Ontario—Order in Council, also report of Minister of Justice on.. .. .. 271*a*
Dominion Police Force—List of employees, with salary, etc.. 197
Dominion Police Force—*re* average number of men employed in year 1915.. .. 45
Dominion Steel Corporation, *re* war orders obtained by.. 178
Dominion Lands—Orders in Council *re*—between January 15, and December, 1915.. 47
Dominion Lands Act—Orders in Council *re*—between January 15, and December, 1915.. 48
Dominion Lands "Forest Reserves and Park Act"—Orders in Council *re*.. .. 49
Dominion Lands Survey Act.. 50
Dominion Government Domestic Loan—Copy of prospectus, etc.. 90
Domestic Loan of Dominion Government—Number of subscribers, etc.. 91
Doucett, Alex. D., investigation *re* claim of respecting cattle killed on I.C.Ry., 1915.. 131
Dredging:—
Inverness Co., N.S., in since 1896 to present.. 67
Contracts for supplies for dredges in East River, Pictou Co., years 1914-15. 139

D

Dismissals:—
Letters, etc., between Government and J. C. Douglas, M.L.A., *re* dismissals in Nova Scotia 97
Documents *re* dismissal of Daniel Buchanan as Pilot, Harbour of St. Anns. 107
Documents *re* dismissal of Clifford G. Brander, of Customs Service, Halifax. 113
Charles McCarthy from Customs Service at Halifax, N.S., etc.. 116
A. J. Crosby, Thomas Lynch and J. B. Naylor, Customs Service at Halifax. 117
W. B. Mills, Bridge and Building Master, Dist. No. 4, I.C.Ry.—Documents *re*.. 134
Proposed dismissal of present Keeper of Lighthouse at Cape Jourmain, Westmorland Co., N.B.. 144
John E. Hallamore, Postmaster at Upper New Cornwall, N.S.. 176
Mr. Bayfield, Supt. of Dredging in B.C., *re* dismissal of, and appointment of J. L. Nelson.. 183
Joseph Fleming on Intercolonial Ry... 188
Hubert Paquin, Postmaster of St. Gilbert de Portneuf.. 189
Documents *re* dismissal of Postmasters of St. Lazare, Vaudreuil Station, Point Fortune, Val des Epoulés, Mont Oscar, St. Justine de Newton.. 190
Dr. W. T. Patton, Department of Interior.. 24
L. F. Sansfaçon, Postmaster of Louisville.. 225
Postmaster McRitchie, of North River Centre, N.S.. 232
James Hall, Postmaster of Milford Haven Bridge, N.S.. 233
J. B. Levesque, Steward on steamer *Champlain*.. 277
Dr. W. T. Patton, Veterinary Inspection Branch at Coutts, Alberta.. .. .. .. 211*a*
J. B. Deschenes and Thos. Bernier, employees on I.C.Ry. at River du Loup. 292
Mr. Chisholm, Inspector of Indian Agencies, Sask.. 191
Drouth area of Alberta—Correspondence *re*.. 243
Duties rebated to importers during year ended December 31, 1915.. 112

E

East River of Pictou—Reports on depths of water in locks in, etc.. 98
East River of Pictou—Supplementary return relating to.. .. .. 98*a*
Estimates.. 3
Estimates, Supplementary, year ending March 31, 1916.. 4
Estimates, Further Supplementary, year ending March 31, 1916 5
Estimates, Further Supplementary, year ending March 31, 1917.. .. .. 5*a*
Estimates, Further Supplementary, year ending March 31, 1917.. .. .. 5*b*
Elevator—Storage at Calgary *re* location of.. 297
Electoral Polling Divisions in Manitoba—*re* apportioning of by Judges under Act. 234
Elections, By—return *re* year of 1915. ..
Employees in Government Departments—names of all who have enlisted since August 4, 1914.. 289

E

European War—Memo. *re* work of Department of Militia and Defence from 1915 to 1916.. 231
Examiners or Inspectors of materials for military purposes—Number of, etc.. .. 193
Examination for Civil Service appointments—Names of persons successfully passing in Prov. of Quebec 94
Expenditures, showing all sums expended in present year to December 31, 1915, by Dept. of Public Works, chargeable to Income.. 140
Experimental Farm, Rosthern, Sask.. .. 87
Experimental Farms—Report of the Director of, for year ending Mar. 31, 1915, Vol. I.. 16
External Affairs—Report for year ended March 31, 1915.. .. .. 29*a*
Extract from Montreal "Gazette" of January 12, 1915, *re* distress in England, etc.. .. .. 198*a*
Extract from Montreal Gazette, of November 1, 1915, *re* help by sale of Canadian flour.. 198
European War—Copies of Documents, Orders in Council *re*.. 42
European War—Copies of Documents, supplement to.. .. .. 42*a*
European War—Orders in Council relating to, from April 29, 1915, to January 12, 1916.. 43

F

Fair Wage Officer—Visits of *re* schedule of wages in shell making, New Glasgow, N.S.. 214
Federal Plan Commission for cities of Ottawa and Hull—Report of for 1915.. 172
Fenian Raid Bounty:—
Application of Aenas McKinnon of Nova Scotia *re*.. 95
Application of Aenas McKinnon of Nova Scotia *re*.. .. .. 95*a*
Names and addresses of persons in Annapolis Co. to whom paid.. 152
Names and addresses in South Cape Breton to whom paid, etc.. 153
Names and addresses of persons in County of Halifax, N.S., to whom paid.. 154
Names and addresses of persons in County of Hants, N.S., to whom paid. 155
Names and addresses of persons in county of Richmond, N.S., to whom paid 156
Re David W McLean, Windsor, N.S.. 205
Re application of Mrs. Flora McIntyre, N.S.. 194
To whom paid in Queens Co., N.S... 149
Finance Department—Number of clerks belonging, paid outside service vote.. 265
Fire Protection on Transcontinental Ry. line between Harvey Junction and W. boundary line.. 278
"Forest Reserves and Park Act"—Orders in Council *re*.. 49
Fort Henry—Amount of money paid out for new buildings and repairs in 1912-13-14-15.. 283
Fisheries Branch, Department of Naval Service—Forty-eighth Annual Report of.. 39

G

Geographic Board Report of for 1915.. 25*d*
Geological Survey—Department of Mines, year 1914.. 26
Georgian Bay Canal—Interim Report of Commission *re* economic problem of.. .. 19*b*
Governor General's Warrants issued since on account of 1915-16.. 63
Grand Trunk Pacific Railway:—
Financial Statement of, etc.. 282
Copies of Mortgage Deed of Trust, etc. 282*a*

H

Hanlover, documents *re* repairs on in County of Shelburne, N.S., in 1915.. 166
Hansard—Report containing motion of Sir W. Laurier *re* expenditure made by Shell Committee.. .. .. 228*a*
Headquarters Staff of 1st, 2nd and 3rd Divisional Area—Names, rank, and qualifications of officers on.. 192
High Cost of Living—Report of Board of Inquiry into.. 84
Homestead Lands—Fractional Areas of in Saskatchewan.. 89
Horses—Correspondence *re* purchase of, etc.. 213
Horses, *re* number bought for remounts in Alberta, etc.. 236

I

Indian Affairs, Department of—Report of for year 1915.. 27
Inland Revenue—Number, names, salaries, etc., of permanent employees in, 1915, 1916.. 260
Insurance—Report of Superintendent of for year 1915.. 8
Insurance—Abstract of Statements of, year ended December 31, 1915.. 9
Interior—Report of Department of for year 1915.. 25
International Nickel Co.—Correspondence of with the Prime Minister.. 78
International Commission pertaining to St. John River—Report of.. 180
Investigation into conduct of officials in Customs service at Halifax, N.S., in year 1915.. 111
Irrigation Act—Orders in Council relating to.. 52
Inland Revenue—Reports, Returns, and Statistics of, for years ended March 31, 1915:—
Part I—Excise.. 12
Part II—Inspection of Weights and Measures, Gas and Electricity.. 13
Part III—Adulteration of Food.. 14
Intercolonial Railway:—
Relating to transfer by estate of Alex. Fraser, of River du Loup, of lot of land to.. 171
Relating to construction of viaduct at Amqui, at Traverse Dubé crossing .. 235

J

Justice—Report of Minister of *re* Penitentiaries of Canada, 1915.. 34

K

Kastella, A., *re* appointment as Mechanical Supt of Dredges; also resignation of same.. .. .. 22*f*

L

Labour—Report of Department of for year 1915.. 36
Launch Way and Boat House—construction of at Bear Cove Beach, N.S. 216
Lavoie, Geo., investigation *re* burning of barn of May 23, 1914.. 129
Law, Rt. Hon. Bonar—Communication from *re* using strength of Empire in the War.. 76
Lightkeeper at Cape Jourmain, Westmorland Co., N.B., *re* proposed retirement of.. 144
Lightkeeper at Arisaig, N.S., *re* appointment at.. 244
Librarians of Parliament—Joint Report of.. 40
Liquor brought into Territories of Canada from outside countries.. 55
List of Shipping for year 1915.. 22
Loan—Dominion Government Domestic .. 90
Loan—Dominion Government Domestic—Number of subscribers, etc.. 91

M

Manitoba Hydrographic Surveys.. .. .. 25*f*
Manufacturers' Association, Canadian—Correspondence of with Prime Minister. 77
Mails, etc.:—
Relating to mail contract from Noel to Maitland, N.S.. 101
Rural delivery route, Shefford County, "Warden No. 1".. 102
Different rural mail routes in Strathcona County.. 103
Different rural mail routes in Strathcona—Supplementary return *re*.. .. 103*a*
Rural mail routes of Hodson and Toney Mills, Pictou County, N.S.. 104
Lemon Ferry Co., of Richmond, N.S., *re* carrying mail across 105
Number of rural delivery routes opened in 1915, name of counties in, etc 106
Re contract for carrying mails between St. François de Montmagny and railway station, years 1914-15.. 108
Re contract for carrying mails between Roberta, Co. of Richmond, and West Bay, Co. of Inverness.. 109
Re contract for carrying mails between Medicine Hat and Eagle Butte, Co. of Medicine Hat.. 110
Re rural mail route between Pictou and West River, N.S.. 119
Re different mail routes in constituency of Qu'Appelle.. 120
Re contract for carrying mails between St. Jean, P.Q., and railway stations of C.P.R. Co., G.T.R. Co., and Vermont Central.. 121
Re rural mail route from Eureka to Sunnybrae in Co. of Pictou.. 122
Re contract for carrying mail to Upper Margaree post office and Gillies P.O. 123
Re contract for carrying mail to Margaree Harbour and Chetlcamp.. .. 124
Re names, amounts, etc., of tenders for carrying of mails in Counties of L'Assomption and Montcalm.. 147
Re mail routes in constituency of Regina.. 163
Re contract for carrying mail from Inverness to Margaree Harbour.. .. 174
Re contract for carrying mail between tram cars and Glace Bay, South Cape Breton.. 175

M

Mails, etc.—*Concluded.*
Re contract for carrying mail to Eastern Harbour and Pleasant Bay.. .. 177
Different mail routes in constituency of Medicine Hat.. .. .., 187
Re delay in establishment of in constituency of Medicine Hat.. .. .. 187*a*
Rural mail route, *re* establishing of from Alma, through Sylvester, N.S. 221
Rural mail route, *re* establishing of from Scotsburn to North Scotsburn, etc.. 222
Marine and Fisheries—Report of for the year 1914-1915 (Marine).. 21
Macdonald, Rev. Isaac Hunter, application of for position as Chaplain.. .. 270
Machine Guns—Amounts contributed for from Medicine Hat.. 199
Matapedia, Lake—Concerning surveys of made in 1914.. 184
Medical Examiners of recruits—names, etc., of appointed since beginning of war to date, 1916.. 260
Medical Doctors—Number of employed by Militia Department at Halifax.. 256
Members of House of Commons and Legislatures of Canada in service, names, etc.. 250
Medical Officers employed in examination of recruits in county of Pictou, 1914-15.. 151
Memorial Tablet—Documents *re* placing of, on P.O. building, New Glasgow, commemorating late Rev Dr. James MacGregor.. 138
Mennonite Church—*re* conference between Minister of Agriculture and, in 1873.. 203
Militia Council—Report of, for year 1915. 35
Militia General Orders promulgated between November, 1914, and December, 1915.. 56
Military building at Rigaud—Correspondence relating to.. 252
Mines Branch—Report of year 1916.. .. 26*a*
Miscellaneous Unforeseen Expenses from April, 1915, to January, 1916.. 58
Montreal Street Ry. Co.—Copy of war orders given to.. 179
Moncton, N.B., *re* names, salaries of employees in I.C.Ry. offices at, also retiring allowances granted, etc.. 135
Morin, Nazaire, and Hébert, Napoléon, *re* investigation held respecting case of. 128

Mc

McNair's Cove, N.S., *re* expenditure at.. 217
McIntyre, Mrs. Flora—Documents *re* application of, for Fenian Raid Bounty.. 194
McKinnon, of Inverness Co., N.S., *re* Fenian Raid Bounty.. 95
McLean, David W., Windsor, N.S., *re* Fenian Raid Bounty paid to.. 205
McQueen Siding, *re* installation of and removal thereof subsequently.. 132
McTavish, Hon. D. B., appointment of as Commissioner *re* fire Parliament Buildings.. 72
McQueen Siding on I.C.Ry., *re* installation of and subsequent removal of.. .. 132*a*

N

National Battlefields Committee—Receipts and Expenditures, 1915 61

N

Naval Service:—
Report of the Department of, for year ending March 31, 1916.. 38
Regulations *re* payment to officers as interpreters.. 74
Copies of Orders in Council *re* Regulations of Department of.. 41
Nickel:—
International Co.—Correspondence of, with Prime Minister.. 78
Order in Council *re* prohibition of exportation of.. 215

O

Oliver Equipments purchased since August 1, 1914, names from whom purchased, etc.. 66
Orders in Council—Copies of *re* regulations of Naval Service.. 41
Ottawa Improvement Commission—Statement of Receipts and Expenditures, 1915.. 60
Overtime paid to men in Printing Bureau, from January 1, 1916, to April 1, 1916. 261

P

Parliament Buildings Fire—Report of Commission appointed to inquire *re*.. 72*a*
Patton, Dr. W. T., *re* dismissal of, etc.. 211
Paul, Capt. Stephen, claim of *re* steamer *Rhoda*.. 96
Patrol Boat A, "Captain Blackford"—Documents *re* repairs in December, 1914 to 1915.. 160
Patriotic Fund, unclaimed balances in banks for.. 159
Patenaude, Hon. E., and Nantel, Hon. W. B., showing amounts spent for furnishing offices of.. 170
Pensions to Canadian Expeditionary Forces, pay allowances for disabled soldiers, also to dependents, etc. 150
Pension list in force in Canada for disabled soldiers—Copy of.. 185
Petitions received by Government *re* disallowance of Act of Ontario Legislature. 271
Pictou—Documents *re* handling freight and coal at.. 299
Pictou Harbour—*re* permanent harbour quay line at.. 288
Pictou Harbour—*re* survey of for proposed new bridge.. 254
Pilot Commissioners—Harbour and District of St. Anns, Co. of Victoria, *re* dismissal of Daniel Buchanan.. 107
Piniarski, W., *re* patent of, in township 25, range 4, office file No. 1752484.. .. 82
Port Morien, N.S.,—*re* repairs to Breakwater at, year 1915.. 143
Port Nelson—Statement total expenditure of public money at, to date, etc.. 291
Post Office Department—*re* amounts expended by, in connection with Yukon service for 1915.. 224
Postmaster General—Report of, for year ended March, 1915.. 24
Post Office at Louiseville—Documents *re* construction of, at.. 169
Post Office and Postmaster of parish of St. Esprit—Correspondence *re*, from October, 1911, to date.. 173
Post Office at Rigaud—Correspondence *re* cost of.. 186

P

Postmaster at West Roachdale, N.S, *re* appointment of, etc.. 200
Prince Rupert—Documents *re* proposed public building in, for Post Office, etc. 182
Pringle, Robt. A., copy of Order in Council appointing as Commissioner *re* Parliament Buildings Fire 72
Printing and Stationery:—
Report of Department of, 1915.. 32
Amount of money paid out for printing outside of Printing Bureau, in years 1912-13-14-15.. 285
Public Service—Names of all employees of all branches of, in Counties of Province of Nova Scotia 284
Public Accounts of Canada, year ended March 31, 1915.. 2
Public Works—Report of Minister of, for year ended March 31, 1915.. 19
Public Works—Return showing sums expended, chargeable to Income, year end December 31, 1915.. 140
Public Works—Return showing all sums expended, chargeable to Capital Account, year ending December 31, 1915. 141

Q

Quarantine de Lévis—Documents, etc., *re* purchase of land for.. 71
Quarantine Buildings at McNab's and Lawlor's Islands—Proposed use of, for Military.. 145
Quarantine purposes—Names and salaries of all Medical Officers appointed for, at principal ports of Canada, etc.. 146
Quebec and Saguenay Railway—*re* purchase of, by Government.. 281
Quebec, Montmorency and Charlevoix Railway—Reports of Engineers, *re*.. .. 295
Quebec, Montmorency and Charlevoix Railway—Correspondence *re* sale of, to Government of Canada.. .. .. 295*a*

R

Rallier du Baty—Communication from Sir G. Perley *re* report on Hospital at Dinard.. 75
"Railway Belt Water Act"—Orders in Council *re*, from Jan. 12, 1915, to December 31, 1915.. 51
Railways and Canals—Report of Department of, for year from April 1, 1914.. 20
Railway Commissioners—Report of Board of, for year ending March 31, 1916.. .. 20*a*
Railway Statistics of Dominion of Canada, year ended June 30, 1915.. .. .. 20*b*
Railway from Sunnybrae—Surveys *re* during 1915.. 208
Railway Subsidies in Canada—Amounts in years 1912, 1913, 1914 and 1915.. .. 251
Recruiting in England re direction of, etc. 269
Recruiting Officers for Counties of Lunenburg, Queens-Shelburne and Yarmouth, N.S., names of, etc.. 248
Recruits—Number of, up to April 1, 1916 (Senate).. 267
Recruiting—*re* parties employed to obtain, etc.. 249
Regina, constituency of—Rural mail routes in.. 163
Regina "Province" and "Standard," Moosejaw "News" and "Saskatchewan Star," re amounts paid to, by Government, 1914, 1915.. 246

R

Remissions and Refunds, Tolls or Duties, year ending March 31, 1915.. 65
Revenue collected—Amount of, during fiscal year up to December 31, 1915, General Tariff, Preferential Tariff and Surtax.. 115
Revenue of Canada for years 1909-10-11, also amounts for agriculture.. 126
Roy, J. Antime—Correspondence with *re* farm purchase.. 257
Royal Northwest Mounted Police:—
Agreement of Dom. Govt. and Prov. of Saskatchewan *re*.. 81
Agreement of Dom. Govt. and Prov. of Alberta *re*.. 80
Report of, for 1915.. 28
Royal Society of Canada—Statement of affairs of, for year ended April 30, 1915. 59
Royal Naval Reserve Officers—*re* payment of missing allowance to.. .. .. 74*a*
Royal Military College:—
Re complaints as to manner of supplying clothing to.. 219
Amount paid out for new buildings and repairs in 1912-13-14-15.. 283
Rules of Supreme Court of Alberta 44

S

Salaries paid to employees in different Departments of the Government, Co. of Cumberland, from 1896 to 1911.. 125
Sealers of British Columbia—Reports on claims of, under last Treaty with U.S.. 79
Secretary of State for Canada—Report of, for year 1915.. 29
Seed Grain Liens—Documents in connection with Government's decision to exact.. 262
Senate of Canada—*re* amendment of B.N.A. Act in reference to.. 244
Sherwood, H. Crossley, *re* appointment of, as Clerk Assistant to office of Routine and Records.. 240
Supplementary return *re* appointment of H. Crossley Sherwood.. .. .. 240*a*
Shareholders in Chartered Banks in Canada—List of, year ended December 31, 1915.. 6
Shell Inspectors employed in N. S. Steel Company, and at New Glasgow, N.S.. 157
Ships in British Columbia—*re* construction of, or assisting same by Government.. 204
Shovels—Reports *re* purchase of 25,000 special pattern by Dept. of Militia and Defence.. 275
Small Arms Ammunition:—
Documents *re* sale of, since August 4, 1914.. .. .. 276*a*
Documents *re* sale of, since August 4, 1914.. 276
Soldiers at North Sydney—*re* clothing, supplies, etc., furnished to.. 237
Soulanges Canal—List of employees on, in 1910; also list of employees on, in 1915. 158
Spirituous Liquors:—
Information *re*, in Great Britain, France, Italy, Belgium, Servia, Canada, Australia, New Zealand, and South Africa.. 255
Amounts paid under retroactive clause between date of such Act and beginning of war.. 288

S

Steamboat Inspection Report.. 23
Storage Elevator at Calgary, *re* location of.. 297
Starling, vessel—*re* chartering of, by Department of Marine and Fisheries.. .. 202
Statistical Branch, Department of Labour—Synopsis of exhibit by, *re* Cost of Labour.. .. .. 84*a*
Stellarton and New Glasgow—Investigation *re* weighing of freight at, on I.C.R., 1914-15.. 136
Steam Trawlers—Tonnage, etc., of all clearing from Canso, N.S., in year 1915. 263
Stoddart, P. A., Fishery Guardian, Shelburne Co., N.S., *re* payments made to.. 201
Strubel, Frank—*re* Homestead of, entered at Land Office at Weyburn and Estevan.. 83
Stream Measurements—Report of progress of, for year 1915.. .. .. 25*c*
Superannuation and Retiring Allowances, year ending December 31, 1915.. 57
St. Eleuthière Station—Relating to changing of, on N. T. Railway.. 226
St. Nicholas Quarry—Documents *re* purchase of.. 272

T

Telegraph lines and location of, erected in Co. of Inverness, N.S.. 100
Telegraph Statistics, year 1915 .. .. .. 20*f*
Temporary Loans—Statement of, to December 31, 1915.. 62
Théberge, J. S.—Investigation *re* loss of horse by, on Intercolonial Railway, 1911 to 1913.. 130
Thetford Mines—Correspondence between Department of Labour and workingmen at, *re* strike.. 148
Topographical Surveys Branch—Report of year 1914-15.. .. .. 25*b*
Trade Unions—Annual Return respecting 70
Transcontinental Railway:—
Report of Commisioners of year 1914.. 37
Fire protection on, etc.. 279
Transatlantic Mail Service—Relating to, for winter service, 1915-16.. 245
Treasury Board Over-ruling—Statement of.. 64
Trent Valley Waterways System—Documents *re* transfer of, by Government of Ontario to Government of Canada.. 296
Trousers, Breeches, etc.—Number, names, prices, etc., of firms or individuals manufacturing.. 92
Trade and Commerce:—
Report of Department of, for year ended March 31, 1915:—
Part I—Canadian Trade (Imports and Exports.. 10
Part II—Canadian Trade with (1) France, (2) Germany, (3) United Kingdom, (4) United States.. .. .. 10*a*
Part III—Canadian Trade with British and Foreign Countries (except France, Germany, United Kingdom and United States).. .. .. 10*b*
Part IV—Miscellaneous information. 10*c*
Part V—Report of the Grain Commissioners for Canada.. .. .. .. 10*d*
Part VI—Subsidized Steamship Services, etc.. .. .. 10*e*
Part VII—Trade of Foreign Countries, Treaties and Conventions.. 10*f*

U

Unclaimed Balances in Chartered Banks for five years prior to December 31, 1915.. 7
Unclaimed Balances in the Banks for patriotic purposes—Correspondence *re*. 159
Union Station at Quebec—Copy of agreement between Government for Transcontinental Ry., C.P.Ry. and C.N.Ry.. 290

V

Vale Railway, Co. of Pictou, N.S., *re* purchase, etc., of, by Railway Department. 209
Valley Railway *re* contracts between Government of Canada and Government of New Brunswick regarding operation of. 279
Vessels—List of, belonging to Government on service; also those not in service.. 273
Veterinary Director General—Report of, for year 1916.. .. .. 15*b*

W

War supplies, *re* application of Industrial Disputes Act *re* delivery of.. .. 238
Waterworks and Sewerage Systems of Canada—Report of Conservation Commission on.. 286

W

Wheat—Quantity of, shipped years 1914, 1915, from Winnipeg to Port Arthur, Fort William, Duluth, etc.. 264
Wharfage on goods landed on Government wharves in Co. of Victoria, N.S... 206
Wharf at Shag Harbour, N.S.—Documents relating to repairs to, in years 1915-1916.. 137
Wharf at Rivière Ouelle, names, occupations of persons employed at, in 1915.. 165
Wharf or blocking at head of Belleville, Yarmouth Co., N.S., expenditure on.. 167
Wharf at Shad Bay, N.S., *re* construction of at, in 1914-15.. 218
Wilson, J. W. V., expenses of, as Fishery Guardian in Shelburne, N.S., 1915.. 161
Wireless Operator—Rank of, in Royal Naval Canadian Volunteer Reserve .. 73
Women's Purity Federation at San Francisco—Report of delegates attending.. 85
Wrecks on St. Lawrence River—Statement of, from 1867 to 1916.. 181

Y

Yukon Territory—Orders in Council *re* government of.. 53

See also Alphabetical List, Page 1.

LIST OF SESSIONAL PAPERS

Arranged in Numerical Order, with their titles at full length; the dates when Ordered and when presented to the House of Parliament; the name of the Senator or Member who moved for each Sessional Paper, and whether it is ordered to be Printed or Not Printed.

CONTENTS OF VOLUME E.

Fifth Census of Canada, 1911—Volume V—Forest, Fishery, Fur and Mineral Production.
Fifth Census of Canada, 1911—Volume VI—Occupations of the people.

CONTENTS OF VOLUME 1.

(This volume is bound in three parts.)

1. Report of the Auditor General for the year ended 31st March, 1915, Volume 1, Parts a b and A to L; Volume III, Parts V to Z. Presented by Sir Thomas White, February 7 1916.
Printed for distribution and sessional papers.

1. Report of the Auditor General for the year ended 31st March, 1915, Volume II, Parts M to U. Presented by Sir Thomas White, February 10, 1916.
Printed for distribution and sessional papers.

1. Report of the Auditor General for the year ended 31st March, 1915, Volume IV, part ZZ. Presented by Sir Thomas White, February 14, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 2.

2. The Public Accounts of Canada for the fiscal year ending March 31, 1915. Presented by Sir Thomas White, February 1, 1916.. ..*Printed for distribution and sessional papers.*

3. Estimates of sums required for the service of the Dominion for the year ending March 31, 1917. Presented by Sir Thomas White, 1916.
Printed for distribution and sessional papers.

4. Supplementary Estimates of sums required for the service of the Dominion for the year ending March 31, 1916. Presented by Sir Thomas White, 1916.
Printed for distribution and sessional papers.

5. Supplementary Estimates of sums required for the service of the Dominion for the year ending March 31, 1917. Presented by Sir Thomas White, 1916.
Printed for distribution and sessional papers

5*a*. Further Supplementary Estimates for the service of the Dominion for the year ending March 31, 1917. Presented by Sir Thomas White, 1916.
Printed for distribution and sessional papers

5*b*. Further Supplementary Estimates for the fiscal year ending March 31, 1917 Presented by Sir Thomas White, May 1916.. .. .. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 3.

6. List of Shareholders in the Chartered Banks of the Dominion of Canada as on December 31, 1915. Presented by Sir Thomas White, February 1, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 4.

7. Report on certified cheques, drafts or bills of exchange, dividends, remaining unpaid and unclaimed balances in Chartered Banks of the Dominion of Canada, for five years and upwards prior to December 31, 1915. Presented by Sir Thomas White, February 1, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 5.

(This volume is bound in two parts.)

8. Report of the Superintendent of Insurance for the year 1915. Presented by Sir Thomas White, 1916.. .. ..*Printed for distribution and sessional papers.*

9. Abstract of Statements of Insurance Companies in Canada for the year ended December 31 1915. Presented by Sir Thomas White, April 10, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 6.

10. Report of the Department of Trade and Commerce for the fiscal year ended March 31, 1915: Part I.—Canadian Trade (Imports in and Exports from Canada). Presented by Sir George Foster, January 13, 1916.. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 7.

10*a*. Report of the Department of Trade and Commerce for the fiscal year ended March 31, 1915: Part II.—Canadian Trade with (1) France, (2) Germany, (3) United Kingdom, (4) United States. Presented by Sir George Foster, 1916.
Printed for distribution and sessional papers.

10*b*. Report of the Department of Trade and Commerce for the fiscal year ended March 31, 1915: Part III.—Canadian Trade with foreign countries (except France, Germany, the United Kingdom and United States). Presented by Sir George Foster, 1916.
Printed for distribution and sessional papers.

10*c*. Report of the Department of Trade and Commerce for the fiscal year ended March 31, 1916: (Part IV.—Miscellaneous Information.) Presented by Sir George Foster, 1916.
Printed for distribution and sessional papers.

10*d*. Report of the Grain Commissioners for Canada. (Part V.) Presented by Sir George Foster, 1916.. .. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 8.

10*e*. Report of the Department of Trade and Commerce for the fiscal year ended March 31, 1915: Part VI.—Subsidized Steamship Services, with statistics showing steamship traffic to December 31, 1915, and Estimates for the fiscal year 1916-17. Presented by Sir George Foster, 1916.. .. ..*Printed for distribution and sessional papers.*

10*f*. Report of Trade and Commerce for the fiscal year ended March 31, 1915: Part VII.—Trade of Foreign Countries, Treaties and Conventions. Presented by Sir George Foster, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 9.

11. Report of the Department of Customs for the year ended March 31, 1915. Presented by Hon. Mr. Reid, January 18, 1916.. .. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 10.

12, 13, 14. Reports, Returns and Statistics of the Inland Revenue of the Dominion of Canada, for the year ended March 31, 1915. Part I.—Excise. Part II.—Inspection of Weights and Measures, Gas and Electricity. Part III.—Adulteration of Food. Presented by Hon. Mr. Patenaude, February 18, 1916..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 11.

15. Report of the Minister of Agriculture for the Dominion of Canada, for the year ended March 31, 1915. Presented by Hon. Mr. Burrell, January 20, 1916.
Printed for distribution and sessional papers.

15a. Report of the Dairy and Cold Storage Commissioner for the fiscal year ending March 31, 1915. (Dairying, Fruit, Extension of Markets and Cold Storage.) Presented by Hon. Mr. Burrell, February 1, 1916.. .. ..*Printed for distribution and sessional papers.*

15b. Report of the Veterinary Director General for the year ending March 31, 1915. Presented by Hon. Mr. Burrell, 1916.. .. ..*Printed for distribution and sessional papers.*

15c. Report on "The Agricultural Instruction Act," 1914-15, pursuant to Section 8, Chapter 5 of 3-4 George V. Presented by Hon. Mr. Burrell January 24, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 12

16. Report of the Director and Officers of the Experimental Farms for the year ending March 31, 1915. Presented by Hon. Mr. Burrell, January 31, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 13.

17. Criminal Statistics for the year ended September 30, 1914. (Appendix to the Report of the Minister of Trade and Commerce for the year 1914.) Presented by Sir George Foster, 1916.. .. ..*Printed for distribution and sessional papers.*

18. Return of By-elections for the House of Commons of Canada held during the year 1915. Presented by Hon. Mr. Speaker, 1916.. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 14.

(This volume is bound in two parts.)

19. Report of the Minister of Public Works on the works under his control for the fiscal year ended March 31, 1915. Presented by Hon. Mr. Rogers, January 13, 1916.
Printed for distribution and sessional papers.

19a. Ottawa River Storage for year 1915.. .. ..*Printed for distribution and sessional papers.*

19b. Interim Report of the Commission appointed to examine into certain general conditions of Transportation bearing on the economic problem of the proposed Georgian Bay Canal. Presented by Hon. Mr. Rogers, April 14, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 15.

20. Annual Report of the Department of Railways and Canals, for the fiscal year from April 1, 1914, to March 31, 1915. Presented by Hon. Mr. Cochrane, February 2, 1916.
Printed for distribution and sessional papers

20a. Canal Statistics for the season of navigation, 1915. Presented by Hon. Mr. Reid, May 17, 1916.. .. ..*Printed for distribution and sessional papers.*

20b. Railway Statistics of the Dominion of Canada, for the year ended June 30, 1915. Presented by Hon. Mr. Cochrane, April 4, 1916.. ..*Printed for distribution and sessional papers*

CONTENTS OF VOLUME 16.

20c. Tenth Report of the Board of Railway Commissioners for Canada, for the year ending March 31, 1915. Presented by Hon. Mr. Cochrane, February 2, 1916.
Printed for distribution and sessional papers

20d. Telephone Statistics of the Dominion of Canada, for the year ended June 30, 1915 Presented by Hon. Mr. Cochrane, April 13, 1915.
Printed for distribution and sessional papers

20e. Express Statistics of the Dominion of Canada, for the year ended June 30, 1915 Presented by Hon. Mr. Cochrane, April 13, 1916.. ..*Printed for distribution and sessional papers.*

20f. Telegraph Statistics of the Dominion of Canada, for the year ended June 30, 1915 Presented by Hon. Mr. Cochrane, May 16, 1916.
Printed for distribution and sessional papers

CONTENTS OF VOLUME 17.

21. Forty-eighth Annual Report of the Department of Marine and Fisheries, for the year 1914-1915.—Marine. Presented by Hon. Mr. Hazen, January 13, 1916.
Printed for distribution and sessional papers.

22. List of Shipping issued by the Department of Marine and Fisheries, being a list of vessels on the registry books of the Dominion of Canada on December 31, 1915. Presented by Hon. Mr. Hazen, 1916.. .. ..*Printed for distribution and sessional papers.*

23. Supplement to the Forty-eighth Annual Report of the Department of Marine and Fisheries for the fiscal year 1914-15. Marine.—Steamboat Inspection Report.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 18.

24. Report of the Postmaster General for the year ended March 31, 1915. Presented by Hon. Mr. Casgrain, January 13, 1916.. .. ....*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 19.

25. Annual Report of the Department of the Interior for the fiscal year ending March 31, 1915. Presented by Hon. Mr. Roche, January 13, 1916.
Printed for distribution and sessional papers.

25*b*. Annual Report of the Topographical Surveys Branch of the Department of the Interior, 1914-15. Presented by Hon. Mr. Roche, May 1, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 20.

25*c*. Report of progress of stream measurements for the calendar year 1915. Presented by Hon. Mr. Roche, 1916.. .. ..*Printed for distribution and sessional papers.*

25*d*. Fourteenth Report of the Geographic Board of Canada for year ended March 31, 1915.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 21.

25*e*. British Columbia Hydrographic Surveys .. ..*Printed for distribution and sessional papers.*

25*f*. Manitoba Hydrographic Surveys, 1912-14.. ..*Printed for distribution and sessional papers.*

25*g* Report of the Chief Medical Officer Department of the Interior, for 1915.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 22.

26. Summary Report of the Geological Survey Department of Mines, for the calendar year 1914. Presented by Hon. Mr. Roche, 1916.
Printed for distribution and sessional papers.

26*a*. Summary Report of the Mines Branch for the calendar year 1914. Presented by Hon. Mr. Roche, 1916.. .. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 23.

27. Report of the Department of Indian Affairs for the year ended March 31, 1915. Presented by Hon. Mr. Roche, January 19, 1916..*Printed for distribution and sessional papers.*

28. Report of the Royal Northwest Mounted Police, 1915. Presented by Sir Robert Borden, January 19, 1916.. .. ..*Printed for distribution and sessional papers.*

CONTENTS OF VOLUME 24.

29. Report of the Secretary of State of Canada for the year ended March 31, 1915. Presented by Hon. Mr. Blondin, February 28, 1916.
Printed for distribution and sessional papers.

29*a*. Report of the work of the Public Archives for the year 1914. Presented, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 25.

30. The Civil Service List of Canada for 1915. Presented by Hon. Mr. Patenaude 1916.
Printed for distribution and sessional papers.

31. Annual Report of the Civil Service Commission of Canada for the year ended August 31, 1915. Presented by Hon. Mr. Patenaude, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 26.

32. Annual Report of the Department of Public Printing and Stationery for the fiscal year ended March 31, 1915. Presented by Hon. Mr. Blondin, March 20, 1916.
Printed for distribution and sessional papers.

33. Report of the Secretary of State for External Affairs for the year ended March 31, 1915. Presented by Sir Robert Borden, February 23, 1916.
Printed for distribution and sessional papers.

34. Report of the Minister of Justice as to Penitentiaries of Canada for the fiscal year ending March 31, 1915.. .. ..*Printed for distribution and sessional papers.*

35. Report of the Militia Council for the Dominion of Canada, for the fiscal year ending March 31, 1915. Presented by Sir Sam Hughes, February 21, 1916.
Printed for distribution and sessional papers.

35*a*. Employment for the Expeditionary Forces after the war. Presented, 1916.
Printed for distribution and sessional papers.

36. Report of the Department of Labour for the fiscal year ending March 31, 1915. Presented by Hon. Mr. Crothers, January 25, 1916.
Printed for distribution and sessional papers.

36*a*. Eighth Report of the Registrar of Boards of Conciliation and Investigations of the proceedings under "The Industrial Disputes Investigation Act, 1907," for the fiscal year ending March 31, 1915. Presented by Hon. Mr. Crothers, January 25, 1916.
Printed for distribution and sessional papers.

CONTENTS OF VOLUME 27.

37. Eleventh Annual Report of the Commissioners of the Transcontinental Railway, for the year ended March 31, 1914. Presented by Hon. Mr. Cochrane, February 2, 1916.
Printed for distribution and sessional papers.

38. Report of the Department of the Naval Service, for the fiscal year ending March 31, 1915. Presented by Hon. Mr. Hazen, January 13, 1916.
Printed for distribution and sessional papers.

38*a*. Supplement to the Report of the Naval Service—Contributions to Canadian Biology, 1914-15. Presented by Hon. Mr. Hazen, 1916.
Printed for distribution and sessional papers.

38*b*. Natural History of the Herring. Presented, 1916.
Printed for distribution and sessional papers.

39. Forty-eighth Annual Report of the Fisheries Branch of the Department of the Naval Service, 1914-1915. Presented by Hon. Mr. Hazen, January 13, 1916.
Printed for distribution and sessional papers.

40. The Report of the Joint Librarians of Parliament. Presented by Hon. Mr. Speaker, January 13, 1916.. .. ..*Not printed.*

CONTENTS OF VOLUME 28.

41. Copies of Orders in Council authorizing Regulations for the Department of Naval Service in accordance with Section 47, Chapter 43, 9-10 Edward VII, as follows:—

P.C. 2864, dated the 4th December, 1915, Payment of Separation Allowance in the case of Warrant Officers.

P.C. 3009, dated 21st December, 1915, with reference to application of the Naval Discipline Act, etc., for the Government of the Naval Volunteer Force.

P.C. 63/422, dated 15th October, 1915, with reference to appointment of Assistant Paymasters in charge.

P.C. 2267, dated 25th September, 1915, with reference to regulations for payment of "Detained Pay."

P.C. 93/2151, dated 17th September, 1915, with reference to allowances to officers and men employed on coding and decoding duties, etc.

P.C. 1712, dated 21st July, 1915, with reference to scheme of pensions for officers and men of the Royal Canadian Forces, etc.

CONTENTS OF VOLUME 28—*Continued.*

P.C. 748, dated 13th April, 1915, with reference to institution of the ratings of rangetaker first and second class in the Royal Canadian Navy.

P.C. 58/1470, dated 24th June, 1915, with reference to increase in amount of Separation Allowance to a motherless child from 3s. to 5s.

P.C. 85/1158, dated 20th May, 1915, with reference to revision of amounts payable on account of Separation Allowance to dependents of Royal Canadian Naval Permanent Ratings.

P.C. 756, dated 13th April, 1915, with reference to payment of Allowances to officers of the Royal Naval Canadian Volunteer Reserve for performance of duties which carry with them an Allowance to officers of the Royal Canadian Navy. Presented by Hon. Mr. Hazen, January 17, 1916.. .. ..*Not printed.*

42. Copies of Proclamations, Orders in Council and Documents relating to the European War. Presented by Sir Robert Borden, January 18, 1916.. .. ..*Not printed.*

42*a*. First Supplement to Copies of Proclamations, Orders in Council and Documents relating to the European War. Presented by Sir Robert Borden, January 18, 1916..*Not printed.*

43. Orders in Council relating to the European War, from 29th April, 1915, to 12th January, 1916, both inclusive. Presented by Sir Robert Borden, January 18, 1916..*Not printed.*

44. Copy of New Rules of Court passed by the Judges of the Supreme Court of Alberta, under the authority of Section 576 of the Criminal Code, at meeting of 27th November, 1915. Presented by Hon. Mr. Meighen, January 20, 1916.. .. ..*Not printed.*

45. Account of the average number of men employed on the Dominion Police Force during each month of the year 1915, and of their pay and travelling expenses, pursuant to Chapter 92, Section 6, Subsection 2, of the Revised Statutes of Canada. Presented by Hon. Mr. Doherty, January 20, 1916.. .. ..*Not printed.*

46. Regulations under "The Destructive Insect and Pest Act," pursuant to Section 9, Chapter 31 of 9-10 Edward VII. Presented by Hon. Mr. Burrell, January 24, 1916...*Not printed.*

47. Return of Orders in Council which have been published in the *Canada Gazette* and in the British Columbia *Gazette*, between 12th January, 1915, and the 31st December, 1915, in accordance with provisions of Subsection (*d*) of Section 38 of the regulations for the survey, administration, disposal and management of Dominion Lands within the 40-mile Railway Belt in the Province of British Columbia. Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

48. Return of Orders in Council which have been published in the *Canada Gazette*, between 12th January, 1915, and the 31st December, 1915, in accordance with the provisions of Section 77 of "The Dominion Lands Act," Chapter 20 of the Statutes of Canada, 1908. Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

49. Return of Orders in Council which have been published in the *Canada Gazette*, between the 16th January, 1915, and the 31st December, 1915, in accordance with the provisions of "The Forest Reserves and Park Act," Section 19 of Chapter 10, 1-2 George V. Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

50. Return of Orders in Council which have been published in the *Canada Gazette*, between the 12th January, 1915, and the 31st December, 1915, in accordance with the provisions of Section 5 of "The Dominion Lands Survey Act," Chapter 21, 7-8 Edward VII. Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

51. Return of Orders in Council which have been published in the *Canada Gazette*, between the 12th January, 1915, and the 31st December, 1915, in accordance with the provisions of Chapter 47, 2 George V, entitled "The Railway Belt Water Act." Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

52. Return of Orders in Council passed between the 16th January, 1915, and the 31st December, 1915, approving of regulations and forms prescribed in accordance with the provisions of Section 57 of the Irrigation Act, Chapter 61, Revised Statutes of Canada, 1906, as amended by Chapter 38, 7-8 Edward VII. Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

53. Return of Orders in Council passed under the provisions of Section 18 of Chapter 63, Revised Statutes of Canada, "An Act to provide for the Government of the Yukon Territory." Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

54. Return showing lands sold by the Canadian Pacific Railway Company during the year which ended on the 30th September, 1915. Presented January 25, 1916...*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

55. Return called for by Section 88 of Chapter 62, Revised Statutes of Canada, requiring that the Minister of the Interior shall lay before Parliament, each year, a return of liquor brought from any place out of Canada into the Territories by special permission in writing of the Commissioner of the Northwest Territories. Presented by Hon. Mr. Roche, January 25, 1916.. .. ..*Not printed.*

56. Copies of General Orders promulgated to the Militia for the period between November 25, 1914, and December 24, 1915. Presented by Sir Sam Hughes, January 26, 1916. *Not printed.*

57. Statement of Superannuation and Retiring Allowances in the Civil Service during the year ending 31st December, 1915, showing name, rank, salary, service, allowance and cause of retirement of each person superannuated or retired, also whether vacancy is filled by promotion, appointment or by transfer, and the salary of any new appointee. Presented by Sir Thomas White, February 1, 1916.. .. ..*Not printed.*

58. Statement of Expenditure on account of "Miscellaneous Unforeseen Expenses," from the 1st April, 1915, to the 12th January, 1916, in accordance with the Appropriation Act of 1915. Presented by Sir Thomas White, February 1, 1916.. .. ..*Not printed.*

59. Statement of the affairs of the Royal Society of Canada, for the year ended April 30, 1915. Presented by Sir Thomas White, February 1, 1916.. .. ..*Not printed.*

60. Report and Statement of Receipts and Expenditures of the Ottawa Improvement Commission to March 31, 1915. Presented by Sir Thomas White, February 1, 1916. *Not printed.*

61. Statement of Receipts and Expenditures of the National Battlefields Commission to 31st March, 1915, as required by 7-8 Edward VII, Chapter 57, Section 12. Presented by Sir Thomas White, February 1, 1916.. .. ..*Not printed.*

62. Statement of Temporary Loans, Dominion of Canada, outstanding December 31, 1915. Presented by Sir Thomas White, February 1, 1916.. .. ..*Not printed.*

63. Statement of Governor General's Warrants issued since the last session of Parliament on account of 1915-16. Presented by Sir Thomas White, February 1, 1916..*Not printed.*

64. Statement of Treasury Board over-ruling, under Section 44, Consolidated Revenue and Audit Act. Presented by Sir Thomas White, February 1, 1916.. .. .. ..*Not printed.*

65. Detailed Statement of all remissions and refunds of the tolls or duties for the fiscal year ending 31st March, 1915. Presented by Hon. Mr. Blondin, February 2, 1916. *Not printed.*

66. Return to an Order of the House of the 8th March, 1915, for a return showing the quantity of Oliver equipments purchased since 1st August, 1914, the persons from whom they were purchased, the price paid to each contractor, and the dates of their delivery. Also a copy of all complaints received from any quarter in regard to the equipment, and of any action, departmental or otherwise, taken in regard to the same. Presented 3rd February, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

67. Return to an Order of the House of the 1st March, 1915, for a return showing the amount of dredging done in the county of Inverness since 1896, up to the present, where such dredging was done, the quantity of dredging done in each place, and dates on which such dredging was done, also the cost in each case of such dredging. Presented February 3, 1916.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

68. Return to an Order of the House of the 17th March, 1915, for a copy of all reports, correspondence and other communications between the Department of Customs and Auguste Desjardins, of St. Denis de Kamouraska, since his appointment as a preventive officer of that Department. Presented by Hon. Mr. Reid, February 3, 1916.—*Mr Lapointe (Kamouraska)*.. .. ..*Not printed.*

69. A detailed statement of all bonds or securities registered in the Department of the Secretary of State of Canada, since last return (15th February, 1915) submitted to the Parliament of Canada under Section 32 of Chaper 19 of the Revised Statutes of Canada, 1906. Presented by Hon. Mr. Blondin, February 3, 1916.. .. ..*Not printed.*

70. Annual return respecting Trade Unions under Chapter 125, R.S.C., 1906. Presented by Hon. Mr. Blondin, February 3, 1916.. .. .. *Not printed.*

71. Return to an Order of the House of the 22nd March, 1915, for a copy of all letters, despatches, correspondence, petitions, recommendations, tenders, etc., relating to the purchase of the land for the Quarantine de Levis. Presented February 3, 1916.—*Mr. Bourassa*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

72. Certified copy of a report of the Committee of the Privy Council, approved by His Royal Highness the Governor General on the 7th February, 1916, appointing Robert A. Pringle, of the city of Ottawa, one of His Majesty's counsel learned in the law, and His Honour D. B. MacTavish, Judge of the County Court for the County of Carleton, a Commission, under the Inquiries Act, to conduct an inquiry into and concerning the origin of the recent disastrous fire which destroyed the Parliament Buildings at Ottawa. Presented by Sir Robert Borden, February 7, 1916.. .. ..*Not printed.*

72a. Report of the Royal Commission appointed to inquire into the origin of the fire which destroyed the Central Parliament Building at Ottawa, on Thursday, 3rd February, 1916. Also copy of evidence taken before the Royal Commission appointed to inquire into the origin of the fire which destroyed the Central Parliament Building at Ottawa, on Thursday, 3rd February, 1916. Presented by Hon. Mr. Rogers, May 16, 1915.
Printed for sessional papers only.

73. Copy of Order in Council, No. P.C. 162, dated 29th January, 1916,—Establishment of the rank of wireless operator in the Royal Naval Canadian Volunteer Reserve and regulations for the proper government thereof. Presented by Hon. Mr. Hazen, February 7, 1916.. .. ..*Not printed.*

74. Copy of Orders in Council, No. P.C. 183, dated 31st January, 1916,—Regulations governing the payment of allowance to officers of the Royal Canadian Naval Service acting as interpreters. Presented by Hon. Mr. Hazen, February 7, 1916.. .. ..*Not printed.*

74a. Copy of Order in Council No. P.C. 54/601, dated 16th March, 1916, authorizing payment of messing allowance to Royal Naval Reserve Officers. Presented by Hon. Mr. Hazen, March 29, 1916.. .. ..*Not printed.*

75. Communication from the Acting High Commissioner for Canada in London, Sir George Perley, enclosing a report on the Canadian Hospital at Dinard by Dr. Rallier du Baty, Chief Surgeon at the said hospital. Presented by Sir Robert Borden, February 7, 1916.
Printed for sessional papers only.

76. A communication from the Right Honourable A. Bonar Law, Colonial Secretary, to His Royal Highness the Governor General, enclosing a copy of the Imperial Parliamentary Debates (House of Commons, 10th January) on a resolution which was adopted by that House, as follows:—"That with a view to increasing the power of the Allies in the prosecution of the war, His Majesty's Government should enter into immediate consultation with the Governments of the Dominions in order with their aid to bring the whole economic strength of the Empire into co-operation with our Allies in a policy directed against the enemy." Presented by Sir Robert Borden, February 7, 1916.
Printed for distribution and sessional papers.

77. Correspondence between the Canadian Manufacturers' Association and the Prime Minister, 1914-1915. Presented by Sir Robert Borden, February 7, 1916.. .. ..*Not printed.*

78. Correspondence between the International Nickel Company and the Prime Minister. Presented by Sir Robert Borden, February 7, 1916.. .. ..*Not printed.*

79. Return to an Order of the House of the 7th February, 1916, for a copy of all correspondence and reports on the claims of Sealers of British Columbia under the last treaty with the American Republic. Presented February 9, 1916.
Printed for sessional papers only.

80. Certified copy of a report of the Committee of the Privy Council, approved by His Royal Highness the Governor General on the 15th April, 1915, giving authority for the renewal, from the 31st March, 1916, of the agreement between the Dominion Government and the Province of Alberta for the service of the Royal Northwest Mounted Police in that province. Presented by Sir Robert Borden, February 10, 1916.
Printed for sessional papers only.

81. Certified copy of a report of the Committee of the Privy Council, approved by His Royal Highness the Governor General on the 21st May, 1915, giving authority for the renewal, from the 31st March, 1916, of the agreement between the Dominion Government and the province of Saskatchewan, for the services of the Royal Northwest Mounted Police in that province. Presented by Sir Robert Borden, February 10, 1916.
Printed for sessional papers only.

82. Return to an Order of the House of the 8th February, 1916, for a copy of all letters, papers, and other documents relating to the application of Wasyl Pinianski for the patent of the southwest quarter section 5, township 25, range 4, west second principal meridian, Office File No. 1752484. Presented February 16, 1916.—*Mr. MacNutt*... ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

83. Return to an Order of the House of the 3rd February, 1916, for a copy of all affidavits, letters, telegrams and other correspondence during the years 1914 and 1915 in reference to the S.E. 7-1-13 west 2nd meridian, now the 160-acre homestead of Frank Strubell, between the Department of the Interior or the Minister, or any officer of the Department and the Land Office at Weyburn and Estevan, and with all parties who endeavoured to secure or assisted in securing homestead entry for the said land. Presented February 16, 1916.—*Mr. Turriff*.. .. ..*Not printed.*

84. Report of the Board of Inquiry appointed to make an investigation into the increase in the cost of living in Canada and the causes which have occasioned or contributed to such result. Presented by February 16, 1916.. .. .. ..*Printed for distribution.*

84*a*. Synopsis of exhibit by the Statistical Branch, Department of Labour, laid before the Board of Inquiry into the Cost of Living, 1915. Presented by Sir Robert Borden, February 29, 1916.. .. ..*Printed for distribution.*

85. Report of delegation representing the Government of Canada at the Ninth Annual Congress held under the auspices of the World's Purity Federation at San Francisco, July 18-24, 1915. Presented by Sir Robert Borden, February 16, 1916.. .. ..*Not printed.*

86. Return to an Address to His Royal Highness the Governor General, of the 7th February, 1916, for a copy of all Orders in Council, letters and correspondence which led to the convening of the conference of local governments which took place in Ottawa during the month of October last; together with all the proceedings and resolutions of the said conference. Presented February 17, 1916.—*Sir Wilfrid Laurier*.. .. .. ..*Not printed.*

87. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents relating to the purchase by the Government of the several parcels of land now comprised in the Experimental Farm at Rosthern, Saskatchewan. Presented February 22, 1916.—*Mr. McCraney*.. .. ..*Not printed.*

88. Return to an Order of the House, of the 7th February, 1916, for a return showing the names and post office addresses of all applicants for bounty under the Deep Sea Fisheries Act, from the districts of Ecum Secum, Marie Joseph, Spanish Ship Bay, and Liscombe, county of Guysborough, N.S., for the years 1912, 1913, 1914 and 1915, distinguishing between applications that have been accepted and the bounty paid, and those that have been rejected, and also the reasons for such rejections, if any. Presented February 22, 1916.—*Mr. Sinclair*.. .. ..*Not printed.*

89. Return to an Order of the House of the 3rd February, 1916, for a return showing the fractional areas of homestead lands, or otherwise, in the province of Saskatchewan, sold in the year 1915, the name of the purchaser, and the price paid in each case. Presented February 22, 1916.—*Mr. Martin (Regina)*.. .. ..*Not printed.*

90. Return to an Order of the House, of the 7th February, 1916, for a return showing a copy of the prospectus, rates of interest, the effective interest, the net yield, commission charges, printing charges and other charges, in connection with the Government Domestic Loan of one hundred million dollars, and also in connection with the loan of forty-five million dollars made at New York in 1915. Presented February 22, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed*

91. Return to an Order of the House of the 7th February, 1916, for a return showing the number of subscribers in the Government Domestic Loan of one hundred million dollars which were in the sum of $1,000 or under, and the number of other subscriptions in multiples of $1,000. Presented February 22, 1916.—*Mr. Maclean (Halifax)*.
Not printed.

92. Return to an Order of the House of the 8th March, 1915, for a return showing:—1. From how many firms or private individuals the Government, or any Department of the Government, has ordered trousers, breeches, and pantaloons since the 1st of July, 1914? 2. The names of these firms? 3. How many trousers, breeches and pantaloons have been ordered from each firm? 4. How many each firm has delivered up to date? 5. How many each firm has yet to deliver? 6. The price each firm is receiving for these trousers, breeches and pantaloons. Presented February 24, 1916.—*Mr. Chisholm (Inverness)* .. ..*Not printed.*

93. Return to an Order of the House of the 8th March, 1915, for a return showing the number of appointments to the Inside Service and to the Outside Service since October, 1911, of persons resident in the county of Wright, the number of dismissals from the service since October, 1911; the number of resignations from the service since above date; with the names of parties at whose request such resignations, if any, were tendered. Presented February 24, 1916.—*Mr. Devlin* .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

94. Return to an Order of the House of the 8th April, 1915, for a return showing:—1. The names of the persons who have successfully passed the Civil Service examination in the province of Quebec since the establishment of the Civil Service Commission. 2. The number of such persons who have been called upon to enter the Civil Service. 3. The number in each grade of those who have pased such examinations with success. Presented February 24, 1916.—*Mr. Boulay*.. .. ..*Not printed.*

95. Return to an Order of the House of the 3rd February, 1916, for a copy of all documents, papers and telegrams in any way referring to the application of Aenas McKinnon, of Iron Mines, Inverness County, for the Fenian Raid Veteran Bounty. Presented February 24, 1916.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

95*a*. Return to an Order of the House of the 14th February, 1916, for a copy of all telegrams, letters, petitions and documents of any kind, referring in any way to the application of Anes or Angus McKinnon, of Iron Mines or Orangedale, Inverness County, for the Fenian Raid Bounty. Presented March 3, 1916.—*Mr. Chisholm (Inverness)*.
Not printed.

96. Return to an Order of the House of the 15th March, 1915, for a copy of the claim of Captain Stephen Paul, owner of the steamer *Rhoda,* for the destruction of his ship, as a wreckage, by the Department of Marine, and of all correspondence with regard to the same. Presented February 24, 1916.—*Sir Wilfrid Laurier*.. .. ..*Not printed.*

97. Return to an Order of the House of the 29th March, 1915, for a copy of all letters and telegrams, or any other written communications which passed between the Minister of Railways and Canals and J. C. Douglas, Esq., M.P.P., of Glace Bay, Nova Scotia, between the 1st of January and the last of December, 1914, and of all letters and telegrams between the Minister of Customs and Public Works, and the Postmaster General, and the said J. C. Douglas during the above period, in respect to the dismissal, appointment or restoration to office of Government officials. Presented February 24, 1916.—*Mr. McKenzie*.. .. ..*Not printed.*

98. Return to an Order of the House of the 3rd February, 1916, for a copy of all reports upon the depths of water in the different locks in the East River of Pictou, improvements, and of all correspondence and recommendations in regard to changes on the plans therefor. Presented February 24, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

98*a*. Supplementary return to an Order of the House of the 3rd February, 1916, for a copy of all reports upon the depths of water in the different locks in the East River of Pictou, improvements, and of all correspondence and recommendations in regard to changes on the plans therefor. Presented March 13, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

99. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams, petitions and other papers relative to the granting of a Conciliation Board to the employees of the Acadia Coal Company, in the county of Pictou, in the autumn of 1915. Presented February 24, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

100. Return to an Order of the House of the 1st March, 1915, for a return showing the number of miles of telegraph lines, and the locations, erected in the county of Inverness, each year since 1896, to the present day, with the cost of each line. Presented February 24, 1916.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

101. Return to an Order of the House of the 3rd February, 1916, for a copy of all tenders, letters, telegrams and contracts relative to a mail contract from Noel to Maitland, in the county of Hants, and relative to the warding of the same under contract. Presented February 24, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

102. Return to an Order of the House of the 22nd March, 1915, for a copy of the petition addressed to the Post Office Department for the establishment of the rural mail delivery route in the county of Shefford, known as Warden No. 1, and of all letters, telegrams reports and other communications connected therewith. Presented February 24, 1916.—*Mr. Boivin*.. .. ..*Not printed.*

103. Return to an Order of the House of the 9th February, 1916, for a return showing the different rural mail routes in the Strathcona constituency, their location and date of establishment, and all rural routes under consideration at the present time. Presented February 24, 1916.—*Mr. Douglas*.. .. ..*Not printed.*

103*a*. Return to an Order of the House of the 16th February, 1916, for a return showing the location of all rural mail routes in the present constituency of Strathcona, the date of their inception, and the location of routes at present under consideration. Presented February 24, 1916.—*Mr. Douglas*.. .. ..*Not printed.*

104. Return to an Order of the House of the 25th March, 1915, for a copy of all letters, papers, petitions, reports and other documents relating to the establishment of a rural mail delivery route, for the purpose of giving postal service to the districts of Hodson and Toney Mills, county of Pictou. Presented February 24, 1916.—*Mr. Macdonald.*
Not printed.

CONTENTS OF VOLUME 28—*Continued.*

105. Return to an Order of the House of the 3rd February, 1916, for a copy of all correspondence, letters, telegrams and memorials received by the Honourable Postmaster General or the Right Hon. Sir Robert L. Borden, since January 1, 1912, relating to the contract for carrying the mail across Lemon Ferry, in the county of Richmond, N.S., and also of all replies thereto. Presented February 24, 1916.—*Mr. Kyte*.. .. ..*Not printed.*

106. Return to an Order of the House of the 7th February, 1916, for a return showing how many rural mail delivery routes have been opened during the last fiscal year, in what counties, and at what cost in each county. Presented February 24, 1916.—*Mr. Lemieux.* *Not printed.*

107. Return to an Order of the House of the 7th February, 1916, for a copy of all correspondence between the Department of Marine and Fisheries, or any department of Government, and the Pilot Commissioners of the harbour and district of St. Anns, in the county of Victoria, during the years 1914 and 1915, in respect to the removal or dismissal of Daniel Buchanan from the office of pilot of said harbour or district. Presented February 24, 1916.—*Mr. McKenzie*.. .. ..*Not printed.*

108. Return to an Order of the House of the 5th April, 1915, for a copy of all documents, letters, correspondence, messages, reports, etc., relating to the calls for tenders for the carrying of the mails between the post office at St. Français de Montmagny and the Intercolonial Station during the years 1914 and 1915, as well as a copy of the tenders that have been sent in relating to the said mail service. Presented February 24, 1916.—*Mr. Lapointe* (*Kamouraska*).. .. ..*Not printed.*

109. Return to an Order of the House of the 3rd February, 1916, for a copy of all correspondence, memorials, letters and telegrams received by the Honourable Postmaster General or the Right Hon. Sir Robert L. Borden, in 1915, relating to the contract for carrying the mails between Roberta, in the county of Richmond, and West Bay, in the county of Inverness, N.S., and also of all replies thereto. Presented February 24, 1916.—*Mr. Kyte*.. .. ..*Not printed.*

110. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, tenders, advertisements, posters, telegrams, and of all other documents in connection with the letting of the contract for conveying the mails between Medicine Hat and Eagle Butte, in the constituency of Medicine Hat, Alberta. Presented February 24, 1916.—*Mr. Buchanan*.. .. ..*Not printed.*

111. Return to an address to His Royal Highness the Governor General, of the 7th February, 1916, for a copy of all correspondence, evidence, official reports, memoranda and Orders in Council, in connection with an investigation or inquiry into the conduct of any officials of the customs service at the Port of Halifax, N.S., in the latter part of 1915, by Mr. Busby, Inspector of Customs. Presented February 25, 1916.—*Mr. Maclean* (*Halifax*).. .. ..*Not printed.*

112. Return to an Order of the House of the 7th February, 1916, for a return showing the total amount of duties rebated to importers during the present fiscal year up to December 31, 1915, with the particulars thereof. Presented February 25, 1916.—*Mr. Maclean* (*Halifax*).. .. ..*Not printed.*

113. Return to an address to His Royal Highness the Governor General, of the 7th February, 1916, for a copy of all correspondence, inquiries, evidence, reports by departmental officials or Orders in Council, relative to the dismissal of Clifford G. Brander of the Customs Preventive Service at Halifax, N.S. Presented February 25, 1916.—*Mr. Maclean* (*Halifax*).. .. ..*Not printed.*

114. Return to an Order of the House of the 7th February, 1916, for a copy of all correspondence, telegrams, or other communications between the officers of the customs at North Sydney, N.S., or any of them, and the Department of Customs, in respect to the renting of a room or rooms for the purposes of the said department at North Sydney. Presented February 25, 1916.—*Mr. Mackenzie* (*Halifax*).. .. ..*Not printed.*

115. Return to an Order of the House of the 7th February, 1916, for a return showing the revenue collected during the present fiscal year up to 31st December, 1915, from the importation of the following classes of dutiable articles, and under the divisions of General Tariff, Preferential Tariff, and Surtax Tariff, together with the quantities and values of such importations: Iron ore, iron and steel and manufactures of iron and steel; cotton and cotton manufactures; leather and manufactures of leather; wool and manufactures of wool; coal, manganese; zinc; copper; meats; eggs and butter.

Where any of the above items are numerously subdivided in the customs return, the principal items of imports as to quantity, value and revenue need only be given. Presented February 25, 1916.—*Mr. Maclean* (*Halifax*).. .. ..*Not printed.*

116. Return to an address to His Royal Highness the Governor General, of the 7th February, 1916, for a copy of all correspondence, evidence, reports, memoranda and Orders in Council relative to the dismissal of Charles McCarthy from the customs service at the Port of Halifax, and in respect to his restoration to office. Presented February 25, 1916.—*Mr. Maclean* (*Halifax*).. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

117. Return to an address to His Royal Highness the Governor General of the 7th February, 1916, for a copy of all evidence, reports, memoranda or Orders in Council, relative to the retirement or dismissal from the customs service at the Port of Halifax, of A. J. Crosby, Thomas Lynch and J. B. Naylor. Presented February 25, 1916.—*Mr. Maclean (Halifax)* . . . .*Not printed.*

118. Return to an Order of the House of the 9th February, 1916, for a copy of all correspondence and reports relating to the closing of the Customs Preventive Station at Vicars, Quebec; the opening of Customs House Office or Preventive Station at Frontier, Quebec, county of Huntingdon, and subsequent protest against the closing of the office at Vicars. Also for a return showing reports since 1912 of inspectors and collector as to the administration and ability of Preventive Officer of Customs John W. Curran, recently dismissed, at Vicars, Quebec. Presented February 25, 1916.—*Mr. Maclean (Halifax). Not printed.*

119. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents, including tenders, relating to the establishment of a rural mail route between Pictou and West River, in the county of Pictou. Presented February 25, 1916.—*Mr. Macdonald*. . . . .*Not printed.*

120. Return to an Order of the House of the 14th Ferbuary, 1916, for a return showing the different rural mail routes in the constituency of Qu'Appelle, their location and date of establishment, and all rural mail routes now being established or under consideration at the present time in the same constituency. Presented February 25, 1916.—*Mr. Thomson (Qu'Appelle)* . . . .*Not printed.*

121. Return to an Order of the House of the 3rd February, 1916, for a copy of all documents, letters, messages, correspondence and reports concerning the contract for carrying the mails between the post office at Saint Jean, P.Q., and the railway stations of the Canadian Pacific Railway Company, the Grand Trunk Railway Company and the Vermont Central Railroad Company since and during the year 1911. Presented February 25, 1916.—*Mr. Demers*. . . . .*Not printed.*

122. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents, including tenders, relating to the establishment of the rural mail route from Eureka to Sunnybrae and return, in the county of Pictou. Presented February 25, 1916.—*Mr. Macdonell*. . . . .*Not printed.*

123. Return to an Order of the House of the 16th February, 1916, for a copy of all telegrams, letters, petitions, and of all documents of all kinds, in any way referring to the awarding of the contract for carrying the mail to Upper Margaree Post Office and Gillies Post Office. Presented February 25, 1916.—*Mr. Chisholm (Inverness)*. . . . .*Not printed.*

124. Return to an Order of the House of the 16th February, 1916, for a copy of all telegrams, letters, petitions, and of all documents of all kinds in any way referring to the awarding of the contract for carrying the mail to Margaree Harbour and Cheticamp. Presented February 25, 1916.—*Mr. Chisholm (Inverness)*. . . . .*Not printed.*

125. Return to an Order of the House of the 8th March, 1915, for a return showing the amounts of money expended, in construction work or repairs, apart from salaries paid to permanent or yearly officials or employees in the Departments of Public Works, Railways and Canals, Militia and Defence, Marine and Fisheries, and Agriculture, within the county of Cumberland, during the fiscal years 1896 to 1911, both inclusive, together with the particular purpose of each expenditure, and where expended. Presented February 28, 1916.—*Mr. Rhodes*. . . . .*Not printed.*

126. Revenues of Canada for years 1909-10-11, also amounts voted for agriculture in years 1909-10-11.—*(Senate)* . . . .*Not printed.*

127. Return to an Order of the House of the 3rd February, 1916, for a copy of the investigation held on the loss of a horse belonging to Louis de Gonzague Belzile, of Amqui, county of Matane, during the year 1915. Presented March 1, 1916.—*Mr. Boulay. Not printed.*

128. Return to an Order of the House of the 3rd February, 1916, for a copy of the report of the investigation held in the case of Messrs. Nazaire Morin and Napoléon Hébert, of Ste. Florence, county of Matane, bearing the number 10083 of the records of Mr. Alward, of Moncton. Presented March 1, 1916.—*Mr. Boulay*. . . . .*Not printed.*

129. Return to an Order of the House of the 3rd February, 1916, for a copy of the report of the investigation held in connection with the burning of the barn of George Lavoie, a farmer at Bic, on the 23rd May, 1914. Presented March 1, 1916.—*Mr. Boulay. Not printed.*

130. Return to an Order of the House of the 3rd February, 1916, for a copy of the investigation held from 1911 to 1913 concerning the loss of a horse, at Lac au Saumon on the Intercolonial Railway by J. S. Théberge. Presented March 1, 1916.—*Mr. Boulay. Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

131. Return to an Order of the House of the 7th February, 1916, for a copy of all letters, telegrams, evidence of witnesses at the investigation, and reports thereon, in relation to the claim of Alexandre D. Doucet, of Beresford, N.B., for cattle killed on the Intercolonial Railroad on May 25, 1915. Presented March 1, 1916.—*Mr. Turgeon.* *Not printed.*

132. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams, correspondence and agreements between the Department of Railways and Canals, and any official thereof, including the officials of the Intercolonial Railway, regarding the installation of the McQueen Siding, so-called, at Shediac, in the province of New Brunswick, and the subsequent removal thereof. Presented March 1, 1916.—*Mr. Carvell*.. .. ..*Not printed.*

132*a*. Supplementary Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams, correspondence and agreements between the Department of Railways and Canals, and any official thereof, including the officials of the Intercolonial Railway, regarding the installation of the McQueen Siding, so-called, at Shediac, in the province of New Brunswick, and the subsequent removal thereof. Presented March 23, 1916.—*Mr. Carvell*.. .. ..*Not printed.*

133. Return to an Order of the House of the 7th February, 1916, for a return showing:—1. The names, post office addresses, rate of wages and gross amount paid during the year 1915, to all engineers and employees of every description, engaged in connection with the survey of a branch line of the Intercolonial Railway in Guysborough County. 2. The gross expenditure in any way connected with the survey referred to in paragraph one since October, 1911. Presented March 1, 1916.—*Mr. Sinclair*.. .. ..*Not printed.*

134. Return to an Order of the House of the 3rd February, 1916, for a copy of all documents, letters and petitions in the possession of the Railway Department relating to the dismissal of Wm. P. Mills, Bridge and Building Master of District Number 4, Intercolonial Railway; and also a copy of all letters, telegrams, petitions and documents of all kinds in the possession of the Government either in Ottawa or at Moncton, relating in any way to the application of said Wm. P. Mills for an investigation into the causes which led to his dismissal. Presented March 1, 1916.—*Mr. Chisholm (Inverness).* *Not printed.*

135. Return to an Order of the House of the 7th February, 1916, for a return showing the names and salaries of all the officials, assistants and clerks employed in the Intercolonial Railway offices in Moncton, including the assistant superintendent's office, dispatcher's office, station and freight house, the names and salaries of the foremen employed in each of the shops, and also the names of all officials, clerks, engine drivers and conductors who have been retired and placed on the pension list since the first of January, 1915, with the amount of the annual retiring allowance to each. Presented March 1, 1916.—*Mr. Copp*.. .. ..*Not printed.*

136. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, papers, evidence, reports and all other documents relating to the investigation into certain alleged irregularities in the weighing of freight on the Intercolonial Railway at Stellarton and New Glasgow in 1914 and 1915, and the dismissal of Arthur McLean in connection therewith. Presented March 1, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

137. Return to an Order of the House of 3rd February, 1916, for a copy of all telegrams, letters and other documents in connection with repairs to wharf at Shag Harbour, Shelburne County, N.S., during the years 1915 and 1916. Presented March 1, 1916.—*Mr. Law*.. .. ..*Not printed.*

138. Return to an Order of the House of the 7th February, 1916, for a copy of all letters, telegrams and other papers or documents in the possession of the Department of Public Works relating to a request made by the Nova Scotia Historical Society for permission to place a memorial tablet commemorating the late Reverend Dr. James MacGregor, on the post office building, New Glasgow, N.S. Presented March 1, 1916.—*Mr. Sinclair.*

139. Return to an Order of the House of the 8th February, 1916, for a return showing:—1. Who had the contract or contracts for supplies, meats and other provisions required for the dredges of the Department of Public Works, working in the East River of Pictou or elsewhere in Pictou County, during the years 1914 and 1915, respectively. 2. Amounts paid respectively to each of said tenderers. Presented March 1, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

140. Return to an Order of the House of the 7th February, 1916, for a return showing all sums of money expended during the present fiscal year to December 31, 1915, by the Department of Public Works, respectively, for public buildings, harbours and rivers, roads and bridges, telegraph and telephone lines, dredging, and for miscellaneous purposes, chargeable to income, showing said expenditure under the above headings and by provinces. Presented March 1, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

141. Return to an Order of the House of the 7th February, 1916, for a return of all sums of money expended, respectively, during the present fiscal year by the Department of Public Works, chargeable to capital account, for public buildings and harbours and rivers, by provinces, designating in detail the purposes of such expenditure. Presented March 1, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

142. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents in connection with the purchase of a site for the post office building at Bear River, N.S. Presented March 1, 1916.—*Mr. Law*.. .. ..*Not printed.*

143. Return to an Order of the House of 7th February, 1916, for a copy of all letters, papers, telegrams, pay-sheets, pay-rolls, receipts and documents of all kinds whatsoever in connection with the extension or repairs on the public breakwater at Port Morien, in South Cape Breton, during 1915. Presented March 1, 1916.—*Mr. Carroll*.. .. ..*Not printed.*

144. Return to an Order of the House of 16th February, 1916, for a copy of all letters, telegrams and correspondence between the Department of Marine and Fisheries, or any official thereof, and any person or persons in reference to the proposed retirement from office of the present keeper of the lighthouse at Cape Jourmain, in the county of Westmorland. Presented March 1, 1916.—*Mr. Copp*.. .. ..*Not printed.*

145. Return to an Order of the House of 7th February, 1916, for a copy of all correspondence between the Department of Militia and Defence or any of its branches, and the Department of Agriculture, in reference to the using of the immigration or quarantine buildings at McNab's Island and Lawlor's Island, Halifax, N.S., for military purposes, and particularly for their use by the 63rd Regiment, Overseas Contingent. Presented March 1, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

146. Return to an Order of the House of 7th February, 1916, for a return showing the names of all medical officers appointed and employed for immigration or quarantine purposes at Halfax, St. John, Quebec, Montreal, Toronto, Winnipeg, Regina, Calgary, Edmonton, Vancouver and Victoria, together with the date of appointment of each, their salary, and in each case designating whether they or any of them are still in the service of the Government, and when not, the date when the service ceased. Presented March 1, 1916. —*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

147. Return to an Order of the House of the 3rd February, 1916, for a return showing:—1. The names of the different tenderers for the carrying of the mails from the rural boxes established in the counties of l'Assomption and Montcalm down to the present day. 2. The figure of each of such contracts, and the name of the tenderer to whom each of such contracts has been awarded, and for what sum. 3. If any contracts were given without tender. If so, to whom, and for what amount. Presented March 2, 1916.— *Mr. Seguin*.. .. ..*Not printed.*

148. Return to an Order of the House of the 21st February, 1916, for a copy of all correspondence and telegrams exchanged between the Labour Department and the workingmen at Thetford Mines prior, during, or after the last strike in that vicinity, and of all other papers relating thereto. Presented March 2, 1916.—*Mr. Verville*.. .. .. ..*Not printed.*

149. Fenian Raid Bounties—to whom paid in Queens County, N.S.—(*Senate*).. ..*Not printed.*

150. Return to an Address to His Royal Highness the Governor General, of the 3rd February, 1916, for a copy of all Orders in Council passed since 4th August, 1914, dealing with members of the Canadian Expeditionary Forces in the following particulars: Pensions to partially or totally disabled soldiers or their dependents; money allowances or other provision made for the support or care of partially or totally disabled returned soldiers; and pay allowances or other consideration to dependents of soldiers while on active service, and after their return from active service, because of disablement from any cause. Presented March 3, 1916.—*Mr. Oliver*.. .. ..*Printed for sessional papers only.*

151. Return to an Order of the House of the 3rd February, 1916, for a return showing the names of all medical officers employed and designated in the years 1914 and 1915, in the examination of recruits in the county of Pictou, and of any changes in the list of said officers in said period. Presented March 3, 1916.—*Mr. Macdonald*.. ..*Not printed.*

152. Return to an Order of the House of the 4th March, 1915, for a return showing the names and addresses of all persons in Annapolis and Digby Counties, Nova Scotia, to whom the bounty under the Fenian Raid Volunteer Bounty Act has been paid; the names and addresses of all persons from said counties whose applications have been rejected; and the names and addresses of all applicants from said counties whose applications have not been disposed of. Presented March 3, 1916.—*Mr. Law*.. .. ..*Not printed.*

153. Return to an Order of the House of the 19th February, 1915, for a return showing the names and addresses of all persons in South Cape Breton, Nova Scotia, who have been paid Fenian Raid Bounty; the names and addresses of all persons in South Cape Breton, N.S., who have made application for said bounty and who have not yet received it. Presented March 3, 1916.—*Mr. Carroll*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

154. Return to an Order of the House of the 1st March, 1915, for a return showing the names and addresses of all persons who received bounty. Raid Bounty was paid in the county of Halifax, N.S., to date. Presented March 3, 1916.—*Mr. Maclean (Halifax).* *Not printed.*

155. Return to an Order of the House of the 31st March, 1915, for a copy of all applications received for Fenian Raid Bounty from residents of the county of Hants, N.S.; also the names of persons who have been paid the bounty and those who have been refused it in said county; with the reasons for refusal, and showing the number of applications that have not yet been dealt with. Presented March 3, 1916.—*Mr. Chisholm (Inverness)*.. .. .. *Not printed.*

156. Return to an Order of the House of the 22nd March, 1915, for a return showing the names and addresses of all persons who received bounty under the provisions of the Fenian Raid Volunteer Bounty Act, in respect of services rendered in the county of Richmond, Nova Scotia; and the names and addresses of all whose claims for bounty have been rejected, and the reasons for rejecting the same. Presented March 3, 1916.—*Mr. Kyte*.. .. .. *Not printed.*

157. Return to an Order of the House of the 23rd February, 1916, for a return showing the names of all shell inspectors employed in and about the Nova Scotia Steel Company, and the other factories producing shells at New Glasgow, in the county of Pictou. Presented March 3, 1916.—*Mr. Macdonald*.. .. .. *Not printed.*

158. Return to an Order of the House of the 16th February, 1916, for a list of the permanent and other employees on the Soulanges Canal in 1910, with the salary of each of them; also a list of the employees, permanent or otherwise, in 1915, and the salary of each of them. Presented March 3, 1916.—*Mr. Boyer*.. .. .. *Not printed.*

159. Unclaimed balances in the banks for patriotic purposes. Correspondence relating to.—*(Senate)*.. .. .. *Not printed.*

160. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents in connection with repairs, upkeep and watchman's services on patrol boat A, *Captain Blackford,* while laid up at Shelburne, N.S., during the month of December, 1914, and subsequent months until ready for sea in 1915. Presented March 6, 1916.—*Mr. Law*.. .. .. *Not printed.*

161. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents in detail, showing expenses, mileage and disbursements of Joseph W. V. Wilson, of Barrington, N.S., as fishery guardian in Shelburne, N.S., during year 1915. Presented March 6, 1916.—*Mr. Law*.. .. .. *Not printed.*

162. Return to an Address to His Royal Highness the Governor General, of the 3rd February, 1916, for a copy of all Orders in Council, letters, telegrams, reports and other documents in connection with the commandeering of wheat about the 27th November, 1915, and in connection with the disposal of such wheat. Presented March 6, 1916.—*Mr. Knowles* *Not printed.*

162*a*. Supplementary Return to an Address to His Royal Higness the Governor General of the 3rd February, 1916, for a copy of all Orders in Council, letters, telegrams, reports and other documents in connection with the commandeering of wheat about the 27th November, 1915, and in connection with the disposal of such wheat. Presented March 10, 1916.—*Mr. Knowles*.. .. .. *Not printed.*

163. Return to an Order of the House of the 21st February, 1916, for a return showing the different rural mail routes in the constituency of Regina, their location and date of establishment, and all rural routes under consideration at the present time in said constituency. Presented March 7, 1916.—*Mr. Martin (Regina)*.. .. .. .. *Not printed.*

164. Return to an Order of the House of the 7th February, 1916, for a copy of all tenders, offers, letters, telegrams, engineer's reports and other documents relating to the construction of a breakwater or boat harbour at North Lake, Prince Edward Island. Presented March 7, 1916.—*Mr. Hughes, (Kings, P.E.I.)*.. .. .. *Not printed.*

165. Return to an Order of the House of the 23rd February, 1916, for a return showing the names of all persons who worked at the repairing of the wharf at Rivière Ouelle during the summer of 1915 with a statement of their occupations and the amounts paid to them, respectively. Presented March 7, 1916.—*Mr. Lapointe (Kamouraska)*.. .. *Not printed.*

166. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams and other documents relative to repairs on the *Hanlover* at Cape Negro, Shelburne County, N.S., in 1915. Presented March 7, 1916.—*Mr. Law*.. .. .. *Not printed.*

167. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, papers, pay-rolls, telegrams and correspondence in connection with the expenditure of, and receipts and vouchers for moneys paid for, the building of a wharf or blocking at the head of Belleville, Yarmouth County, N.S. Presented March 7, 1916.—*Mr. Law.* *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

168. Return to an Order of the House of the 16th February, 1916, for a copy of all letters, petitions, correspondence and telegrams, exchanged between the Government, its resident engineer of the district, and all other persons concerning the construction of a bridge between Ile Perrot and Ste. Ann de Bellevue, and Ile Perrot and Vaudreuil. Presented March 7, 1916.—*Mr. Boyer*.. .. ..*Not printed.*

169. Return to an Order of the House of the 21st February, 1916, for a copy of all letters and correspondence between A. Bellemare, Esq., M.P., and the Government, or any member thereof, in connection with the construction of the post office at Louiseville. Presented March 7, 1916.—*Mr. Gauvreau*.. .. ..*Not printed.*

170. Return to an Order of the House of the 21st February, 1916, for a return showing the amounts spent for the furnishing of the office of the Hon. E. Patenaude, Minister of Inland Revenue; with a copy of all invoices. And also a statement of the amounts spent for the furnishing of the office of the Hon. W. B. Nantel, when Minister of Inland Revenue; with a copy of all invoices. Presented March 7, 1916.—*Mr. Lanctot.*
Not printed.

171. Return to an Order of the House of the 3rd February, 1916, for a copy of all documents, title deeds, papers, notarial deeds or private writings in connection with the sale, donation or transfer, by the estate of Alex. Fraser, of Rivière du Loup, to the Government or the Railway Department, for the Intercolonial, the lot of land or part of the lot of land, at the east of the Intercolonial bridge at Rivière du Loup, at a place called Gauvreau Yard; also of all correspondence in this connection. Presented March 7, 1916.—*Mr. Gauvreau*.. .. ..*Not printed.*

172. Report of the Federal Plan Commission on a general plan for the cities of Ottawa and Hull, 1915. Presented by Sir Robert Borden, March 10, 1916.. .. ..*Not printed.*

173. Return to an Order of the House of the 3rd February, 1916, for copies of all telegrams, letters, petitions, correspondence and other documents whatsoever relating to the post office and the postmaster of the Parish of St. Esprit, in the county of Montcalm, from October, 1911, to the present day. Presented March 10, 1916.—*Mr. Seguin.*
Not printed.

174. Return to an Order of the House of the 16th February, 1916, for a copy of all telegrams, letters, petitions and documents of all kinds, in any way referring to the awarding of the contract for carrying the mail from Inverness to Margaree Harbour. Presented March 10, 1916.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

175. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, papers, telegrams and documents of all kinds whatsoever in connection with the tenders and awarding of the contract for carrying the mails between the tram cars and the post office at Glace Bay, South Cape Breton. Presented March 10, 1916.—*Mr. Carroll.*
Not printed.

176. Return to an Order of the House of the 7th February, 1916, for a copy of all papers, memoranda, correspondence, reports, etc., in connection with the dismissal of John E. Hallamore, as postmaster at Upper New Cornwall, Lunenburg County, N.S. Presented March 10, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

177. Return to an Order of the House of the 16th February, 1916, for a copy of all telegrams, letters, petitions, and of all documents of all kinds in any way referring to the awarding of the contract for carrying the mail to Eastern Harbour and Pleasant Bay. Presented March 10, 1916.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

178. Return to an Order of the House of the 21st February, 1916, for a detailed statement of all war orders obtained by the Dominion Steel Corporation of Sydney, Nova Scotia. Presented March 10, 1916.—*Mr. Lemieux*.. .. ..*Not printed.*

179. Return to an Order of the House of the 21st February, 1916, for a copy of the war orders given to the Montreal Street Railway Company. Presented March 10, 1916.— *Mr. Fortier*.. .. ..*Not printed.*

180. Report of the International Commission pertaining to the St. John river. Presented by Hon. Mr. Rogers, March 10, 1916.. .. ..*Printed for sessional papers only.*

181. Return to an Order of the House of the 21st February, 1916, for a detailed statement of all the wrecks which have taken place on the St. Lawrence river from 1867 until 1916, inclusive. Presented March 13, 1916.—*Mr. Lemieux*.. .. ..*Not printed.*

182. Return to an Address to His Royal Highness the Governor General of the 3rd February, 1916, for a copy of all Orders in Council, letters, telegrams, reports and other documents regarding the proposed public building in Prince Rupert for post office and other purposes, and regarding the land proposed for such public building and the purchase of such land. Presented March 13, 1916.—*Mr. Knowles*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

183. Return to an Address to His Royal Highness the Governor General of the 7th February, 1916, for a copy of the Order in Council or departmental order dismissing Mr. Bayfield from the position of Superintendent of Dredging in British Columbia; and also a copy of the Order in Council or departmental order appointing J. L. Nelson in his place. Presented March 13, 1916.—*Mr. Pugsley*.. .. ..*Not printed.*

184. Return to an Order of the House of the 23rd February, 1916, for a copy of all reports and documents concerning the surveys made by the Federal Government during the autumn of 1914 of Lake Matapedia and the river of the same name down to the village of Amqui. Presented March 13, 1916.—*Mr. Lapointe (Kamouraska)*.. ..*Not printed.*

185. Return to an Order of the House of the 13th March, 1916, for a copy of the pension list in force in Canada for disabled soldiers and of all petitions, letters or other documents relating to the amendment or readjustment of the same. Presented March 14, 1916.—*Printed for distribution and sessional papers.*

186. Return to an Order of the House of the 16th February, 1916, for a copy of all letters, petitions, correspondence and telegrams between the Government, the engineers, and all other persons concerning the building of the post office at Rigaud; also of the amounts of money paid to divers persons for such building, furnishing, the land, the care of the grounds and other works. Presented March 15, 1916.—*Mr. Boyer*.. .. ..*Not printed.*

187. Return to an Order of the House of the 6th March, 1916, for a return showing the different rural mail routes in the constituency of Medicine Hat, with their location and date of establishment; and also all rural mail routes now being established or under consideration at the present time in the same constituency. Presented March 15, 1916. —*Mr. Buchanan*.. .. ..*Not printed.*

187*a*. Return to an Order of the House of the 20th March, 1916, for a return showing:—1. The reason for the delay in the establishment of the rural mail routes, reported under consideration, in the constituency of Medicine Hat. 2. When these routes were first applied for. 3. If the applications possessed the required number of signatures. 4. If tenders have been invited. If so, for what routes. 5. Why the lowest tenders were not accepted, and the routes established. 6. If any tenders are being invited for these routes. 7. If there is a likelihood of any of these routes being operated immediately. Presented March 27, 1916.—*Mr. Buchanan*.. .. ..*Not printed.*

188. Return to an Order of the House of the 21st February, 1916, for a copy of all letters, telegrams, investigations and reports relating to the dismissal of Joseph Fleming, conductor Intercolonial Railway, and in regard to his reinstatement. Presented March 16, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

189. Return to an Order of the House of the 18th March, 1915, for a copy of all petitions, telegrams, communications and other documents relating to the dismissal of Mr. Hubert Paquin, postmaster of St. Gilbert de Portneuf. Presented March 16, 1916.—*Mr. Delisle.* *Not printed.*

190. Return to an Order of the House of the 16th February, 1916, for a copy of all letters, petitions, correspondence and telegrams, exchanged between the Government, its Inquiry Commissioner, Mr. G. H. Bergeron, and all other persons, concerning the inquiry, the dismissal and replacing of the postmasters of the different post offices mentioned below; and of all correspondence relating to the appointments of the present postmasters who replace the former ones, who had been either dismissed or replaced for one reason or another:—St. Lazare Village, Vaudreuil Station, Pointe Fortune, Val des Eboulis, Mont Oscar, St. Justine de Newton, Ste. Marthe. Presented March 16, 1916.—*Mr. Boyer.* *Not printed*

191. Dismissal of Mr. Chisholm, Inspector of Indian Agencies, Saskatchewan.—(*Senate*). *Not printed.*

192. Return to an Order of the House of the 28th February, 1916, for a return showing:—1. The names, rank and military qualifications of the officers on the Headquarters Staff of the 1st, 2nd and 3rd Divisional Areas, including those on Staffs of Camps and Schools of Instruction, on October 1, 1915. 2. The names of those of the above who on that date had volunteered, taken the oath and been attested for overseas service. Presented March 20, 1916.—*Mr. Proulx*.. .. ..*Not printed.*

193. Return to an Order of the House of the 21st February, 1916, for a return showing:—1. How many persons have been employed by the Department of Militia since the beginning of the war in the examining, appraising or testing of materials, such as clothing, harness, etc., purchased for military purposes. 2. How many of such employees are practical trades people, experts, or otherwise experienced persons in the respective callings connected with the various materials as purchased. Presented March 20, 1916.—*Mr. Verville*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

194. Return to an Order of the House of the 6th March, 1916, for a copy of all telegrams, letters, petitions and documents of all kinds referring in any way to the application of Mrs. Flora McIntyre, of River Dennis, Inverness County, N.S., for the Fenian Raid Veteran Bounty of her late husband, Angus McIntyre, late of River Dennis. Presented March 20, 1916.—*Mr. Chisholm (Inverness)*.. .. ..*Not printed.*

195. Return to an Order of the House of the 13th March, 1916, for a return showing:—1. The names, dates of appointment, post office addresses at time of appointment, and former occupations of the censors employed by the Militia Department at Louisburg and North Sydney, Nova Scotia. 2. The names of all the said censors who are also decoders, and the names and addresses of all who are employed in the censorship service at the above points. 3. The amount paid to each censor or decoder since the 4th of August, 1914, up to the 1st February, 1916, or to any party or person in connection with the censorship, or decoding services at the above places. Presented March 20, 1916.—*Mr. McKenie.*
Not printed.

196. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams, agreements and all other papers relative to the creation of a Board of Conciliation, during the year 1915, under the Industrial Disputes Investigation Act in regard to the employees of the Nova Scotia Steel Company, in the county of Pictou. Presented March 20, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

197. Return to an Order of the House of the 6th March, 1916, for a list of the employees in the Dominion Police Force, with the salary of each of them. Presented March 20, 1916. —*Mr. Boulay*.. .. ..*Not printed.*

198. Return showing:—1. Whether the Government have taken cognizance of the following article published in the Montreal "Gazette" on November 1, 1915:—"Canadian Help Comes from Sale of Gift Flour. Foodstuffs not Needed by the English Poor were Bought for Belgian Relief.—Funds to Aid East Coast.—Hon. Walter Long Suggested to Canadian Government that $750,000 be Allotted, and Latter Agreed.—(Special cable from the "Gazette's" resident staff correspondent.)

"London, October 31,—'Canada's aid to the east coast towns of England, which are suffering through the war, is the subject of some misconception,' said Sir George Perley to-day. In a statement in the Commons, Hon. Walter Long said that the necessary funds for a Government scheme of help for hotel and lodging house keepers had been generously provided by the Canadian Government. This gave rise to the idea that the Dominion was taking a new step, but the fact is that no money is coming from Canada. Of the flour sent by Canada a year ago to relieve distress in England, very little was distributed, as poverty was in no way abnormal. Some 400,000 bags of this flour were transferred to the American committee for Belgian relief, which purchased them. The money paid for this flour being in the hands of the Local Government Board, Hon. Walter Long, as President of the Board, suggested to Sir George Perley that this might be utilized for the relief of the east coast towns where the season had been ruined owing to the lack of railway facilities and the disinclination of the public to visit the east coast because of the possibility of German naval or aerial raids. The Dominion Government acquiesced in this proposal, and the sum of $750,000, part of the proceeds of the sale of the flour, has now been allotted for this purpose. Canada's generosity will therefore go to alleviate the distress of a large number of better-class people, who are direct sufferers from the war, instead of the destitute poor, for whom it was intended, but who, it develops, were not in need of it." 2. Whether the said article is accurate. If not, in what respect it is inaccurate. Presented March 20, 1916.—*Mr. Papineau.*
Not printed.

198*a*. Return showing:—1. Whether the Government is aware that the following extract from an article was published on the 12th January, 1915, in the Montreal "Gazette":—

"Distress Caused in England by War is Negligible.—Comparatively Small Portion of Colonial Gifts Used for National Relief.—Much Went to Belgians.—War Office also took Large Share.—Salvation Army has Scheme Requiring Canadian Co-operation.—(Special cable from the "Gazette's" resident staff correspondent.)

"London, January 11.—Very satisfactory evidence of the comparative absence in England of any distress caused by the war is furnished by a report on the special work of the Local Government Board arising out of the war, which was issued to-day as a White Paper. The action by Noel Kershaw, dealing with the disposition of the gifts from the Colonies, shows that only a small part of the goods allocated has been required for relieving the distress of civilians.

"The following is the disposition of the 940,530 bags of flour received from Canada: To the local committees for the relief of distress, 90,474; to the Belgian Refugees Committees, 1,691; transferred to the War Office, 99,760; further offer to the War Office, 300,000; to the Belgian Relief Commission, 443,886; sold, owing to damage, 4,719." 2. Who had charge of accepting delivery and the shipping of this flour. 3. Whether the Government have any information of the shortage of 59,430 bags of flour, alleged in said article. If not, what became of the flour that was short. Presented March 20, 1916.—*Mr. Papineau*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

199. Return to an Order of the House of the 6th March, 1916, for a return showing the amounts contributed from the constituency of Medicine Hat for machine guns, and by whom contributed or forwarded. Presented March 21, 1916.—*Mr. Buchanan*.. ..*Not printed.*

200. Return to an Order of the House of the 13th March, 1916, for a copy of all letters, petitions, recommendations and other documents in the possession of the Post Office Department relating to the appointment of the postmaster at West Roachdale, Guysborough County, Nova Scotia, to take the place of J. H. McGuire, deceased. Presented March 21, 1916.—*Mr. Sinclair*.. .. ..*Not printed.*

201. Return to an Order of the House of the 28th February, 1916, for a return showing in detail the payment or payments amounting to $647.50, paid to P. A. Stoddart, fishery guardian, Shelburne County, N.S., during the year ending March 31, 1915. Presented March 21, 1916.—*Mr. Kyte*.. .. ..*Not printed.*

202. Return to an Order of the House of the 28th February, 1916, for a copy of all correspondence, letters, telegrams and documents of all kinds relating to the chartering of the vessel *Starling*, by the Department of Marine and Fisheries. Presented March 21, 1916. *Mr. Kyte*.. .. ..*Not printed.*

203. Return to an Order of the House of the 7th February, 1916, for a copy of all documents, letters, messages, correspondence and reports concerning a conference between the Minister of Agriculture and certain representatives of the Mennonite Church in or about July, 1873, and referred to in a certain letter dated 23rd July, 1873, signed by P. M. Lowe, Secretary of the Department of Agriculture, and addressed to Messrs. David Klassen, Jacob Peters, Heinrich Wiebe and Cornelius Toews, delegates from Southern Russia. Presented March 21, 1916.—*Mr. McCraney*.. .. .. ..*Not printed.*

204. Return to an Order of the House of the 13th March, 1916, for a copy of all letters, telegrams, petitions, memorials and other documents relating to the subsidizing by the Government of the construction of ships in British Columbia, or of ships when built; or as to the laying down or constructing or assisting in the construction in British Columbia of twenty-five ships by the Government, or as to assisting by subsidies or otherwise in the construction of ships in the Dominion. Presented March 23, 1916.—*Mr. Macdonald.* *Not printed.*

205. Return to an Order of the House of the 13th March, 1916, for a copy of the affidavit of David W. McLean, Windsor, N.S., to whom Warrant No. 25737 was issued for Fenian Raid Bounty, and also a copy of all correspondence and other documents relating to the payment of the same. Presented March 23, 1916.—*Mr. Macdonald*. .. ..*Not printed.*

206. Return to an Order of the House of the 9th March, 1916, for a return showing:—1. The amount collected in wharfage on goods landed on Government wharves in the county of Victoria, at Neils Harbour, Ingonish, Englishtown, South Gut, Baddeck, Little Narrows, Nyaiga, and Big Bras d'Or. 2. The amount collected at each of the above places, by whom collected, and how much returned to the Government in each case. Presented March 27, 1916.—*Mr. McKenzie*.. .. ..*Not printed.*

207. Return to an Order of the House of the 20th March, 1916, for a return showing:—The names of the 54 Canadian officers employed in the Canadian Pay and Record Office, London, and amounts per month paid to each of them. Presented March 27, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

208. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams, petitions, directions and other documents relative to the surveys for a railway under the Railway Department, which have been carried on during the past summer, at points east and west from Sunnybrae, in the county of Pictou. Presented March 27, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

209. Return to an Order of the House of the 21st February, 1916, for a copy of all papers, agreements, letters, telegrams and other documents relating to the proposal to purchase, lease, or use of, the railway known as the Vale Railway, county of Pictou, and to the operation of the same by the Railway Department. Presented March 27, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

210. Return to an Order of the House of the 7th February, 1916, for a return showing the number and purpose of all commissions appointed by the Government since 1911, and the cost of each, together with names of the various members of such commissions. Presented March 27, 1916.—*Mr. Pardee* .. ..*Not printed.*

211. Return to an Order of the House of the 6th March, 1916, for a copy of all correspondence, letters, telegrams and documents relating to the dismissal or resignation of Dr W. T. Patton from the service of the Veterinary Inspection Branch of the Department of the Interior, and his re-appointment and his later dismissal or resignation. Presented March 27, 1916.—*Mr. Buchanan* .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

211*a*. Return to an Order of the House of the 3rd April, 1916, for a copy of all correspondence, letters, telegrams and documents relating to the dismissal or resignation of Dr. W. T. Patton, from the service of the Veterinary Inspection Branch of the Department of Agriculture at Coutts, Alberta, and his re-appointment and later dismissal or resignation. Presented May 10, 1916.—*Mr. Buchanan*.. .. ..*Not printed.*

212. Return to an Order of the House of the 28th February, 1916, for a copy of all accounts, telegrams, letters, bills of costs and other documents relating to the case of J. P. Dionne against the King, before the Exchequer Court, in which case Mr. Leo Bérube was attorney and Mr. E. H. Cimon was counsel, both being lawyers of Fraserville. Presented March 27, 1916.—*Mr. Gauvreau*.. .. ..*Not printed*

212*a*. Return to an Order of the House of the 5th April, 1916, for a copy of all telegrams and letters from Leo Berube, lawyer, M.P.P., to the Minister of Justice, relating to the production of the official and public documents asked for by C. A. Gauvreau, M.P., in the case of J. P. Dionne vs. The King, and of any answers of the Minister of Justice to such telegrams and letters. Presented April 10, 1916.—*Mr. Gauvreau*.. .. ..*Not printed*

213. Return to an Address to His Royal Highness the Governor General, of the 7th February, 1916, for a copy of all correspondence with the Imperial authorities in connection with the purchase of horses, and the prohibiting of the export of horses. Presented March 27, 1916.—*Sir Wilfrid Laurier*.. .. ..*Not printed.*

214. Return to an Order of the House of the 1st March, 1916, for a copy of all correspondence, telegrams, reports and documents of all kinds relating to the visits of a fair wage officer to New Glasgow, N.S., in connection with the schedule of wages of men employed in works making shells at that place. Presented March 28, 1916.—*Mr. Macdonald.*
Not printed.

215. Copy of Order in Council P.C. No. 634, dated 24th March, 1916, *re* the prohibition of the exportation of certain goods including nickel, nickel ore and nickel matte, to certain foreign ports. Presented by Sir Robert Borden, March 28, 1916.
Printed for sessional papers only.

216. Return to an Order of the House of the 6th March, 1916, for a copy of all correspondence, accounts, vouchers, memoranda, etc., relating to the construction of a launch way and boat house at Bear Cove Beach, Halifax County, N.S., and completed in 1914. Presented March 29, 1916.—*Mr. Maclean (Halifax)*.. .. .. ,.*Not printed.*

217. Return to an Order of the House of the 6th March, 1916, for a detailed statement of the expenditure last year at McNair's Cove, Nova Scotia, giving the names of the workmen, the number thus employed, the amount paid to each; also the amount paid for supplies and material, and the names of the persons to whom the same was paid. Presented March 29, 1916.—*Mr. Chisholm (Antigonish)*.. .. ..*Not printed.*

218. Return to an Order of the House of the 6th March, 1916, for a copy of all correspondence, accounts, vouchers, receipts, etc., in connection with the construction of a wharf at Shad Bay, Halifax County, N.S., in 1914 and 1915. Presented March 29, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

219. Return to an Order of the House of the 16th March, 1916, for a return showing:—1. Whether the Government has received any complaints as to the manner of supplying clothing to the Royal Military College, or as to its fit, workmanship or materials employed, or as to any delay in furnishing the cadets with clothing. 2. If so, from whom such complaints have been received. 3. On what grounds. 4. What form the complaint was in. 5. The nature of the complaint. 6. If the Government is aware as to whether or not there has been dissatisfaction as to the fit, workmanship and materials employed, or as to any delay in furnishing the cadets with clothing. 7. If it is true, as alleged, that the late Commandant of the Royal Military College, Colonel Crowe, before he left, recommended a change of system for the supply of clothing, and outlined the features of such a system. 8. If so, the details of the plan suggested. 9. To what extent the plan suggested by Colonel Crowe was adopted. If not adopted, why not. 10. Whether the present Commandant of the Royal Military College made any suggestions as to a change in the system of supplying clothing to the cadets. 11. If so, the changes which he suggested. Presented March 30, 1916.—*Mr. Carvell.*
Not printed.

220. Escape of alien enemies from detention camps at Amherst, N.S.—(*Senate*)..*Not printed.*

221. Return to an Order of the House of the 21st February, 1916, for a copy of all letters, petitions, papers, telegrams, tenders and other documents relating to the establishment of a rural mail route from Alma, through Sylvester and Loch Broom, and as to the closing of the post offices at Sylvester and Loch Broom. Presented March 31, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

222. Return to an Order of the House of the 3rd February, 1916, for a copy of all petitions, letters, papers, telegrams, tenders and other documents relating to the establishment of rural mail route from Scotsburn to North Scotsburn, Rogers Hill and Hardwood Hill, and as to the closing of any post offices on said route. Presented March 31, 1916.—*Mr. Macdonald*. . . . . *Not printed.*

223. Return to an Order of the House of the 9th February, 1916, for a copy of all documents, letters, messages, correspondence, reports, etc., regarding the cancellation of the subsidy contract to the Compagnie de Navigation Trans-St. Laurent, and the granting of a like contract to another company, for service between Rivière du Loup, Tadoussac and other ports on the north shore, including all correspondence exchanged between the Department of Trade and Commerce, the Post Office Department, or the ministers of such departments and the two above-named companies. Presented April 3, 1916.—*Mr. Gauvreau*. . . . . *Not printed.*

224. Return to an Order of the House of the 7th February, 1916, for a return showing the amounts expended by the Post Office Department for that part of the present fiscal year ending 31st December, 1915, under the following subheads: Conveyance of mails by land; conveyance of mails by railways; conveyance of mails by steamboats; making and repairing mail bags, locks, etc.; rural mail boxes, salaries, travelling expenses, manufacturing postage stamps and postage notes, tradesmen's bills, stationery, printing and advertising, miscellaneous disbursements, and maintenance of the service in the Yukon. Also showing the revenue for the same period under the various sub-heads of revenue mentioned in Appendix "A" of the report of the Postmaster General for the year ending March 31, 1915. Presented April 3, 1916.—*Mr. Maclean (Halifax). Not printed.*

225. Return to an Order of the House of the 21st February, 1916, for a copy of a petition from the citizens of Louisville, requesting that L. F. Sanfaçon be not dismissed from his position of postmaster of that town; also of all letters sent by A. Bellemare, M.P., in connection with the dismissal of said L. F. Sanfaçon and asking for such dismissal; and of all letters from the same A. Bellemare, M.P., recommending Chas Ed. Lasage as postmaster in the place of the said L. F. Sanfaçon. Presented April 3, 1916.—*Mr. Gauvreau*. . . . . *Not printed.*

226. Return to an Order of the House of the 23rd February, 1916, for a copy of all documents, reports, correspondence, etc., relating to the changing of St. Eleuthère Station on the National Transcontinental Railway. Presented April 3, 1916.—*Mr. Lapointe (Kamouraska)*. . . . . *Not printed.*

227. Return to an Order of the House of the 13th March, 1916, for a copy of all instructions, letters, telegrams, and of other documents relating to any action taken, or to be taken, against the firm of Jas. W. Cumming, by the Department of Railways on account of the disclosures made in regard to irregularities in the weighing of freight, as appears in Return No. 25, dated February 29, 1916. Presented April 3, 1916.—*Mr. Macdonald. Not printed.*

228. Certified copy of a Report of the Committee of the Privy Council, approved by His Royal Highness the Governor General on the 3rd April, 1916, respecting the appointment of a Royal Commission to inquire into certain contracts made by a committee (known as the Shell Committee) of which General Sir Alexander Bertram was chairman. Presented by Sir Robert Borden, April 3, 1916. . . . . *Not printed.*

228*a*. Certified copy of a Report of the Committee of the Privy Council, approved by His Royal Highness the Governor General on the 15th April, 1916, concerning the transmission of the Hansard report containing the debate on the motion of Sir Wilfrid Laurier re expenditure made by the Shell Committee (so-called), to the Right Honourable the Secretary of State for the Colonies, together with a copy of the Order in Council approved on the 3rd instant authorizing the issue of a Royal Commission to inquire into certain contracts made by the said Shell Committee (so-called). Presented by Sir Robert Borden, April 17, 1916. . . . . *Not printed.*

229. Return to an Order of the House of the 20th March, 1916, for a copy of all letters, recommendations, telegrams, reports of officials and other documents relating to the appointment of A. Kastella as Mechanical Superintendent of Dredges, and as to his resignation from said office, and also as to causes and reasons of his resignation or removal. Presented April 4, 1916.—*Mr. Macdonald*. . . . . *Not printed.*

230. Return to an Address to His Royal Highness the Governor General, of the 21st February, 1916, for a copy of all letters, telegrams, memos, Orders in Council, reports, and of all and every document concerning the construction of the dam at Grand Mère, county of Champlain, province of Quebec, by the Laurentide Co., Limited. Presented April 4, 1916—*Mr. Lemieux*. . . . . *Not printed.*

231. Memorandum No. 2, respecting work of the Department of Militia and Defence—European War 1914-15, from 1st February, 1915 to 31st January, 1916. Presented by Hon. Mr. Kemp, April 5, 1916. *Printed for sessional papers only.*

CONTENTS OF VOLUME 28—*Continued.*

232. Return to an Order of the House of the 15th March, 1916, for a copy of all letters, telegrams and petitions in the possession or under the control of the Post Office Department having reference to the dismissal of Postmaster McRitchie at North River Centre, Victoria County, Nova Scotia, and to the appointment of Neil McLeod in his place. Presented April 5, 1914.—*Mr. McKenzie*.. .. ..*Not printed.*

233. Return to an Order of the House of the 27th March, 1916, for a copy of all petitions, correspondence, telegrams, recommendations and other papers or documents in the possession of the Postmaster General or his department, relating to the dismissal of James Hall, Postmaster at Milford Haven Bridge, Guysborough County, Nova Scotia, and the appointment of Guy O'Connor, as his successor. Presented April 5, 1916.—*Mr. Sinclair.* *Not printed.*

234. Return to an Order of the House of the 7th February, 1916, for a report showing the apportioning of electoral polling divisions in Manitoba, made by judges under authority of the Dominion Elections Act, 7-8 Edward VII, Chapter 26. Presented April 5, 1916.—*Sir Wilfrid Laurier*.. .. ..*Not printed.*

235. Return to an Order of the House of the 23rd February, 1916, for a copy of all profiles, reports, correspondence and all documents concerning the construction of a viaduct at Amqui, on the Intercolonial Railway, at the place called Traverse Dubé, Dubé Crossing; also of the plans of properties belonging to the Intercolonial Railway at Amqui, and of the land leased to the Municipality of Amqui, with a copy of the lease affecting such land. Presented April 5, 1916.—*Mr. Lapointe* (*Kamouraska*).. .. .. ..*Not printed.*

236. Return to an Order of the House of the 20th March, 1916, for a return showing the number of horses bought for remounts in Alberta, the persons from whom they were purchased, and the amount paid for each horse. Presented April 6, 1916.—*Mr. Buchanan.* *Not printed.*

237. Return to an Order of the House of the 15th March, 1916, for a return showing:—1. Who has been furnishing food, clothing and other necessary supplies to the soldiers at North Sydney and Sydney Mines, since the 4th August, 1914, to the 1st February, 1916. 2. The names and amounts paid to each, and amounts due to each on 1st February, 1916, over and above what has already been paid. 3. Whether the said supplies of all kinds were obtained or called for by public tender. If so, how the tenders were called, and who the tenderers were. 4. If the contracts for such supplies were always given to the lowest tenderer. 5. The names of those who tendered, and the figures of the tenders in each case. 6. The different methods by which tenders were invited, and for what classes of merchandise or supplies. Presented April 6, 1916.—*Mr. McKenzie*.. ..*Not printed.*

238. Order in Council No. P.C. 680, dated 23rd March, 1916, respecting the application of the Industrial Disputes Investigation Act, 1907, in the case of disputes between employers and employees affecting the delivery of war supplies. Presented by Hon. Mr. Roche, April 6, 1916.. .. ..*Not printed.*

239. Return to an Order of the House of the 13th March, 1916, for a copy of all the evidence taken by the Commission appointed to inquire into claims for damages made against the Militia Department in the town of Sydney Mines, Nova Scotia, and of the report made upon each claim or case, said claims being for damages to lands and other property. Presented April 7, 1916.—*Mr. McKenzie*.. .. ..*Not printed.*

240 Return to an Order of the House of the 1st March, 1916, for a copy of all letters, correspondence and telegrams between the Speaker, the Clerk of the House of Commons, the Civil Service Commission and the Minister of Finance in regard to the proposed appointment of Mr. H. Crossley Sherwood, as Assistant Clerk of Routine and Records, from 1st October, 1914, down to the present date. Presented April 7, 1916.—*Mr. Turriff.* *Not printed.*

240*a*. Supplementary Return to an Order of the House of the 1st March, 1916, for a copy of all letters, correspondence and telegrams between the Speaker, the Clerk of the House of Commons, the Civil Service Commission and the Minister of Finance in regard to the proposed appointment of Mr. H. Crossley Sherwood, as Assistant Clerk of Routine and Records, from 1st October, 1914, down to the present date. Presented April 10, 1916.—*Mr. Turriff*.. .. ..*Not printed.*

241. Return to an Order of the House of the 20th March, 1916, for a copy of all recommendations, letters, telegrams and correspondence relating to the recent appointment of a lightkeeper at Arisaig, N.S. Presented April 7, 1916.—*Mr. Chisholm* (*Antigonish*). *Not printed.*

242. Return to an Order of the Senate dated 31st March, 1916:—For a copy of all papers, letters and all correspondence regarding the passport granted to W. F. Bauman, an alien enemy. The said Bauman is a Bavarian.—(*Senate*).. .. ..*Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

243. Return to an Order of the House of the 3rd February, 1916, for a copy of all letters, telegrams, or other communications sent to the Government or any member or department thereof before 15th August, 1914, pointing out the necessity of granting relief to the settlers in the drouth-stricken area of Alberta. Presented April 10, 1916.—*Mr. Buchanan*. . . . . *Not printed.*

244. Return to an Address to His Royal Highness the Governor General, for a copy of all correspondence with the Imperial authorities respecting legislation by the Parliament of the United Kingdom, in answer to the petition of the Canadian Parliament asking for amendment of the *British North America Act* with reference to the Senate. Presented April 10, 1916.—*Sir Wilfrid Laurier*. . . . . . *Printed for sessional papers only.*

245. Return to an Address to His Royal Highness the Governor General of the 7th February, 1916, for a copy of all letters, correspondence, memoranda, Orders in Council, etc., relative to the Transatlantic Mail Service for the winter season 1915-16, and passing between the contractor company and any Department of Government or Minister of the Crown. Presented April 10, 1916.—*Mr. Maclean (Halifax)*. . . . . . *Not printed.*

246. Return to an Order of the House of the 21st February, 1916, for a return showing the amounts of money paid by all Departments of the Government to the Regina "Province" and "Standard," the Moosejaw "News," and the 'Saskatchewan Star," respectively, in each of the years 1914 and 1915. Presented April 10, 1916.—*Mr. Martin (Regina)*. . . . . . *Not printed.*

247. Return to an Order of the House of the 5th April, 1916, for a copy of all questions asked of candidates for examination in the Inside Civil Service since the 1st May, 1912. Presented April 10, 1916.—*Mr. Boulay*. . . . . . *Not printed.*

248. Return to an Order of the House of the 3rd February, 1916, for a return showing:—1. Who recruiting officers were for the counties of Lunenburg, Queens, Shelburne and Yarmouth, Nova Scotia, during the months of July, August, September, October, November and December, 1915. 2. What remuneration each received during each month, for salary, disbursements and expenses. 3. If they are still employed as recruiting officers. 4. If so, what salary is being paid each recruiting officer per day or per month. Presented March 10, 1916.—*Mr. Kyte*. . . . . . *Not printed.*

249. Return to an Order of the House of the 16th February, 1916, for a return showing:—1. Whether the Government, or the Department of Militia and Defence has employed any parties other than the officers of the permanent force to obtain recruits for the overseas forces. 2. If so, the number of persons so employed in each province. Presented April 11, 1916.—*Mr. Hughes (P.E.I.)*. . . . . . *Not printed.*

250. Return to an Order of the House of the 3rd February, 1916, for a return showing the names and addresses of members of the House of Commons and of the various Provincial Legislatures in Canada who are in the service of the Department of Militia and Defence, either in Canada or overseas; the official rank and rate of pay of each; the names of those who are now in Canada; the names of those who are in England; and the names of those who are or have been in active service at any of the battle fronts. Presented April 11, 1916.—*Mr. Kyte*. . . . . . *Not printed.*

251. Return to an Order of the House of the 16th February, 1916, for a return showing:—1. The amounts expended in railway subsidies in Canada during the years 1912, 1913, 1914 and 1915. 2. The amounts by provinces, and the names of the lines to which granted. 3. Amounts expended on the construction of Government-owned railways in Canada during the above years. 4. The amount expended in each province, and the name of the line of railway on which such expenditure was made. 5. Amounts expended on harbour and river improvements in Canada during the above years. 6 The amounts by provinces and the particular places where expended. 7. Amounts expended on the building of public wharves, public breakwaters, and public dredging in North Cape Breton and Victoria during the years 1905 to 1911, inclusive, including the expenditure on Government railways. 8. Amounts expended for like purposes in the said county, during the years 1912, 1913, 1914 and 1915. Presented April 11, 1916.—*Mr McKenzie.* *Not printed*

252. Return to an Order of the House of the 29th March, 1916, for a copy of all letters, telegrams, etc., exchanged between the Department of Public Works and the Department of Justice and the Council of the Town of Rigaud, Archibald Macdonald, Elzear Montpetit, and the Rigaud Granite Company, Limited, in connection with the military building. Presented April 11, 1916.—*Mr. Boyer*. . . . . . *Not printed*

253. Return to an Order of the House of the 3rd April, 1916, for a copy of all letters, telegrams and correspondence of all kinds in any way referring to a subsidy granted to the ss. *Amethist*, plying between Montreal and Newfoundland ports during the years 1910-11 and 1911-12. Presented April 11, 1916.—*Mr. Maclean (Halifax)*. . *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

254. Return to an Order of the House of the 21st February, 1916, for a copy of all letters, papers, telegrams and other documents relating to the survey in the harbour of Pictou, for a proposed new bridge, by the Railway Department; and also a statement showing the amounts paid in connection with said survey, the names of the persons to whom paid, and the purposes for which they were paid. Presented April 11, 1916.—*Mr. Macdonald*.. .. ..*Not printed.*

255. Return to an Address of the Senate, dated 21st day of March, 1916, for:—A statement giving the following information as regards each of the following countries: Great Britain, France, Russia, Italy, Belgium, Servia, the Dominion of Canada, Australia, New Zealand, and the Confederation of South Africa, for each of the last three years for which the information may be at hand, namely:—

(*a*) The quantity and value of spirituous liquors produced or manufactured;
(*b*) The quantity and value imported;
(*c*) The quantity and value exported; and
(*d*) The quantity and value consumed, giving in each case, the information for each kind of spirituous liquors separately. Ordered, That the same do lie on the Table. —(*Senate*).. .. ..*Not printed.*

256. Return to an Order of the House of the 16th March, 1916, for a return showing:—1. The number of medical doctors employed by the Militia Department at Halifax, N.S. 2. The name of each, and their rank and pay, respectively. 3. If the entire time of all or any is devoted to the militia service. 4. When not constantly employed in the militia service, the usual daily period of service. Presented April 12, 1916.—*Mr. Maclean (Halifax)*.. .. ..*Not printed.*

257. Return to an Order of the House of the 3rd April, 1916, for a copy of the correspondence between Mr. J. Antime Roy, of l'Isle Verts, and the Federal Government, on the subject of a farm that might be sold or leased to the Government for the purposes of an experimental farm. Presented April 12, 1916.—*Mr. Paquet*.. .. ..*Not printed.*

258. Return to an Order of the House of the 28th February, 1916, for a copy of the contract with the Amalgamated Dry Dock and Engineering Company for the construction of a dry dock at North Vancouver, B.C., together with the application for subsidy therefor, and also a copy of all reports of engineers' correspondence, and all other documents relating thereto. Presented April 12, 1916.—*Mr. Pugsley*.. .. ..*Not printed.*

259. List of those in the Canadian Expeditionary Forces who had received decorations, medals and mentions in despatches, to 17th March, 1916. Presented by Hon. Mr. Kemp, April 12, 1916.. .. ..*Printed for sessional papers only.*

259*a*. List of decorations and medals awarded to members of the Canadian Expeditionary Force and officers of the Canadian Militia to 17th March, 1915, checked with the London "Gazette" to the above date. Presented by Sir Robert Borden, May 2, 1916.*Not printed.*

260. Return to an Order of the House of the 13th March, 1916, for a return showing the names of all the medical examiners of recruits appointed since the war started to date. Presented April 13, 1916.—*Mr. Nesbitt*.. .. ..*Not printed.*

261. Return showing:—1. How much overtime was paid to men in the Printing Bureau from 1st January, 1916, to 1st April, 1916. 2. The names of the men who were paid overtime. 3. Which were day men, and which night men. 4. What rate of overtime each man received, how much at 1½ day rate, and how much at double rate. Presented April 17, 1916.—*Mr. Turriff*.. .. ..*Not printed.*

262. Return to an Address to His Royal Highness the Governor General of the 3rd February, 1916, for a copy of all Orders in Council, letters, telegrams, recommendations and other documents in connection with the Government's decision in September, 1915, to exact payment of one-half of the seed grain liens. Presented April 18, 1916.—*Mr. Knowles.* *Not printed.*

263. Return to an Order of the House of the 9th February, 1916, for a return showing the name, port of registry, tonnage and name of the master of all steam trawlers that cleared outwards from the port of Canso, Nova Scotia, in the year 1915. Also a copy of all reports and declarations under the hand of the master or chief officer of each of the said trawlers so clearing outward from said port since 16th April, 1915, required to be signed by such masters under the provisions of an Order in Council passed on the 16th April, 1915. Presented April 25, 1916.—*Mr. Sinclair*.. .. ..*Not printed.*

264. Return to an Order of the House of the 7th February, 1916, for a statement showing the quantity of wheat shipped month by month, during the calendar years 1914 and 1915, from Winnipeg to Fort William and Port Arthur, and by what railways; to Duluth by the Canadian Northern Railway or allied system; to Minneapolis and St. Paul by the Canadian Pacific Railway, to the seaboard by rail over Canadian territory and to American ports over American railways. Presented April 25, 1916.—*Sir Wilfrid Laurier.* *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

265. Return to an Order of the House of the 12th April, 1916, for a return showing:—1. How many clerks there are in the Finance Department who belong to and are paid from the outside service vote and who work in the inside service. 2. The names of said clerks. 3. Salary paid to each. 4. How long each has been in the service of the Department. 5. If all or any of these clerks have passed any examination. If so, what examination and on what date or dates. Presented April 26, 1916.—*Mr. Turriff.* . . . . .*Not printed.*

266. Return to an Order of the House of the 23rd February, 1916, for a return showing:—1. The number of permanent employees in the Department of Inland Revenue in 1915-16. 2. How many there will be in 1916-17. 3. How much money was paid in salaries for temporary employees in each of the following years: 1912-13, 1913-14, 1914-15 and 1915-16. 4. The names of the temporary employees and the dates of their appointment, respectively. Presented April 26, 1916.—*Mr. Lanctot.* . . . .*Not printed.*

267. Return to an Order of the Senate dated the 14th instant, showing the number of men recruited up to the first day of April, 1916.—(*Senate*) . . . .*Not printed.*

268. Return to an Order of the Senate, dated the 23rd day of March, 1916, of all papers and documents dealing with the escapes and the liberation of alien enemy prisoners from the detention camp situated at Banff, in the province of Alberta. Ordered, That the same do lie on the table.—(*Senate*) . . . .*Not printed.*

269. Return to an Order of the House of the 19th April, 1916, for a return showing:—1 Whether there is a Director of Recruiting and Organizations in England for the Canadian Service. 2. If so, his name and duties. 3. The number employed upon his staff. 4. The total expenses of his staff. Presented April 28, 1916. . . . .*Not printed.*

270. Return to an Order of the Senate, dated 11th instant:—For a copy of an application made by Rev. Isaac Hunter Macdonald, of Kintore, Ontario, to the Militia Department for a position of chaplain or major; also, of all copies of letters, papers or telegrams either recommending or opposing said application.—(*Senate*) . . . .*Not printed.*

271. Return to an Address to His Royal Highness the Governor General of the 29th March, 1916, for a copy of all petitions received by the Governor General in Council requesting the disavowal of the Act of the Legislature of the Province of Ontario, Chapter 45, 5 George V, 1915, concerning the School Commission of the Roman Catholic Schools of the City of Ottawa, and of all documents, memoranda, reports, letters and correspondence concerning the said petitions for disavowal, or concerning the said Act of the Legislature of the Province of Ontario, 5 George V, Chapter 45. Presented May 1, 1916.—*Mr. Lapointe (Kamouraska)* . . . .*Not printed.*

271*a*. Order in Council and Report of Minister of Justice transmitting to Lieutenant Governor of Ontario copy of petition from Samuel Genest and others, praying for the disallowance of an Act of the Legislature of Ontario, Chapter 45 of 5 George V (1915). Order in Council and Report of Minister of Justice on the Statutes of the Legislature of Ontario, passed in the 5th year of His Majesty's reign (1915). Report of Prime Minister of Ontario on petition relating to the disallowance of an Act of the Legislature of Ontario, Chapter 45 of 5 George V (1915). Presented May 3, 1916.—*Mr. Lapointe (Kamouraska)* . . . .*Printed for sessional papers only.*

272. Return to an Order of the House of the 20th March, 1916, for a copy of all telegrams, letters, correspondence and contracts between the Quebec Harbour Commission and Benjamin Demers, of the parish of St. Nicolas, county of Lévis, concerning the purchase of the St. Nicolas quarry. Presented May 1, 1916.—*Mr. Bourassa* . . . . . . *Not printed*

273. Return to an Order of the House of the 13th March, 1916, for a return showing a list of vessels belonging to the Canadian Government which are on service under the provision of the Canadian Naval Act, and of all vessels not now in service and their present condition and suitability for service, and also for a copy of all letters, petitions or communications had by or with the Government in regard to the establishment of a Canadian Naval Brigade. Presented May 1, 1916.—*Mr Macdonald* . . *Not printed*

274. Return to an Order of the House of the 29th March, 1916, for a copy of all correspondence, petitions and papers, including the report of Charles Bruce, engineer, in the possession of the Department of Marine and Fisheries relating to the construction of a bait freezer at White Head, Nova Scotia. Presented May 1, 1916.—*Mr. Sinclair*
Not printed

275. Duplicate Return to an Order of the House of the 17th March, 1915, for a copy of all correspondence and reports relating to the purchase of 25,000 shovels of special pattern, mentioned in Order in Council P.C. 2302, dated 4th September, 1914, on page 38 of memoranda respecting work of the Department of Militia and Defence, and also relating to any further purchases of such shovels. Presented May 1, 1916.—*Mr. Hughes (P.E.I.)* . . . . *Not printed*

CONTENTS OF VOLUME 28—*Continued.*

276. Return to an Order of the House of the 5th April, 1916, for a copy of all letters, telegrams, offers, tenders, reports, contracts and documents relating to the sale or other disposal of small arms ammunition since 4th August, 1914. Presented May 1, 1916.—*Mr. Macdonald*. . . . . *Not printed.*

276*a*. Supplementary Return to an Order of the House of the 5th April, 1916, for a copy of all letters, telegrams, offers, tenders, reports, contracts and documents relating to the sale or other disposal of small arms ammunition since 4th August, 1914. Presented May 2, 1916.—*Mr. Macdonald*. . . . . *Not printed.*

277. Return to an Order of the House of the 23rd February, 1916, for a copy of all documents, correspondence, reports, etc., concerning the dismissal of J. B. Levesque, of Rivière Ouelle, as steward on the steamer *Champlain.* Presented May 2, 1916.—*Mr. Lapointe (Kamouraska)*. . . . . *Not printed.*

278. Return to an Order of the House of the 13th March, 1916, for a copy of all correspondence, memoranda, reports, telegrams, recommendations, orders, etc., between the Department of Railways and Canals and the officers of the St. Maurice Fire Protective Association with reference to fire protection on the Transcontinental Railway line between Hervey Junction and the western boundary of the Province of Quebec. Presented May 2, 1916.—*Mr. Bureau*. . . . . *Not printed.*

279. Return to an Order of the House of the 20th March, 1916, for a copy of all letters, telegrams, correspondence and contracts between the Department of Railways and Canals or any official thereof, including the officials of the Intercolonial Railway, and any member of the Government of New Brunswick, the St. John and Quebec Railway Company or any official thereof, regarding the operation of the Valley Railway, so-called, in the Province of New Brunswick, from the first day of October, 1914, down to the present date. Presented May 2, 1916.—*Mr. Carvell*. . . . . *Not printed.*

280. Return to an Order of the House of the 10th April, 1916, for a copy of a certain lease made by the Government of Canada to one J. A. Culverwell, of a certain water-power on the Trent waterway, known as the Burleigh Falls power; and of all assignments of said lease and of the consents of the Government of Canada thereto; and also a copy of all correspondence, telegrams, tenders, reports, contracts and other papers, relating to the said original lease. Presented May 2, 1916.—*Mr. Burnham*. . . . . . *Not printed.*

281. Return to an Order of the Senate, dated the 12th April, 1916, showing copies of all petitions, correspondence, etc., relating to the purchase, by the Government, of the Quebec and Saguenay Railway.—*(Senate)*. . . . . *Not printed.*

282. 1. Copy of letter from the Chairman of the Grand Trunk Railway Company of Canada to the Prime Minister *re* proposals made in respect to the Grand Trunk Pacific Railway Company.

2. Schedule of outstanding bonds, debentures, loans and notes, 1st January, 1916, and interest payments of the Grand Trunk Pacific Railway Company and Grand Trunk Pacific Branch Lines Company.

3. Memorandum *re* Grand Trunk Pacific Act, 1914, and proceeds of securities issued thereunder.

4. Statement showing bonds, etc., authorized, issued and outstanding and net proceeds therefrom, also interest payable for the years 1916 and 1917 (as from 29th February, 1916), Grand Trunk Pacific Railway and Grand Trunk Pacific Branch Lines.

5. Advances by Grand Trunk Railway Company at 29th February, 1916.

6. Financial statements of the Canadian Northern Railway System, 15th April, 1916.

7. Memorandum *re* Canadian Northern Railway Company Guarantee Act, 1914, and proceeds of securities issued thereunder.

8. Letter from G. A. Bell, financial comptroller of the Department of Railways and Canals to the Prime Minister, in respect to issue of his certificate for the purpose of releasing the proceeds of the forty-five million dollar, 4 per cent debenture stock, guaranteed by the Dominion Government. Presented by Sir Robert Borden, May 3, 1916. *Printed for distribution and sessional papers.*

282*a*. Copies of mortgage deed of trust securing an issue of $16,000,000 of Grand Trunk Pacific Railway bonds, guaranteed by the Dominion Government. Presented by Sir T. White, May 5, 1916. . . . . *Printed for distribution and sessional papers.*

282*b*. Copies of mortgage deed of trust securing an issue of $45,000,000 of Canadian Northern Railway securities, guaranteed by the Dominion Government, issued under the legislation of 1914. Presented by Sir Thos. White, May 5, 1916.

283. Return to an Order of the House of the 23rd February, 1916, for a return showing:—1. The amount which has been paid out for new buildings and repairs at the Royal Military College and at Fort Henry, in each of the years 1912, 1913, 1914 and 1915. 2. To whom the money was paid, and the amount in each case. 3. What portion of the work was tendered for, and the amount of each tender submitted. Presented May 3, 1916.—*Mr. Edwards*. . . . . *Not printed.*

CONTENTS OF VOLUME 28—*Continued.*

284. Return to an Order of the House of the 27th March, 1916, for a return showing the names and addresses of all persons in the Public Service of any and every Department of the Government of Canada, in the counties of Cape Breton, Victoria, Inverness, Richmond, Guysborough, Antigonish and Pictou, Province of Nova Scotia. Presented May 4, 1916.—*Mr. Carroll*. . . . . *Not printed.*

285. Return to an Order of the House of the 17th February, 1916, for a return showing the amount which has been paid out for printing outside of the Printing Bureau in each province, in each of the years 1912, 1913, 1914 and 1915, and to whom paid. Presented May 5, 1916.—*Mr. Best*. . . . . *Not printed.*

285a. Supplementary Return to an Order of the House of the 17th February, 1916, for a return showing the amount which has been paid out for printing outside of the Printing Bureau in each province, in each of the years 1912, 1913, 1914 and 1915, and to whom paid. Presented May 17, 1916.—*Mr. Best*. . . . . *Not printed.*

286. Report of the Commission on the Waterworks and Sewerage Systems of Canada. Presented by Hon. Mr. Hazen, May 8, 1916. . . . . *Not printed.*

287. Return to an Order of the House of the 12th April, 1916, for a return showing:—1. How many clerks there are in the Customs Department who belong to and are paid from the outside service vote and who work in the inside service. 2. The names of said clerks. 3. Salary paid to each. 4. How long each has been in the service of the Department. 5. If all or any of these clerks have passed any examination. If so, what examination and on what date or dates. Presented May 10, 1916.—*Mr. Turriff*. . . . . *Not printed.*

288. Return to an Order of the House of the 6th March, 1916, for a return showing the amounts paid under retroactive clause of the Act providing for an impost of 50 cents per proof gallon on all spirits taken from bond between the date of the outbreak of war and the date of the passage of such Act; and also by whom paid, and the date of payment. Presented May 10, 1916.—*Mr. Graham*. . . . . *Not printed.*

289. Return to an Order of the House of the 3rd February, 1916, for a return showing the names of all employees of the Government of Canada in the inside and outside service who have enlisted since the 4th day of August, 1914, for overseas service; and the names of all employees of the Government of Canada in the inside and outside service who have enlisted since the 4th day of August, 1914, for home defence; also the salary received by each previous to enlisting; and the rate of pay received by each since enlisting; specifying those, if any, who continue to enjoy the salaries paid them before their enlistment and the amount of same. Presented May 10, 1916.—*Mr. Kyte*. . *Not printed.*

290. Return to an Order of the Senate, dated 26th April, 1916, for:—A copy of the agreement between the Government of Canada, acting for the Transcontinental Railway, the Canadian Pacific Railway Company and the Canadian Northern Railway Company for the construction, operation and maintenance of the Union Station at Quebec, which the Honourable the Acting Minister of Railways says (*Hansard*, page 2690) is to be used by these three railways.—(*Senate*). . . . . *Not printed.*

291. Return to an humble Address of the Senate, dated 29th March, 1916, to His Royal Highness the Governor General; praying His Royal Highness to have laid on the Table of the Senate:—A statement of all expenses to date in connection with the expenditures of public moneys at Port Nelson; also an estimate of the further expenditure to complete the works at Port Nelson on Hudson Bay.—(*Senate*). . . . . *Not printed.*

292. Return to an Order of the House of the 3rd April, 1916, for a copy of all investigations, letters and correspondence whatsoever, regarding the dismissal of J. B. Deschênes and Thomas Bernier, employees on the Intercolonial Railway at Rivière du Loup. Presented May 12, 1916.—*Mr. Boulay*. . . . . *Not printed.*

293. Return to an Order of the House of the 19th April, 1916, for a return showing a list of the decoders and censors employed at Halifax since the war broke out, together with the names, dates of employment, total amount paid, by whom recommended, and former employment of each. Presented May 12, 1916.—*Mr. Sinclair*. . . . . *Not printed.*

294. Return to an Order of the House of the 22nd March, 1916, for a return showing:—1. Whether there is a list of companies, firms, or persons resident in Halifax, N.S., at present in the Department of Militia and Defence from whom are asked tenders for war supplies on behalf of the said Department or War Purchasing Commission. If so, the names of such companies, firms or persons. 2. During the calendar year 1915, whether public tenders were asked for any war supplies at Halifax, N.S. 3. If so, the nature of the supplies for which tenders were asked, to whom tenders were awarded, and the prices, for the said respective articles or supplies. Presented May 12, 1916.—*Mr. Maclean (Halifax)*. . . . . *Not printed.*

295. Reports of engineers relating to the Lotbinière and Megantic Railway; the Quebec, Montmorency and Charlevoix Railway between Quebec and Cape Tourmente, and the Quebec and Saguenay Railway from Cape Tourmente to Nairn Falls, near Murray Bay. Presented by Hon. Mr. Reid, May 15, 1916 . . . . *Not printed.*

CONTENTS OF VOLUME 28—*Concluded.*

295a. Correspondence in respect to the offer of sale to the Government of Canada of the Quebec, Montmorency and Charlevoix Railway, the Quebec and Saguenay Railway and the Lotbinière and Megantic Railway. Presented by Hon. Mr. Reid, May 16, 1916.
Not printed.

296. Return to an Address to His Royal Highness the Governor General of the 1st March, 1916, for a copy of all correspondence, letters, telegrams, Orders in Council, etc., relating to the transfer by the Government of Ontario to the Government of Canada, of the rights held by the former in the lakes, dams, etc., contiguous to or forming a part of the Trent Valley Waterways System. Presented May 17, 1916.—*Mr. Graham.*
Not printed.

297. Return to an Order of the House of the 1st May, 1916, for a copy of all papers, telegrams, letters and other documents in connection with the decision to locate an interior storage elevator at Calgary, Alberta. Presented May 17, 1916.. .. ..*Not printed.*

298. Return to an Order of the House of the 12th April, 1916, for a return showing the plan and description of the proposed permanent harbour quay line in the harbour at Pictou, and for a copy of all papers, letters, telegrams and other documents relating to the establishment of the same. Presented May 17, 1916.—*Mr. Macdonald* .. ..*Not printed.*

299. Return to an Order of the House of the 21st February, 1916, for a copy of all tenders, offers, letters, telegrams and other documents relating to the arrangements for the handling of freight and coal at Pictou, in connection with the boats engaged in the winter service between Pictou and Prince Edward Island during the year 1914-1915, and during the present season. Presented May 18, 1916.—*Mr. Macdonald* .. .. ..*Not printed.*

Falls at low water on Little Qualicum River about three miles below Cameron lake.

DOMINION WATER POWER BRANCH
DEPARTMENT OF THE INTERIOR
OTTAWA, CANADA.

WATER RESOURCES PAPER No. 14

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY

FOR

THE CALENDAR YEAR 1914

BY

R. G. SWAN, B.A. Sc.

Chief Engineer

Prepared under the direction of the Superintendent of Water Powers.

OTTAWA
PRINTED BY J. DE L. TACHÉ, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1915

25e—1915] 1½

To Field Marshal His Royal Highness Prince Arthur William Patrick Albert, Duke of Connaught and of Strathearn, K.G., K.T., K.P., etc., etc., etc., Governor General and Commander in Chief of the Dominion of Canada.

May it Please Your Royal Highness:

The undersigned has the honour to lay before Your Royal Highness the British Columbia Hydrographic Survey Report for 1914.

Respectfully submitted,

W. J. ROCHE,
Minister of the Interior.

Ottawa, May 1, 1915.

DEPARTMENT OF THE INTERIOR,

OTTAWA, May 1, 1915.

The Honourable W. J. ROCHE, M.D.
Minister of the Interior.

SIR,—I have the honour to submit the British Columbia Hydrographic Survey Report for 1914, and to recommend that it be published as Water Resources Paper No. 14 of the Dominion Water Power Branch.

I have the honour to be, sir,
Your obedient servant,

W. W. CORY,
Deputy Minister of the Interior.

Department of the Interior, Water Power Branch,

Ottawa, May 1, 1915.

W. W. Cory, Esq., C.M.G.,

Deputy Minister of the Interior,

Sir,—I have the honour to submit the attached report by R. G. Swan, B. A.Sc., Chief Engineer of the British Columbia Hydrographic Survey.

In view of its important bearing on the industrial development of southern British Columbia, I would recommend that it be published as Water Resources Paper No. 14 of the Dominion Water Power Branch.

Respectfully submitted,

J. B. CHALLIES,

Superintendent, Dominion Water Power Branch.

Ottawa, May 1, 1915.

J. B. Challies, Esq.,
Superintendent,
Dominion Water Power Branch,
Department of the Interior,
Ottawa.

Sir,—I have the honour to transmit herewith my Annual Report of the British Columbia Hydrographic Survey for the calendar year 1914, together with the reports of engineers in charge of divisions.

Your obedient servant,

R. G. Swan,
Chief Engineer.

TABLE OF CONTENTS.

I.

	Page.
Report of the Chief Engineer	3
Scope of Work	3
Organization	3
Coast Division—	
List of Regular Gauging Stations	4
Miscellaneous Meterings	5
Kamloops Division	6
List of Regular Gauging Stations	6
Miscellaneous Meterings	8
Nelson Division—	
List of Regular Gauging Stations	9
Miscellaneous Meterings	11
Explanation of Tables	11
Definition of Terms	12
Convenient Equivalents	12
Accuracy and Reliability of Data	13
Methods of Measuring stream flow	13
Co-operation and Acknowledgements	13

II.

Coast Division.

Report of Division Engineer	17
Territory	17
Uses of Water	17
Present Water-power Developments	17
Possible Water-power Developments	17
Municipal Water Supply	17
Reclamation	17
Irrigation	18
Location of Stations	18
Precipitation and Temperature	18
Comparison of Stream Measurements	18
Districts	18
Southern District	19
Lillooet District	20
Vancouver Island District	21
Water-power Developments	24
Possible Water-power Developments	24
Irrigation Streams	25
Municipal Water Supply	25
Reclamation and Drainage	26
Southern District	26
Total Monthly Precipitation, 1914	26
Mean Monthly Temperature, 1914	26
Difference from average Precipitation, 1914	27
Difference from average Temperature, 1914	27
Comparison of Monthly Discharges, 1914	27
Lillooet District—	
Total Monthly Precipitation 1914	28
Mean Monthly Temperature 1914	28
Vancouver Island District—	
Total Monthly Precipitation, 1914	28
Mean Monthly Temperature, 1914	28
Difference from Average Precipitation, 1914	29
Difference from average Temperature, 1914	29

III

KAMLOOPS DIVISION.

PAGE.

Report of Division Engineer ... 33
Territory ... 33
Uses of Water ... 33
Irrigation ... 33
Water-power Development ... 33
Water-power Possibilities ... 33
Municipal Supply ... 34
Topography of Kamloops Division ... 34
Precipitation and Climate ... 34
District and Staff ... 35
Kamloops District ... 35
Ashcroft and Nicola District ... 36
Okanagan District ... 36
Kamloops Office ... 36
Inspections ... 36
Developed Water Powers ... 38
Barrière River ... 38
Boundary Creek ... 39
Crazy Creek ... 39
Fortune or Davis Creek ... 39
Kettle River at Cascade ... 39
Kettle River at North Forks ... 39
Murray Creek ... 40
Nakalliston Creek ... 40
Similkameen Creek ... 40
Total Monthly Precipitation, 1914 ... 40
Mean Monthly Temperature, 1914 ... 40
Difference from Average Precipitation, 1914 ... 41
Difference from Average Temperature, 1914 ... 41

IV.

NELSON DIVISION.

Report of Division Engineer ... 45
General Remarks ... 45
Nelson Division ... 45
Climatic Conditions ... 45
Precipitation ... 47
Chinook Winds ... 47
Snowfall Data along the C.P.R. and Selkirk Range ... 47
Temperature ... 48
Snowfall Table ... 48
Co-operation ... 48
Hydrographic Districts ... 48
Problem of Transportation ... 49
Winter Measurements ... 50
Total Monthly Precipitation 1914 ... 51
Mean Monthly Temperature 1914 ... 52
Difference from Average Precipitation 1914 ... 52
Difference from Average Temperature 1914 ... 52

HYDROGRAPHIC DATA—COAST DIVISION.

Southern District ... 55
Belknap Creek ... 55
Boulder Creek ... 61
Brandt Creek ... 64
Capilano Creek ... 69
Chehalis River ... 72
Chilliwack River ... 75

SESSIONAL PAPER No. 25e

HYDROGRAPHIC DATA—COAST DIVISION—*Concluded.* PAGE.

Coquihalla River ... 78
Fraser River ... 81
Hixon Creek ... 84
Jones Creek ... 88
Lynn Creek ... 91
Mesliloet River ... 94
Nicolum River ... 97
Norton Creek ... 99
Seymour Creek ... 102
Silver-Pitt Creek ... 105
Slollicum River ... 108
South Lillooet River ... 108
Sumallo River ... 111
Young Creek ... 115

Vancouver Island District—
Big Qualicum River ... 117
Campbell River ... 120
Chemainus River ... 123
Cowichan River ... 126
Englishman River ... 129
Haslam Creek ... 131
Koksilah River ... 134
Little Qualicum River ... 137
Nanaimo River ... 140
Oyster River ... 143
Puntledge River ... 146
Shawnigan Creek ... 152
Sproat River ... 155
Stamp River ... 159
Tsolum River ... 165

Lillooet District—
Bridge River ... 168
Cayuse Creek ... 171
Cheakamus River ... 174
Fountain Creek ... 177
Green River ... 179
Laluwissin Creek ... 185
Lillooet River ... 187
Riley Creek ... 190
Seton Creek ... 192
Six Mile Creek ... 197
Soo River ... 200
Texas Creek ... 201

Miscellaneous Meterings— 204

HYDROGRAPHIC DATA—KAMLOOPS DIVISION.

Kamloops District—
Bolean Creek ... 207
Campbell Creek ... 210
Canyon Creek ... 213
Clearwater River ... 216
Little Clearwater River ... 220
Cherry Creek ... 223
Essell Creek ... 226
Guichon Creek ... 229
Heffley Creek (Below Heffley Lake) ... 232
Heffley Creek (Lower) ... 235
Ingram Creek ... 238
Jamieson Creek ... 241
Louis Creek ... 244
Monte Creek (Div. to Summit Lake) ... 247
Monte Creek (Below Div. to Summit Lake) ... 250
Monte Creek (Above Bostock Diversion) ... 253
Myrtle River ... 256
Paul Creek (Below Paul Lake) ... 258
Raft River ... 260
Siwash Creek ... 263
Thompson River (Kamloops) ... 264
Tranquille River ... 267

HYDROGRAPHIC DATA—KAMLOOPS DIVISION—*Concluded.*

Okanagan District— PAGE.
Adams River ... 270
Ashnola Creek ... 275
Boundary Creek ... 278
Celeste Creek ... 281
Crazy Creek ... 284
Eagle River ... 287
Granite Creek ... 290
Kettle River (North Fork) ... 292
Kettle River (W. Fork) ... 295
Kettle River (Nicholsons Bdg.) ... 298
Kettle River (Carson) ... 301
Niskonlith Creek ... 306
Okanagan River ... 308
Similkameen River ... 311
Shuswap River ... 314
South Similkameen River ... 316
Tulameen River ... 320
Thompson River (Chase) ... 324
Ashcroft District—
Barnes Creek ... 327
Bonaparte River ... 330
Criss Creek ... 333
Coldwater River ... 336
Deadman River ... 339
Fraser River (Lytton) ... 342
Hat Creek (Above Hammonds Div.) ... 344
Nahatlatch River (Upper) ... 347
Nahatlatch River (Lower) ... 350
Nicola River (Merritt) ... 352
Nicola River (Mouth) ... 355
Spius Creek ... 358
Thompson River (Spences Bdg.) ... 361
Miscellaneous Meterings— 363

HYDROGRAPHIC DATA—NELSON DIVISION.

Nelson District—
Cariboo Creek ... 367
Carpenter Creek ... 368
Columbia River (Castlegar) ... 373
Columbia River (Revelstoke) ... 377
Four Mile Creek (Below Mill) ... 380
Four Mile Creek (Above Intake) ... 383
Goat River ... 386
Kaslo Creek ... 389
Kooskanax Creek ... 391
Kootenay River ... 395
Nakusp Creek ... 419
Pend d'Oreille River ... 422
Sawmill Creek ... 425
Slocan River ... 427
Revelstoke District—
Akolkolex River ... 431
Beaver River ... 434
Blaeberry River ... 437
Bugaboo Creek ... 440
Canyon Creek ... 442
Columbia River (Golden) ... 443
Columbia River (Trail) ... 446
Dutch Creek ... 449
Field Springs (No. 1) ... 450
Field Springs (No. 2) ... 450
Field Springs (No. 3) ... 450
Findlay Creek ... 454
Horsethief Creek ... 457
Hospital Creek (Weir) ... 458

HYDROGRAPHIC DATA—NELSON DIVISION—*Continued.* PAGE.

Illecillewaet River (Glacier) 460
Illecillewaet River (Revelstoke) 462
Incomappleux River 466
Kicking Horse River (Golden) 468
Kicking Horse River (Field) 472
Kicking Horse River (No. 2 Tunnel) 474
No. 2 Creek 478
Sinclair Creek 481
Spillimacheen River 482
Toby Creek 486
N. Vermilion Creek 488
S. Vermilion Creek 490
Windermere Creek 492

Cranbrook District—
Bull River 494
Cherry Creek 497
Elk River 503
Gold Creek 506
Kootenay River 508
Linklater Creek 512
Mark Creek 513
Mud Creek 516
Phillips Creek 518
Rock Creek 521
Big Sand Creek 523
Little Sand Creek 524
St. Marys River 526

Miscellaneous Meterings 530

Index 531

ILLUSTRATIONS.

PAGE.

Falls at low water on Little Qualicum river about three miles below Cameron lake..Frontispiece.
Impounding dam of Puntledge river hydro-electric installation on the Puntledge river near outlet from Comox lake..... 22
Diversion dam showing flume to intake of Puntledge river hydro-electric installation on Puntledge river, about two miles below impounding dam..... 23
Dam, Barriere River Development, City of Kamloops..... 37
Exterior, Barriere Hydro-Electric Power House, Municipal Plant for City of Kamloops, B.C..... 37
Interior, Barriere River Hydro-Electric Power House, Municipal plant for City of Kamloops, B.C..... 38
Interior, Sub-station, City of Kamloops, B.C..... 38
Cranbrook District (II). Photograph showing support for cable way and platform attachment for cable car..... 49
Cranbrook District (III). Photograph showing cable car and method of operating..... 50
Installing metal faced gauge at metering section on Sumallo river, one mile from mouth 111
Installing metal faced gauge at metering section on Oyster river, Vancouver Island.... 144
Wooden staff gauge at Sproat lake near outlet attached to rock filled crib..... 156
Metering section on Sproat river near outlet from Sproat lake..... 157
Confluence of Myrtle and Clearwater rivers..... 216
Myrtle river, Dawson Falls..... 256
Helmcken Falls and Myrtle river canyon..... 257
Adams lake..... 270
Adams river, automatic stage house..... 271
Adams river, automatic water stage register..... 272
Nelson District (1) Highway Bridge on Columbia River near Trail, showing metering section on upstream side of bridge..... 446
Cranbrook District (V)—Bull river looking up from metering section..... 495
Cranbrook District (I)—Photograph showing Elk river cable station above canyon..... 503

MAP.

Southern British Columbia, showing gauging stations.....Inside back cover.

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER I

REPORT OF R. G. SWAN, B.A.Sc.

Chief Engineer.

CHAPTER I.

REPORT OF THE CHIEF ENGINEER.

SCOPE OF WORK.

The study of water supply may be said to be carried on for three purposes, viz.: Irrigation, Domestic and Municipal Water Supply, and Water-power development. The agricultural development of the semi-arid sections of the province is dependent on the amount of water available. The rapid settlement of the province, due to new railroad lines, demands a close study of both the quality and quantity of the water supply, for the progress of any industrial centre is practically dependent on the cost of power available for its manufactures and benefits and conveniences for its residents. The variation in the run-off from year to year necessitates a close study of stream flow for a number of years before any estimate can be made of the annual discharge of any stream. In connection with many undertakings, costly mistakes have been made owing to the fact that a careful study of the stream flow was not made before commencing construction operations.

The hydrographic work in British Columbia covers fairly well the southern half of the province, the stations being established on the rivers which are considered of the most importance, and of which the flow is likely to be utilized in the near future.

In the Railway Belt we have co-operated with the Dominion Lands Branch, reporting on all engineering works in connection with irrigation and drainage projects, foreshore applications for leases in connection with quarrying, the removal of sand and gravel, marine docks, and elevators. Numerous surveys have also been made for the setting aside of Dominion lands for the protection of municipal water supply.

The Conservation Commission of Canada has been furnished with all the hydrographic data required in its forthcoming report on British Columbia water-powers. The furnishing of this data has involved a very considerable amount of extra work, not only in having additional copies of the data made available in the form desired by the Commission, but also in having the various field officers of the survey carry on work incident to the particular requirements of the Commission.

The co-operation between the Provincial Water Rights Branch and this Survey has been extensive and of mutual value. The provincial engineers have rendered every reasonable assistance to the engineers of this survey. Many valuable suggestions as to organization and scope of work have been received from the Comptroller of Water Rights, Mr. William Young, and have been incorporated in our work.

No small amount of time has been given by the chief engineer and the various divisional engineers to free consultation in connection with hydrographic questions that have arisen throughout the province. It is felt that this work, requiring as it does the exercise of much patience and tact, has given permanent satisfaction to the interested portion of the public.

ORGANIZATION.

DIVISION OF WORK.

Mention was made in my report for 1913 of the establishment of divisional officers with a view to facilitating the work as much as possible. The section of the province covered by the survey in 1914 was divided into three divisions,

namely, Coast, Kamloops, and Nelson. In establishing divisional officers at Vancouver, Kamloops, and Nelson, the most central points were chosen for the successful working of each division. A glance at the accompanying map will give a better idea than can be given in a general description of the areas covered by each division. In the past the most expensive feature of field work in British Columbia has been that of transportation. In an endeavour to overcome this, each division was again divided into three districts, the work in the districts being in charge of district hydrographers who remain in the field for practically the entire season, thus economizing in time and transportation expenditures.

COAST DIVISION.

C. G. Cline, Division Engineer.

The three districts comprising the Coast division are the Southern, the Vancouver Island, and the Lillooet. A general description of each district will be found on pages 19 to 23 of the division engineer's report.

The Southern district has been in charge of C. G. Cline, B.A.Sc.

The Vancouver Island district has been in charge of C. E. Webb, B.A.Sc.

The Lillooet district has been in charge of H. C. Hughes, B.Sc.

Practically all the stations in the Southern district were established under the organization of the Railway Belt Hydrographic Survey, and are consequently fairly well rated. For this reason, Mr. Cline has had sufficient time to generally supervise the work of the other two districts.

Owing to the fact that the Vancouver Island and Lillooet districts comprise new territory, a great deal of work in the establishment of gauging stations has been necessitated. To relieve this pressing work, Mr. Cotton has assisted Mr. Webb and Mr. Hughes until the latter part of August. By this time the work was well established, and Mr. Cotton having volunteered for active service it was not necessary to fill the vacancy so caused.

The computations for the stations of each district have been made by the engineer in charge of the field work of that district and checked by the division engineer.

Coast Division.—List of Regular Gauging Stations.

SOUTHERN DISTRICT.

Station Number.	Name.	Location.	
1000	Belknap creek	Tp. 6, R. 7, W. 7 M	Prov. Water Dist. 1.
*1060	Black creek	Near Howe sound	" "
1063	Belknap creek	Tp. 7, R. 7, W. 7 M	" "
1001	Boulder creek	Tp. 3, R. 27, W. 6 M	" "
1002	Brandt creek	Tp. 7, R. 7, W. 7 M	" "
1021	Brandt creek	Tp. 7, R. 7, W. 7 M	" "
1023	Capilano creek	Near North Vancouver	" "
1003	Chehalis river	Tp. 4, R. 30, W. 6 M	" "
1004	Chilliwack river	Tp. 23, E. C. M	" "
1005	Coquihalla river	Tp. 5, R. 26, W. 6 M	" "
1007	Fraser river	Tp. 5, R. 26, W. 6 M	" "
1009	Hixon creek	Tp. 6, R. 7, W. 7 M	" "
1064	Hixon creek	Tp. 6, R. 7, W. 7 M	" "
1010	Jones creek	Tp. 3, R. 27, W. 6 M	" "
1046	Lynn creek	Near North Vancouver	" "
1011	Mesliloet river	Tp. 7, R. 7, W. 7 M	" "
1058	Nicolum river	Tp. 4, R. 5, W. 6 M	" "
1013	Norton creek	Tp. 7, R. 7, W. 7 M	" "
1022	Seymour creek	Near North Vancouver	" "
1017	Silver-Pitt creek	Tp. 4, R. 5, W. 7 M	" "
1033	Slollicum river	Tp. 5, R. 28, W. 6 M	" "
1018	South Lillooet river	Tp. 12, E. C. M	" "
*1065	Skagit river	4 miles from international boundy.	" "
1056	Sumallo river	Near Railway Belt boundary	" "
1057	Sumallo river	Tp. 3, R. 24, W. 6 M	" "
1020	Young creek	Tp. 7, R. 7, W. 7 M	" "

Note.—Stations marked with an asterisk (*) have been only recently established, and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded, and run-off data will be returned in the report for 1915.

SESSIONAL PAPER No. 25e

Coast Division.—List of Regular Gauging Stations.

VANCOUVER ISLAND DISTRICT.

Station Number.	Name.	Location.		
1032	Big Qualicum river	One and one-half miles from mouth	Prov. Water Dist.	1.
1042	Campbell river	At Campbell lake	"	"
1027	Chemainus river	One mile from mouth near Chemainus	"	"
1054	Cowichan river	At Cowichan lake	"	"
1030	Englishman river	One and one-half miles from mouth, near Parksville	"	"
1029	Haslam creek	Two miles from mouth, near Ladysmith	"	"
1026	Koksilah river	Two miles from mouth	"	"
1031	Little Qualicum river	At Cameron lake	"	"
1028	Nanaimo river	Six miles from mouth	"	"
1040	Oyster river	One mile from mouth	"	"
1036	Puntledge river	One mile from mouth, near Courtenay	"	
1063	Puntledge river	Diversion dam above Canadian Collieries power plant	"	
1025	Shawnigan creek	At Shawnigan lake, Koenigs	"	"
1051	Sproat river	At Sproat lake	"	"
1052	Stamp river	At Great Central lake	"	"
*1053	Stamp river	One-half mile above Stamp falls	"	"
1039	Tsolum river	Three miles from mouth, near Courtenay	"	"

Note.—Stations marked with an asterisk (*) have been only recently established and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded and run-off data will be returned in the report for 1915.

Coast Division.—List of Regular Gauging Stations.

LILLOOET DISTRICT.

Station Number.	Stream.	Location.		
1045	Bridge river	Thirty miles from mouth	Prov. Water Dist	1.
1048	Cayuse creek	Above Seton creek	"	"
1034	Cheakamus river	One mile above mouth	"	"
1047	Fountain creek	Above irrigation ditches	"	"
1035	Green river	Above Nairn falls	"	"
1041	Green river	Below Green lake	"	"
1050	Laluwissin creek	Above irrigation ditches	"	"
1038	Lillooet river	Six miles above Lillooet	"	"
1043	Riley creek	Above irrigation ditches	"	"
1049	Seton creek	Below Seton lake	"	"
1061	Six Mile creek	Near Mouth	"	"
1037	Soo river	One mile from mouth	"	"
1044	Texas creek	One mile from mouth	"	"

Coast Division.—List of Miscellaneous Gauging Stations.

SOUTHERN DISTRICT.

Name.	Location.		
Trout—East	Hastings townsite	Prov. Water Dist	1.
Trout—West	Hastings townsite	"	"
Windermere	Bidwell bay, Burrard inlet	"	"
Capilano	Intake from Capilano creek	"	"

VANCOUVER ISLAND.

Ash	Mouth	"	"
Sooke	Sooke inlet	"	"

KAMLOOPS DIVISION.

E. M. Dann, Divisional Engineer.

The three districts comprising the Kamloops division are the Kamloops, the Okanagan, and the Ashcroft. A general description of each district will be found on pages 35 and 36 of the division engineer's report.

Kamloops district has been in charge of E. H. Tredcroft, C.E.

Okanagan district has been in charge of K. G. Chisholm, B.Sc.

Ashcroft district has been in charge of C. B. Corbould, B.A.Sc.

The transportation facilities in this division are much better than in the Coast and Nelson divisions, and Mr. Dann has availed himself of these facilities to assist and supervise the establishment of new stations in the extension of this work.

The computations for the stations of each district have been made by the engineer in charge of the field work of that district, and checked by the division engineer.

Kamloops Division.—List of Regular Gauging Stations.

KAMLOOPS DISTRICT.

Station Number.	Name.	Location.			
2002	Bolean creek	Tp. 18, R. 12, W. 6 M	Prov. Water Dist.	2.	
*2068	Boulder creek	Near Chu Chua	"	"	
2004	Campbell creek	Tp. 19, R. 16, W. 6 M	"	"	
2057	Canyon creek	Tp. 21, R. 15, W. 6 M	"	"	
2047	Clearwater river	Near Raft river	"	"	
2056	Little Clearwater river	Near Raft river	"	"	
2005	Cherry creek	Tp. 19, R. 19, W. 6 M	"	"	
2011	Essell creek	Tp. 17, R. 14, W. 6 M	"	"	
*2067	Fishtrap creek	Near Barriere	"	"	
2014	Guichon creek	Near Mamit lake	"	"	3
2019	Heffley creek, (below Heffley lake)	Tp. 22, R. 16, W. 6 M	"	"	2
2018	Heffley creek (Lower)	Tp. 22, R. 17, W. 6 M	"	"	
2020	Ingram creek	Tp. 17, R. 13, W. 6 M	"	"	
2022	Jamieson creek	Tp. 22, R. 17, W. 6 M	"	"	
2023	Louis creek	Tp. 23, R. 15, W. 6 M	"	"	
2026	Monte creek (Division to Summit lake)	Tp. 18, R. 14, W. 6 M	"	"	
2025	Monte creek (below Division to Summit lake)	Tp. 13, R. 14, W. 6 M	"	"	
2024	Monte creek (above Bostock diversion)	Tp. 19, R. 15, W. 6 M	"	"	
*2069	Myrtle river	Near Raft river	"	"	
2032	Paul creek (below Paul lake)	Tp. 20, R. 16, W. 6 M	"	"	
2055	Raft river	Near Raft river	"	"	
2058	Siwash creek	Tp. 22, R. 16, W. 6 M	"	"	
2040	Thompson river (Kamloops)	Tp. 20. R. 17, W. 6 M	"	"	
**2041	N. Thompson river (above Jamieson creek)	Tp. 22, R. 17, W. 6 M	"	"	
**2059	N. Thompson river (above Clearwater river)	Near C.N.R. Mile 71 north of Kamloops	"	"	
2043	Tranquille river	Tp. 20, R. 19, W. 6 M	"	"	
*2066	Whitewood river	Near Barriere	"	"	

Note.—Stations marked with an asterisk (*) have been only recently established, and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded, and run-off data will be returned in the report for 1915.

**Owing to certain discrepancies between the results found on the two North Thompson river stations, the data for 1914 on both these stations is withheld until the difficulties can be adjusted in the open season.

SESSIONAL PAPER No. 25e

Kamloops Division.—List of Regular Gauging Stations—*Con.*

OKANAGAN DISTRICT.

Station Number.	Name.	Location.
2000	Adams river	Tp. 23, R. 12, W. 6 M.	Prov. Water Dist.	2.
2065	Ashnola creek	Near Ashnola	"	"	4.
2048	Boundary creek	At Greenwood	"	"	5.
2050	Celeste creek	Near Albas	"	"	2.
2051	Crazy creek	Tp. 23, R. 5, W. 6 M.	"	"	2.
2010	Eagle river	Tp. 23, R. 6, W. 6 M.	"	"	2.
2064	Granite creek	Near Coalmont	"	"	4.
2052	Kettle river (N. Fork)	At Grand Forks	"	"	5.
2045	Kettle river (W. Fork)	Near Westbridge	"	"	5.
2046	Kettle river (Nicholsons Bridge)	Near Kettle Valley	"	"	5.
2049	Kettle river (Carson)	At Carson	"	"	5.
2031	Niskonlith creek	Tp. 21, R. 13, W. 6 M.	"	"	2.
2053	Okanagan river	Near Fairview	"	"	4.
*2061	Seymour river	Near Seymour Arm	"	"	2.
2054	Similkameen river	Near Ashnola	"	"	4.
2034	Shuswap river	Tp. 18, R. 9, W. 6 M.	"	"	2.
2063	South Similkameen river	At Princeton	"	"	4.
2055	Tulameen river	At Coalmont	"	"	5.
2042	Thompson river (Chase)	Tp. 21, R. 13, W. 6 M.	"	"	2.

Note.—Stations marked with an asterisk (*) have been only recently established, and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded, and run-off data will be returned in the report for 1915.

Kamloops Division.—List of Regular Gauging Stations.

ASHCROFT DISTRICT.

Station Number.	Name.	Location.
2001	Barnes creek	Tp. 20, R. 24, W. 6 M.	Prov. Water Dist.	2.
2003	Bonaparte river	Tp. 21, R. 24, W. 6 M.	"	"	2.
2007	Criss creek	Tp. 22, R. 22, W. 6 M.	"	"	2.
2006	Coldwater river	At Merritt	"	"	3.
2008	Deadman river	Tp. 22, R. 22, W. 6 M.	"	"	2.
2012	Fraser river (Lytton)	Tp. 15, R. 27, W. 6 M.	"	"	1
2016	Hat creek (above Hammond's diversion)	Tp. 19, R. 26, W. 6 M.	"	"	2
2028	Nahatlatch river (Upper)	Tp. 12, R. 27, W. 6 M.	"	"	1
2027	Nahatlatch river (Lower)	Tp. 12, R. 27, W. 6 M.	"	"	1
2029	Nicoln river (Merritt)	At Merritt	"	"	3
2030	Nicola river (Mouth)	Tp. 17, R. 25, W. 6 M.	"	"	3
2037	Spius creek	Tp. 13, R. 23, W. 6 M.	"	"	3
2039	Thompson river (Spences Bridge)	Tp. 17, R. 25, W. 6 M.	"	"	3

Kamloops Division.—List of Miscellaneous Gauging Stations.

KAMLOOPS DISTRICT.

Name.	Location.
Alkali	Tp. 19, R. 19, W. 6 M. ..Prov. Water Dist. 2.
Bear	Near Raft river " " 2.
Beaver river	Near Raft river " " 2.
Cahilty	Tp. 23, R. 15, W. 6 M. " " 2.
Candle	Near Raft river " " 2.
Chartrand	Tp. 17, R. 21, W. 6 M. " " 3.
Chartrand (Springs)	Tp. 17, R. 21, W. 6 M. " " 3.
Cherry creek (Cornwall ranch)	Tp. 19, R. 19, W. 6 M. " " 2.
Dupuis	Tp. 17, R. 21, W. 6 M. " " 3.
Edwards	Tp. 22, R. 16, W. 6 M. " " 2.
Greenstone creek	Tp. 17, R. 20, W. 6 M. " " 3.
Gordon	Tp. 22, R. 21, W. 6 M. " " 2.
Guichon creek (Chartrand's diversion)	Tp. 17, R. 21, W. 6 M. " " 3.
Guichon creek (F. Allen's ranch)	Tp. 18, R. 21, W. 6 M. " " 3.
Guichon creek (Chartrand's ranch)	Tp. 17, R. 21, W. 6 M. " " 3.
Hemp	Near Raft river " " 2.
Heffley creek (Anderson's diversion)	Tp. 22, R. 16, W. 6 M. " " 2.
Meadow	Tp. 17, R. 21, W. 6 M. " " 3.
Noble	Tp. 21, R. 17, W. 6 M. " " 2.
Paul creek (at outlet of lake)	Tp. 20, R. 16, W. 6 M. " " 2.
Pendleton	Tp. 19, R. 19, W. 6 M. " " 2.
Quenville	Tp. 17, R. 21, W. 6 M. " " 3.
Three Mile	Tp. 20, R. 20, W. 6 M. " " 2.
Witch	Tp. 18, R. 21, W. 6 M. " " 3.

Kamloops Division.—List of Miscellaneous Gauging Stations.

OKANAGAN DISTRICT.

Name.	Location.
Cinnemousun	Tp. 23, R. 7, W. 6 M. ..Prov. Water Dist. 2.
Queest	Tp. 24, R. 7, W. 6 M. " " 2.
Scotch	Tp. 22, R. 11, W. 6 M. " " 2.
Seymour creek	Near Seymour Arm " " 2.
Sixmile	Near Granite creek " " 4.
Twenty Mile	Near Hedley " " 4.

ASHCROFT DISTRICT.

Hat creek (Hammond's diversion)	Tp. 19, R. 26, W. 6 M. ..Prov. Water Dist. 2.

NELSON DIVISION.

C. E. Richardson, Division Engineer.

The three districts comprising the Nelson division are the Nelson, the Revelstoke, and the Cranbrook. A general description of each district will be found on pages 48 and 49 of the division engineer's report.

Nelson district has been in charge of C. E. Richardson, B.A.Sc.

Revelstoke district has been in charge of J. A. Elliot, B.A.Sc.

Cranbrook district has been in charge of D. O'B. Gill, B.Sc.

A considerable number of gauging stations were established throughout this division by the Provincial Water Rights Branch, and on some of the small over-recorded irrigation streams the hydrographic work is still continued by that branch.

Toward the end of October, Mr. Gill left the staff for active service with the Royal Engineers.

Computations for the Nelson and Revelstoke districts have been made by Mr. Richardson and Mr. Elliott, while the computations for the Cranbrook district have been made by Mr. Beeston, office engineer. All work was checked by the division engineer.

Nelson Division—List of Regular Gauging Stations.

NELSON DISTRICT.

Station Number.	Name.	Location.
3057	Cariboo creek	Near Burton City ... Prov. Water Dist. No. 6
3024	Carpenter creek	Near New Denver ... " " 6
3025	Carpenter creek	Near Sandon ... " " 6
3004	Columbia river (Castlegar)	Near Castlegar ... " " 6
3007	Columbia river (Trail)	Near Trail ... " " 6
*3066	Duncan creek	Near Howser ... " " 6
3027	Four Mile creek (below mill)	Near Silverton ... " " 6
3028	Four Mile creek (above intake)	Near Silverton ... " " 6
*3070	Fry creek	Near Johnstones Landing (12 miles from Kaslo) ... " " 6
*3071	Glacier creek	Near Howser ... " " 6
3031	Goat river	Near Erickson ... " " 6
3029	Kaslo creek	Near Kaslo ... " " 6
3022	Kooskanax creek	Near Nakusp ... " " 6
3075	Kootenay river	Near Bonnington falls " " 6
3076	Kootenay river	Near Bonnington pool " " 6
3077	Kootenay river	Near Nelson ... " " 6
3014	Kootenay river	Near Glade ... " " 6
*3068	Lardeau river	Near Howser ... " " 6
3021	Nakusp creek	Near Nakusp ... " " 6
3017	Pend d'Oreille river	Near Waneta ... " " 6
3026	Sawmill creek	Near New Denver ... " " 6
3018	Slocan river	Near Crescent Val ... " " 6
*3023	Wilson creek	Near Roseberry ... " " 6

Note.—Stations marked with an asterisk (*) have been only recently established, and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded, and run-off data for 1914 will be returned in the report for 1915.

Nelson Division.—List of Regular Gauging Stations.

REVELSTOKE DISTRICT.

Station Number.	Name.	Location.
3000	Akolkolex river	Tp. 22, R. 1, W. 6 M. Prov. Water Dist. No. 8
3001	Beaver river	Tp. 29, R. 25, W. 5 M. " " 8
3002	Blaeberry river	Tp. 28, R. 22, W. 5 M. " " 8
3003	Bugaboo creek	Near Spillimacheen " " 8
*3051	Canyon creek	Tp. 25, R. 22, W. 5 M. " " 8
3005	Columbia river (Golden)	Tp. 27, R. 22, W 5 M. " " 8
3007	Columbia river (Revelstoke)	Tp. 23, R. 2, W. 6 M. " " 8
3035	Dutch creek	Near Fairmont Springs " " 8
3062	Field Springs (No. 1)	Tp. 28, R. 18, W. 5 M. " " 8
3063	Field Springs (No. 2)	Tp. 28, R. 18, W. 5 M. " " 8
3064	Field Springs (No. 3)	Tp. 28, R. 18, W. 5 M. " " 8
3036	Findlay creek	Near Thunder Hill " " 8
3008	Horsethief creek	Near Wilmer " " 8
3053	Hospital creek (Weir)	Tp. 27, R. 22, W. 5 M. " " 8
3010	Illecillewaet river (Glacier)	Tp. 26, R. 26, W. 5 M. " " 8
3009	Illecillewaet river (Revelstoke)	Tp. 23, R. 2, W. 6 M. " " 8
3030	Incomappleux river	Near Beaton " " 8
3011	Kicking Horse river (Golden)	Tp. 27, R. 22, W. 5 M. " " 8
3012	Kicking Horse river (Field)	Tp. 28, R. 18, W. 5 M " " 8
3013	Kicking Horse river (No. 2 Tunnel)	Tp. 28, R. 18, W. 5 M " " 8
3015	No. 2 Creek	Near Wilmer " " 8
*3074	Salmon river	Near Beaton " " 8
3034	Sinclair creek	Near Sinclair " " 8
3019	Spillimacheen river	Near Spillimacheen " " 8
*3060	Shuswap river	Near Athalmer " " 8
*3061	Stoddart creek	Near Athalmer " " 8
3020	Toby creek	Near Athalmer " " 8
3032	N. Vermillion creek	Near Edgewater " " 8
3033	S. Vermillion creek	Near Edgewater " " 8
*3054	Washout creek	Near Galena " " 8
3055	Windermere creek	Near Windermere " " 8

Note.—Stations marked with an asterisk (*) have been only recently established, and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded, and run-off data will be returned in the report for 1915.

Nelson Division.—List of Regular Gauging Stations.

CRANBROOK DISTRICT.

Station Number.	Name.	Location.
3039	Bull river	Near Bull river Prov. Water Dist. No. 7
3038	Cherry creek	Near Wasa " " 7
3048	Elk river	Near Elko " " 7
3047	Gold creek	Near Newgate " " 7
3041	Kootenay river	Near Wardner " " 7
3045	Linklater creek	Near Newgate " " 7
3037	Mark creek	Near Marysville " " 7
*3056	Moyie creek	Near Kingsgate " " 7
3044	Mud creek	Near Elko " " 7
3046	Phillips creek	Near Roosville " " 7
3049	Rock creek	Near Baynes " " 7
3042	Big Sand creek	Near Jaffray " " 7
3043	Little Sand creek	Near Jaffray " " 7
3050	St. Marys river	Near Wycliffe " " 7

SESSIONAL PAPER No. 25e

NELSON DIVISION—List of Miscellaneous Gauging Stations.

NELSON DISTRICT

Name.	Location.
Kootenay river	Near Taghun, Prov. Water Dist. No. 6

REVELSTOKE DISTRICT.

Boulder creek	Tp. 3, R. 27, W. 6 M.	Prov. Water Dist. No. 8
Columbia river	Near Athalmer	" " 8
Field river	Tp. 28, R. 18, W. 5 M.	" " 8
Horse	Tp. 26, R. 21, W. 5 M.	" " 8
Hospital	Tp. 27, R. 22, W. 5 M.	" " 8

CRANBROOK DISTRICT.

Little Bull	Near Bull river	Prov. Water Dist. No. 7
Lewis	Near Wasa	" " 7
Sheep	Near Wasa	" " 7
Skookumchuk	Near Wasa	" " 7

EXPLANATION OF TABLES.

For each regular gauging station the following data are given so far as available:—

1. Description of station.
2. Table of discharge measurements.
3. Daily gauge-height discharge table.
4. Tables of monthly discharges and run-off.

Under the description of stations is given the location, general information regarding the equipment, and the time the station has been maintained. Regarding stations established this year, is given briefly, the source, description of drainage area, and present uses of the river. In addition, the description covers ice conditions and their effect on the relation of gauge height to discharge.

The table of discharge measurements gives the number of measurements made during the year, the date measurement was made, name of hydrographer, the width and area of the cross section and the discharge in cubic feet per second. The zero of the gauge is placed in an arbitrary datum, and has no relation to the zero flow or bed of the river. In general, the zero is located below the lowest known flow.

The daily gauge-height discharge table gives the daily elevation of the surface of the river above the zero of the gauge, and the daily discharge in cubic feet per second for the observed gauge height.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gauge height was highest. As the gauge height is the mean for the day, there may have been short periods when the gauge height and corresponding discharges were higher than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gauge height was lowest. The column headed "Mean" is the average flow for each second during the month. On this the computations for the remaining columns are based.

DEFINITIONS OF TERMS.

The volume of water flowing in a stream called the run-off or "discharge" is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second feet, gallons per minute, and run-off in second feet per square mile; and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre feet.

The units used in this report are second-feet, second-feet per square mile, run-off in inches, and acre-feet.

"Second-foot" is an abbreviation for a cubic foot per second (c.f.s.) and is the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the following table of equivalents.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is a common unit of measurement of quantity, and is generally used in connection with storage.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:—

1 second-foot equals 35·71 British Columbia miner's inches.

1 second-foot equals 6·23 British imperial gallons per second; equals 538,472 gallons for one day.

1 second-foot equals 7·48 United States gallons per second; equals 646,272 gallons for one day.

1 second-foot for one year covers 1 square mile 1·131 feet or 13·572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet; equals 724 acre-feet.

1 second-foot equals about 1 acre-inch per hour.

1 second-foot for one day equals 86,400 cubic feet; equals 1·983 acre-feet.

1 second-foot for one 28-day month equals 55·52 acre-feet.

1 second-foot for one 29-day month equals 57·50 acre-feet.

1 second-foot for one 30-day month equals 59·48 acre-feet.

1 second-foot for one 31-day month equals 61·46 acre-feet.

1 second-foot for one 28-day month covers 1 square mile 1·041 inches deep.

1 second-foot for one 29-day month covers 1 square mile 1·079 inches deep.

1 second foot for one 30-day month covers 1 square mile 1·116 inches deep.

1 second-foot for one 31-day month covers 1 square mile 1·153 inches deep.

100 British imperial gallons per minute equals 0·268 second-feet.

100 United States gallons per minute equals 0·223 second-feet.

1,000,000 British imperial gallons per day equals 1·86 second-feet.

1,000,000 United States gallons per day equals 1·55 second-feet.

1,000,000 British imperial gallons equals 3·68 acre-feet.

1,000,000 United States gallons equals 3·07 acre-feet.
1,000,000 cubic feet equals 22·95 acre-feet.
1 acre-foot equals 43,560 cubic feet.
1 acre-foot equals 271,472 British imperial gallons.
1 acre-foot equals 325,850 United States gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0·0737 second-foot per year.
1 acre equals 43,560 square feet.
1 cubic foot equals 6·23 British imperial gallons.
1 cubic foot equals 7·48 United States gallons.
1 cubic foot of water weighs 62·4 pounds.
1 horse-power equals 550 foot-pounds per second.
1 horse-power equals 746 watts.
1 hores-power equals 1 second-foot falling 8·80 feet.

To calculate water power quickly:

$$\frac{\text{sec.-ft.} \times \text{fall in feet}}{11} = \text{net horse-power on water wheel, realizing 80 per cent of theoretical power.}$$

ACCURACY AND RELIABILITY OF DATA.

Practically all discharge measurements made under fair conditions are well within 5 per cent of the true discharge of the time of observation. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve, when well defined, is much more accurate than the individual measurements.

In order to give information regarding the probable accuracy of the computed results, an accuracy column is inserted in the monthly discharge table. Accuracy "A" indicates that the mean accuracy is probably accurate within 5 per cent; "B" within 10 per cent; "C" within 15 per cent; "D" within 15 to 25 per cent. Special conditions are covered by foot notes.

The accuracy in many cases is not as great as we would wish, the area covered is very large, and a large number of the stations have been maintained for less than a year. Future observations may render necessary a certain amount of revision of the data here supplied.

The topographic surveys of the province are very incomplete, and the drainage areas are, in many cases, only approximate; consequently the figures showing discharge per square mile, and run-off depth in inches may be somewhat in error.

METHODS OF MEASURING STREAM FLOW.

It is not intended to enter into a discussion of these methods in the report. The methods used are practically identical with those used by the Water Resources Branch of the United States Geological Survey, recognized the most up-to-date method of stream flow measurement. The text of "River Discharge" by Holt and Grover amply illustrates the methods employed.

CO-OPERATION AND ACKNOWLEDGMENTS.

Thanks are due to Mr. G. R. G. Conway, of the British Columbia Electric Railway Company; Mr. R. F. Hayward, of the Western Canada Power Company, Vancouver; and Mr. Wm. Young, Comptroller of Water Rights, Department of Lands, Victoria, B.C., for stream flow and other data submitted with this report. Thanks are also due Mr. F. H. Peters, Commissioner of Irrigation, Department of the Interior, Calgary, by whose courtesy our current-meters have been rated each year.

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER 2

Coast Division

REPORT OF C. G. CLINE, B.A.Sc., D.L.S.
Division Engineer.

CHAPTER II.

COAST DIVISION.

TERRITORY.

The boundaries of the Coast division follow the lines of the watersheds as much as possible in order to facilitate the work of stream measurement. The districts into which the Coast division has been divided follow the same plan. For this reason it is rather difficult to exactly outline the boundaries of the division and districts.

The Coast division includes the southwestern portion of British Columbia as far as North Bend on the Canadian Pacific railway, and Lillooet on the Pacific Great Eastern Railway; It also includes the whole of Vancouver island. All stations numbered between 1,000 and 1,065 are in the Coast division. Reference to the key map will show the general extent of the territory covered.

USES OF WATER.

In this division the chief use to which water may be put is for power, and a large number of streams are commercially valuable for this purpose only.

PRESENT WATER-POWER DEVELOPMENTS.

A small portion only of the power available is at present developed, and a list of the streams on which water power is being developed is included in this report. Some of these plants are described herein, but most of the descriptions were given in the report for 1913. In such cases the description is not repeated, but proper references are given.

POSSIBLE WATER-POWER DEVELOPMENTS.

In last year's report a list was given of a number of streams with water-power possibilities, supplemented in most cases by a general description of a practicable scheme of development. In this report, this list is reprinted and amplified, but descriptions are not reprinted; proper references are, however, inserted. Streams not included in last year's list are described in detail herein. This list is being made as complete as possible as new ground is covered from year to year.

MUNICIPAL SUPPLY.

Every city and municipality of any size requires a good supply of clear, uncontaminated water for domestic purposes. At present regular measurements are being made on a number of streams used in this way, and a list of these is included herein. As the country develops the number of streams required for such a purpose will naturally increase.

RECLAMATION.

In certain parts of the division there are tracts of land, which, though they are at present of comparatively little value for agricultural purposes could be reclaimed at a reasonable expense. In constructing a system of dykes and

making channel improvements to reclaim such land, there is generally some stream which must be controlled. Accurate records of the run-off of such rivers is of prime importance. A number of these streams are being gauged at present a list of which is appended.

IRRIGATION.

In the vicinity of Lillooet it is necessary to irrigate the farms, and water from a number of streams is used for this purpose. A list is here given of the irrigation streams on which regular measurements are being made during the irrigation season, and includes a number of streams which are not used for irrigation at present, but which may be used at some time in the future, when the necessary engineering works have been constructed.

LOCATION OF STATIONS.

Gauging stations are generally established close to possible future points of diversion for water supply, irrigation or power. On some streams, however, the desired location is so difficult of access that the cost of maintaining a gauging station would be prohibitive; in such cases, stations are established at more convenient places and from the records so obtained the stream flow at the desired site is estimated.

PRECIPITATION AND TEMPERATURE.

Records have been prepared showing the monthly precipitation and the mean monthly temperatures for 1914 at the various stations, and the variation from the average where the records have been kept for a sufficient number of years to render these figures of any value is also given. A study of these tables will show the general effect of these important factors on the flow of the streams, and the figures for the variation from the average for a number of years will indicate to some extent, the general characteristics of the stream flow for 1914 as compared with other years.

COMPARISON OF STREAM MEASUREMENTS.

A table is also included, giving the monthly discharges of a number of gauging stations for the past two or three years, thus providing a ready means for the comparison of yearly run-off. The continuance of the stream measurement work will make comparisons of this nature increasingly valuable from year to year.

One of the outstanding features in 1914 was the very heavy freshet which, with the exception of the Fraser river, occured early in January on nearly all the streams in the Coast division. A winter flood of this nature is not an uncommon occurrence in this part of the country, although it is not usually so great as during this past year.

DISTRICTS.

The territory comprising the Coast division has been divided into three districts. The Southern district includes that portion of the Railway Belt which lies in the Coast division, and some contiguous watersheds not included in either of the other districts. The Lillooet district includes the streams along the route of the Pacific Great Eastern railway from the head of Howe sound to the vicinity of Lillooet. Beyond Lillooet the territory is included in the Kamloops division. Vancouver island constitutes a district by itself.

Work was started in the Southern district in the Railway Belt late in the fall of 1911, so that on some of the streams there are now three years' complete measurements—1912, 1913, and 1914. The monthly and yearly discharges at these stations are tabulated in this report for the purpose of comparing the flow for 1914 with that of the previous two years. Such comparisons should be of considerable value in considering streams on which there are measurements for one year only. The work in the Southern district was extended during 1913 and 1914 to include a number of streams outside the Railway Belt.

Work was started in the Lillooet district in the fall of 1913, so that on some of the streams there is one year's complete records. A number of other stations were established in 1914, and the list will probably be somewhat increased in 1915. Transportation conditions in this district have until recently been very poor, and on that account the work has been delayed. The completion of the Pacific Great Eastern railway from Squamish to Lillooet will greatly better conditions during 1915, and will ensure a much greater number of measurements in a shorter time.

On Vancouver island, work was started by the engineers of this survey in the spring and summer of 1914. On some of the streams the stations had already been established by the engineers of the Provincial Water Rights Branch, and in such cases records are available for a whole year. Some of the stations were not established until after the spring freshet, so that the rating curves are not well defined for the higher stages; this will be remedied during 1915.

General descriptions have been prepared by the engineers in charge of each district, covering more especially the local conditions and particulars of the work peculiar to each district.

SOUTHERN DISTRICT.

The general characteristics of the Southern district are determined mainly by the mountainous nature of the country and its proximity to the Pacific ocean.

The commercial and industrial activities of the cities and harbours of the Burrard peninsula have been developed within a few miles of large areas of virgin forests and snow-capped mountains. The settlement is confined mainly to the Fraser valley, and the valleys of the tributary streams are almost entirely unoccupied. The transportation facilities in the valleys are very poor, and it is hard to find any one to read the gauges, and it is both difficult and expensive to maintain gauging stations except near the mouths of these streams.

The influence of the mountains is shown in the local variations in the precipitation. In the lower Fraser valley the average rainfall is about 60 inches. At Ladner and Steveston, which are not near the hills, it is only 40 inches or less. It increases rapidly as the hills are approached, sometimes doubling in amount within a few miles. At Coquitlam junction the average is about 70 inches, while at lake Coquitlam, some 10 miles farther north, the average is about one hundred and fifty. This is the largest average precipitation recorded at any of the stations, though even this amount is probably exceeded on some of the mountains.

The effect of the ocean is seen in the mildness of the climate in the lower Fraser valley. Near sea-level there is very little ice and snow in winter, and the summer is not exceedingly hot, the seasonal variation at any one place being comparatively small. There is, however, a considerable difference of temperature at different altitudes, with the result that though there is little or no snow at sea-level, there is a very heavy fall of snow among the hills. On the mountain peaks snow remains nearly all summer.

A reference to the tables of precipitation and temperature for the Southern district will show more definitely the special characteristics of the weather for 1914. The stations near the top of the tables are the ones nearest the coast, while those near the bottom are the ones farther east. The first four stations, Britannia Beach, Vancouver, Steveston, and Ladner are all on the coast, with Britannia Beach farthest north and Ladner farthest south. One set of tables gives the total monthly and annual precipitation and the mean monthly and annual variation from the corresponding averages for the last ten years or more.

This second set of tables shows how the precipitation and temperature for 1914 compared with the average. On the whole, the year was somewhat drier and considerably warmer than usual. The most unusual occurrence was the extra heavy precipitation in January, accompanied by warm weather. This caused a very large run-off during the month, and as a result the amount of snow on the hills was considerably reduced. The warmer weather during the spring and summer resulted in an earlier melting of the snow than usual, with a consequent earlier low-water period toward the end of the summer, while on the other hand the heavier precipitation of September and October ended the low-water stage at an earlier date than usual. The warm weather of November was followed by a cold snap in the latter part of December.

The effect of these variations in the weather is seen in the flow of the streams; the table of comparison of monthly discharges gives the average monthly discharges for certain streams for the last three years. It shows a larger discharge for 1914 during January and also in March and April. The flow fell off for July, and the summer low-water came in August and early in September. There were freshets in September and October and high water in November. Towards the end of December the streams were low. For the whole year, the warmer weather caused a larger run-off than usual on the streams which have very extensive snowfields; on the others, the lighter precipitation was reflected in the somewhat smaller discharge. The Fraser river, having such an extensive drainage area, responds only to variations common to the greater part of the country through which it flows.

LILLOOET DISTRICT.

This district includes the country along the Pacific Great Eastern railway from Squamish to Lillooet. Squamish is situated on tidewater at the head of Howe Sound. Lillooet is on the Fraser river, 120 miles inland, and at an elevation of 850 feet. Midway between the two is the Lillooet river, with a broad valley known as Pemberton Meadows.

From Squamish, the railroad climbs up through the canyon of the Cheakamus river to the lakes at the summit, rising 2,000 feet in 38 miles. There are four lakes at practically the same elevation, and they extend about 8 miles. Green lake is the largest and discharges through Green river into the Lillooet river, falling 1,400 feet in 14 miles. Nairn falls is located about 8 miles from the mouth, and has a drop of some two hundred feet in a quarter of a mile. Soo river and Sixmile creek empty into Green river above the falls.

The Lillooet river flows for a considerable distance through the Pemberton Meadows, and enters Lillooet lake just below the mouth of Green river. During this part of its course the Lillooet river has very little fall, it consequently overflows its banks, flooding most of the bottom land in the meadows. There is a large area of very fertile land in the Lillooet valley, and when some system of controlling the river is put in operation it should develop into a very important agricultural district.

The town of Lillooet is on the west side of the Fraser river, 3 miles east of Seton lake. It has a population of about 600 and is situated in quite an extensive farming district. The climate is very dry, so that irrigation is absolutely necessary for the production of crops. The large amount of bright sunshine and warm weather during the summer, combined with the general fertility of the soil, produces very rapid growth when the necessary moisture is supplied by irrigation. Measurements are being made on a number of irrigation streams in this vicinity.

VANCOUVER ISLAND DISTRICT.

The Vancouver Island district comprises the whole of Vancouver island. The island has an area of approximately 12,900 square miles, being some 260 miles in length, with an average width of 50 miles. Vancouver island lies off the southern coast of British Columbia, and trends N. 50° W. along the coast.

Vancouver island is divided into two principal drainages, those of the east and west coast, by the Beaufort range of mountains. This range extends from a group in the south of which mount Arrowsmith at an altitude of 5,900 feet predominates to a much larger group in the north, several of whose peaks rise over 7,000 feet. Glaciers are to be found on several of the higher peaks. With the mountainous interior and a comparatively narrow coastal plane, the rivers, for the most part, are short and have considerable fall. This is most advantageous for hydro-electric developments. The streams which do not rise from lakes are mostly flashy.

The climate is moderate, the mean temperatures of each month varying from a minimum of about 30 degrees to a maximum of 65 degrees, except in the higher altitudes. The precipitation is least on the southeast coast, averaging some 30 inches. It increases rapidly especially up to the west coast, to a precipitation of about 130 inches at the north end of the island. The rainfall is usually least in the months of July and August and greatest in the month of November in all parts of Vancouver island.

The accompanying tables show the temperatures and precipitation at five different localities for the year 1914. Tables giving the monthly variation, for 1914, from the monthly average temperature and precipitation for the past ten years or more, are also shown. From these tables it is seen that the temperature on the whole island was above the average, while the precipitation was also higher.

The means of transportation are improving rapidly. The Esquimalt and Nanaimo Railway, which has been operating between Victoria, Nanaimo, and Port Alberni, opened its extension from Parksville to Courtenay in August, 1914. The Canadian Northern Pacific railway line from Victoria to Alberni is nearing completion and a line is located as far as Campbell river. The Great Northern operates a line on the Saanich peninsula from Sidney to Victoria. The Canadian Northern also has a line under construction from Victoria to Patricia bay on the Saanich peninsula. There is a good coastal service maintained by several navigation companies. These, with the excellent government highways, will greatly assist in the further development of Vancouver island.

The excellent agricultural possibilities on the island, due to the richness of the soil and the abundant rainfall, is well exemplified by the fine farms in the older settlements of the Saanich, Cowichan, and Comox districts.

Vancouver island is rich in mineral wealth. The large coal deposits in the vicinity of Nanaimo and Cumberland are all being extensively mined. On the west coast, valuable deposits of gold and copper have been found. Cement is manufactured extensively in the Saanich district. Good pottery clay is found near Victoria; pottery to the value of $90,000, and bricks to $110,000 were manufactured in 1913. Two powder factories have plants on the island.

The timber wealth of the island is its greatest asset. Considerable timber has already been cut, but the lumber industry may still be considered in its infancy.

The British Columbia Electric Railway Company installed the first hydro-electric plant on Vancouver Island on the Goldstream river in 1898, about 15 miles from Victoria. This plant at present develops 3,000 horse-power. There are four units: two 350 k.w., one 500 k.w., and one 1,000 k.w. Current is generated at 700 volts, and is stepped up to 17,500 volts. The development consists of one pipeline of 33 inch pipe, 4,000 feet long, branching into 30 inch pipes at the back of power-house. The head is 680 feet.

Another more recent development of the British Columbia Electric Company is at the mouth of Jordan river, where 25,000 horse-power is developed from three units: two 6,000 horse-power and one 13,000 horse-power. The plant works under a high pressure head of 1,145 feet. The pipeline for the first two units (4,000 k.v. a. generator, and Doble wheel) is 2,600 feet in length. It is 50 inches in diameter at intake, and Ys to 36-inch pipes, which are reduced to 30 inches at the power-house. The third unit (8,000 k.v.a. generator, and Pelton Doble wheel) uses a 54-inch pipe at the intake, reduced to 44 inches at the power-house. Current is generated at 2,200 volts and is stepped up to 60,000 volts.

Both these plants are used to supply light and power in the city of Victoria and surrounding district.

Impounding dam of Puntledge River Hydro-Electric Installation on Puntledge river near outlet rom Comox lake.

The Puntledge River Hydro-Electric Installation, owned by the Canadian Collieries (Dunsmuir) Limited, is located on the Puntledge river about 6 miles above Courtenay. The plant is operated under a static head of 350 feet. The pipeline is 10,500 feet in length. The line consists of a single 8 foot wooden stave pipe from forebay, to a Y for two 6 foot pipes; only one is used at present and leads to a Y from which two 50 inch pipes carry water to the power-house.

Diversion dam showing flume to intake, of Puntledge River Hydro-Electric Installation on Puntledge river about two miles below impounding dam.

Present installation developing 12,500 horse-power, consists of one-half of ultimate plant. The generators are 4,400 k. v. a., 13,200 volt machines. The turbines are of Francis reaction type with single runner on horizontal axis.

This plant supplies light and power for the mines and the several towns of Cumberland, Bevan, Union Bay, and Courtenay.

The Campbell River Power Company have made extensive surveys in view of a large development at the falls on Campbell river, about 7 miles from the mouth.

The Ritchie Agnew Power Company contemplates the installation of a plant to develop about 35,000 horse-power on the Stamp river at Stamp falls, about 8 miles from Alberni.

There are many other streams on which surveys have been made, and which offer good possibilities for hydro-electric development, notably, Little Qualicum river, Nanaimo river, and Sproat river.

Owing to the abundant rainfall, practically no water is required for irrigation. The uses of water on Vancouver island are principally confined, therefore, to municipal water supply and power development.

The numerous large lakes which are located throughout the island afford a cheap means of assembling the timber cut from their shores, as well as good storage for large developments. Many ranchers have small hydro-electric plants to supply light and power for their own use. This is made practicable by the many small streams coming from the hills and cheap developments are possible. For the manufacture of electric chemicals, Vancouver island offers several excellent developments. On Cowichan river, the Government have a large fish hatchery, and the Cowichan river has been reserved for fishing.

Stream measurements were started in May, 1914, on Vancouver island, by the British Columbia Hydrographic Survey. Previous to that time, work had been done by the Provincial Water Rights Branch. Sixteen regular metering

stations were maintained and rated during the year. The Provincial Water Rights Branch gave every assistance possible and supplied much valuable data on many of the streams on which they had already done work.

During 1915 it is hoped to extend the work to the west coast and north end of the island, besides maintaining the stations already established.

DEVELOPED WATER-POWERS.

These plants are described either in this report or in the report for 1913, i.e., Water Resources Paper No. 8. This list will show where these descriptions can be found. The measurements taken in 1914 are given in the 1914 report.

SOUTHERN DISTRICT.

Coquitlam river	1913	report (Water Resources Paper No 8).
Gilley creek	1913	" "
Power river	1913	" "
Stave river	1913	" "

LILLOOET DISTRICT.

McGillivray creek	1914	report (Water Resources Paper No. 14) Seton creek.

VANCOUVER ISLAND.

Puntledge river	1914	report (Water Resources Paper No. 14).
Jordan river	1914	" "
Goldstream river	1914	" "

POSSIBLE WATER-POWER DEVELOPMENTS.

A general description of each possible development has been given either in this report or in the report for 1913. This list will show where these descriptions may be found. The stream-flow data are included in the 1914 report.

SOUTHERN DISTRICT.

Chehalis river	1913	report (Water Resources Paper No. 8).
Chilliwack river	1913	" "
Coquihalla river	1913	" "
Jones Creek	1913	" "
Mesliloet (Indian river)	1913	" "
Mesliloet river tributaries	1913	" "
Nicolum river	1914	" "
North Lillooet river	1913	" "
Rainbow creek	1913	" "
Raven creek	1913	" "
Samallow river	1914	" "
Silver-Hope creek	1913	" "
Silver-Pitt creek	1913	" "
Slollicum creek	1913	" "
South Lillooet river	1913	" "

SESSIONAL PAPER No. 25e

LILLOOET DISTRICT.

Bridge river	1913 report	(Water Resources Paper No. 8).		
Cheakamus river	1913	"	"	
Cayuse creek	1914	"	"	14
Green river	1913	"	"	
Little Blackwater river	1914	"	(Seton) "	
Soo river	1914	"	"	

VANCOUVER ISLAND.

Campbell river	1914 report	(Water Resources Paper No. 14).	
Stamp river at falls	1914	"	"
Little Qualicum river	1914	"	"
Nanaimo river	1914	"	"
Sproat river	1914	"	"
Stamp river at Great Central lake	1914	"	"

IRRIGATION STREAMS.

A general description of each stream has been given either in this report or in the report for 1913. This list will show where the description may be found. The measurements made in 1914 are given in the 1914 report.

SOUTHERN DISTRICT.

Silver-Hope creek, 1913 report. (Water Resources Paper No. 8).

LILLOOET DISTRICT.

Cayuse creek	1914 report	(Water Resources Paper No. 14).	
Fountain creek	1914	"	"
Laluwissin creek	1914	"	"
Riley creek	1914	"	"
Texas creek	1914	"	"

VANCOUVER ISLAND.

No irrigation.

MUNICIPAL WATER SUPPLY.

A general description of each stream has been given either in this report or in the report for 1913. This list will show where these descriptions may be found. The measurements for 1914 are given in the 1914 report.

SOUTHERN DISTRICT

Capilano creek	1913 report	(Water Resources Paper No. 8).	
Lynn creek	1913	"	"
Seymour creek	1913	"	"
Silver-Pitt creek	1913	"	"
Trout Creek	Miscellaneous measurements only—1914 report.		
Windermere creek	Miscellaneous measurement only—1914 report.		

VANCOUVER ISLAND.

Shawnigan creek.....1914 report.
Soo river.....Miscellaneous measurements only.

RECLAMATION AND DRAINAGE

The data for 1914 of the streams which are of interest in connection with reclamation and drainage projects is given in this report and the description in the 1913 report.

SOUTHERN DISTRICT.

Chilliwack river.
Silver-Pitt creek.

LILLOOET DISTRICT.

Lillooet river.

Total Monthly Precipitation, Southern District, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Britannia Beach	16·85	3·80	5·86	5·32	1·48	2·08	0·48	0·77	8·25	14·42	14·94	2·45	76·70
Vancouver	10·56	4·87	3·33	3·28	0·74	3·58	0·42	0·75	6·86	6·37	10·18	2·84	53·78
Steveston	8·41	2·10	1·44	2·46	0·53	2·44	0·13	0·37	3·60	4·41	6·17	2·59	34·65
Ladner	5·45	2·60	1·90	1·65	0·45	1·90	0·35	0·20	2·65	2·60	6·35	0·95	27·05
Buntzen lake	19·29	7·82	8·04	5·08	3·38	4·69	0·80	1·13	10·99	15·25	18·90	3·59	98·96
Coquitlam lake	26·51	9·54	10·00	6·92	4·71	5·26	0·57	1·30	13·85	20·27	25·37	5·28	129·58
Coquitlam junction	13·21	5·69	4·09	4·70	1·36	4·19	0·77	0·88	7·98	.....	12·09	3·23	.....
New Westminster	9·95	4·78	3·27	3·95	1·04	4·11	0·56	0·68	5·57	5·62	10·95	2·44	52·92
Stave Falls	12·22	4·72	5·60	7·49	2·65	4·18	0·87	0·54	9·86	7·63	15·20	3·13	74·09
North Nicomen	17·01	4·44	5·09	5·00	2·61	3·08	0·08	0·51	8·15	6·45	12·64	2·70	67·76
Agassiz	13·96	4·06	3·12	2·94	3·55	5·18	0·15	0·60	6·29	7·53	14·72	0·53	62·63
Jones creek	15·19	4·46	8·87	6·22	7·15	5·21	1·06	0·89	7·01	5·50	14·75	2·31	78·62
Chilliwack	14·68	3·27	4·49	3·94	1·97	3·14	0·17	0·45	6·35	4·71	9·87	2·08	55·12
Hope	10·94	4·31	5·01	3·62	3·10	1·96	0·11	0·79	.....	3·83	10·25	1·70	.....

Mean Monthly Temperature, Southern District, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Britannia Beach	38·8	38·9	46·3	49·2	55·8	55·0	59·8	59·6	53·9	53·5	42·2	37·0	49·2
Vancouver	40·5	38·7	44·9	50·6	56·4	58·7	63·5	61·8	54·8	52·5	44·5	36·4	50·3
Steveston	40·6	38·0	42·6	47·8	53·1	57·1	61·6	58·8	53·8	50·6	43·8	34·2	48·5
Ladner	43·4	38·8	45·1	50·4	55·0	56·8	62·5	60·4	55·9	54·2	45·1	34·5	50·2
New Westminster	38·8	37·7	44·7	50·6	57·4	59·3	64·1	63·5	55·0	53·1	43·2	35·1	50·2
Stave Falls	38·2	36·1	43·4	49·7	58·1	60·5	65·9	64·3	55·4	53·0	43·6	33·7	50·2
North Nicomen	38·6	38·1	46·0	52·0	58·8	59·9	64·7	64·4	55·2	53·5	44·1	34·6	50·8
Agassiz	38·0	39·6	45·0	51·6	56·3	57·2	62·1	63·0	54·2	50·4	42·6	35·2	49·6
Jones lake	30·0	29·0	34·0	40·0	50·0	51·0	60·0	61·0	50·0	45·0	35·7	25·5	42·6
Chilliwack	36·9	37·3	45·1	51·2	54·8	58·3	63·2	61·7	54·7	52·0	43·3	34·1	49·4
Hope	33·6	34·2	42·4	51·2	56·5	58·6	65·3	64·7	.....	50·4	40·1	29·8	.....

SESSIONAL PAPER No. 25e

Difference from Average Precipitation, Southern District, 1914.

(Difference of Total for month from monthly average for previous ten years or more.)

Locality.	No. Years Records	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Vancouver	14	2·38	−1·91	−1·15	1·14	2·74	0·77	−1·20	−1·04	2·54	0·63	−1·27	−4·72	−6·57
Steveston	17	2·92	−1·79	−1·00	0·58	−1·73	0·55	−0·81	−0·77	1·12	1·06	−0·87	−2·72	−3·46
Ladner	14	0·66	−0·60	−1·11	0·16	−1·87	0·24	−0·78	−0·95	−0·11	−1·51	0·19	−3·95	−9·95
Buntzen lake	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	−14·1
Coquitlam lake	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	−25·8
Coquitlam Junction	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Westminster	27	1·38	−0·32	−1·26	0·63	−1·18	0·98	−0·75	−1·28	1·94	0·22	1·82	−5·57	−3·39
North Nicomen	21	8·25	−3·89	−0·95	0·24	−1·95	−0·99	−1·86	−1·75	3·52	−1·02	0·42	−6·97	−6·95
Agassiz	24	7·16	−1·56	−1·89	−1·23	−0·96	0·36	−2·15	−2·15	1·63	1·73	5·81	−6·84	−0·09
Chilliwack	11	6·16	−3·10	0·06	0·23	−1·72	0·00	−1·86	−1·65	2·25	−1·22	0·53	−6·63	−6·95

N.B.—All quantities are plus unless otherwise designated.

Difference from Average Temperature, Southern District, 1914.

(Difference of Average for month from monthly average for previous ten years or more.)

Locality.	No. Years Records	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Vancouver	14	3·0	0·3	2·8	1·6	2·8	1·0	0·4	0·3	−0·9	3·1	2·2	−2·5	−14·1
Steveston	19	4·8	−0·3	1·9	1·3	0·8	0·5	−3·3	−0·4	0·1	2·6	1·6	−4·8	−11·4
Ladner	14	9·6	1·3	3·5	3·5	2·5	−0·4	1·0	1·3	1·3	5·0	1·4	−4·0	−23·4
New Westminster	27	2·2	−0·4	1·8	2·2	3·2	0·1	1·6	1·0	−1·7	3·7	1·6	−2·5	−12·8
North Nicomen	21	3·7	0·6	3·4	3·2	3·8	0·9	0·1	1·0	2·5	3·2	1·1	−3·9	−14·6
Agassiz	24	3·6	1·8	1·0	5·1	2·1	−1·8	−1·9	−0·3	−2·6	−0·4	1·5	−2·0	− 6·1
Chilliwack	11	6·7	−0·2	2·6	1·4	−0·4	−1·1	−0·9	−1·5	−2·2	1·5	2·0	−3·2	− 4·7

N.B.—All quantities are plus unless otherwise designated.

Comparison of Monthly Discharges, Southern District, 1914.

Locality.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept	Oct.	Nov.	Dec.	Mean.
Coquihalla river	1912	942	981	415	884	2,662	2,059	799	460	365	471	1,004	587	969
	1913	557	592	391	1,195	3,330	3,961	1,705	580	1,000	1,665	1,243	719	1,412
	1914	1,350	560	1,560	2,850	3,980	2,630	720	279	444	345	1,460	674	1,405
Chilliwack river	1912	1,518	1,870	865	980	4,581	6,387	3,089	1,386	956	893	2,347	1,232	2,175
	1913	1,208	1,942	1,064	1,557	4,416	4,779	5,724	2,303	2,664	2,770	2,533	1,557	2,710
	1914	4,280	1,170	2,250	3,110	4,170	4,000	3,140	1,320	1,310	1,510	3,080	1,340	2,560
Chehalis river	1912	.....	.....	248	425	904	760	386	310	390	631	2,127	999	.....
	1913	551	1,350	1,080	1,465	2,460	1,693	916	441	1,010	1,765	3,295	1,615	1,467
	1914	4,230	1,570	3,800	3,610	1,980	1,130	690	270	990	2,040	4,480	730	2,130
Fraser river	1912	.....	.....	16,150	40,720	150,000	186,000	136,000	113,000	70,170	53,000	39,300	27,800	.....
	1913	17,800	25,300	19,000	34,400	82,300	306,800	201,000	177,000	113,900	60,300	37,200	27,000	92,12
	1914	39,500	29,600	34,600	72,800	187,000	243,600	216,000	119,000	76,000	70,800	64,300	41,100	99,500
Jones creek	1912	86	136	55	64	192	270	207	177	96	82	154	98	135
	1913	60	89	68	94	238	395	350	199	178	201	175	94	180
	1914	173	57	109	158	223	221	213	119	114	96	215	73	148
South Lillooet river	1912	1,412	1,393	210	455	802	817	387	520	533	733	2,111	1,062	872
	1913	593	1,180	693	872	1,238	1,095	757	303	526	1,021	2,038	908	954
	1914	1,450	532	1,040	1,030	594	367	161	108	656	1,210	2,280	887	818

Total Monthly Precipitation, Lillooet District, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Pemberton hatchery	5·85	1·51	2·81	2·34	1·58	1·57	0·34	0·41	5·41	4·35	8·44	0·98	35·32
Pemberton Meadows	10·73	2·28	3·03	2·46	0·76	1·35	0·28	0·08	4·63	5·46	9·23	1·65	41·99
15-mile ranch (Pavilion)	1·40	0·46	0·39	0·24	0·89	1·18	0·44	0·10	1·92	0·37	2·50	0·45	10·54

Mean Monthly Temperature, Lillooet District, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Pemberton hatchery	30·4	30·4	39·4	48·5	54·7	58·7	64·9	64·8	53·4	48·4	37·0	27·3	46·5
Pemberton Meadows	27·9	27·2	37·5	47·6	56·2	59·9	64·4	62·3	53·6	49·1	36·3	20·8	45·2
15-mile ranch (Pavilion)	24·6	24·2	39·3	50·3	57·1	60·9	69·7	69·3	55·2	48·6	34·8	18·8	46·0

Total Monthly Precipitation, Vancouver Island District, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Victoria	8·47	1·56	2·05	1·04	0·18	1·67	.....	0·18	1·98	2·58	5·83	0·59	.....
Sooke	14·22	3·60	.....	2·65	0·58	2·93	0·06	0·36	3·42	6·22	9·48	1·42	.....
Shawnigan lake	13·29	2·42	2·99	2·31	0·88	2·61	0·11	0·10	3·16	5·18	8·22	1·75	43·02
Cobble Hill	11·32	1·99	1·93	2·33	0·36	2·08	0·11	0·15	2·72	4·40	8·73	1·02	37·14
Cowichan (Tzouhalem)	13·04	2·35	2·08	2·78	0·31	2·29	0·15	0·26	3·40	5·15	9·40	1·53	42·74
Ladysmith	17·34	4·40	2·55	3·85	0·31	2·11	0·38	0·07	4·48	10·26	10·71	1·69	58·15
Nanaimo	10·89	2·60	2·54	2·60	0·16	1·70	0·10	0·33	4·03	6·13	7·62	2·16	40·86
Nanoose bay	9·17	2·26	2·60	2·60	0·14	3·15	0·16	0·25	4·61	6·12	7·36	1·44	39·86
Qualicum Beach	7·75	2·38	2·34	2·88	0·39	2·41	0·28	0·34	4·77	8·01	7·15	1·07	39·77
Campbell lake	.....	.....	.....	.....	.....	.....	.....	.....	3·90	8·42	13·29	.....	.....
Alberni	16·29	5·72	8·14	7·07	1·07	3·64	0·31	0·17	7·08	16·08	14·18	2·51	82·26
Alert bay	6·13	3·84	5·00	3·60	1·04	0·86	1·25	1·00	4·00	6·88	9·42	2·74	45·76
Clayoquot	21·55	11·59	13·72	14·08	2·65	3·08	1·05	1·66	9·11	19·44	24·35	7·44	129·72
Quatsino	18·46	5·76	12·42	9·36	3·83	1·34	0·74	1·05	.....	14·51	17·35	.....	.....
Holberg	23·89	9·57	17·94	11·80	7·15	2·06	3·50	2·66	6·97	19·56	26·47	5·57	137·14

Mean Monthly Temperature, Vancouver Island District, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Victoria	42·1	42·0	46·9	50·5	55·9	55·9	59·7	59·5	53·6	52·7	45·0	39·6	50·2
Sooke	39·7	41·0	.....	48·6	53·4	55·2	59·6	59·5	58·9	52·2	44·2	38·3	.....
Shawnigan lake	37·0	37·8	43·6	48·7	55·5	57·8	69·2	64·1	54·1	50·6	40·9	33·9	49·4
Cobble Hill	38·8	38·1	43·5	47·9	54·4	56·5	60·5	59·0	53·2	55·4	42·6	36·2	48·8
Cowichan (Tzouhalem)	40·2	39·8	45·4	50·0	55·5	58·7	63·9	62·4	55·4	50·1	43·8	36·0	50·1
Ladysmith	37·7	37·6	44·4	49·6	56·0	57·8	62·6	62·7	54·1	51·7	41·8	35·3	49·3
Nanaimo	39·8	39·6	44·7	49·6	57·0	58·8	64·4	63·7	54·7	51·8	43·6	36·9	50·3
Nanoose bay	38·0	38·1	43·4	48·3	54·4	56·9	62·5	61·7	50·7	50·8	42·1	35·2	48·5
Qualicum Beach	37·1	36·4	42·1	46·8	53·5	56·6	62·4	61·3	52·9	50·3	40·5	32·1	47·7
Campbell lake	.....	.....	.....	.....	.....	.....	.....	.....	53·1	50·6	40·8	.....	.....
Alberni	36·1	37·1	44·2	49·4	54·3	57·7	63·6	66·9	55·5	53·0	42·6	34·4	49·5
Alert bay	38·4	42·3	45·1	50·4	53·0	54·6	57·2	57·9	53·4	53·8	45·3	38·1	49·1
Clayoquot	41·1	42·3	45·2	48·9	54·8	55·4	58·8	59·1	54·2	53·1	45·5	41·2	50·0
Quatsino	37·6	39·8	42·9	47·6	51·7	54·5	58·9	59·2	.....	51·6	43·4	35·8	.....
Holberg	37·8	39·7	43·6	47·7	52·8	54·1	58·5	61·4	54·8	54·2	44·7	36·2	48·8

SESSIONAL PAPER No. 25e

Difference from Average Precipitation, Vancouver Island District, 1914.

(Difference of Total for month from monthly average for previous ten years or more.)

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Victoria	3·93	−2·01	−0·14	−0·76	−1·17	−0·71	−0·35	−0·41	−0·12	0·32	−0·24	−5·68	−7·34
Nanaimo	6·24	−1·54	−0·53	0·92	−1·94	−0·74	−0·65	−0·43	1·96	3·04	−1·15	−5·01	0·17
Alberni	6·29	−2·62	2·56	2·51	−1·89	1·27	−0·66	−0·97	3·99	10·34	1·79	−8·11	14·50
Clayoquot	6·96	−1·06	2·89	5·13	−3·74	−1·12	−0·96	−1·88	2·05	6·65	4·77	−8·95	10·74
Quatsino	5·59	−7·09	3·01	.....	−1·99	−3·29	−2·32	−3·00	.....	2·91	0·10	−12·16	.....

N.B.—All quantities are plus unless otherwise designated.

Difference from Average Temperature, Vancouver Island District, 1914.

(Difference of Average for month from monthly average for previous ten years or more.)

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Victoria	2·0	1·9	2·9	1·6	2·4	−0·2	−1·2	−0·8	−3·0	1·2	−0·9	−3·2	2·7
Nanaimo	4·0	2·0	2·8	3·1	3·9	1·1	1·3	0·3	−2·4	2·3	0·4	−2·3	16·5
Alberni	2·4	−0·6	2·0	2·2	−0·4	−1·1	−1·6	1·9	−2·3	2·2	1·8	−2·8	3·7
Clayoquot	1·6	1·5	2·7	3·3	4·0	1·1	0·6	−0·6	1·4	2·3	0·4	−1·0	15·7
Quatsino	−2·3	1·8	1·1	.....	0·3	1·1	1·4	1·4	.....	3·2	1·2	−4·5	.....

N.B.—All quantities are plus unless otherwise designated.

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER 3

Kamloops Division

REPORT OF E. M. DANN, B.A.Sc., D.L.S.
Division Engineer.

CHAPTER III.

THE KAMLOOPS DIVISION.

TERRITORY.

The Kamloops division covers practically the whole of the great interior plateau lying between the Hope range of mountains in the vicinity of Lytton, and the Gold range near Revelstoke on the main line of the Canadian Pacific railway. Speaking broadly, the territory is drained by the Thompson river with its north and south branches; the former heading in the vicinity of the Yellowhead pass, the latter in Shuswap lake and its surrounding hills.

In addition to the vast catchment area of the Thompson, in whose valley flow some of the most important and contentious sources of water supply throughout the whole of British Columbia, the Kamloops division also covers a small portion of the Columbia River basin lying north of the international boundary, and drained by the Kettle, Similkameen, and Okanagan rivers.

The total area of the Kamloops division is 33,000 square miles.

USES OF WATER.

IRRIGATION.

The principal industry carried on throughout this division is agriculture in all its varied forms. Owing to the semi-arid nature of most of the country the principal need of water is for irrigation, and any other use to which it may be put is directly or indirectly, connected with that science. The community which uses hydro-electric power, for example, depends for its existence upon agriculture, and this could not be carried on without irrigation. Further, without irrigation there would be little demand for water for domestic and municipal supply.

Thus it will be seen that in the Kamloops division the great natural resource, water, is used pre-eminently for irrigation.

WATER-POWER DEVELOPMENT.

Most of the power derived from falling water is developed outside the most arid section of the division, although, notably in the instance of the Kamloops municipal plant on the Barrier river, power is sometimes transmitted through irrigation areas. A discussion of the hydro-electric plants in the Kamloops division has been made in other reports, although a short description of each is appended hereto.

WATER-POWER POSSIBILITIES.

The latest possibilities of water-power development within the division are many times more important than the development powers. It is doubtful if any stream in the province has as many splendid sites for future development as the Clearwater river and its principal tributary the Myrtle, a full description of which may be found in this report. (See "Hydrographic Data of Stream Flow," Clearwater and Myrtle rivers.) The power capacities of many other large streams are shown elsewhere in this report and in Water Resources Papers Nos. 1 and 8 published by the Dominion Water Power Branch.

There is, however, in the development by farmers and others, of power upon the smaller streams, a very great immediate future. The rational handling of irrigation water may enable a rancher to operate a small plant, producing sufficient power at a very low cost for his farm needs. Power to light house and barns, power for cooking purposes, power for wood-sawing and for a hundred and one necessities, lies at many a door, and is capable of very cheap and efficient development.

MUNICIPAL SUPPLY.

In every large centre of the province the intelligent selection of a source of municipal water supply is of vast importance. The supply must be pure, in the broad sense of that word, and regular. In this particular area, as in fact throughout the whole of British Columbia, little trouble arises from impurity of supply, and our mountain streams carry, generally speaking, a quality of water ideal for domestic use. The quantity therefore is that which is of particucular interest to the public at large, and throughout the division studies are being commenced of streams where a knowledge of the amount of water is of much importance in this relation.

TOPOGRAPHY OF THE KAMLOOPS DIVISION.

The wide valley of the Thompson is bordered on either side by bench lands and table-like plateaus at the lower elevations, through which the erosive effect of surface run-off has literally cut hundreds of deep gulches. The appearance of the surface soil in midsummer is barren and uninviting save where irrigation water has painted an oasis of verdant green. To get the best idea of the topography of the area of which Kamloops is the centre, and to realize to what extent it is in fact a plateau, one must view it from a mountain top. Mount Tod (7,000 feet) is the highest peak in this part of the division. From it one may see gentle sloping and park-like tablelands cut by small streams whose waters, shaded from the sun by a covering of willows, seek their way to the larger arteries of flow in the bottom valleys. To the west the mountains of the Hope range; to the east the Gold range—the wardens of the Selkirks—reach out to the sky, snow-capped; while between, stretches this splendid plateau like the deck of a vast suspension bridge hanging between mighty towers.

Of similar topography are the Okanagan and Kettle River valleys.

The Similkameen valley presents a marked contrast to the country just described. Here the hills rise steeply on either side of the river to a height of 5,000 and 6,000 feet above the sea. They are well covered with timber, particularly on their northern slopes and, except in the bottom lands where some irrigation is required, there is very little agriculture carried on.

PRECIPITATION AND CLIMATE.

Precipitation and climate are very closely related, and both are to a large extent dependent on topography. With increasing altitude we have lower temperature and higher precipitation. The remarkably small precipitation in the Kamloops division is due to the fact that there are no high mountains to cause condensation of the moisture laden winds from the Pacific.

Tables are to be seen elsewhere in this report showing the precipitation and temperatures for certain meteorological stations in the province for each month; the variation from the average is also tabulated for those stations where records are available for a sufficiently long period to render these average figures of some value.

It is well to bear in mind while scanning these records, that in general these stations are located in centres of population which are as a rule at low altitudes. This means that for any considerable area the mean monthly precipitation is greater, and the mean monthly temperature less, than the figures given for the centre of population for that area.

The greater part of the Kamloops division lies within the dry belt, where the mean annual precipitation varies from a minimum of 5 inches per annum near Ashcroft to a maximum of probably 35 or 40 inches at the highest altitude in the section. Outside the dry belt, however, on some of the higher elevations of the clearwater drainage basin in the north, and the peaks of the Hope and Hagameen ranges which feed the Tulameen and South Similkameen rivers, the precipitation is thought to be over 50 inches, although no accurate records have been taken at these high points.

DISTRICTS AND STAFF.

For the purpose of organizing stream measurement work in a simple and systematic manner, the division has been split up into three arbitrary districts, the boundaries of which are largely determined by transportation routes. An assistant engineer is directly responsible for the maintenance of station equipment and of the acquirement of data on all streams of importance throughout the district.

KAMLOOPS DISTRICT.

The Kamloops district is such a large and important area, that in view of the establishment of many new stations on streams tributary to the North Thompson river it was found advisable to divide it into two sections with an assistant engineer in charge of each.

The section immediately around Kamloops was supervised by Mr. C. B. Corbould, B.A.Sc., Assistant Engineer, and included the many contentious irrigation streams in the vicinity of Kamloops, Grand Prairie and Mamit lake. The vast importance of irrigation interests in this country, and the thorough knowledge of stream flow necessary to intelligent development, warrants a much more complete investigation than, with the present assistance and funds available, it has been possible to give.

The suddenness of the freshet and its short duration, coupled with the fact that the peak occurs simultaneously on widely separated streams, renders the work exceedingly difficult in this section.

Work in the North Thompson section was supervised by Mr. E. H. Tredcroft, C.E., Assistant Engineer, and a desultory train service on the newly built Canadian Northern Pacific railway, rendered the streams more accessible than hitherto. Stations were established on the North Thompson river (above its confluence with the Clearwater), on Raft river, on Myrtle river and on Boulder, Whitewood, Fishtrap, and Little Clearwater creeks. In the early spring a cable station was built on the Clearwater river at Brookfield's ranch and hydrographic work was continued with good results.

Owing to its inaccessibility and the limited funds available, it was impracticable to rate the Myrtle river during 1914. Gauge readings were however commenced and a record of the flow during the latter part of 1914 will be developed when a rating curve is defined.

The importance of this district for the future production of water-power is very great, the wonderful Helmcken falls on the Myrtle river being the most important of many power sites in the Clearwater country. At this point the Myrtle river plunges headlong over a sheer cliff, 450 feet in height, to a rocky

canyon below, presenting a sight which will classify the Helmeken falls among the scenic beauties of the world. Its distance from the Canadian Northern Pacific main line at Mile 71, north of Kamloops, is about 40 miles. At present the only means of access is by pack trail (see photographs, and description of Myrtle river under "hydrographic data of stream flow").

THE ASHCROFT AND NICOLA DISTRICT.

The streams in the vicinity of Asheroft are of inestimable importance, owing to the extreme aridity of the climate and the consequent higher "duty" of irrigation water. Hydrographic work was carried on throughout this section with Mr. Corbould as assistant engineer.

In the Nicola valley, Mr. K. G. Chisholm, B.Sc., Assistant Engineer, was in charge of field work. New stations were established on Spius creek and the Coldwater river, both of which are capable of power development.

THE OKANAGAN DISTRICT.

Acquisition of field data on streams of the southern Okanagan, of the Kettle valley, and of the Similkameen country was in the hands of Mr. Chisholm, and field work was vigorously carried on. Stations were established on the more important streams and in nearly all cases first-class rating curves were defined during the season. This section is of particular interest on account of the fact that its larger waterways are of an international character, the Kettle river, for example, crossing the United States boundary line three times.

In the Shuswap lake section, the tributary streams are only accessible by motor boat. It was possible to make but two trips around this section, so that very limited information is available about the outlying streams; gauge readings are being taken regularly, however, and records of flow will be published at a later date on such streams as Seymour river, which has latent power possibilities.

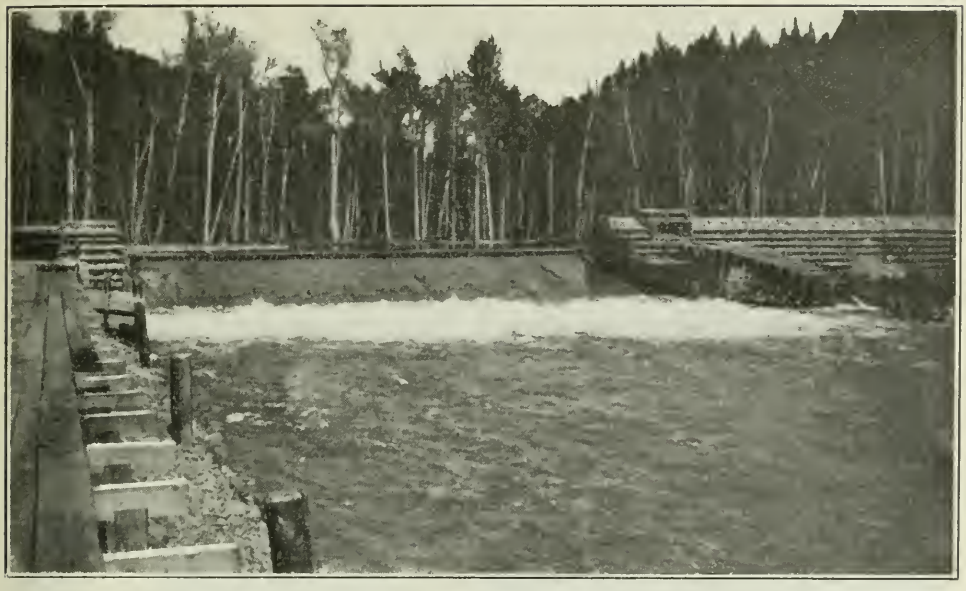
On the Adams river, another power stream of importance, an automatic, self-recording gauge was installed in October, 1914, by Mr. Trederoft, and has given good service, no trouble from ice conditions having been encountered. Owing to the artificial regulation of the flow of this stream at Adams lake, by the Adams River Lumber Co., and the sluicing operations which the company has carried on, the fluctuation in stage was erratic, and it was found impracticable to secure precise results through the services of a gauge reader.

KAMLOOPS OFFICE.

Suitable office accommodation was procured in the Acadia block, Kamloops, where compilation, checking and plotting of field work is carried on. Unpublished data for the year are gladly compiled and made available for the public at any time. The division engineer visited and inspected most of the field stations in each district throughout the year, and kept constantly in touch with all gauge readers, supervising office work and assisting in the checking of field data. Miss B. B. Allan, as stenographer and office clerk, had charge of all filing, indexing, and gauge readers' returns.

INSPECTIONS.

In addition to actual stream flow work, all irrigation projects, involving Dominion Lands, within the Railway Belt of British Columbia, were inspected in co-operation with the Dominion Lands agent, by the division engineer at Kamloops. The construction of irrigation works in connection with such applications was supervised, and several surveys carried out in the field for the purpose of defining land covered by storage works and served by irrigation ditches.



Dam, Barriere River Development, City of Kamloops.

Exterior Barriere Hydro-Electric Power House—Municipal plant for City of Kamloops, British Columbia.

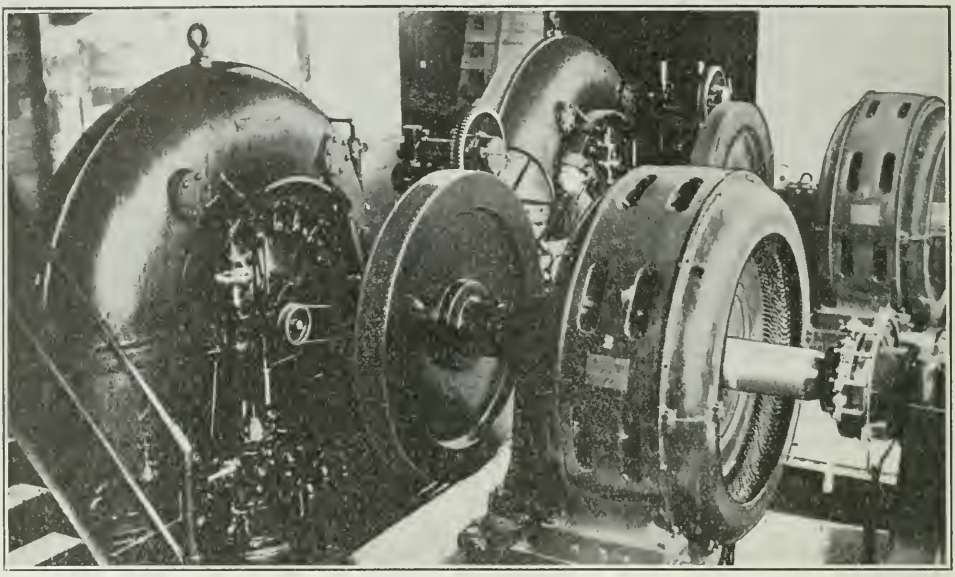
Photograph by courtesy of Messrs. Ducane, Dutcher & Co., Consulting Engineers, Vancouver.

A timber flume (8′ x 4′) some three and a half miles long gives a concentrated head of 190 feet on the turbines. There are two penstocks of wood stave construction. The power house is of concrete.

DEVELOPED WATER-POWERS.

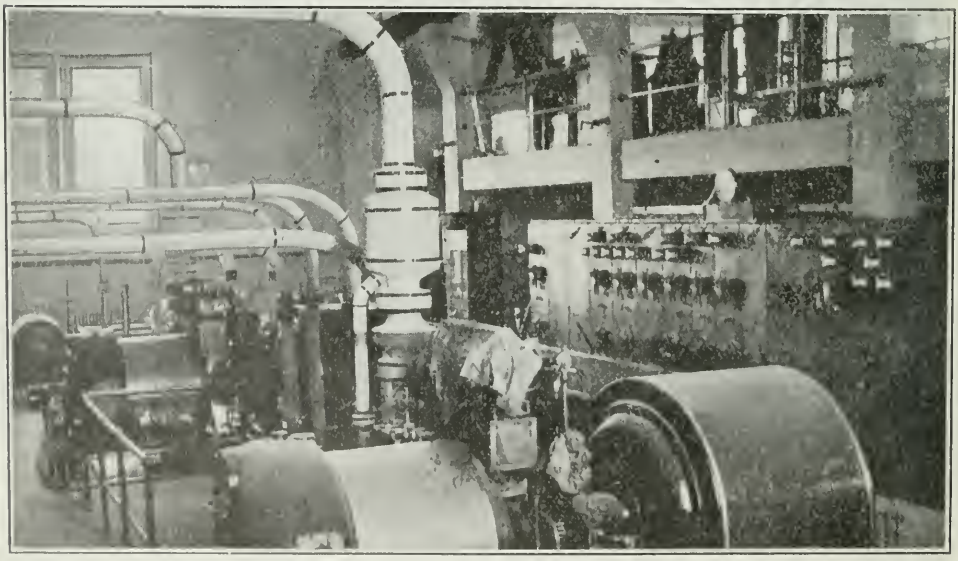
BARRIERE RIVER.

A 2,200 horse-power development has just been completed on the Barriere river, some 40 miles north of that city, by the municipality of Kamloops, with



Interior Barriere River Hydro-Electric Power House, Municipal plant for City of Kamloops. Photograph by courtesy of Messrs. Ducane, Dutcher & Co., Consulting Engineers, Vancouver.

The present development has two 1,100 H. P. Platt Iron Works Victor-Francis turbines operating under 190′ head, with 750 K.V.A. Canadian Westinghouse Co. 2,200 volts, 3 phase 60 cycle generators (600 R.P.M.) with direct connected 40 K. W. Exciter.



Interior Sub-Station, City of Kamloops.

Messrs. Ducane, Dutcher & Co., of Vancouver as engineers. A timber flume $3\frac{1}{2}$ miles long gives a concentrated head of 190 feet on the turbine, of which there are two of the Victor-Francis type. The penstocks are of wood stave, and are buried. The power-house is of concrete, and the plant itself is of exceptionally compact design.

An unfortunate landslide, such as British Columbian engineers are often called upon to deal with, has, at the time of writing, caused the plant to be temporarily shut down, a portion of the flume having settled with the slide. This matter is being adjusted and it is hoped the development will shortly be in operation again.

An auxiliary steam plant at Kamloops looks after the demand for power, during the winter period, when it is expected that the hydro-electric plant will be shut down for a period of six weeks to two months.

BOUNDARY CREEK.

There is a small hydro-electric development at Boundary falls, by which the city of Greenwood derives light and power. The plant operates under a head of 130 feet and has a capacity of 250 horse-power.

CRAZY CREEK.

At Taft, B.C., the Forest Mills of British Columbia, Ltd., has a small Pelton wheel development of 150 horse-power. Water is diverted through a 7-inch wood stave pipeline and operates under a head of about 150 feet. The power is used in connection with the sawmill as well as for fire protection, lighting, and domestic purposes.

FORTUNE OR DAVIS CREEK.

Near the city of Armstrong, B.C., on Fortune (or Davis) creek there is a small Pelton wheel development of about 200 horse-power, municipally owned, and used for lighting and power purposes. It operates under a head of 500 feet, water being carried from the storage reservoir by a pipeline, a distance of three-quarters of a mile to the power house. A transmission line carries power at 2,200 volts to the city of Armstrong.

KETTLE RIVER AT CASCADE.

The West Kootenay Power and Light Co., operates a plant on the Kettle river with a capacity of 3,900 horse-power under a head of 155 feet which is maintained in conjunction with the plants at Bonnington falls on the Kootenay river. Power is used at Grand Forks, Phoenix, and Nelson for lighting, and for the mines and smelters.

KETTLE RIVER (NORTH FORK).

A 700 horse-power plant operating under a 30-foot head is maintained and used by the Granby smelter near Grand Forks.

MURRAY CREEK.

A Pelton wheel development of 100 horse-power operating under a 220-foot head delivers light and power to the town of Spences Bridge. Water is taken to wheel direct from Murray creek in a 16-inch riveted steel pipe, the upper 175 feet of pipe being laid through a rock tunnel.

NAKALLISTON CREEK.

The Mount Olie Light and Power Plant develops some 30 horse-power from Nakalliston creek for the use of that settlement, which is about 50 miles north of Kamloops, B.C. Six hundred feet of 16-inch wood stave pipeline carries water to a small turbine acting under a 50-foot head.

SIMILKAMEEN RIVER.

The Daly Reduction Co., which owns and operates the well-known Nickel Plate Gold Mine at Hedley, B.C., has during 1914, completed the construction of a hydro-electric plant with a capacity of 1,800 horse-power. By means of a dam and a 3-mile wooden flume, a head of 67 feet is obtained. This installation superseded a plant on Twenty-mile creek, which proved of little service during low-water periods, and in conjunction with which an auxiliary steam plant had to be used

Total Monthly Precipitation, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Kamloops	1·68	2·18	0·26	0·38	1·31	0·54	0·53	0·38	1·09	0·79	1·01	0·58	10·73
Monte creek	0·84	2·08	.....	0·15	0·60	1·09	0·98	0·38	1·20	0·76	1·00	0·78	.....
Salmon Arm	3·08	1·36	0·87	1·27	1·36	1·34	0·73	0·19	2·17	1·54	3·02	1·55	18·48
Vernon	1·25	1·22	0·51	0·42	1·07	1·05	0·62	0·53	1·96	1·18	1·46	1·15	12·42
Keremeos	2·20	0·66	0·72	1·05	0·50	1·31	0·49	0·20	1·31	0·73	1·21	0·65	11·03
Kelowna	2·34	2·98	0·30	0·20	0·87	1·07	0·20	0·26	2·65	0·70	1·43	0·48	13·48
Penticton	2·13	0·49	0·46	1·26	1·22	1·24	0·35	0·31	2·16	0·81	1·25	0·76	12·44
Princeton	2·36	1·16	0·73	0·65	1·32	0·88	0·21	0·12	1·39	1·00	2·04	0·96	12·82

Mean Monthly Temperature, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Kamloops	29·8	25·2	39·9	51·6	58·0	63·9	70·9	68·7	56·5	49·9	37·7	21·5	.....
Monte creek	32·1	23·8	.....	49·0	51·9	62·2	69·0	60·0	52·8	47·1	35·8	18·8	.....
Salmon Arm	30·2	26·2	37·9	48·7	55·1	61·4	67·0	64·8	54·0	47·5	37·2	23·2	.....
Vernon	29·4	25·0	38·3	49·1	55·5	61·2	68·6	67·1	55·1	46·8	36·5	21·3	.....
Keremeos	31·8	28·3	41·7	52·1	59·0	61·5	71·3	70·0	56·5	49·4	38·1	20·2	.....
Kelowna	30·8	27·2	39·4	48·8	55·1	62·6	68·6	63·7	54·1	48·2	39·5	26·0	.....
Penticton	34·3	30·4	41·0	50·3	56·4	62·2	69·6	67·8	56·2	49·8	40·3	26·1	.....
Princeton	24·5	23·9	35·5	46·8	52·6	56·9	64·6	62·1	51·4	45·5	33·6	15·6	.....

Difference from Average Precipitation, 1914.

(Difference of Total for month from Monthly Average for previous ten years or more.)

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Kamloops	0·73	1·37	−0·06	0·00	0·28	−0·74	−0·73	−0·65	0·10	0·26	−0·11	−0·97	−0·58
Salmon Arm	0·44	0·02	0·25	0·43	0·03	−0·52	.....	−0·79	0·46	0·07	....	−0·56	.....
Vernon	0·09	1·10	−0·15	−0·08	−0·21	−0·60	−0·68	−0·83	0·58	0·39	−0·03	−0·12	−0·54
Kelowna	0·88	1·76	−0·29	−0·98	−0·21	−0·33	−0·86	−0·77	1·48	−0·15	0·56	−0·90	−0·93
Princeton	1·05	0·16	0·13	0·11	−0·02	−0·17	−0·89	−0·82	0·34	0·17	0·17	−0·38	−0·15

N.B.—All quantities are plus unless otherwise designated.

Difference from Average Temperature, 1914.

(Difference of Average for month from Monthly Average for previous ten years or more.)

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Kamloops	5·1	−2·6	2·2	1·7	−0·4	0·1	1·2	0·6	1·9	1·4	2·7	−7·3	6·6
Salmon Arm	11·4	0·4	2·9	3·0	−2·3	1·7	.....	1·3	−1·9	4·2	.....	−5·9	.....
Vernon	7·8	−0·8	2·9	2·5	1·0	0·8	2·3	2·0	0·1	1·5	2·5	−6·5	16·1
Kelowna	5·2	1·5	2·7	2·1	−0·3	3·1	2·1	0·0	−0·7	3·4	3·1	−4·3	17·9
Princeton	7·7	0·7	2·9	2·6	0·7	0·3	1·7	0·8	−1·7	2·1	2·6	−6·7	13·7

N.B.—All quantities are plus unless otherwise designated.

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER 4

Nelson Division

REPORT OF C. E. RICHARDSON, B.A.Sc., D.L.S.
Division Engineer.

CHAPTER IV.

NELSON DIVISION.

GENERAL REMARKS.

Mr. J. C. Hoyt, M. Am. Soc., C.E., Hydraulic Engineer in charge Division of Surface Waters, United States Geological Survey, and Mr. N. C. Grover, Chief Engineer United States Geological Survey, in their book on "River Discharge", makes the following statement:—

> The hydraulic engineer is interested in water from the time it reaches the earth in the form of rain or snow until it returns again to the atmosphere in the form of an invisible vapour.

The magnitude of this statement reveals the immense amount of data that the hydraulic engineer must collect in an endeavour to determine the most economical method of procedure with his work. The statement that each stream is a law unto itself is particularly true in the Nelson Division.

NELSON DIVISION.

The Nelson division comprises that part of British Columbia known as East and West Kootenay districts. The whole division is drained by Columbia river, and with the exception of Okanagan and Kettle rivers, comprises the total drainage of the Columbia in Canada. The East and West Kootenays are divided by Selkirk range of the Rockies, and the Selkirks are encompassed on the north, south, east, and west by Columbia river and one of its tributaries, the Kootenay. The Columbia rises in Columbia and Windermere lakes, 90 miles south of the C.P.R. main line at Golden, and flows in a northwesterly direction for about 200 miles to the mouth of Canoe river at Big Bend. From Canoe river the Columbia flows practically south for about 250 miles, past Revelstoke, through Arrow lakes, crossing the international boundary near Waneta, B.C. Kootenay river rises in Beaverfoot range of the Rockies, about 20 miles south of the C.P.R. main line at Palliser, B.C., and flows practically south for 175 miles, passing within 1 mile of Columbia lake, and crossing the international boundary near Newgate, B.C. It flows through Montana into Idaho, U.S.A., re-entering British Columbia (West Kootenay district), 60 miles west of Newgate and 20 miles south of Kootenay Landing, at which point it loses itself in Kootenay lake. From the west arm of Kootenay lake the river flows in a southwesterly direction, discharging in Columbia river near Castlegar, about 20 miles north of the international boundary.

The total area of the Nelson Division (East and West Kootenay), is approximately 29,000 square miles. Of this some 15,000 square miles are drained by the Columbia river above the mouth of the Kootenay. The Kootenay river drains approximately 13,000 square miles in British Columbia. The remaining 1,000 square miles are drained by Pend d'Oreille river, of which Flathead river in southeast Kootenay is a tributary; the Pend d'Oreille discharges into Columbia river near Waneta, 200 yards above the International boundary.

CLIMATIC CONDITIONS.

Run-off is relative directly to topography and climatic conditions. Climatic conditions are themselves partially dependent on topography. In the study of stream flow it is essential to be familiar with these two factors. The topogra-

phy, however, remains a constant factor, and the variation in the flow of streams is due directly to climatic conditions. In the opening paragraphs of the report the following remark was made:—"The statement that each stream is a law unto itself is particularly true in the Kootenays." This statement is based on the fact that in the Kootenays there is a greater variation in climatic conditions, even within a radius of a very few miles. It is impossible, therefore, to describe the climatic conditions in a general way and consider them for any one locality. Although there is no direct relation between the various localities, there are marked variations between some of the districts. The following tables and remarks are intended to show these striking variations, and in comparison with them a general resemblance may be seen between other districts.

The attached tables of precipitation for various points in the Kootenays are compiled from the monthly reports for 1914 of the Meteorological Survey, Mr. R. F. Stupart director. One table shows the monthly precipitation, while the other shows the difference from the average for the past ten years or more.

In these tables a comparison is shown between ten points, five in East Kootenay and five in West Kootenay, for 1914. Of these ten points, eight are in the valleys of the Columbia and Kootenay rivers. Glacier in West Kootenay and Fernie in East Kootenay are near the summits of the Selkirks and Rockies, respectively. Although marked variations may be noted in this table, it also shows conclusively that the precipitation in West Kootenay is much greater than in East Kootenay.

The cause of the variation in precipitation at these points may be partially explained as follows:—

Practically all the precipitation which falls in the Kootenays comes from the west. The moisture laden clouds coming from the Pacific first hit the heavily-timbered Coast range. The result is that on the west slope of the Coast range the precipitation is very heavy. These clouds then pass over the rolling hills in the central division of Yale district. The precipitation there is so light that the country is semi-arid. Gold range is only high enough to reach the lower clouds, and the precipitation on the west slope of Gold range is not very heavy though considerably greater than around Kamloops. After the Gold range comes the Selkirks. The Selkirks, particularly in the north half of the Kootenays, are high and heavily timbered. They reach well into the moisture laden clouds and the result is a heavy precipitat on on the west slope or in West Kootenay. The lower clouds have been precipitated by the Selkirks, and hence when the Rockies are reached by the remaining clouds a smaller per cent will be affected. Thus the precipitation in East Kootenay will be less. This is correct for the northern part of the Kootenays. In the south, however, the Rockies are higher than the Selkirks, and around Fernie the precipitation is very heavy. To offset this, the Valley of the Kootenay in this vicinity is wide, and around Cranbrook the precipitation is very light.

A comparison of East and West Kootenay has just been made. It might be interesting to compare the precipitation in the Kootenays along the Columbia and Kootenay valleys from south to north. In East Kootenay from Elko to the Windermere country, the precipitation is about the same. Proceeding north from Windermere (Wilmer on table), the precipitation in the Columbia valley increases slightly to Spillimacheen. From there to Golden it is fairly constant. From Golden north the precipitation gradually increases till within a few miles of the Big Bend. Captain Armstrong, a member of the Public Works Department (Canada) at Nelson, and a man well informed on the Kootenays, made the following statement:—

PRECIPITATION.

It was early in May, 1894. Proceeding north from Golden the snow became gradually deeper. At Kimbasket lake it was about 4 feet deep and well packed. Past Kimbasket lake the depth of snow still increased, till we came to a point immediately below the mouth of Wood river. Within a distance of a quarter of a mile there was a pronounced change, from 8 feet of snow to green grass. The lower valley of Canoe river appeared very dry. Jack pine was present.

Captain Armstrong accounted for this change by the fact that the Selkirks had practically disappeared, and the mountains to the east, west, and north were not high, and the moisture-laden clouds were not penetrated until about Wood river. It is possible, however, that this sudden change might have been produced by Chinook winds.

CHINOOK WINDS.

Captain Armstrong also gave a very interesting description of the Chinook winds in East Kootenay. They come from the south, up Kootenay valley, and touch Tobacco plains near Newgate at the international boundary. From Tobacco plains they appear to rise and are not apparent again till in the vicinity of Columbia lake, the source of Columbia river. Their effect is noticed very much around Windermere lake and at the mouth of Toby creek. In January, 1901, in the valley around Windermere lake the thermometer reached 65° F., and the snow all disappeared. Toby creek valley was affected till an altitude of about 5,000 feet was reached, the height of the Chinook clouds. Above 5,000 feet there was not any effect from the Chinook. When the temperature in the valley was as high as 65° F. at the Paradise mine on Toby creek, 8,000 feet altitude, the thermometer ranged from −20° F. to −26° F. day and night. North of Toby creek the Chinook appears to lift or die out, and is not again very evident.

In West Kootenay the precipitation seems rather similar in the valley at most points as far north as Nakusp. Farther north, however, it increases considerably.

SNOWFALL DATA ALONG THE C.P.R. IN SELKIRK RANGE.

The C.P.R. have kept snowfall records each year since 1887 at various points along the main line in the Selkirks. The following table is taken from these records, and shows the annual snowfall in feet and inches. The location of the points at which records were taken is denoted by the number of miles and direction from Roger pass, the summit of the Selkirks

SNOWFALL TABLE.

Date.	Revelstoke 35 M. SW.	Laurie tunnel 12 S.W.	Cambie 3½ S.W.	Glacier 2⅔ S.	22 Shed 2⅔ S.	18 Shed 1½ S.	14 Shed 1 N.E.	Cu. band.
	Ft. Ins.	Ft. Ins.	Ft. Ins.	Ft. Ins.	Ft. Ins.	Ft. Ins.	Ft. Ins.	Ft. Ins.
1888-9	.....	.....	.....	.....	.....	28 0	.....	14 8
1889-90	.....	.....	.....	.....	.....	33 3	.....	20 9
1890-91	.....	.....	.....	.....	.....	.....	.....	17 6
1891-92	.....	.....	.....	.....	.....	36 3	.....	21 0
1892-93	.....	.....	.....	.....	.....	38 10	.....	23 11
1893-94	.....	.....	.....	43 4	.....	.....	.....	23 9
1894-95	.....	.....	.....	28 11	.....	.....	.....	16 4
1895-96	.....	.....	.....	.....	.....	.....	.....	27 8
1896-97	.....	.....	.....	34 11	.....	.....	.....	.....
1897-98	.....	.....	.....	27 6	.....	.....	.....	.....
1898-99	.....	.....	.....	43 2	.....	.....	.....	18 11
1899-1900	.....	.....	.....	26 9	.....	.....	.....	18 10
1900-01	.....	.....	.....	32 1	.....	34 11	.....	17 10
1901-02	.....	.....	.....	28 6	.....	35 3	.....	19 3
1902-03	.....	.....	.....	32 0	.....	28 9	.....	22 11
1903-04	.....	.....	.....	31 11	.....	46 8	.....	24 1
1904-05	.....	.....	.....	16 7	.....	17 0	.....	17 0
1905-06	4 9	.....	.....	15 4	.....	15 5	.....	13 10
1906-07	11 2	.....	.....	39 8	.....	28 7	.....	18 10
1907-08	8 4	24 4	.....	37 11	26 6	31 8	.....	20 5
1908-09	12 9	.....	.....	34 0	29 10	30 11	.....	23 5
1909-10	11 5	25 2	.....	36 9	32 1	32 2	.....	29 5
1910-11	15 8	24 7	.....	40 7	36 8	39 2	.....	21 7
1911-12	11 2	21 2	.....	32 7	33 2	32 5	.....	15 9
1912-13	15 10	27 1	41 5	45 1	47 2	44 11	37 4	23 8
1913-14	11 7	21 6	33 0	35 0	.....	35 11	.....	23 10

TEMPERATURE.

The attached tables show the average monthly temperature for the same localities for which the precipitation tables were compiled. The variation from the average for the past ten years for each month is also shown.

It may be seen from this table, that in the valleys, the temperature in East Kootenay is lower than in West Kootenay. There is no doubt that variation in elevation has a great deal to do with variation in temperature. It has been stated on good authority that at high elevations, such as 7,000 or 8,000 feet in the Rockies near Golden, there is much less variation in temperature than there is at Golden (2,500). During cold spells at Golden the temperature will be lower than at a point 4,500 or 5,500 feet above. At other times the temperature is lower for the higher elevation. Insufficient study has been carried on to go more deeply into this interesting problem.

CO-OPERATION.

Before the advent of the British Columbia Hydrographic Survey in the Kootenays considerable amount of work had been done by the Railway Belt Hydrographic Survey in the Railway Belt; and by the Provincial Water Rights Branch in other parts of the division.

The Provincial Water Rights Branch has three district engineers in the Nelson division. Mr. H. B. Hicks in Cranbrook district, Mr. W. J. E. Biker in Nelson district, and Mr. O. J. Bergoust in Revelstoke district. These engineers have given their earnest co-operation in obtaining data on many streams in this division.

HYDROGRAPHIC DISTRICTS.

At the opening of the 1914 season (April) the staff of the Nelson division consisted of a division engineer, two assistant engineers, and an office assistant. The division was divided into three districts, Mr. Gill was put in charge of the

Cranbrook district, Mr. Elliott in charge of the Revelstoke district, while Mr. Beeston and the division engineer both attended to the Nelson district. Many new stations were established during the spring and early summer. Owing to the loss of one of the staff in August the work was considerably curtailed for the rest of the year, with the result that it was impossible to obtain discharge curves for all the streams in the division. Another year's work, however, will make it possible to rate all these stations.

PROBLEM OF TRANSPORTATION.

Owing to the size of the Nelson division and the varying nature of the country, the problem of transportation is of vital importance. The streams in

Cranbrook District (H)—Photograph showing support for cable way and platform attachment for cable car.

the vicinity of Nelson are reached, for the most part, by boat. In the Upper Columbia valley and Cranbrook districts, many of the streams are remote from the railroads; to cover these districts horses are of little use on account of the great distance to be covered in a trip, but by using an automobile of its own, this survey could greatly reduce the cost of the work in these two districts.

Cranbrook District (III).—Photograph showing cable car and method of operating.

WINTER MEASUREMENTS.

Winter measurements are absolutely essential on the majority of streams in the Nelson division. In East and North-west Kootenay the streams are frozen or affected by ice from November or December to March or April. In South-west Kootenay the streams seldom freeze over for more than a week or so at a time, and in the larger rivers ice conditions do not exist except during extremely cold spells.

There are two periods of low water in this division in the late summer or early fall, and during the winter. On all glacial fed streams and on a great many others low water occurs during the winter and renders winter measurements necessary.

It is not intended here to enter into a discussion on stream gauging under ice conditions, but, should any one be interested in this work, reference is made to United States Water Supply Paper No. 337, by Mr. W. G. Hoyt. In this paper the most advanced methods and theories are discussed.

It is a much more difficult matter to obtain reliable measurements under ice conditions than during the open season, for the following reasons:—

(1.) *The Personal Equation.*—Particularly during very cold weather it is a most uncomfortable undertaking. The engineer should be supplied with the warmest clothing outfit, such as shoepacks, etc., and several pairs of gloves.

(2) *Frazil Ice.*—In the Kootenays when ice conditions exist, frazil ice is generally present. The best metering sections are always above a riffle, and these sections or parts of them are always packed with frazil ice. It is a hard proposition to determine if there is any water flowing through the ice and also the width of the channel free from this packed frazil ice. Again, when this ice is flowing downstream it is liable to affect the action of the meter.

(3) *Meter.*—During cold weather the meter is very liable to freeze when it is out of the water.

Needless to say, the cost of winter measurements is much in excess of the open season work. Transportation is more difficult, ice has to be chopped and the measurement takes much longer.

Not many winter measurements were made in 1914. Mr. Webb covered the streams in Revelstoke district in February. In Nelson district streams on which regular gauging stations were established were all metered at various times throughout the winter. The larger of these streams, such as the Kootenay Pend d'Oreille, Columbia, and Slocan, did not freeze, so the open season curve was applicable for the whole year. In December, Messrs. Elliott and Corbould metered the power streams in Cranbrook district during a cold spell. All measurements were made in cold weather from 0°F to −20°F. Frazil ice was flowing in practically all the streams they metered and caused much trouble. The results, however, should be fairly reliable and are of value. It is an established fact that the run-off during the winter months varies with the temperature. In most years the low flow in the Kootenays occurs in February or March and, it is believed, takes place shortly after the last cold spell of the season. Particular attention will be paid to winter measurements during the latter part of February and early March in 1915.

TOTAL Monthly Precipitation, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Golden	3·65	0·20	1·37	0·75	1·10	1·09	0·42	0·45	1·73	1·35	1·67	0·75	14·53
Wilmer	2·18	0·45	0·44	1·30	1·32	1·51	1·96	0·82	2·54	0·88	1·23	0·53	15·69
Glacier	10·45	4·95	9·00	4·25	2·93	3·37	1·86	0·88	3·33	2·55	9·10	3·55	56·22
Revelstoke	9·89	2·06	3·23	2·42	1·25	2·53	0·97	1·19	3·87	2·23	7·09	1·65	38·38
Nakusp	5·24	1·54	0·96	3·07	1·65	2·43	1·57	0·93	2·90	1·98	3·31	1·58	27·16
Nelson	6·10	1·00	1·58	3·07	1·95	2·56	1·05	0·24	3·44	1·85	4·03	0·70	27·57
Waneta	5·01	1·20	2·36	2·33	2·87	3·36	1·36	0·00	3·93	1·33	2·99	1·43	28·17
Cranbrook	3·63	0·15	..	0·79	1·08	2·02	0·97	0·44	1·27	1·57	2·47	0·80	
Elko	1·91	0·50	1·06	1·48	2·01	2·74	0·90	1·62	1·39	2·45	2·08	0·80	18·94
Fernie	10·94	1·23	2·93	2·66	1·64	1·38	1·45	2·15	4·77	4·47	7·09	0·81	42·52

Mean Monthly Temperature, 1914.

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Golden	20·5	20·1	30·8	44·4	50·5	56·7	63·4	59·5	50·5	43·4	30·3	8·4	39·9
Wilmer	22·6	20·4	32·0	43·6	50·9	56·6	64·4	61·1	50·8	41·4	30·9	11·4	40·5
Glacier	20·5	18·6	26·3	36·4	43·8	51·1	57·5	55·7	45·0	40·0	27·5	11·0	36·1
Revelstoke	27·8	24·8	33·9	44·9	53·5	58·6	65·1	62·4	52·7	45·2	35·4	18·8	43·5
Nakusp	33·9	26·7	35·0	45·3	52·5	56·1	64·0	61·2	50·5	44·5	36·3	22·3	44·0
Nelson	30·0	28·3	39·1	48·5	55·0	58·5	68·8	68·6	53·1	46·1	37·5	23·6	46·4
Waneta	29·0	25·1	37·3	47·1	53·5	58·0	67·8	66·6	52·1	45·4	35·4	18·5	44·7
Cranbrook	25·9	19·6	.....	46·0	52·4	57·5	64·5	61·5	51·9	43·4	34·8	10·4	.....
Elko	30·7	24·3	37·4	50·4	53·8	59·3	69·1	67·3	54·8	45·8	37·1	14·9	45·4
Fernie	25·7	18·6	31·4	42·7	49·6	55·3	62·9	59·7	49·1	42·1	53·4	11·8	40·2

Difference from Average Precipitation, 1914

(Difference of Total for month from monthly Average for previous ten years or more.)

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.	Year.
Golden	−2·36	−0·68	0·48	0·19	0·21	−0·55	−0·95	−1·18	0·08	−1·12	−1·00	−0·78	−7·14
Glacier	1·80	−2·76	1·30	1·31	1·15	0·58	−0·53	−1·49	−0·81	−1·37	0·00	−4·52	−5·34
Revelstoke	4·35	−2·62	0·50	0·47	−0·97	−0·56	−1·62	−1·21	0·51	−1·88	1·40	−2·91	−6·54
Nelson	3·48	6·86	−0·05	1·65	−0·21	−0·23	−1·87	−1·70	1·62	−0·45	0·52	−1·84	0·06
Elko	1·31	−0·65	−0·02	0·52	−0·25	0·15	−0·65	0·28	0·05	1·46	0·11	−0·45	0·86

N.B.—All quantities are plus unless otherwise designated.

Difference from Average Temperature, 1914.

(Difference of Average for month from Monthly Average for previous ten years or more.)

Locality.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Golden	11·8	1·2	1·3	2·8	−0·8	−0·3	2·1	1·3	0·8	3·0	1·9	−10·5	14·6
Glacier	2·0	0·6	0·8	0·9	−0·9	−0·1	0·5	1·2	−1·1	4·8	1·8	−7·5	3·0
Revelstoke	7·3	2·1	1·0	1·7	1·5	0·2	2·1	1·1	0·2	2·2	1·1	−8·1	12·0
Nelson	−5·7	−0·4	2·1	1·5	1·3	−2·2	2·2	5·7	−2·9	1·1	0·9	−6·9	−3·3
Elko	8·1	−1·8	3·0	5·0	0·9	−0·7	2·6	4·0	4·6	2·8	1·3	−13·6	16·2

N.B.—All quantities are plus unless otherwise designated.

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER 5

Coast Division—Hydrographic Data

CHAPTER V.

COAST DIVISION—HYDROGRAPHIC DATA.

REGULAR METERING STATION.

Belknap Creek at Belknap Lake (1000).

Location.—Just at lower end of Belknap lake in section 36, township 6, range 7, west of 7th meridian.

Records Available.—Measurements were started in October, 1912, and have been more or less continuous ever since.

Drainage Area.—Not known.

Gauge.—Vertical staff gauge.

Channel.—Bed of stream strewn with rocks and boulders, giving uneven bottom, but permanent control.

Discharge Measurements.—Nine meter measurements made during 1912, 1913, and 1914 define the rating curve very well except for extreme low and extreme high water.

Winter Flow.—Very heavy snowfall but very little ice, so that open-water conditions obtain practically all winter.

Accuracy.—D. Poor because the gauge readings were not taken very frequently.

Co-operation.—Gauge readings are made by employees of the Westminster Power Company.

Discharge Measurements of Belknap Creek, Belknap Lake, 1912-1913-1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1912.							
Oct. 21	C. G. Cline	1,046	33	51	0·7	1·60	34
1913.							
June 4	H. C. Hughes	1,673	35	101	2·7	3·20	257
" 11	do	1,673	34	85	1·8	2·70	148
" 25	do	1,673	34	88	1·8	2·65	147
July 22	do	1,673	36	106	2·0	2·92	202
" 31	do	1,673	35	74	1·0	2·02	75
Sept. 22	F. MacLachlan	1,673	35	50	0·8	1·55	41
1914.							
Aug. 1	C. G. Cline	1,933	33	66	0·8	1·72	50
Nov 15	H. C. Hughes	1,933	35	71	0·5	1·50	34

Daily Gauge Height and Discharge of Belknap Creek at Belknap Lake for 1914.

Day.	February.		March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	9	.....	23	.....	20	.....	81	.....	109	.....	170
2	0·8	9	.....	26	.....	27	.....	84	.....	112	2·85	183
3	.....	9	.....	28	.....	33	.....	86	.....	116	.....	165
4	.....	9	1·45	30	.....	42	.....	89	2·45	120	.....	147
5	.....	9	.....	33	.....	49	.....	91	.....	100	.....	129
6	.....	9	.....	36	1·8	57	2·2	93	2·1	83	.....	111
7	.....	10	.....	39	.....	58	.....	101	.....	83	2·2	93
8	.....	10	.....	40	.....	59	.....	109	.....	83	.....	93
9	.....	10	.....	42	.....	60	.....	117	.....	83	2·2	93
10	.....	10	.....	44	.....	61	.....	125	.....	83	.....	102
11	.....	10	.....	45	.....	62	.....	133	2·1	83	.....	111
12	.....	10	.....	47	.....	63	.....	141	.....	93	.....	119
13	.....	11	.....	49	.....	64	.....	149	.....	105	.....	127
14	.....	11	.....	51	.....	65	.....	157	.....	117	.....	116
15	.....	11	.....	53	.....	66	.....	165	.....	129	.....	105
16	.....	11	.....	55	.....	67	.....	173	2·6	141	2·2	93
17	.....	11	.....	57	.....	68	.....	181	.....	134	.....	99
18	1·0	11	.....	59	.....	69	.....	189	2·5	127	2·32	105
19	.....	11	1·85	61	.....	70	.....	197	.....	126	.....	97
20	.....	12	.....	56	.....	71	.....	205	.....	125	.....	89
21	.....	13	.....	51	.....	73	.....	213	.....	124	.....	81
22	.....	14	.....	46	2·0	74	3·05	222	.....	123	.....	73
23	.....	15	.....	41	.....	74	.....	207	.....	122	.....	65
24	.....	15	.....	40	.....	75	.....	192	.....	121	2·8	57
25	.....	16	.....	37	.....	75	.....	177	.....	120	1·83	60
26	.....	17	.....	33	.....	76	.....	162	.....	119	.....	60
27	.....	19	.....	29	.....	77	.....	147	.....	117	1·86	61
28	.....	20	.....	22	.....	77	.....	132	.....	115	.....	55
29	.....	.....	.....	18	.....	78	.....	117	2·4	114	.....	52
30	.....	.....	.....	15	2·05	79	2·3	103	2·7	156	1·7	49
31	.....	.....	1·05	12	.....	.....	.....	106	.....	.....	1·7	49

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Belknap Creek at Belknap Lake for 1914.

Day.	August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·72	50	1·26	20	.....	70	.....	300	.....	50
2	.....	50	.....	22	.....	60	3·90	410	1·65	45
3	.....	50	.....	25	1·75	53	.....	400	.....	40
4	.....	50	.....	27	.....	50	.....	300	1·45	30
5	.....	50	.....	30	.....	45	.....	200	.....	30
6	.....	50	.....	32	.....	40	.....	150	.....	25
7	1·75	53	.....	35	.....	35	.....	150	.....	20
8	.....	50	1·55	37	.....	30	2·65	150	.....	15
9	.....	45	1·65	45	.....	25	.....	100	1·0	11
10	1·60	41	.....	50	1·30	22	.....	90	.....	11
11	.....	45	.....	50	.....	30	.....	80	.....	11
12	1·70	49	.....	50	.....	40	1·85	60	.....	11
13	1·70	49	.....	50	.....	50	.....	50	.....	10
14	.....	49	.....	100	.....	100	.....	40	.....	10
15	1·70	49	.....	300	.....	200	1·50	33	.....	10
16	.....	45	.....	500	.....	400	.....	35	.....	10
17	.....	40	.....	600	.....	500	.....	40	.....	10
18	1·46	30	5·00	630	4·80	590	.....	40	.....	10
19	.....	30	.....	500	.....	500	.....	45	.....	10
20	1·44	29	3·40	300	.....	400	.....	45	.....	10
21	.....	29	.....	250	.....	200	1·70	49	.....	10
22	1·44	29	.....	200	.....	100	.....	80	.....	10
23	.....	29	.....	150	.....	70	2·40	115	.....	10
24	.....	25	.....	120	1·80	57	.....	120	.....	10
25	1·35	25	.....	120	.....	55	.....	140	.....	10
26	.....	25	.....	120	.....	50	.....	150	.....	9
27	.....	24	.....	115	.....	50	2·70	155	.....	9
28	.....	23	2·40	115	1·70	49	.....	150	.....	9
29	1·31	22	.....	100	.....	50	.....	120	0·8	9
30	.....	21	.....	90	.....	100	.....	100	.....	10
31	.....	21	.....	.....	.....	200	.....	.....	1·1	13

Monthly Discharge of Belknap Creek at Belknap Lake for 1914.

Month.	Discharge in Second-Feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
February	.....	.....	12	D
March	.....	.....	39	D
April	79	20	63	D
May	222	81	143	D
June	156	83	113	C
July	183	49	97	C
August	53	21	38	C
September	630	20	159	D
October	590	22	136	D
November	410	33	130	D
December	50	9	16	D

Belknap Creek below Ann Lake (1063).

Location.—About half way between Ann lake and Belknap lake, near the proposed site for the diversion dam, and in section 36, township 6, range 7, west of 7th meridian.

Records Available.—June to December, 1914.

Drainage Area.—Not known.

Gauge.—Vertical staff gauge.

Channel.—Boulders and gravel.

Discharge Measurements.—Five meter measurements made during 1913 and 1914 define the rating curve accurately except for very high stages.

Winter Flow.—Stream freezes at gauging section for a week or two in very cold weather.

Accuracy.—D. Poor on account of the infrequency of the gauge readings.

Co-operation.—Gauge readings are made by employees of the Westminster Power Company.

Discharge Measurements of Belknap Creek below Ann Lake, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 24	H. C. Hughes	1,673	27	76	1·8	2·52	135
Aug. 1	do	1,673	32	91	0·9	2·08	82
Sept. 19	F. MacLachlan	1,673	30	60	0·5	1·20	30
1914.							
Aug. 1	C. G. Cline	1,933	31	83	0·6	1·55	50
Nov. 10	H. C. Hughes	1,933	31	59	0·5	1·12	28

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Belknap Creek below Ann Lake, 1914.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	1·55	48	1·05	24	.....	60	.....	200
2	.....	.....	2·75	170	.....	48	.....	26	.....	50	3·20	250
3	.....	.....	.....	150	.....	48	.....	28	1·45	43	.....	200
4	.....	.....	.....	130	.....	50	.....	30	.....	40	.....	150
5	.....	.....	.....	120	.....	50	.....	32	.....	40	.....	140
6	.....	.....	.....	100	.....	50	.....	34	.....	35	.....	130
7	.....	.....	2·15	90	.....	50	.....	36	.....	30	.....	120
8	.....	.....	.....	95	1·58	50	1·35	38	.....	25	2·40	117
9	.....	.....	.....	100	1·45	43	.....	40	1·05	24	.....	100
10	.....	.....	.....	110	1·42	42	.....	50	.....	30	.....	80
11	1·9	70	.....	115	.....	44	.....	60	.....	50	.....	70
12	.....	.....	.....	120	1·50	46	.....	70	.....	60	.....	50
13	.....	.....	2·45	125	1·55	48	.....	80	.....	70	1·50	46
14	.....	.....	.....	110	1·50	46	.....	100	.....	80	.....	40
15	.....	.....	.....	100	1·50	46	.....	200	.....	100	.....	30
16	2·5	130	2·15	90	.....	40	.....	400	.....	200	1·10	26
17	.....	.....	.....	100	.....	35	.....	500	.....	400	.....	30
18	2·4	117	2·25	100	1·23	32	5·10	600	4·55	500	.....	35
19	.....	.....	2·28	100	1·23	32	.....	400	.....	300	.....	40
20	.....	.....	.....	90	1·23	32	3·05	220	.....	200	.....	45
21	.....	.....	.....	80	1·23	32	.....	200	.....	100	1·55	48
22	.....	.....	.....	70	1·23	32	.....	150	.....	80	.....	70
23	.....	.....	.....	60	.....	30	.....	100	.....	50	2·15	90
24	.....	.....	1·76	60	.....	30	.....	100	1·55	48	.....	100
25	.....	.....	.....	60	1·13	27	.....	90	.....	45	.....	110
26	.....	.....	.....	60	.....	27	.....	90	.....	45	.....	120
27	.....	.....	1·76	60	.....	26	.....	90	.....	45	2·45	125
28	.....	.....	.....	55	.....	26	2·10	85	1·45	43	.....	100
29	2·3	105	.....	50	1·10	26	.....	80	.....	50	.....	80
30	2·6	145	1·55	48	.....	25	.....	70	.....	100	.....	60
31	.....	.....	.....	48	.....	25	.....	.....	.....	200	.....	.....

Daily Gauge Height and Discharge of Belknap Creek below Ann Lake, for 1914.—*Concluded.*

Day.	December.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1		50
2	1·55	48
3		45
4	1·40	40
5		35
6		30
7		30
8		25
9	1·05	24
10		23
11	1·00	22
12		22
13		22
14		20
15		20
16		20
17		20
18		20
19		20
20		20
21		18
22		18
23		18
24		18
25		18
26		18
27		18
28		18
29		18
30		18
31	0·85	18

Monthly Discharge of Belknap Creek below Ann Lake, for 1914.

Month.	Discharge in Second-Feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
July	170	48	89	C
August	50	25	38	C
September	600	24	134	D
October	500	24	101	D
November	250	26	93	D
December	50	18	24	D

Boulder Creek (1001).

Location.—Near mouth of creek and near Jones lake in section 28, township 3, range 27, west of 6th meridian.

Records available.—Daily discharges from January, 1913, to December, 1914.

Drainage Area.—Not known.

Gauge.—A fine wire is stretched tightly across the stream, and the distance to the water surface is measured with a graduated rod. These figures are subtracted from 15.00 to give the direct readings.

Channel.—Bed of stream covered with large rocks, giving an uneven bottom but good control.

Winter Flow.—The stream freezes over for a month or two each winter.

Accuracy.—Below 100 cubic feet per second, "B". Above 100 cubic feet per second, "C".

Co-operation.—The records on this stream are kept by Messrs. Anderson and Warden, Civil Engineers, Vancouver, for the Vancouver Power Company.

Discharge Measurements of Boulder Creek near mouth, 1911–12–13–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 3.....	K. N. Smith.....	1,057	28	24	0·5	4·20	12·6
1912.							
Sept. 8.. ..	C. G. Cline.....	1,046	30	24	0·5	4·25	13·4
1913.							
July 24	K. G. Chisholm..... ...	1,055	27	52	1·6	4·90	84·6
Sept. 11.....	K. G. Chisholm and F. MacLachlan.....	1,055	32	34	1·0	4·60	34·6
1914.							
July 24.....	C. G. Cline.	1,933	30	34	0·7	4·40	22·7

Daily Gauge Height and Discharge of Boulder Creek near mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·25	15	4·3	16	4·8	65	4·45	25	5·1	120	5·25	150
2	4·25	15	4·3	16	4·65	44	4·45	25	5·4	180	5·25	150
3	4·25	15	4·4	22	4·55	33	4·8	65	5·45	190	5·15	130
4	5·3	160	4·4	22	4·5	28	5·0	105	5·15	130	4·9	85
5	5·6	220	4·4	22	4·45	25	5·25	150	5·05	115	4·8	75
6	6·0	300	4·95	95	4·4	22	5·05	110	5·0	105	4·75	58
7	5·35	170	4·7	50	4·4	22	5·05	110	5·05	115	4·7	50
8	4·95	95	4·55	33	4·6	37	5·1	120	5·1	120	4·7	50
9	4·75	57	4·5	28	4·6	37	5·1	120	5·2	140	4·8	65
10	4·7	50	4·4	22	4·5	28	5·1	120	5·3	160	4·75	58
11	4·65	43	4·25	15	4·5	28	5·05	110	5·25	150	4·9	85
12	4·6	37	4·25	15	4·5	28	5·0	105	5·25	150	5·05	115
13	4·55	33	4·2	13	4·8	65	5·05	110	5·3	160	5·05	115
14	4·55	33	4·2	13	5·3	160	5·1	120	5·5	200	5·05	115
15	4·5	28	4·25	15	4·8	65	5·3	160	5·3	160	5·1	120
16	4·5	28	4·3	16	5·0	105	5·0	105	5·2	140	5·15	130
17	4·4	22	4·3	16	5·1	120	4·85	75	5·2	140	5·05	115
18	4·4	22	4·3	16	5·0	105	4·85	75	5·2	140	5·0	105
19	4·4	22	4·3	16	4·95	95	5·4	180	5·15	130	4·9	85
20	4·35	19	4·35	19	5·1	120	5·1	120	5·2	140	4·9	85
21	4·35	19	4·4	22	5·1	120	4·9	85	5·2	140	4·8	65
22	4·35	19	4·5	28	5·0	105	4·85	75	5·25	150	4·8	65
23	4·35	19	4·45	25	4·9	85	4·85	75	5·3	160	4·75	58
24	4·35	19	4·45	25	4·85	75	4·8	65	5·25	150	4·8	65
25	4·40	22	4·45	25	4·7	50	4·75	58	5·15	130	4·85	75
26	4·4	22	4·4	22	4·8	65	4·75	58	5·0	105	4·85	75
27	4·4	22	4·6	37	4·6	37	4·75	58	5·0	105	5·1	120
28	4·4	22	4·5	28	4·55	33	4·75	58	4·9	85	4·9	85
29	4·4	22	.....	.....	4·55	33	4·7	50	4·8	65	4·95	95
30	4·4	22	.....	.....	4·5	28	4·85	75	4·9	85	4·95	95
31	4·35	19	.....	.....	4·5	28	.....	.....	5·1	120	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Boulder Creek near mouth for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·95	95	4·3	16	4·05	9	4·35	19	5·3	160	4·6	37
2	4·95	95	4·25	15	4·05	9	4·35	19	5·1	120	4·5	28
3	4·95	95	4·25	15	4·05	9	4·3	16	5·1	120	4·5	28
4	4·9	85	4·25	15	4·05	9	4·3	16	5·25	150	4·4	22
5	4·8	65	4·25	15	4·05	9	4·25	15	5·0	105	4·4	22
6	4·7	50	4·25	15	4·05	9	4·25	15	4·8	65	4·4	22
7	4·7	50	4·3	16	4·05	9	4·2	13	4·7	50	4·35	19
8	4·7	50	4·45	25	4·4	22	4·2	13	4·8	65	4·35	19
9	4·7	50	4·3	16	4·45	25	4·2	13	4·9	85	4·3	16
10	4·7	50	4·25	15	4·35	19	4·2	13	4·8	65	4·3	16
11	4·7	50	4·25	15	4·5	28	4·4	22	5·15	130	Frozen..	15
12	4·7	50	4·2	13	4·35	19	4·35	19	4·9	85	.....	15
13	4·7	50	4·2	13	4·3	16	4·4	22	4·6	37	.....	15
14	4·7	50	4·2	13	4·35	19	4·3	16	4·6	37	.....	15
15	4·7	50	4·15	12	4·6	37	4·25	15	4·6	37	.....	15
16	4·6	37	4·15	12	4·5	28	4·2	13	4·5	28	.....	15
17	4·6	37	4·15	12	4·5	28	4·8	65	4·5	28	.....	15
18	4·6	37	4·15	12	5·0	105	4·7	50	4·45	25	.....	15
19	4·6	37	4·15	12	4·85	75	4·85	75	4·6	37	.....	15
20	4·6	37	4·15	12	4·7	50	4·65	44	4·7	50	.....	15
21	4·55	33	4·15	12	4·65	44	4·5	28	4·8	65	.....	10
22	4·5	28	4·15	12	4·5	28	4·45	25	4·8	65	.....	10
23	4·45	25	4·1	10	4·45	25	4·4	22	4·8	65	.....	10
24	4·4	22	4·1	10	4·35	19	4·4	22	4·85	75	.....	10
25	4·4	22	4·1	10	4·3	16	4·4	22	4·95	95	.....	10
26	4·4	22	4·1	10	4·25	15	4·35	19	5·10	120	.....	10
27	4·4	22	4·1	10	4·6	37	4·3	16	5·05	115	.....	15
28	4·35	19	4·05	9	4·45	25	4·25	15	4·90	85	.....	15
29	4·3	16	4·05	9	4·4	22	4·25	15	4·75	60	.....	15
30	4·3	16	4·05	9	4·35	19	4·5	28	4·65	44	.....	15
31	4·3	16	4·05	9	.....	.....	4·9	85	.....	.....	Frozen..	15

Monthly Discharge of Boulder Creek near mouth for 1914.

Month.	Discharge in Second-Feet.			Run-Off.	
	Maximum.	Minimum.	Mean.	Total in acre-feet.	Accuracy
January	300	15	52	3,200	C
February	95	13	25	1,390	B
March	160	22	61	3,750	B
April	180	25	92	5,470	C
May	200	65	135	8,300	C
June	150	50	91	5,410	C
July	95	15	44	2,700	B
August	25	9	13	800	B
September	105	9	26	1,550	B
October	85	13	25	1,540	B
November	160	25	75	4,520	C
December	37	10	17	1,050	C
The year	300	9	55	39,680	C

Brandt Creek at Mouth (1002)

Location.—Section 4, township 7, range 7, west of the 7th meridian.

Records Available.—October 19 to December 31, 1912; January 1 to December 31, 1913; January 1, to September 11, 1914, station abandoned, and new station above Young creek used.

Drainage Area.—Not known.

Gauge.—Vertical staff gauge, nailed to tree. Generally five or six readings a week.

Channel.—Rocky bed, giving a rough bottom but permanent control.

Discharge measurements.—Rating curve well defined by nine meter measurements made during 1912 and 1913.

Winter Flow.—Open all year.

Accuracy.—B, when gauge readings were taken frequently enough.

Co-operation.— Gauge readers maintained by Westminster Power Company.

Discharge Measurements of Brandt Creek at mouth, 1912–13–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 19	C. G. Cline	1046	30	25	1·5	2·02	37
1913.							
May 29	H. C. Hughes	1673	40	53	2·3	2·63	122
June 9	do	1673	36	49	1·9	2·45	94
June 18	do	1673	36	45	1·7	2·35	75
June 27	do	1673	36	53	2·2	2·57	115
July 3	do	1673	36	42	1·4	2·26	59
July 29	do	1673	19	20	0·6	1·62	13
Sept 24	F. MacLachlan	1673	21	19	0·5	1·48	9
*Nov. 7	do	1521	41	27	1·3	2·08	36
Nov. 12	do	1521	40	23	1·1	1·91	25
Nov. 13	do	1521	40	21	1·1	1·84	24
1914.							
May 15	do	1521	41	46	2·3	2·56	102

* Different section.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Brandt Creek at mouth for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·00	33	1·8	21	3·0	190	1·9	26	2·5	100	2·5	100
2	2·55	110	1·7	16	2·5	100	1·92	28	2·65	130	2·4	83
3	2·45	90	1·7	16	2·5	100	2·6	120	2·6	120	2·2	53
4	5·20	610	1·7	16	2·25	60	2·7	140	2·3	67	2·08	40
5	3·20	230	1·65	14	2·05	37	2·8	155	2·25	60	1·95	30
6	3·30	245	.....	15	2·0	33	2·55	110	2·3	67	1·9	26
7	2·90	175	.....	15	.....	40	2·5	100	2·3	67	.....	30
8	.....	150	1·7	16	.....	50	2·45	90	2·5	100	.....	35
9	.....	100	.....	16	.....	60	2·50	100	2·45	90	.....	40
10	.....	80	1·7	16	.....	70	2·5	100	2·35	75	2·1	42
11	.....	60	1·7	16	.....	80	2·5	100	.....	100	2·2	53
12	.....	50	1·75	18	.....	90	2·3	67	.....	120	2·2	53
13	.....	40	2·05	37	.....	100	3·5	280	2·7	140	2·3	67
14	2·0	33	1·9	26	.....	110	3·0	190	2·6	120	2·5	100
15	.....	35	1·9	26	.....	120	3·4	265	2·4	83	2·6	120
16	.....	40	1·92	27	2·65	130	2·9	175	2·5	100	2·2	53
17	2·1	42	1·97	31	2·60	120	.....	160	2·25	60	2·1	42
18	2·1	42	1·95	30	2·50	100	2·7	140	2·25	60	.....	40
19	2·1	42	2·0	33	2·65	130	3·4	265	2·25	60	2·05	38
20	1·95	30	2·0	33	2·70	140	2·5	100	2·4	83	2·05	38
21	1·9	26	2·3	67	2·65	130	2·3	67	2·45	90	2·00	33
22	.....	20	2·4	83	2·50	100	2·25	60	2·7	140	2·00	33
23	1·75	18	2·7	140	2·30	67	2·3	67	2·5	100	2·00	33
24	1·7	16	2·5	100	2·20	53	2·25	60	2·3	67	2·10	42
25	1·7	16	2·2	53	2·10	42	2·1	42	2·7	140	2·68	135
26	2·15	48	2·1	42	2·0	33	.....	45	3·3	245	2·40	83
27	1·9	26	2·3	67	1·9	26	.....	45	2·7	140	2·70	140
28	1·8	21	2·2	53	1·9	26	2·15	48	2·3	67	.....	130
29	1·8	21	.....	.....	2·3	67	2·15	48	2·1	42	.....	120
30	1·95	30	.....	.....	2·1	42	2·3	67	2·3	67	.....	110
31	1·9	26	.....	.....	2·0	33	.....	.....	2·6	120	.....	.....

Daily Gauge Height and Discharge of Brandt Creek at mouth for 1914.

Day.	July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·1	42	.....	7	.....	.....
2	.....	40	.....	6	1·10	5
3	.....	40	1·3	6	.....	.....
4	.....	30	.....	6	.....	.....
5	.....	30	.....	7	.....	.....
6	1·9	26	.....	7	.....	.....
7	.....	26	.....	7	1·10	5
8	.....	24	.....	7	.....	.....
9	.....	22	.....	8	.....	.....
10	.....	20	1·44	8	1·80	21
11	.....	18	.....	8	1·60	12
12	.....	16	.....	8	.....	.....
13	1·7	16	.....	7	.....	.....
14	1·9	26	.....	7	.....	.....
15	1·8	21	1·40	7	.....	.....
16	.....	20	.....	6	.....	.....
17	.....	18	1·24	6	.....	.....
18	.....	15	.....	6	.....	.....
19	.....	12	.....	6	.....	.....
20	.....	10	.....	6	.....	.....
21	1·45	8	.....	6	.....	.....
22	1·42	7	.....	6	.....	.....
23	1·45	8	.....	6	.....	.....
24	.....	8	1·25	6	.....	.....
25	.....	8	.....	6	.....	.....
26	.....	8	.....	6	.....	.....
27	.....	8	.....	5	.....	.....
28	1·45	8	.....	5	.....	.....
29	.....	8	.....	5	.....	.....
30	.....	8	1·10	5	.....	.....
31	.....	7	.....	5	.....	.....

Monthly Discharge of Brandt Creek at mouth for 1914.

Month.	Discharge in Second-Feet.			Accuracy
	Maximum.	Minimum.	Mean.	
January	610	16	81	D
February	140	14	37	B
March	190	26	80	C
April	280	26	109	B
May	245	42	97	B
June	140	26	65	C
July	42	7	18	D
August	8	5	6	D

Brandt Creek above Young Creek (1021).

Location.—A few hundred feet above the mouth of Young creek, in section 10, township 7, range 7, west of 7th meridian.

Records Available.—Part of 1914, with interruptions.

Drainage Area.—Not known.

Gauge.—The original staff gauge has been replaced by a chain gauge mounted on a pole which is fastened to trees and projects over the stream.

Channel.—Solid rock at control.

Discharge measurements.—Nine meter measurements were made during 1913 and 1914, but most of them were referred to the old gauge which was washed out.

Winter Flow.—Very heavy snowfall but practically no ice, so that open water conditions obtain all winter.

Accuracy.—D.

Co-operation.—Gauge readers are maintained by Westminster Power Company.

DISCHARGE MEASUREMENTS of Brandt Creek above Young Creek, 1913-1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 3	H. C. Hughes	1673	11	21·5	3·3	1·70	73·5
" 10	do	1673	11	16·5	2·2	1·50	37·0
" 18	do	1673	11	18·0	3·1	1·60	54·2
July 7	do	1673	10	12·9	1·6	1·30	21·0
" 30	do	1673	10	8·4	0·6	0·70	4·7
Sept. 30	F. MacLachlan	1673	9	8·4	0·3	0·51	2·4[1]
1914.							
May 18	F. MacLachlan	1521	12	15·7	1·5	1·88	23·1
July 31	C. G. Cline	1933	8	1·1	0·7	0·70	0·8
Nov. 14	H. C. Hughes	1933	10	10·4	0·6	1·64	6·6[2]

[1] First staff gauge washed out January 6, 1914. Replaced the same month.

[2] Second gauge washed out October 19, 1914. Replaced November 14, 1914, by chain gauge.

Daily Gauge Height and Discharge of Brandt Creek above Young for 1914.

Day.	February.		March.		April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·8	1·5	.....	.....	.....	.....	.....	15	.....	14	.....	40
2	.....	.....	.....	.....	.....	.....	.....	16	.....	12	2·15	52
3	.....	.....	.....	.....	.....	.....	.....	17	.....	12	.....	40
4	.....	.....	.....	.....	.....	.....	.....	18	1·6	12	.....	30
5	.....	.....	1·05	3·5	.....	.....	.....	19	.....	10	.....	20
6	.....	.....	.....	.....	1·9	25·0	1·8	20	1·35	6	.....	15
7	.....	.....	.....	.....	.....	.....	.....	20	.....	6	.....	10
8	.....	.....	.....	.....	.....	.....	.....	20	.....	8	1·40	7
9	.....	.....	.....	.....	.....	.....	.....	20	.....	10	.....	7
10	.....	.....	.....	.....	.....	.....	.....	21	.....	10	1·40	7
11	.....	.....	.....	.....	.....	.....	.....	21	1·6	12	.....	7
12	.....	.....	.....	.....	.....	.....	.....	21	.....	12	.....	6
13	.....	.....	.....	.....	.....	.....	.....	21	1·6	12	1·3	6
14	.....	.....	.....	.....	.....	.....	.....	22	.....	14	.....	5
15	.....	.....	.....	.....	.....	.....	.....	22	.....	16	.....	4
16	.....	.....	.....	.....	.....	.....	.....	22	.....	18	1·0	3
17	.....	.....	.....	.....	.....	.....	.....	23	1·75	18	.....	3
18	1·1	4·0	.....	.....	.....	.....	1·85	23	.....	16	0·94	2·5
19	.....	.....	1·9	25·0	.....	.....	.....	25	1·7	15	.....	2
20	.....	.....	.....	.....	.....	.....	.....	30	.....	15	0·85	1·8
21	.....	.....	.....	.....	.....	.....	.....	40	.....	15	.....	1·6
22	.....	.....	.....	.....	1·6	12·0	2·1	42	.....	14	.....	1·4
23	.....	.....	.....	.....	.....	.....	.....	40	.....	13	.....	1·2
24	.....	.....	.....	.....	.....	.....	.....	40	.....	12	0·78	1·0
25	.....	.....	.....	.....	.....	.....	.....	35	.....	11	.....	1
26	.....	.....	.....	.....	.....	.....	.....	30	.....	10	.....	2
27	.....	.....	.....	.....	.....	.....	.....	25	.....	10	0·9	2
28	.....	.....	.....	.....	.....	.....	.....	20	.....	9	.....	2
29	.....	.....	.....	.....	.....	.....	.....	15	1·5	9	.....	1
30	.....	.....	.....	.....	1·65	14·0	1·7	15	.....	20	0·71	0·8
31	.....	.....	1·1	4·0	.....	.....	.....	15	.....	.....	0·71	0·8

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Brandt Creek above Young Creek, 1914.

Day.	August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	0·8	0·57	0·4	.....	.....	.....	.....	1·70	.....
2	.....	0·8	.....	0·6	.....	.....	.....	.....	.....	.....
3	0·7	0·8	.....	0·8	0·90	2·00	.....	.....	.....	.....
4	.....	0·8	.....	1·0	.....	.....	.....	.....	.....	.....
5	.....	0·7	.....	1·2	.....	.....	.....	.....	1·60	6
6	.....	0·7	.....	1·4	.....	.....	.....	.....	.....	.....
7	.....	0·6	.....	1·6	.....	.....	.....	.....	.....	.....
8	.....	0·6	0·85	1·8	.....	.....	.....	.....	1·50	.....
9	.....	0·5	0·98	2·8	.....	.....	.....	.....	.....	.....
10	0·6	0·5	.....	4	0·90	2·00	.....	.....	1·50	.....
11	.....	0·5	.....	6	.....	.....	2·40	.....	.....	.....
12	.....	0·5	.....	10	.....	.....	.....	.....	.....	.....
13	.....	0·5	.....	20	.....	.....	.....	.....	.....	.....
14	0·6	0·5	.....	50	.....	.....	1·60	6	1·55	.....
15	0·6	0·5	.....	100	.....	.....	.....	.....	.....	.....
16	.....	0·5	.....	150	.....	.....	1·50	.....	.....	.....
17	.....	0·5	.....	200	.....	.....	.....	.....	.....	.....
18	0·6	0·5	3·20	250	3·20	2·50	.....	.....	1·45	.....
19	.....	0·5	.....	100	.....	.....	.....	.....	.....	.....
20	0·6	0·5	1·80	20	.....	.....	.....	.....	.....	.....
21	.....	0·5	.....	15	.....	.....	2·50	.....	1·45	.....
22	0·6	0·5	.....	10	.....	.....	.....	.....	.....	.....
23	.....	0·5	.....	10	.....	.....	2·70	.....	1·35	.....
24	.....	0·5	.....	10	.....	.....	.....	.....	.....	.....
25	0·6	0·5	.....	8	.....	.....	.....	.....	.....	.....
26	.....	0·5	.....	6	.....	.....	2·00	.....	.....	.....
27	0·6	0·5	.....	4	.....	.....	.....	.....	.....	.....
28	.....	0·5	1·05	3·5	.....	.....	2·15	.....	1·40	.....
29	0·6	0·5	.....	3	.....	.....	.....	.....	.....	.....
30	.....	0·5	.....	3	.....	.....	.....	.....	2·35	.....
31	.....	0·4	.....	.....	.....	.....	.....	.....	.....	.....

Monthly Discharge of Brandt Creek above Young Creek, for 1914.

Month.	Discharge in Second-Feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
May	42	15	24	D
June	20	6	12	D
July	52	0·8	9·1	C
August	0·8	0·4	0·6	C
September	250	0·4	33	D

Capilano Creek (1023).

Location.—Just above the Vancouver intake about 6 miles from the mouth of the creek.

Records Available.—Daily discharges from November, 1913, to date.

Drainage Area.—Fifty-five square miles, estimated by the engineers of the Provincial Water Rights Branch.

Gauge.—Vertical staff, readings twice a day.

Channel.—Rocky bed, water swift at high stages. At low water a small temporary dam is sometimes placed in the channel below the gauge. The gauge readings have been corrected to allow for the backwater caused by it.

Discharge Measurements.—Eight meter measurements during 1914.

Winter Flow.—Open water all year.

Accuracy.—C.

Co-operation.—Gauge readings taken by employees of the Vancouver Waterworks Department.

DISCHARGE MEASUREMENTS of Capilano Creek above city intake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
April 23	H. J. E. Keys, F. MacLachlan and C. G. Cline	1057	89	344	2·17	5·10	745
May 28	C. G. Cline	1521	90	354	2·10	5·15	717
June 19	do	1933	86	343	1·91	5·10	633
Aug. 13	do	1933	60	92	1·10	4·10	100[1]
Sept. 9	do	1933	59	95	1·10	4·70	102[1]
Oct. 8	C. E. Webb	1057	82	115	1·66	4·05	191
" 19	H. C. Hughes	1057	113	529	7·85	7·70	4,100
" 26	do	1933	54	206	2·00	4·40	407

[1] Affected by backwater from dam.

DAILY GAUGE HEIGHT AND DISCHARGE of Capilano Creek at Intake for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6·00	1,570	5·05	700	7·75	4,250	4·50	400	5·80	1,350	6·05	1,630
2	6·65	2,420	4·85	580	6·55	2,300	5·70	1,250	6·15	1,760	5·95	1,500
3	6·80	2,650	4·75	520	6·50	2,230	5·75	1,300	5·85	1,400	5·65	1,200
4	10·10	8,350	4·55	420	5·75	1,300	6·00	1,580	5·40	950	5·15	770
5	9·25	6,900	4·50	400	5·50	1,050	6·60	2,350	5·25	840	4·75	520
6	10·40	8,900	4·50	400	5·35	900	5·80	1,350	5·40	950	4·55	420
7	7·55	3,900	4·50	400	5·15	750	5·20	800	5·40	950	5·33	900
8	7·10	3,120	4·50	400	5·60	1,150	5·60	1,150	5·60	1,150	5·17	780
9	7·15	3,200	4·50	400	5·50	1,050	5·70	1,250	5·50	1,050	5·00	660
10	6·95	2,870	4·50	400	5·30	870	5·70	1,250	5·25	840	4·92	610
11	6·15	1,760	4·65	470	5·50	1,050	5·60	1,150	5·45	1,000	5·08	670
12	5·85	1,400	4·85	580	5·60	1,150	5·50	1,050	5·65	1,200	5·25	840
13	5·90	1,480	5·00	660	5·75	1,300	7·05	3,050	6·05	1,630	5·25	840
14	5·65	1,200	5·05	700	7·70	4,150	6·75	2,570	6·15	1,760	5·50	1,050
15	5·35	900	5·10	720	5·55	1,100	6·70	2,500	6·00	1,580	6·00	1,580
16	6·80	2,650	5·10	720	5·50	1,050	5·85	1,400	5·65	1,200	5·92	1,500
17	5·95	1,530	5·10	720	5·70	1,250	5·45	1,000	5·50	1,050	5·67	1,220
18	5·90	1,480	5·10	720	5·50	1,050	5·85	1,400	5·45	1,000	5·58	1,120
19	5·70	1,250	5·20	800	5·70	1,250	5·25	1,900	5·35	900	5·17	780
20	5·20	800	5·20	800	5·95	1,500	5·80	1,350	5·75	1,300	4·96	630
21	5·10	720	5·35	900	5·85	1,400	5·30	870	6·00	1,580	5·17	780
22	4·95	630	6·15	1,750	5·70	1,250	5·15	760	6·10	1,700	5·17	780
23	4·80	550	6·25	1,900	5·15	760	5·15	760	6·00	1,580	5·00	660
24	4·80	550	6·95	2,880	4·95	630	5·20	800	5·50	1,050	5·00	660
25	5·55	1,100	5·90	1,480	4·75	520	4·85	580	5·85	1,400	5·83	1,400
26	6·30	1,950	5·50	1,050	4·65	470	4·75	520	6·05	1,760	5·25	840
27	5·10	730	6·15	1,750	4·60	450	4·90	600	5·85	1,400	5·08	670
28	4·90	600	5·70	1,250	4·50	400	4·80	550	5·20	800	5·08	670
29	4·75	520	4·70	.....	4·70	500	4·70	500	4·85	580	5·46	1,000
30	5·35	900	.....	.....	4·60	450	5·05	690	4·95	630	5·62	1,170
31	5·05	700	.....	.....	4·55	420	.....	.....	5·75	1,300	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Capilano Creek at Intake for 1914 —*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gzuge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·67	1,220	3·46	80	3·17	80	4·9	600	9·0	6,400	5·1	725
2	5·75	1,300	3·46	80	3·07	55	5·5	1,050	8·7	5,900	4·8	550
3	5·46	1,000	3·42	80	3·12	55	4·8	550	6·2	1,825	4·8	550
4	5·04	680	3·33	70	3·07	55	4·2	275	7·0	2,950	4·6	450
5	4·79	550	3·37	70	2·82	40	4·1	240	5·6	1,150	4·3	315
6	4·75	520	3·76	140	2·95	45	4·0	205	5·2	800	4·2	275
7	4·67	490	3·80	150	2·95	45	4·0	205	5·3	875	4·1	240
8	4·62	460	3·88	170	3·95	190	3·9	175	7·4	3,600	4·0	205
9	4·46	380	3·67	120	3·45	80	3·9	175	6·2	1,800	4·0	205
10	4·47	370	3·56	100	3·74	135	4·1	240	5·9	1,500	3·9	175
11	4·47	370	3·60	105	3·70	125	4·3	315	6·0	1,600	3·8	150
12	4·47	370	3·60	105	3·37	70	8·0	4,700	5·2	800	3·8	150
13	4·34	330	3·60	105	3·16	60	8·5	5,600	5·0	660	3·6	105
14	4·42	360	3·60	105	3·45	80	5·8	1,350	4·6	450	3·6	105
15	4·30	315	3·60	105	3·95	190	5·1	725	4·2	275	3·6	105
16	4·13	250	3·60	105	3·53	90	9·0	6,400	4·2	275	3·7	125
17	4·30	315	3·52	90	4·12	250	8·1	4,900	4·1	240	3·5	85
18	4·38	350	3·32	70	7·65	4,060	10·2	8,500	4·0	205	3·5	85
19	4·34	330	3·40	75	8·52	5,620	8·3	5,200	5·4	950	3·3	65
20	3·92	180	3·40	75	6·32	1,970	6·7	2,500	5·2	800	3·3	65
21	3·76	140	3·40	75	5·19	790	5·8	1,350	5·4	950	3·3	65
22	3·72	130	3·40	75	4·52	410	5·1	725	5·8	1,350	3·2	60
23	3·84	160	3·40	75	4·19	270	4·8	550	6·5	2,225	3·2	60
24	3·88	170	3·32	70	4·07	235	4·2	275	6·5	2,225	3·1	55
25	3·88	170	3·32	70	3·90	175	4·2	275	6·8	2,650	3·1	55
26	3·97	200	3·32	70	4·82	560	4·2	275	6·0	1,575	3·2	60
27	3·76	140	3·26	65	5·57	1,120	4·2	275	6·0	1,575	3·4	75
28	3·67	120	3·30	65	5·40	950	4·1	240	6·4	2,075	3·4	75
29	3·46	80	3·30	65	4·82	560	4·0	205	5·4	950	4·3	315
30	3·50	85	3·30	65	4·98	650	5·4	950	5·0	660	4·5	400
31	3·50	85	3·30	65	.....	.....	6·5	2,225	.....	.....	4·5	400

Monthly Discharge of Capilano Creek at Intake for 1914.

(Drainage area, 55 square miles).

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet	
January	8,900	520	2,170	39·50	45·50	133,000	C
February	2,800	400	875	15·90	16·60	48,600	C
March	4,250	400	1,225	22·30	25·70	75,300	C
April	3,050	400	1,220	22·20	24·80	72,600	C
May	1,760	580	1,215	22·10	25·50	74,700	C
June	1,630	420	930	16·90	18·90	55,300	C
July	1,300	80	375	6·82	7·80	23,100	C
August	170	65	90	1·63	1·88	5,500	C
September	5,620	40	635	11·55	12·90	37,800	C
October	8,500	175	1,655	30·10	34·70	101,000	C
November	6,400	205	1,645	29·90	33·40	97,700	C
December	725	55	205	37·30	43·00	12·600	C
The year	8,900	55	1,020	21·35	290·68	737,200	C

Chehalis River (1003).

Location.—One and a half miles from the mouth, in section 14, township 4, range 30, west of the 6th meridian.

Records Available.—Continuous records since March, 1912.

Drainage Area.—Two hundred square miles.

Gauge.—Chain gauge suspended over river by pole spiked to two trees and held in position by a stay wire from the top of one of the trees.

Channel.—Rocky bed, water swift at higher stages.

Discharge measurements.—Ten discharge measurements during 1912, 1913 and 1914.

Winter Flow.—Open water all year.

Accuracy.—Below 3,000 cubic feet per second, "B". Above 3,000 cubic feet per second, "C".

Discharge Measurements of Chehalis River at $1\frac{1}{2}$ miles from mouth, 1911–12–13–14.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Dec. 14	N. M. Smith	1057	105	273	3·74	3·80	1,021
1912.							
Mar. 8	C. G. Cline	1046	110	162	1·82	2·70	295
July 15	do	1046	123	221	2·42	3·07	535
Sept. 11	do	1046	105	248	2·40	2·90	594
Nov. 23	do	1048	140	600	4·85	4·95	2,910
Dec. 4	do	1048	130	343	3·56	3·92	1,220
1913.							
May 21	do	1044	145	460	3·90	4·40	1,810
Sept. 8	do	1055	145	395	3·95	4·40	1,560
1914.							
May 22	do	1521	143	423	4·20	4·50	1,730
Aug. 25	do	1933	100	180	1·10	2·60	188

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Chehalis River one mile from mouth for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·9	1,140	4·3	1,550	6·4	9,600	4·8	2,450	4·6	2,000	4·1	1,320
2	3·8	1,060	4·2	1,430	5·7	6,250	4·7	2,200	4·55	1,910	4·05	1,280
3	3·7	980	4·05	1,270	5·2	3,850	4·8	2,450	4·5	1,820	4·0	1,230
4	6·6	10,600	3·9	1,140	5·0	3,100	4·9	2,750	4·6	2,000	4·1	1,320
5	8·0	17,000	3·8	1,060	4·7	2,200	5·2	3,850	4·6	2,000	4·0	1,230
6	9·0	22,000	3·7	980	4·5	1,820	5·1	3,450	4·55	1,910	4·0	1,230
7	8·0	17,000	3·8	1,060	4·4	1,670	4·95	2,920	4·5	1,820	4·1	1,320
8	6·4	9,600	3·7	980	4·5	1,820	4·8	2,450	4·45	1,750	4·0	1,230
9	6·0	7,700	3·6	900	4·6	2,000	4·7	2,200	4·4	1,670	3·9	1,140
10	5·5	5,300	3·6	900	4·6	2,000	4·6	2,000	4·6	2,000	3·95	1,180
11	5·2	3,850	3·7	980	4·5	1,820	4·5	1,820	5·0	3,100	4·0	1,230
12	5·1	3,450	3·7	980	4·4	1,670	4·5	1,820	4·8	2,450	4·0	1,230
13	5·0	3,100	3·8	1,060	4·5	1,820	4·6	2,000	4·8	2,450	3·95	1,180
14	5·0	3,100	3·8	1,060	6·5	10,100	4·8	2,450	4,75	2,320	3·95	1,180
15	4·8	2,450	3·8	1,060	5·7	6,250	6·7	11,000	4·70	2,200	3·9	1,140
16	4·7	2,200	3·8	1,060	6·0	7,700	5·7	6,250	4·65	2,100	3·9	1,140
17	4·6	2,000	3·7	980	6·5	10,100	5·4	4,850	4·60	2,000	3·85	1,100
18	4·5	1,820	3·6	900	5·8	6,700	5·6	5,800	4·50	1,820	3·8	1,060
19	4·3	1,550	3·6	900	5·6	5,800	6·9	12,000	4·40	1,670	3·8	1,060
20	4·1	1,320	3·6	900	5·4	4,850	5·8	6,700	4·50	1,820	3·85	1,100
21	3·9	1,140	3·75	1,020	5·2	3,850	5·5	5,300	4·5	1,820	3·9	1,140
22	4·0	1,230	5·2	3,850	5·1	3,450	5·3	4,350	4·55	1,910	3·75	1,020
23	4·1	1,320	5·0	3,100	4·85	2,600	5·0	3,100	4·5	1,820	3·6	900
24	4·0	1,230	5·0	3,100	4·8	2,450	4·8	2,450	4·5	1,820	3·55	860
25	3·8	1,060	4·8	2,450	5·0	3,100	4·7	2,200	4·6	2,000	3·7	980
26	3·9	1,140	4·7	2,200	4·9	2,750	4·6	2,000	4·8	2,450	3·8	1,060
27	4·0	1,230	5·3	4,350	4·7	2,200	4·5	1,820	4·9	2,750	3·8	1,060
28	3·9	1,140	4·9	2,750	4·5	1,820	4·45	1,750	4·5	1,820	3·8	1,060
29	4·0	1,230	.....	.....	4·35	1,610	4·5	1,820	4·2	1,430	3·7	980
30	4·3	1,550	.....	.....	4·2	1,430	4·6	2,000	4·15	1,370	3·65	940
31	4·4	1,670	.....	.....	4·2	1,430	.....	.....	4·1	1,320	.....	.....

Daily Gauge Height and Discharge of Chehalis River one mile from mouth for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·75	1,020	2·8	350	2·50	200	3·8	1,060	6·0	7,700	4·7	2,200
2	3·8	1,060	2·8	350	2·45	170	3·7	980	6·2	8,700	4·5	1,820
3	3·8	1,060	2·8	350	2·4	150	3·5	820	6·0	7,700	4·3	1,550
4	3·8	1,060	2·8	350	2·4	150	3·4	750	6·5	10,100	4·2	1,430
5	3·8	1,060	2·8	350	2·4	150	3·3	670	5·9	7,200	4·05	1,270
6	3·7	980	2·75	320	2·35	120	3·25	630	5·4	4,850	3·85	1,100
7	3·65	940	2·75	320	2·35	120	3·2	600	5·2	3,850	3·7	980
8	3·6	900	2·8	350	2·4	150	3·2	600	5·3	4,350	3·6	900
9	3·5	820	2·75	320	2·6	250	3·2	600	5·4	4,850	3·5	820
10	3·4	750	2·65	270	3·0	470	3·25	630	5·5	5,300	3·4	750
11	3·3	670	2·55	220	2·9	410	3·3	670	5·9	7,200	3·35	710
12	3·3	670	2·55	220	2·8	350	4·2	1,430	5·4	4,850	3·20	600
13	3·35	710	2·6	250	2·8	350	3·8	1,060	5·2	3,850	3·2	600
14	3·4	750	2·6	250	3·0	470	4·0	1,230	4·9	2,750	3·15	570
15	3·35	710	2·65	270	3·4	750	3·9	1,140	4·7	2,200	3·15	570
16	3·3	670	2·65	270	3·7	980	4·9	2,750	4·3	1,550	3·1	540
17	3·3	670	2·7	300	4·0	1,230	5·2	3,850	4·0	1,230	3·1	540
18	3·25	630	2·7	300	5·6	5,800	5·6	5,800	4·2	1,430	3·05	500
19	3·2	600	2·65	270	4·8	2,450	6·4	9,600	4·6	2,000	3·0	470
20	3·2	600	2·6	250	4·7	2,200	6·0	7,700	4·8	2,450	2·95	440
21	3.15	570	2·6	250	4·5	1,820	5·3	4,350	4·7	2,200	2·85	380
22	3·1	540	2·6	250	4·1	1,320	4·8	2,450	4·8	2,450	2·8	350
23	3·1	540	2·6	250	3·8	1,060	4·5	1,820	5·2	3,850	2·75	320
24	3·05	500	2·6	250	3·7	980	4·3	1,550	5·0	3,100	2·75	320
25	3·0	470	2·6	250	3·6	900	4·0	1,230	6·0	7,700	2·8	350
26	3·0	470	2·6	250	3·65	940	3·8	1,060	5·6	5,800	2·9	410
27	2·95	440	2·55	225	4·5	1,820	3·7	980	5·4	4,850	2·9	410
28	2·9	410	2·55	225	4·3	1,550	3·6	900	5·3	4,350	2·95	440
29	2·85	380	2·5	200	4·0	1,230	3·6	900	5·1	3,450	3·0	470
30	2·8	350	2·45	170	3·9	1,140	3·8	1,060	4·8	2,450	2·9	410
31	2·8	350	2·4	150	.....	.....	5·3	4,350	.....	.....	2·95	440

Monthly Discharge of Chehalis River one mile from mouth for 1914.

(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	22,000	980	4,230	21·15	24·37	260,000	C
February	4,350	900	1,570	7·85	8·17	87,200	B
March	10,100	1,430	3,800	19·00	21·90	234,000	C
April	12,000	1,750	3,610	18·05	20·13	215,000	C
May	3,100	1,320	1,980	9·90	11·41	122,000	B
June	1,320	860	1,130	5·65	6·30	67,000	B
July	1,060	350	690	3·45	3·98	42,400	B
August	350	150	270	1·35	1·56	16,600	B
September	5,800	120	990	4·95	5·52	58,900	B
October	9,600	600	2,040	10·20	11·76	125,400	C
November	10,100	1,230	4,480	22·40	25·00	267,000	C
December	2,200	320	730	3·65	4·21	44,900	B
The year	22,000	120	2,130	10·65	141·30	1,540,600	C

Chilliwack River (1004).

Location.—Five miles above Sumas lake in section 1, township 23, east of Coast meridian.

Records Available.—Daily discharges continuous since November, 1911.

Drainage Area.—Four hundred and fifty square miles, of which about 100 is in the State of Washington.

Gauge.—Vertical staff on rock filled crib. Readings daily.

Channel.—Rocky bottom, good control, water deep; swift at high stages.

Discharge Measurements.—Fifteen meter measurements made during 1911, 1912, 1913, and 1914.

Winter Flow.—Open water all year.

Accuracy.—A.

Discharge Measurements of Chilliwack River near Vedder River Hotel, 1911–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Dec. 18	Smith	1057	76	451·2	2·61	1·70	1,180
1912.							
Mar. 21	C. G. Cline	1046	65	424·0	1·76	1·00	750
" 22	do	1046	65	508·5	1·52	1·00	770
July 8	do	1046	85	658·0	4·69	2·90	3,090
Aug. 30	do	1046	65	552·0	2·03	1·60	1,120
Nov. 21	do	1048	85	684·0	5·32	3·15	3,540
1913.							
June 5	K. G. Chisholm	1055	165	969·0	8·90	5·00	8,640
July 13	H. J. E. Keys	1055	155	710·0	7·41	4·05	5,270
1914.							
Jan. 10	do	1046	110	816·0	5·47	3·65	4,450
" 12	do	1046	100	718·0	4·31	2·80	3,090
" 13	do	1046	105	740·0	4·49	2·98	3,320
" 15	do	1046	95	790·0	3·70	2·70	2,920
" 17	do	1046	95	780·0	3·27	2·54	2,550
" 22	do	1046	94	665·0	3·04	2·27	2,020
" 23	do	1046	90	718·0	2·63	2·05	1,893

Daily Gauge Height and Discharge of Chilliwack River near Sumas Lake for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·4	1,000	1·9	1,550	2·6	2,650	2·0	1,700	2·6	2,650	3·6	4,400
2	1·3	900	1·85	1,470	2·4	2,300	2·1	1,850	3·25	3,770	4·25	5,900
3	1·3	900	1·8	1,400	2·3	2,150	2·2	2,000	4·0	5,300	3·9	5,000
4	2·1	1,850	1·75	1,350	2·2	2,000	2·6	2,650	3·45	4,100	3·6	4,400
5	4·65	7,300	1·5	1,100	2·0	1,700	2·95	3,220	3·3	3,850	3·25	3,770
6	7·3	20,000	1·45	1,050	1·9	1,550	2·8	3,000	3·2	3,700	3·0	3,300
7	6·6	16,000	1·5	1,100	1·8	1,400	2·7	2,800	3·1	3,500	2·9	3,150
8	6·0	13,000	1·55	1,150	1·85	1,470	2·75	2,900	3·05	3,400	2·85	3,070
9	5·5	10,900	1·5	1,100	1·85	1,470	2·8	3,000	3·1	3,500	2·7	2,800
10	4·9	8,300	1·5	1,100	1·9	1,550	2·85	3,070	3·15	3,600	2·8	3,000
11	3·7	4,600	1·5	1,100	1·85	1,470	2·9	3,150	3·1	3,500	2·95	3,220
12	3·3	3,850	1·45	1,050	1·8	1,400	2·85	3,070	3·2	3,700	3·05	3,400
13	3·2	3,700	1·4	1,000	1·9	1,550	2·95	3,220	3·3	3,850	3·2	3,700
14	3·1	3,500	1·45	1,050	2·5	2,500	3·1	3,500	3·7	4,600	3·3	3,850
15	3·0	3,300	1·4	1,000	2·5	2,500	3·6	4,400	4·2	5,800	3·7	4,600
16	3·0	3,300	1·45	1,050	2·7	2,800	3·3	3,850	4·0	5,300	4·0	5,300
17	2·8	3,000	1·45	1,050	2·75	2,900	3·05	3,400	3·85	4,900	4·1	5,500
18	2·7	2,800	1·4	1,000	2·85	3,070	3·10	3,500	3·6	4,400	4·0	5,300
19	2·6	2,650	1·4	1,000	2·75	2,900	3·7	4,600	3·5	4,200	3·6	4,400
20	2·5	2,500	1·45	1,050	2·8	3,000	3·6	4,400	3·55	4,300	3·4	4,000
21	2·3	2,150	1·5	1,100	2·8	3,000	3·4	4,000	3·7	4,600	3·3	3,850
22	2·2	2,000	1·6	1,200	2·85	3,070	3·1	3,500	3·9	5,000	3·4	4,000
23	2·15	1,920	1·65	1,250	2·8	3,000	2·95	3,220	3·95	5,100	3·3	3,850
24	2·05	1,770	1·6	1,200	2·75	2,900	2·85	3,070	4·0	5,300	3·25	3,775
25	2·05	1,770	1·65	1,250	2·6	2,650	2·7	2,800	3·8	4,800	3·2	3,700
26	2·1	1,850	1·6	1,200	2·5	2,500	2·65	2,720	3·6	4,400	3·15	3,600
27	2·0	1,700	1·7	1,300	2·35	2,220	2·65	2,720	3·4	4,000	3·2	3,700
28	1·9	1,550	1·9	1,550	2·3	2,150	2·6	2,650	3·3	3,850	3·25	3,775
29	1·85	1,470	.....	.....	2·3	2,150	2·6	2,650	3·05	3,400	3·3	3,850
30	1·95	1,620	.....	.....	2·15	1,920	2·55	2,570	3·0	3,300	3·4	4,000
31	1·9	1,550	.....	.....	2·1	1,850	.....	.....	3·25	3,770	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Chilliwack River near Sumas Lake for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·6	4,400	2·0	1,700	1·4	1,000	1·6	1,200	3·3	3,850	2·5	2,500
2	3·65	4,500	2·0	1,700	1·35	950	1·65	1,250	3·8	4,800	2·8	3,000
3	3·7	4,600	2·0	1,700	1·35	950	1·7	1,300	3·5	4,200	2·4	2,300
4	3·6	4,400	2·0	1,700	1·3	900	1·6	1,200	3·4	4,000	2·3	2,150
5	3·4	4,000	1·95	1,620	1·25	870	1·55	1,150	3·3	3,850	2·2	2,000
6	3·25	3,770	1·9	1,550	1·2	850	1·5	1,100	3·2	3,700	2·2	2,000
7	3·2	3,700	1·85	1,470	1·2	850	1·4	1,000	2·9	3,150	2·1	1,850
8	3·2	3,700	1·8	1,400	1·45	1,050	1·35	950	2·8	3,000	2·0	1,700
9	3·1	3,500	1·8	1,400	1·55	1,150	1·4	1,000	2·7	2,800	1·9	1,550
10	3·2	3,700	1·75	1,350	1·55	1,150	1·45	1,050	2·8	3,000	1·8	1,400
11	3·2	3,700	1·7	1,300	1·5	1,100	1·4	1,000	3·9	5,000	1·7	1,300
12	3·25	3,770	1·7	1,300	1·4	1,000	1·35	950	3·4	4,000	1·65	1,250
13	3·1	3,500	1·75	1,350	1·35	950	1·4	1,000	2·8	3,000	1·5	1,100
14	3·05	3,400	1·75	1,350	1·4	1,000	1·45	1,050	2·6	2,650	1·55	1,150
15	3·0	3,300	1·7	1,300	1·5	1,100	1·45	1,050	2·5	2,500	1·6	1,200
16	3·1	3,500	1·75	1,350	1·55	1,150	1·5	1,100	2·4	2,300	1·55	1,150
17	2·95	3,220	1·7	1,300	1·7	1,300	2·45	2,400	2·35	2,220	1·5	1,100
18	2·9	3,150	1·7	1,300	2·5	2,500	2·6	2,650	2·4	2,300	1·45	1,050
19	2·85	3,070	1·65	1,250	2·4	2,300	2·4	2,300	2·5	2,500	1·4	1,000
20	2·8	3,000	1·65	1,250	2·3	2,150	2·25	2,070	2·6	2,650	1·4	1,000
21	2·6	2,650	1,65	1,250	2·2	2,000	2·45	2,400	2·7	2,800	1·35	950
22	2·45	2,400	1·6	1,200	2·1	1,850	2·3	2,150	2·6	2,650	1·35	950
23	2·45	2,400	1·55	1,150	1·9	1,550	2·25	2,070	2·5	2,500	1·3	900
24	2·4	2,300	1·55	1,150	1·8	1,400	2·2	2,000	2·45	2,400	1·3	900
25	2·3	2,150	1·55	1,150	1,75	1,350	2·15	1,920	2·4	2,300	1·25	870
26	2·25	2,070	1·55	1,150	1·8	1,400	2·1	1,850	2·8	3,000	1·25	870
27	2·2	2,000	1·5	1,100	1·9	1,550	1·75	1,350	2·75	2,900	1·2	850
28	2·2	2,000	1·5	1,100	1·8	1,400	1·75	1,350	2·7	2,800	1·25	870
29	2·15	1,920	1·45	1,050	1·7	1,300	1·8	1,400	2·7	2,800	1·3	900
30	2·1	1,850	1·45	1,050	1·75	1,350	2·0	1,700	2·6	2,650	1·3	900
31	2·05	1,770	1·4	1,000	.....	.....	2·1	1,850	.....	.....	1·35	950

Monthly Discharge of Chilliwack River near Sumas Lake for 1914.

(Drainage area, 450 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	2,000	900	4,280	9·52	10·98	263,000	B
February	1,550	1,000	1,170	2·60	2·71	65,000	A
March	3,070	1,400	2,250	5·00	5·76	138,000	A
April	4,600	1,700	3,110	6·92	7·72	185,000	A
May	5,800	2,650	4,170	9·28	10·70	256,000	A
June	5,900	2,800	4,000	8·90	9·93	238,000	A
July	4,600	1,770	3,140	6·98	8·05	193,000	A
August	1,700	1,000	1,320	2·93	3·38	81,000	A
September	850	850	1,310	2·91	3·25	78,000	A
October	950	950	1,510	3·36	3·87	93,000	A
November	2,220	2,220	3,080	6·85	7·64	183,000	A
December	850	850	1,340	2·98	3·44	82,000	A
The year	20,000	850	2,560	5·69	77·43	1,855,000	A

Coquihalla River (1005.)

Location.—Near mouth of river, not far from Hope, in section 10, township 5, range 26, west of the 6th meridian.

Records Available.—Continuous records since November, 1911.

Drainage Area.—Three hundred and sixty square miles.

Gauge.—Cable gauge on highway bridge. Readings two or three times a week.

Channel.—Bottom rocky and stream rather shallow; water swift at the higher stages.

Discharge Measurements.—Sixteen meter measurements made during 1912, 1913, and 1914.

Winter Flow.— In very cold weather, ice forms along the edges of the stream, with some anchor ice at the riffle which forms the control.

Accuracy.—C. Gauge readings only about three times a week.

Discharge Measurements of Coquihalla River near mouth, 1912–13–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1912.							
June 8	Cline & Corbould	1046	149	597	4·8	3·30	2,880
June 29	C. G. Cline	1046	122	275	3·2	1·90	890
Sept. 13	do	1046	110	171	2·0	1·05	334
Nov. 15	do	1048	120	276	2·8	1·65	762
Nov. 18	do	1048	120	350	3·5	2·25	1,210
Nov. 20	do	1048	120	386	3·9	2·45	1,510
1913.							
May 12	C. G. Cline & K. G. Chisholm	1044	150	576	5·7	3·50	3,140
June 21	C. G. Cline & K. G. Chisholm	1044	154	540	5·8	3·65	3,040
July 21	K. G. Chisholm	1055	122	378	3·7	2·60	1,410
Sept. 9	K. G. Chisholm & F. MacLachlan	1055	119	383	3·7	2·70	1,440
Oct. 13	H. J. E. Keys	1057	129	524	6·0	3·47	3,160
1914.							
July 9	Cline & Hughes	1933	125	299	3·0	1·90	858
July 18	C. G. Cline	1933	120	224	2·5	1·60	553
Aug. 28	do	1933	110	130	1·4	0·75	178
Oct. 27	H. C. Hughes	1933	100	188	1·56	0·91	283
Dec. 18	do	1521	80	206	1·47	1·68	300[1]

[1]Ice conditions.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Coquihalla River near mouth.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	470	1·5	590	2·6	1,580	.....	1,100	.....	4,200	4·1	4,160
2	.....	470	1·5	590	2·3	1,240	.....	1,200	4·3	4,550	3·8	3,580
3	1·3	470	.....	550	.....	1,000	2·4	1,340	.....	4,000	.....	3,200
4	.....	1,000	.....	500	.....	900	2·3	1,240	.....	3,600	.....	2,900
5	3·4	2,840	1·3	470	1·7	730	.....	1,900	3·6	3,200	3·20	2,480
6	5·6	7,040	1·5	590	1·65	700	3·25	2,570	.....	3,200	.....	2,350
7	3·9	3,770	.....	560	1·6	660	.....	2,600	.....	3,200	.....	2,200
8	3·4	2,840	.....	540	1·9	890	.....	2,800	3·6	3,200	2·95	2,080
9	.....	2,500	.....	520	.....	810	.....	2,900	.....	3,600	.....	2,200
10	.....	2,000	.....	500	1·7	730	3·45	2,930	.....	4,000	.....	2,300
11	.....	1,500	1·3	470	1·8	810	3·5	3,020	.....	4,500	3·2	2,480
12	2·2	1,150	.....	470	.....	1,200	.....	3,300	.....	5,000	.....	2,800
13	.....	1,100	1·3	470	.....	2,000	.....	3,600	.....	5,400	.....	3,100
14	.....	1,100	1·3	470	3·2	2,480	.....	3,900	5·0	5,880	.....	3,400
15	2·1	1,060	1·45	560	.....	2,200	4·15	4,260	4·85	5,600	3·85	3,670
16	.....	1,030	.....	550	2·9	2,000	.....	4,300	4·5	4,930	.....	3,600
17	2·05	1,000	.....	530	3·8	3,580	.....	4,400	.....	4,400	.....	3,400
18	1·92	900	.....	520	3·4	2,840	.....	4,500	4·0	3,960	3·65	3,300
19	1·8	810	.....	500	3·3	2,660	4·3	4,550	3·8	3,580	.....	3,100
20	.....	810	.....	480	3·05	2,230	.....	3,400	.....	3,800	3·45	2,930
21	1·8	810	1·3	470	3·05	2,230	3·1	2,310	4·1	4,160	3·15	2,400
22	.....	800	.....	560	3·15	2,400	.....	2,200	.....	4,200	.....	2,300
23	.....	780	1·6	660	.....	2,200	.....	2,100	.....	4,250	.....	2,200
24	.....	760	.....	700	.....	2,000	.....	2,000	.....	4,300	.....	2,100
25	.....	740	1·7	730	.....	1,500	2·9	2,000	4·2	4,360	.....	2,000
26	.....	720	.....	730	2·4	1,340	2·95	2,080	3·8	3,580	.....	1,900
27	.....	700	.....	730	.....	1,250	.....	2,500	3·8	3,580	.....	1,800
28	.....	680	1·7	730	2·2	1,150	.....	3,000	3·4	2,840	.....	1,700
29	.....	670	.....	.....	.....	1,050	.....	3,500	3·25	2,570	.....	1,600
30	1·6	660	.....	.....	2·0	970	.....	4,000	.....	2,700	.....	1,500
31	1·6	660	.....	.....	2·0	970	.....	.....	3·45	2,930	.....	.....

Daily Gauge Height and Discharge of Coquihalla River near mouth for 1914

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	1,400	1·1	370	.....	220	1·05	350	.....	1,000	.....	1,200
2	.....	1,300	.....	350	·70	220	.....	380	.....	1,500	.....	1,150
3	.....	1,200	.....	350	.....	220	1·15	400	3·0	2,150	2·2	1,150
4	.....	1,100	1·0	320	.....	220	.....	370	.....	1,800	.....	1,100
5	.....	1,000	.....	320	.....	220	1·05	350	.....	1,500	.....	1,050
6	.....	900	.....	320	.....	220	.....	340	2·25	1,200	.....	1,000
7	.....	900	.....	320	·70	220	.....	320	2·1	1,060	.....	950
8	.....	900	1·0	320	.....	300	·95	300	.....	1,200	.....	900
9	1·9	890	.....	310	1·05	350	.....	300	.....	1,300	.....	850
10	1·95	930	·95	300	.....	400	.....	300	2·5	1,460	1·8	810
11	.....	900	.....	300	1·3	470	.....	300	.....	1,400	.....	800
12	.....	800	·95	300	.....	470	.....	300	.....	1,300	.....	750
13	.....	800	.....	300	.....	470	.....	300	.....	1,200	.....	700
14	.....	800	.....	290	1·3	470	·95	300	2·2	1,150	1·6	660
15	.....	700	.....	280	1·55	630	·90	270	.....	1,000	.....	600
16	1·6	660	.....	270	.....	700	·90	270	.....	900	.....	500
17	1·6	660	.....	260	.....	800	.....	300	1·8	810	.....	420
18	1·6	660	.....	250	1·95	930	.....	350	.....	900	1·7	300
19	.....	600	·85	250	.....	800	.....	400	2·1	1,060	.....	300
20	.....	600	.....	250	.....	700	1·25	450	2·55	1,520	.....	300
21	1·4	530	·85	250	.....	600	.....	450	.....	1,600	.....	300
22	1·3	470	·85	250	.....	500	.....	400	.....	1,800	.....	300
23	1·3	470	.....	250	1·15	400	1·15	400	.....	2,000	.....	300
24	1·25	450	.....	250	1·1	570	.....	400	.....	2,200	1·0	320
25	.....	450	.....	240	.....	350	.....	350	.....	2,400	.....	320
26	1·25	450	·80	240	1·00	320	.....	300	3·2	2,480	.....	310
27	1·05	350	·75	230	.....	400	·95	300	.....	2,000	.....	300
28	.....	350	·75	230	1·35	500	.....	300	2·5	1,460	·95	300
29	.....	370	·80	240	.....	450	.....	320	.....	1,300	.....	300
30	1·10	370	·75	230	.....	400	1·0	320	2·25	1,200	.....	300
31	.....	370	.....	220	.....	.....	.....	500	.....	.....	.....	290

Monthly Discharge of Coquihalla River near mouth for 1914.

(Drainage area, 360 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	7,040	470	1,350	3·75	4·32	83,000	C
February	730	470	560	1·56	1·62	31,100	C
March	3,580	660	1,560	4·34	5·00	95,900	C
April	4,550	1,100	2,850	7·92	8·84	170,000	C
May	5,880	2,570	3,980	11·07	12·75	245,000	C
June	4,160	1,500	2,630	7·31	8·16	156,500	C
July	1,400	350	720	2·00	2·31	44,300	C
August	370	220	279	0·78	0·90	17,200	C
September	930	220	444	1·23	1·37	26,400	C
October	500	270	345	0·96	1·11	21,200	C
November	2,480	810	1,460	4·06	4·53	86,960	C
December	1,200	290	674	1·87	2·16	41,400	C
The year	5,880	220	1,405	3·9	53·07	1,018,900	C

Fraser River (1007).

Location.—At Hope, in section 16, township 5, range 26, west of the 6th meridian.

Records Available.—Daily discharges, continuous since March, 1912.

Drainage Area.—Above gauging station, 85,600 square miles; above mouth, 90,000 square miles.

Gauge.—Painted on rock bluff at Kettle Valley Railway bridge; readings daily.

Channel.—Permanent channel, deep water; swift at higher stages.

Discharge Measurements.—Nine measurements during 1912, 1913, and 1914; some made with meter, some by floats.

Winter Flow.—Not usually ice enough to affect the gauge height-discharge relations.

Accuracy.—C.

Co-operation.—Gauge read by the engineers of the Kettle Valley Railroad.

Discharge Measurements of Fraser River at Hope, 1912-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
March 5	C. G. Cline	1046	690	14,405	1·3	10·0	18,300[1]
June 6	B. Corbould	1046	1,000	19,835	6·8	21·0	147,000
" 28	C. G. Cline	1046	710	26,300	8·5	24·5	225,000[2]
Sept. 24	do	1046	575	12,500	5·9	14·0	73,400[2]
" 26	do	1046	885	17,200	4·0	14·7	70,000[3]
1913.							
June 21	K. G. Chisholm	Floats	1,016	27,100	10·2	26·0	278,000[4]
1914.							
July 10	Cline & Hughes	Floats	1,110	25,300	10·3	24·0	234,000[4]
Aug. 28	C. G. Cline	"	951	18,200	6·2	16·8	101,000[4]
Oct. 28	H. C. Hughes	"	870	16,200	4·4	14·5	72,800[4]

[1] Section at gauge. [2] Measured at Yale. [3] Section above gauge. [4] Float measurement.

Daily Gauge Height and Discharge of Fraser River at Hope for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	50,000	11·0	28,000	11·8	36,000	11·5	33,000	17·6	108,000	23·3	206,000
2	.....	50,000	11·2	30,000	11·7	35,000	11·4	32,000	18·3	117,000	23·0	200,000
3	.....	50,000	11·2	30,000	11·5	33,000	11·5	33,000	19·1	129,000	23·1	202,000
4	.....	50,000	11·2	30,000	11·4	32,000	11·6	34,000	19·4	133,000	22·8	195,000
5	13·3	53,000	11·2	30,000	11·4	32,000	12·0	38,000	19·4	133,000	22·8	195,000
6	14·9	73,000	11·1	29,000	11·4	32,000	12·2	40,000	20·3	146,000	23·6	214,000
7	13·6	57,000	10·9	27,000	11·3	31,000	12·3	42,000	20·1	144,000	24·2	229,000
8	13·1	51,000	10·7	25,000	11·3	31,000	12·6	45,000	19·8	138,000	24·3	232,000
9	12·8	47,000	10·8	26,000	11·3	31,000	12·8	47,000	19·9	140,000	24·0	224,000
10	12·6	45,000	10·8	26,000	11·3	31,000	13·1	51,000	20·2	145,000	23·9	222,000
11	12·3	42,000	11·1	29,000	11·3	31,000	13·4	54,000	20·4	148,000	23·9	222,000
12	12·1	39,000	11·1	29,000	11·3	31,000	13·7	58,000	21·3	164,000	24·3	232,000
13	12·2	40,000	11·2	30,000	11·3	31,000	14·0	62,000	21·9	176,000	24·4	234,000
14	12·3	42,000	11·3	31,000	11·8	36,000	14·8	72,000	22·8	195,000	24·6	240,000
15	12·1	39,000	11·4	32,000	11·8	36,000	15·4	79,000	23·3	206,000	25·1	253,000
16	11·9	37,000	11·4	32,000	11·7	35,000	15·4	79,000	23·6	214,000	25·6	267,000
17	11·9	37,000	11·4	32,000	11·9	37,000	15·8	84,000	24·0	224,000	26·2	283,000
18	11·9	37,000	11·4	32,000	12·0	38,000	16·2	90,000	24·4	234,000	26·5	292,000
19	11·9	37,000	11·3	31,000	12·0	38,000	16·9	99,000	24·5	237,000	26·9	303,000
20	11·9	37,000	11·2	30,000	12·0	38,000	17·2	103,000	24·1	226,000	27·2	311,000
21	11·5	33,000	11·2	30,000	12·1	39,000	17·1	101,000	23·6	214,000	27·0	306,000
22	11·4	32,000	11·3	31,000	12·2	40,000	17·3	104,000	23·5	212,000	26·2	283,000
23	11·4	32,000	11·3	31,000	12·2	40,000	17·3	104,000	23·7	216,000	25·5	264,000
24	11·4	32,000	11·3	31,000	12·2	40,000	17·3	104,000	24·0	224,000	25·0	250,000
25	11·2	30,000	11·3	31,000	12·1	39,000	16·8	98,000	23·9	222,000	25·0	250,000
26	10·8	26,000	11·3	31,000	11·8	36,000	16·7	96,000	24·0	224,000	24·9	248,000
27	10·9	27,000	11·4	32,000	11·5	33,000	16·8	98,000	24·2	229,000	24·5	237,000
28	10·8	26,000	11·4	32,000	11·4	32,000	17·0	100,000	24·6	240,000	24·5	237,000
29	10·6	24,500	.....	.....	11·5	33,000	17·0	100,000	24·0	224,000	24·2	229,000
30	10·5	24,000	.....	.....	11·5	33,000	17·2	103,000	23·6	214,000	24·9	248,000
31	10·6	24,500	.....	.....	11·5	33,000	.....	.....	23·6	214,000	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Fraser River at Hope for 1914 —*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	24·9	248,000	20·8	154,000	16·4	92,000	15·0	74,000	15·3	78,000	14·0	62,000
2	25·0	250,000	20·5	150,000	16·0	87,000	15·1	75,000	15·5	80,000	13·9	60,000
3	24·8	245,000	20·3	146,000	15·8	84,000	15·0	74,000	15·6	82,000	13·6	57,000
4	25·1	253,000	20·1	144,000	15·5	80,000	15·2	76,000	15·2	76,000	13·3	53,000
5	25·2	256,000	19·9	140,000	15·4	79,000	15·1	75,000	15·1	75,000	13·1	51,000
6	25·0	250,000	19·7	137,000	15·4	79,000	15·2	76,000	14·9	73,000	13·1	51,000
7	25·0	250,000	19·9	140,000	15·6	82,000	14·7	70,000	14·8	72,000	13·0	50,000
8	24·8	245,000	19·6	136,000	15·5	80,000	14·5	68,000	14·8	72,000	12·8	47,000
9	24·6	240,000	19·4	133,000	15·4	79,000	14·4	66,000	14·6	69,000	12·5	44,000
10	24·5	237,000	19·1	129,000	15·3	78,000	14·2	64,000	14·5	68,000	12·3	42,000
11	24·3	232,000	19·0	127,000	15·3	78,000	14·2	64,000	14·5	68,000	12·0	38,000
12	24·3	232,000	18·8	124,000	15·2	76,000	14·0	62,000	14·3	65,000	11·8	36,000
13	24·2	229,000	18·4	119,000	15·1	75,000	13·9	60,000	14·2	64,000	11·7	35,000
14	24·4	234,000	18·2	116,000	15·0	74,000	14·0	62,000	14·0	62,000	11·6	34,000
15	24·2	229,000	18·1	115,000	15·2	76,000	14·2	64,000	13·8	59,000	11·4	32,000
16	24·0	224,000	18·0	114,000	14·9	73,000	14·5	68,000	13·8	59,000	11·5	33,000
17	23·9	222,000	18·0	114,000	14·4	66,000	14·7	70,000	13·7	58,000	11·5	33,000
18	23·6	214,000	17·9	112,000	14·7	70,000	14·7	70,000	13·6	57,000	11·3	31,000
19	23·6	214,000	17·9	112,000	14·7	70,000	14·9	73,000	13·4	54,000	11·2	30,000
20	23·3	206,000	17·8	110,000	14·9	73,000	14·8	72,000	13·3	53,000	11·2	30,000
21	23·1	202,000	17·6	108,000	14·8	72,000	14·9	73,000	13·2	52,000	11·4	32,000
22	22·9	198,000	17·5	107,000	14·7	70,000	15·0	74,000	13·3	53,000	11·6	34,000
23	23·0	200,000	17·5	107,000	14·9	73,000	14·9	73,000	13·5	55,000	11·7	35,000
24	22·5	188,000	17·4	106,000	15·0	74,000	14·7	70,000	14·0	62,000	11·8	36,000
25	22·3	184,000	17·3	104,000	14·8	72,000	14·8	72,000	13·9	60,000	12·0	38,000
26	22·2	182,000	17·2	103,000	14·8	72,000	14·9	73,000	13·9	60,000	11·9	37,000
27	22·0	178,000	17·0	100,000	14·9	73,000	15·1	75,000	14·0	62,000	12·0	38,000
28	21·8	174,000	17·0	100,000	15·0	74,000	15·0	74,000	13·9	60,000	12·4	43,000
29	21·5	168,000	16·8	98,000	14·9	73,000	15·1	75,000	13·9	60,000	12·6	45,000
30	21·1	160,000	16·8	98,000	15·2	76,000	15·2	76,000	14·0	62,000	12·5	44,000
31	21·0	158,000	16·7	96,000	.....	.....	15·2	76,000	.....	.....	12·3	42,000

Monthly Discharge of Fraser River at Hope, for 1914.

(Drainage area, 85,600 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	73,000	24,000	39,500	0·46	0·53	2,430,000
February	32,000	25,000	29,600	0·45	0·36	1,640,000
March	40,000	31,000	34,600	0·40	0·46	2,127,000
April	104,000	32,000	72,800	0·85	0·95	4,330,000
May	240,000	108,000	187,000	2·18	2·51	11,500,000
June	311,000	195,000	243,600	2·85	3·18	14,500,000
July	256,000	158,000	216,000	2·53	2·92	13,280,000
August	154,000	90,000	119,000	1·39	1·60	7,320,000
September	92,000	66,000	76,000	0·89	0·99	4,520,000
October	76,000	60,000	70,800	0·83	0·96	4,350,000
November	82,000	52,000	64,300	0·75	0·84	3,830,000
December	62,000	30,000	41,100	0·48	0·55	2,530,000
The year	311,000	24,000	99,500	1·16	15·85	72,357,000

Accuracy "C."

Hixon Creek near Mouth (1009).

Location.—About half a mile from the mouth, in section 34, township 6, range 7, west of 7th meridian.

Records Available.—November and December, 1912; January to December, 1913; January to July, 1914, station discontinued.

Drainage Area.—Not known.

Gauge.—Vertical staff gauge, readings about three times a week.

Channel.—Rock and gravel.

Discharge Measurements.—Five measurements during 1913 and 1914.

Winter Flow.—Open water conditions, no ice.

Accuracy.—C. and D.

Co-operation.—Gauge readers maintained by Westminster Power Company.

Discharge Measurements of Hixon Creek near mouth, 1913-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 24	F. MacLachlan	1673	48	27	1·2	3·79	33
Oct. 18	do	1673	54	44	1·6	4·34	72
Oct. 31	do	1673	51	32	1·2	3·89	36
Nov. 5	do	1521	56	53	2·3	4·59	121
1914.							
May 19	do	1521	59	71	3·1	4·87	217

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Hixon Creek at mouth for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·2	60	.....	50	.....	150	4·15	55	4·75	170	5·2	360
2	4·6	125	.....	40	4·75	170	4·15	55	4·9	230	...	250
3	.....	500	3·9	39	.....	150	4·85	210	.....	170	4·55	110
4	6·0	750	.....	37	.....	100	.....	250	4·55	110	.....	90
5	.....	700	3·8	35	4·35	75	5·05	300	.....	130	4·2	60
6	5·7	600	3·75	33	4·3	70	.....	250	.....	150	..	60
7	5·15	340	.....	33	.....	80	4·8	185	.....	170	.....	70
8	.....	300	3·75	33	.....	90	4·78	170	4·8	185	.....	80
9	.....	200	3·75	33	.....	100	4·8	185	4·75	165	..	80
10	.....	150	.....	33	.....	100	.....	185	.....	190	.....	90
11	.....	140	3·75	33	.....	120	4·8	185	.....	220	.....	100
12	.....	130	3·75	33	.....	130	.....	400	.....	250	4·5	100
13	.....	120	.....	40	.....	140	5·8	650	5·0	270	.....	110
14	.....	110	4·1	50	.....	150	5·15	340	4·95	250	.....	120
15	.....	100	.....	50	.....	160	5·6	560	.....	220	4·6	125
16	.....	90	4·1	50	4·75	170	4·95	250	.....	180	.....	150
17	4·35	80	.....	50	4·70	150	4·85	210	4·7	150	.....	200
18	.....	85	.....	55	4·65	135	.....	200	.....	200	4·95	250
19	4·45	90	.....	60	.....	150	.....	180	4·9	230	.....	200
20	.....	70	4·2	60	.....	170	4·75	170	.....	270	.....	150
21	4·2	60	.....	120	4·80	185	.....	150	5·1	320	.....	100
22	.....	50	4·8	185	.....	150	.....	140	.....	300	4·40	85
23	4·0	44	.....	150	4·55	110	4·6	125	.....	250	.....	100
24	4·0	44	.....	120	4·45	95	...	100	4·7	150	...	200
25	.....	70	4·4	85	.....	80	4·35	80	.....	150	4·95	250
26	4·4	85	.....	90	4·15	55	.....	80	.....	150	.....	250
27	4·1	50	4·45	90	4·05	47	.....	80	.....	160	...	240
28	4·0	44	.....	100	4·07	48	4·37	80	4·75	165	.....	230
29	.....	50	.....	.....	.....	60	.....	100	4·4	85	.....	220
30	4·2	60	.....	.....	4·3	70	.....	150	.....	200	.....	210
31	.....	60	.....	.....	.....	60	.....	.....	5·1	320	.....	.....

Daily Gauge Height and Discharge of Hixon Creek at mouth for 1914.

Day.	July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				
2			4·3	70
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17	4·65	140		
18				
19				
20	4·75	165		
21				
22	4·50	100		
23				
24				
25				
26				
27				
28				
29				
30				
31				

Monthly Discharge of Hixon Creek at mouth for 1914.

Month.	Discharge in Second-Feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
January	750	44	173	D
February	185	33	64	C
March	185	47	114	C
April	650	55	202	C
May	320	85	199	C
June	360	60	155	D

Hixon Creek above Belknap Creek (1064.)

Location.—About a mile above the mouth of Belknap creek, in section 36, township 6, range 7, west of 7th meridian.

Records Available.—April to September, 1914. Not maintained regularly at present.

Drainage Area.—Not known.

Gauge.—Vertical staff, nailed to tree.

Channel.—Rocks and gravel, with natural log weir as control.

Discharge Measurements.—Four meter measurements during 1913 and 1914.

Winter Flow.—Very heavy snowfall and some ice in winter.

Accuracy.—D.

Co-operation.—Gauge readings taken by employees of Westminster Power Company.

DISCHARGE MEASUREMENTS of Hixon Creek above Belknap Creek, 1913-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
July 8	H. C. Hughes	1673	23	31	1·3	1·41	42·1
July 31	do	1673	24	13	0·7	1·15	9·8
Sept. 22	do	1673	21	12	0·5	0·90	6·1
1914.							
Aug. 1	C. G. Cline	1933	22	18	0·5	1·01	9·3

DAILY GAUGE HEIGHT AND DISCHARGE of Hixon Creek above Belknap Creek for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									1·00	10	0·78	4
2							1·4	42				
3												
4					1·3	32						
5												
6			1·8	80	1·05	14						
7							1·2	24				
8											1·0	10
9							1·2	24				
10									0·90	6		
11					1·0	10						
12												
13							1·25	28	1·0	10		
14												
15									1·0	10		
16					1·45	45	1·18	22				
17												
18							1·3	32	0·9	6		
19					1·3	32						
20									0·9	6		
21												
22	1·2	24	1·8	80								
23												
24							0·95	8				
25							0·94	8	0·85	5		
26												
27							1·0	10				
28												
29					1·3	32			0·8	4		
30	1·2	24	1·35	36	1·55	55	1·01	10				
31												

MONTHLY DISCHARGE of Hixon Creek above Belknap Creek, for 1914.

MONTH.	DISCHARGE IN SECOND-FEET.		
	Maximum.	Minimum.	Mean.
June	55	10	28
July	50	8	23
August	10	4	7

Accuracy "D."

JONES CREEK (1010).

Location.—At outlet of Jones lake in section 28, township 3, range 27, west of the 6th meridian.

Records Available.—Continuous records have been kept by Messrs. Anderson and Warden for the Vancouver Power Company since April, 1911.

Drainage Area.—Twenty-five square miles, determined by triangulation survey by Anderson and Warden.

Gauge.—Vertical staff fastened to rock filled crib. Readings daily.

Channel.—Uniform section with deep water and good control.

Discharge Measurements.—Five meter measurements during 1911, 1912, 1913 and 1914.

Winter Flow.—Open water practically all year.

Accuracy.—A.

Co-operation.—The records of this stream are kept by Messrs. Anderson and Warden, Civil Engineers, Vancouver, for the Vancouver Power Company.

DISCHARGE MEASUREMENTS of Jones Creek at Jones Lake, 1911-12-13-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Nov. 3	K. H. Smith	1057	51	96	0·5	0·50	518
1912.							
Sept. 18	C. G. Cline	1046	51	104	0·8	0·85	87
1913.							
July 24	K. G. Chisholm	1055	51	180	2·3	2·06	411
Sept. 11	K. G. Chisholm & F. MacLachlan	1055	51	131	1·3	1·24	175
1914.							
July 23	C. G. Cline	1933	51	128	1·3	1·22	164

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Jones Creek at Jones lake for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge[3] Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·60	60	0·70	70	0·80	85	0·85	90	1·10	140	1·40	215
2	0·60	60	0·70	70	0·90	100	0·80	85	1·20	165	1·50	240
3	0·60	60	0·65	65	0·90	100	0·85	90	1·60	270	1·60	270
4	0·90	100	0·65	65	0·80	85	0·90	100	1·65	280	1·60	270
5	1·75	310	0·60	60	0·75	75	1·10	140	1·45	230	1·50	240
6	2·80	680	0·60	60	0·70	70	1·10	140	1·35	200	1·40	215
7	2·60	600	0·55	55	0·70	70	1·10	140	1·30	190	1·30	190
8	2·15	440	0·55	55	0·75	75	1·10	140	1·30	190	1·20	165
9	1·85	340	0·55	55	0·70	70	1·10	140	1·35	200	1·20	165
10	1·60	270	0·55	55	0·70	70	1·10	140	1·35	200	1·15	150
11	1·45	230	0·55	55	0·70	70	1·10	140	1·40	215	1·15	150
12	1·35	200	0·55	55	0·65	65	1·05	130	1·40	215	1·20	165
13	1·25	180	0·50	50	0·70	70	1·10	140	1·40	215	1·30	190
14	1·20	165	0·50	50	1·00	120	1·20	165	1·55	250	1·40	215
15	1·15	150	0·50	50	1·10	140	1·30	190	1·65	280	1·55	260
16	1·10	140	0·50	50	1·15	150	1·40	215	1·55	250	1·70	295
17	1·05	130	0·50	50	1·25	180	1·30	190	1·50	240	1·75	310
18	1·00	120	0·50	50	1·15	150	1·25	180	1·45	230	1·75	310
19	0·95	110	0·45	45	1·10	140	1·45	230	1·40	215	1·65	280
20	0·90	100	0·45	45	1·15	150	1·65	280	1·40	215	1·60	270
21	0 90	100	0·45	45	1·15	150	1·50	240	1·40	215	1·55	250
22	0·85	90	0·55	55	1·10	140	1·40	215	1·45	230	1·50	240
23	0·85	90	0·60	60	1·10	140	1·30	190	1·50	240	1·40	215
24	0·80	85	0·65	65	1·10	140	1·25	180	1·55	250	1·30	190
25	0·80	85	0·65	65	1·10	140	1·20	165	1·55	250	1·30	190
26	0 80	85	0·65	65	1·05	130	1·15	150	1·65	280	1·30	190
27	0 80	85	0·70	70	1·00	120	1·10	140	1·60	270	1·30	190
28	0·80	85	0·65	65	0·95	110	1·10	140	1·45	230	1·30	190
29	0·80	85	.....	.....	0·90	100	1·10	140	1·35	200	1·30	190
30	0·75	75	.....	.....	0·90	100	1·05	130	1·25	180	1·45	230
31	0·70	70	.....	.....	0·85	90	.....	.....	1·25	180	.....	.....

Daily Gauge Height and Discharge of Jones Creek at Jones lake for 1914 —*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·55	250	1·00	120	0·85	90	·90	100	1·30	190	1·15	150
2	1·60	270	1·00	120	0·80	85	·90	100	1·70	295	1·10	140
3	1·65	280	1·05	130	0·80	85	·85	90	1·90	325	1·05	130
4	1·70	295	1·10	140	0·80	85	·80	85	1·75	310	1·00	120
5	1·60	270	1·10	140	0·75	80	·75	80	1·65	280	·95	110
6	1·55	250	1·10	140	0·70	70	·70	70	1·55	250	·90	100
7	1·45	230	1·10	140	0·70	70	·70	70	1·45	230	·85	90
8	1·45	230	1·10	140	0·85	90	·70	70	1·30	190	·80	85
9	1·45	230	1·05	130	0·90	100	·70	70	1·40	215	·80	85
10	1·45	230	1·00	120	0·90	100	·70	70	1·35	200	·75	75
11	1·50	240	1·00	120	1·00	120	·70	70	1·80	325	·75	75
12	1·50	240	1·00	120	1·00	120	·70	70	1·70	295	·70	70
13	1·55	250	1·05	130	0·90	100	·75	80	1·60	270	·70	70
14	1·55	250	1·10	140	0·90	100	·75	80	1·40	215	·65	65
15	1·55	250	1·10	140	1·00	120	·80	85	1·30	190	·65	65
16	1·50	240	1·05	130	0·95	110	·75	80	1·20	165	·60	60
17	1·45	230	1·00	120	0·90	100	1·05	130	1·10	140	·55	55
18	1·45	230	0·95	110	1·10	140	1·15	150	1·10	140	·55	55
19	1·50	240	0·95	110	1·30	190	1·20	165	1·10	140	·55	55
20	1·50	240	0·95	110	1·30	190	1·20	165	1·20	165	·55	55
21	1·40	215	1·00	120	1·20	165	1·10	140	1·20	165	·55	55
22	1·30	190	1·00	120	1·10	140	1·00	120	1·20	165	·55	55
23	1·25	180	0·95	110	1·05	130	·95	110	1·20	165	·50	50
24	1·20	165	0·95	110	1·00	120	·90	100	1·10	140	·50	50
25	1·15	150	0·90	100	0·95	110	·85	90	1·20	165	·50	50
26	1·10	140	0·90	100	0·95	110	·80	85	1·60	270	·50	50
27	1·10	140	0·90	100	1·05	130	·80	85	1·45	230	·50	50
28	1·05	130	0·90	100	1·05	130	·75	80	1·45	230	·50	50
29	1·00	120	0·90	100	1·00	120	·70	70	1·40	215	·50	50
30	1·00	120	0·90	100	0·95	110	·85	90	1·30	190	·50	50
31	1·00	120	0·85	90	.....	.....	1·15	130	.....	.....	·55	55

Monthly Discharge of Jones Creek at Jones lake for 1914.

(Drainage area, 25 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	680	60	173	6·92	7·98	10,600	A
February	70	45	57	2·28	2·37	3,160	B
March	180	65	.109	4·36	5·03	6·700	A
April	280	85	158	6·32	7·05	9,400	A
May	280	140	223	8·92	10·28	13,700	A
June	310	150	221	8·84	9·86	13,200	A
July	295	120	213	8·52	9·82	13,100	A
August	140	90	119	4·76	5·49	7,320	A
September	190	70	114	4·56	5·09	6,780	A
October	165	70	96	3·84	4·43	5,900	A
November	325	140	215	8·60	9·60	12,800	A
December	150	50	73	2·92	3·37	4,490	B
The year	680	45	148	5·90	80·37	107,150	A

Lynn Creek (1046.)

Location.—Below the overflow from the North Vancouver town intake, and about 4 miles from the mouth of the creek.

Records Available.—Daily discharges since June, 1914.

Drainage Area.—Seventeen square miles. Estimated by the engineers of the Provincial Water Rights Branch.

Gauge.—Cable gauge on flume bridge.

Channel.—Boulders and solid rock.

Discharge Measurements.—Four meter measurements made during 1914.

Winter Flow.—Open water all year.

Accuracy.—C.

Co-operation.—Gauge readings are made by Mr. Kirkland, who is employed at the intake by the Waterworks Department of North Vancouver.

Discharge Measurements of Lynn Creek below intake 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 10	C. G. Cline	1933	30	54·0	2·40	5·00	124
" 17	"	1933	30	60·0	2·30	5·12	135
Aug. 18	"	1933	11	9·4	0·20	3·45	2·2
Oct. 21	H. C. Hughes	1933	44	91·0	2·82	5·80	250

Daily Gauge Height and Discharge of Lynn Creek below Intake for 1914.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	5·05	130	3·30	2	3·25	1	4·90	110	7·15	510
2	.....	.....	4·95	120	3·25	1	3·05	1	4·90	110	7·90	660
3	.....	.....	4·85	105	3·15	1	3·00	1	4·50	65	7·30	540
4	.....	.....	4·85	105	3·10	1	2·90	1	4·35	52	6·15	320
5	.....	.....	4·70	86	3·10	1	2·90	1	4·25	44	5·65	230
6	.....	.....	4·65	80	3·30	2	2·80	1	4·10	34	5·80	260
7	.....	.....	4·70	86	3·55	7	2·90	1	4·15	37	5·95	285
8	.....	.....	4·50	65	3·85	20	3·10	1	4·75	92	5·45	380
9	.....	.....	4·45	60	3·75	15	3·40	2	4·80	98	6·10	315
10	4·95	115	4·35	52	3·50	5	3·50	5	4·90	110	6·10	315
11	5·05	130	4·45	60	3·35	2	3·95	25	4·80	98	5·90	275
12	5·05	130	4·40	56	3·30	2	4·30	48	7·40	560	5·75	250
13	5·15	150	4·35	52	3·25	1	4·45	60	6·05	305	5·50	200
14	5·35	180	4·40	56	3·15	1	4·70	86	5·30	170	5·35	180
15	5·30	170	4·35	52	3·25	1	4·85	105	4·95	120	5·20	155
16	5·50	200	4·30	48	3·30	2	5·10	140	6·40	370	5·75	250
17	5·00	125	4·10	34	3·25	2	5·50	200	6·70	425	5·50	200
18	5·20	155	4·05	31	3·35	2	5·85	265	6·50	390	5·50	200
19	5·10	140	4·00	28	3·30	2	6·25	340	6·00	295	5·65	230
20	4·95	120	4·10	34	3·45	3	6·75	480	5·95	280	5·75	250
21	5·30	170	3·95	25	3·40	2	5·50	200	5·90	275	5·70	240
22	5·45	190	3·75	15	3·35	2	5·40	185	5·30	170	5·50	200
23	5·10	140	3·75	15	3·25	2	5·70	240	5·10	140	5·85	270
24	4·85	105	3·80	17	3·35	2	6·05	305	4·90	110	6·35	360
25	4·80	98	3·80	17	3·35	2	6·65	415	4·70	86	6·65	415
26	4·80	98	3·65	10	3·35	2	6·70	425	4·40	56	6·85	450
27	5·00	125	3·60	8	3·15	1	6·30	350	4·30	48	6·75	430
28	5·15	150	3·55	6	3·25	1	5·50	200	4·20	41	6·80	445
29	5·20	155	3·55	6	3·25	1	5·30	170	4·25	44	6·25	340
30	5·35	175	3·40	2	3·15	1	5·15	150	4·95	120	6·00	295
31	.....	.....	3·35	2	3·25	1	.....	.....	5·65	230	.....	.....

Daily Gauge Height and Discharge of Lynn Creek below Intake for 1914 —*Con.*

Day.	December.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	5·80	260
2	5·80	260
3	5·95	285
4	5·45	190
5	5·50	200
6	5 35	180
7	5 25	160
8	4 95	120
9	4 65	80
10	4·55	70
11	4·40	56
12	4·40	56
13	4·35	52
14	4·15	37
15	4·05	31
16	3·95	25
17	3·90	22
18	3·90	22
19	3·90	22
20	3·80	17
21	3·75	15
22	3·75	15
23	3·75	15
24	3·65	10
25	3·75	15
26	4·10	34
27	4·70	86
28	4·85	104
29	4·75	92
30	4·40	56
31	4·30	48

Monthly Discharge of Lynn Creek below Intake for 1914.

(Drainage area, 17 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
July	130	2	47	2·8	3·7	2,900	C
August	30	1	3	0·2	0·2	180	D
September	430	1	145	8·5	9·5	8,600	D
October	560	34	164	9·7	11·2	10,100	C
November	660	155	315	18·5	20·6	18,700	C
December	285	10	85	5 0	5·8	5,200	C

Mesliloet River (1011).

Location.—A short distance below canyon, 8 miles from mouth of river and in section 8 , township 7, range 7, west of 7th meridian.

Records Available.—Continuous since October 31, 1912.

Drainage Area.—Estimated at 65 square miles.

Gauge.—Vertical staff; readings two or three times a week.

Channel.—Boulders and gravel; permanent control.

Discharge Measurements.—Twelve meter measurements taken during 1912, 1913, and 1914 define the rating curve for almost the entire range.

Winter Flow.—Open water conditions all winter.

Accuracy.—The value B is assigned where the gauge readings have been taken frequently enough to warrant it.

Co-operation.—Gauge readers are maintained by the Westminster Power Company.

Discharge Measurements of Mesliloet River eight miles from mouth 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 31.....	C. G. Cline.....	1046	70	120	1·6	2·26	188[1]
1913.							
June 6.....	H. C. Hughes.....	1673	80	232	2·9	3·25	662
" 13.....	do	1673	80	240	3·1	3·40	713
" 17.....	do	1673	80	195	2·4	2·90	446
July 3.....	do	1673	80	203	2·4	2·98	471
" 29.....	do	1673	75	146	1·6	2·28	230
Sept. 17.....	C. G. Cline.....	1673	70	109	1·2	1·87	122
Oct. 9.....	F. MacLachlan.....	1673	77	81	0·9	1·61	76
Nov. 10.....	do	1521	83	186	2·2	2·86	417
" 16.....	do	1521	85	277	3·5	3·58	942
1914.							
Aug. 2.....	C. G. Cline.....	1933	75	131	1·2	2·00	154
Nov. 11.....	H. C. Hughes.....	1933	80	220	2·6	3·05	555

[1] Station established.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Mesliloet River eight miles from mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	400	.....	110	3·80	1,010	2·1	170	2·95	461	3·4	720
2	2·90	436	.....	100	.....	700	2·1	170	3·2	595	3·1	540
3	2·75	368	.....	95	2·75	368	.....	380	.....	490	2·85	410
4	6·80	3,320	1·70	89	.....	290	3·2	595	2·8	389	.....	360
5	.....	2,400	.....	80	2·30	222	.....	520	.....	380	2·45	265
6	4·60	1,580	1·60	72	2·30	222	.....	470	.....	375	.....	265
7	.....	1,440	1·60	72	.....	240	.....	450	2·75	368	.....	270
8	.....	1,270	1·60	72	.....	260	2·9	436	.....	388	.....	270
9	.....	1,110	.....	76	.....	280	2·95	461	2·85	413	.....	275
10	.....	950	1·65	80	.....	300	3·0	485	2·8	389	2·5	280
11	.....	790	1·65	80	.....	320	.....	400	.....	460	.....	295
12	.....	620	.....	108	.....	340	2·6	311	.....	530	2·6	311
13	.....	440	1·95	136	.....	360	.....	640	.....	600	.....	533
14	2·40	251	.....	136	.....	380	3·75	975	3·3	660	3·45	755
15	.....	260	1·95	136	.....	400	3·95	1,115	3·2	595	3·6	860
16	.....	270	.....	141	.....	420	.....	760	2·9	436	.....	730
17	2·50	280	2·00	147	2·90	436	2·85	413	.....	420	3·05	510
18	2·45	265	.....	160	2·80	389	3·15	570	.....	400	2·9	436
19	.....	235	.....	190	.....	464	3·7	940	2·8	389	.....	380
20	2·25	210	.....	220	3·10	540	3·15	570	3·0	485	2·65	329
21	2·20	195	2·40	251	3·05	510	.....	440	3·7	940	.....	285
22	.....	160	2·55	295	3·00	485	2·6	311	.....	720	2·40	251
23	1·95	136	.....	350	.....	390	2·55	295	3·05	510	2·40	251
24	1·90	125	2·85	413	2·55	295	.....	285	.....	650	2·40	251
25	.....	155	.....	300	2·40	251	.....	275	3·5	790	3·05	510
26	2·20	195	2·20	195	2·25	210	.....	265	4·0	1,150	2·55	295
27	.....	155	.....	210	.....	190	.....	255	3·3	660	.....	295
28	1·85	116	2·30	222	2·10	170	.....	245	2·8	389	.....	295
29	.....	121	.....	.....	2·50	280	2·35	236	2·5	280	.....	290
30	.....	128	.....	.....	2·30	222	.....	350	.....	360	.....	285
31	1·95	136	.....	.....	.....	200	.....	.....	2·9	436	.....	.....

Daily Gauge Height and Discharge of Mesliloet River eight miles from mouth, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Guage Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·50	280	.....	145	.....	50	.....	260	.....	1,600	2·75	370
2	.....	280	2·00	147	1·46	50	.....	257	.....	1,400	.....	300
3	.....	280	.....	145	.....	60	2·40	250	.....	1,300	.....	250
4	.....	280	.....	145	.....	75	.....	210	4·00	1,150	2·35	235
5	.....	280	.....	140	.....	85	.....	190	.....	900	.....	200
6	2·50	280	.....	140	.....	100	.....	170	.....	600	.....	170
7	.....	280	.....	135	.....	115	.....	150	2·70	347	2·00	145
8	.....	280	.....	130	.....	125	.....	135	.....	380	.....	140
9	.....	285	.....	125	.....	135	1·85	115	.....	430	.....	130
10	.....	285	.....	125	2·00	145	.....	150	3·00	485	.....	120
11	.....	290	1·90	125	1·75	95	.....	200	.....	430	.....	110
12	.....	290	.....	125	.....	100	.....	400	.....	350	1·80	105
13	.....	295	.....	120	.....	200	.....	600	.....	290	.....	100
14	2·55	295	.....	115	.....	300	.....	800	2·35	235	1·70	90
15	2·50	280	1·85	115	.....	1,000	.....	1,000	.....	210	.....	90
16	.....	260	.....	100	.....	1,200	.....	1,300	.....	190	.....	80
17	.....	240	1·65	80	4·50	1,510	4·30	1,370	2·10	170	.....	70
18	.....	220	.....	80	5·00	1,880	.....	1,300	.....	220	1·60	70
19	.....	195	.....	80	.....	1,300	.....	1,200	2·50	280	.....	70
20	.....	170	.....	75	3·40	720	4·00	1,150	.....	450	.....	65
21	1·95	136	.....	75	.....	700	.....	1,000	.....	600	1·55	65
22	1·95	136	.....	70	.....	600	.....	850	.....	750	.....	60
23	.....	145	.....	70	.....	500	3·40	720	3·65	900	1·50	60
24	.....	155	.....	65	.....	400	.....	600	.....	1,100	.....	60
25	.....	165	.....	65	.....	350	.....	460	4·40	1,440	.....	65
26	.....	175	.....	65	.....	350	.....	330	.....	1,200	.....	65
27	.....	185	.....	60	.....	350	2·20	195	.....	1,000	1·55	65
28	2·20	195	.....	60	2·65	330	.....	300	3·55	820	.....	80
29	1·95	136	.....	55	.....	300	.....	1,000	.....	800	.....	90
30	.....	140	.....	55	.....	280	.....	1,500	.....	700	.....	100
31	.....	145	.....	50	.....	.....	4·90	1,800	.....	.....	1·90	125

Monthly Discharge of Mesliloet River eight miles from mouth, for 1914.

(Drainage area, 65 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	3,320	116	597	9·2	10·6	36,700	B
February	413	72	162	2·5	2·6	9,000	B
March	1,010	170	360	5·5	6·3	22,100	B
April	1,115	170	460	7·1	7·9	27,400	B
May	1,150	280	520	8·0	9·2	32,000	B
June	755	251	393	6·0	6·7	23,400	B
July	295	136	228	3·5	4·0	14,000	C
August	147	50	99	1·5	1·7	6,100	C
September	1,880	50	447	6·9	7·7	26,600	C
October	1,800	115	644	9·9	11·4	39,600	C
November	1,600	170	691	10·6	11·8	41,100	C
December	370	60	121	1·9	2·2	7,400	C
The year	1,880	50	394	6·05	82·1	285,400	C

Nicolum River (1058).

Location.—At the pack trail bridge, 4 miles from the mouth of the river and 9 miles from Hope; in section 27, township 4, range 5, west of 6th meridian

Records Available.—August to December, 1914—irregular.

Drainage Area.—Thirty square miles (above gauging station.)

Gauge.—Vertical staff. Readings irregular.

Channel.—Rocky; water swift at high stages.

Discharge Measurements.—Four during 1914; one of them was under ice conditions.

Winter Flow.—Stream remains open all winter but during cold spells anchor ice disturbs somewhat the ordinary relation between gauge height and discharge.

NICOLUM RIVER.

The Nicolum river has its source in the Nicolum lakes at an elevation of something like twenty-one hundred feet. It discharges into the Coquihalla river near Hope, about 4 miles from the Fraser river at an elevation of some three hundred feet. The stream has a drainage area of 30 square miles above the gauging section.

For the greater part of the year there is no direct surface flow from the lakes into the river, but the flow is kept up by seepage, which comes out as springs in the bed of the stream, some little distance below the lakes. It is only for a short period during the spring freshet that the lakes overflow directly into the stream. This condition of affairs gives a very uniform flow, which, however, is affected to some extent by two tributaries which enter from either side of the stream a few miles below the lake.

The precipitation in the Nicolum river watershed probably averages something over seventy inches. In the winter there is very little snow near the mouth of the creek, but at the headwaters there is a considerable depth. The stream does not generally freeze at the gauging station but the water is sometimes backed up a little by ice.

The pack trail from Hope to Princeton follows the Nicolum river from its mouth to the lakes. Part of this road was widened at one time for the use of wagons, and it would be a simple matter to convert it into a wagon road at least as far as the Nicolum lakes. Lately, however, it has been used merely as a pack trail.

There is practically no settlement or development in the Nicolum valley. The country is mostly mountainous, and there is very little good farming land, with the exception of a fringe around the lakes.

The Nicolum lakes are located at one end of a valley which lies among the hills at an altitude of some twenty-one hundred feet. The Nicolum river drains one end of this valley. The Sumallo river flows down from the hills near the other end of the valley on its way to join the Skagit below. The natural conditions are such that it would be quite possible to divert the Sumallo river into the Nicolum lakes. This would give a fairly good flow of water at quite a high head. By utilizing the total fall to the Fraser river, a head of something like two thousand feet could be obtained, though this would require a pipe line about 10 miles long. The lakes would give good storage, particularly since their area could be greatly increased by means of storage dams. The natural seepage which takes place from the lakes at present would be a considerable disadvantage. However, test pits which have been sunk, seem to indicate that there is only one of the lakes that supplies this seepage and that the glacial silt in the rest of the valley bottom would prevent any such losses, provided that the one troublesome lake was omitted from the storage system.

The flow available for such a development is given by the flow of the Sumallo river as measured at the station eight miles from the mouth. To this must be added a portion of the flow as measured at the station on the Nicolum, which cannot all be utilized because it includes the water brought down by the two tributaries which enter below the lake, and it would only be possible to divert one of these streams into the proposed pipeline. The measurements at the upper station on the Sumallo, however, are not as complete as those which have been taken at the station near the mouth, since it was not possible to get regular gauge readings. In using the flow of the Sumallo river at the lower station, a considerable reduction should be made. This amount can be determined by comparing the discharges at the two stations, at various times of the year. It is expected that next year more complete data on these streams will be available.

Discharge Measurements of Nicolum River at Nine-mile Bridge, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 17	C. G. Cline	1933	26	27·0	2·80	1·55	74·3
Aug. 27	do	1933	26	16·4	1·50	1·10	24·0
Oct. 29	H. C. Hughes	1933	28	15·7	1·60	1·10	24·0
Dec. 17	do	1521	28	16·5	1·87	1·35	30·8[1]

[1] Ice conditions.

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Nicolum River four miles from mouth for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				45				35				
2			1·30	45			1·20	35				
3				45				35				
4			1·30	45			1·20	35			1·60	85
5								35				
6											1·50	70
7												
8							1·20	35				
9												
10												
11												
12			1·25	40							1·40	57
13				35								
14			1·20	35								
15					1·30	45					1·25	40
16					1·20	35						
17	1·55	77	1·20	35							Ice.	33
18			1·20	35					1·45	64		
19			1·10	25					1·50	70		
20				25			1·20	35	1·60	85		
21							1·20	35	1·60	85		
22												
23												
24									1·70	100		
25												
26												
27			1·10	25								
28												
29			1·10	25	1·20	35	1·10	25				
30												
31												

NORTON CREEK (1013.)

Location.—An outlet of Norton lake in section 10, township 7, range 7, west of 7th meridian.

Records Available.—Continuous since October 20, 1912, except for part of January, 1914.

Drainage Area.—Not known—very small.

Gauge.—Vertical staff. Very few readings during the winter of 1914.

Channel.—Boulders.

Discharge Measurements.—Twelve meter measurements made during 1912, 1913, and 1914, define the rating curve accurately except for highest freshets.

Winter Flow.—The lake freezes over, but the stream remains free of ice at the gauge.

Accuracy.—C. and D. Gauge readings irregular for part of the year.

Co-operation.—The gauge readers are maintained by the Westminster Power Company.

Discharge Measurements of Norton Creek at Norton Lake, 1912-13-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Height.	Gauge Velocity.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1912.							
Oct. 20	C. G. Cline	1046	9·0	11·8	0·6	2·53	7·6[1]
1913.							
June 3	H. C. Hughes	1673	16·0	16·0	1·0	2·85	16·3[2]
June 10	do	1673	8·5	9·3	1·0	2·60	9·3
June 24	do	1673	8·0	7·5	0·8	2·52	5·7
July 7	do	1673	10·0	13·3	0·6	2·53	7·7
July 23	do	1673	6·0	6·4	0·3	2·11	1·8
Aug. 2	do	1673	6·0	5·1	0·1	1·85	0·5
Sept. 23	F. MacLachlan	1673	3·5	1·9	0·9	2·06	1·8
1914.							
May 17	F. MacLachlan	1521	10,0	4·0	1·6	2·43	6·2
May 17	do	1521	9·5	11·8	0·6	2·43	6·6
July 31	C. G. Cline	1933	3·0	1·0	0·5	1·80	0·5
Nov. 14	H. C. Hughes	1933	10·0	12·8	0·8	2·65	10·3

[1]Station established.
[2]Several different sections used.
[3]Different section for a check.

Daily Gauge Height and Discharge of Norton Creek at Norton Lake for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Discharge Height.	Gauge charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				3	3·1	27		6		11·0		5·2
2			2·2	2·7		22		9		10·0		5·2
3				2·8		17		11		9·5		5·2
4				2·9	2·8	14		13		9·0	2·4	5·2
5	3·50	46		3	2·7	11		15	2·6	8·6		4·5
6				3		11	2·9	18	2·55	7·7	2·3	3·7
7				3		11		18		7·5		3·7
8				3		12		18		7·2		3·7
9				3		12		18		6·8		3·7
10				3		13		18		6·4		3·7
11				3		13		18		6·0	2·3	3·7
12				3		14		18		5·9		3·5
13				3		14		18		5·8		3·3
14				3		15		18		5·7		3·1
15				3		15		18		5·6		2·9
16				3		16		18		5·5	2·2	2·7
17				3		17		18		5·3	2·2	2·7
18			2·25	3·2		17		18	2·4	5·2		2·5
19			2·25	3·2	2·9	18		18		5·0	2·15	2·3
20				3·5		17		18		4·8		2·8
21				4		16	2·9	18		4·6		3·3
22				5		15	2·8	14	2·35	4·5		3·8
23				6		13		14		4·5		4·1
24				7		11		14		4·6		4·5
25				8		10		14		4·7		4·9
26				9		9		14		4·8	2·40	5·2
27				10		8		14		4·9	2·30	3·7
28			2·7	11		7		14		5·0	2·30	3·7
29						6	2·8	14		5·1	2·30	3·7
30						5		12	2·4	5·2	2·30	3·7
31					2·3	3·7				5·2		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Norton Creek at Norton lake, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	3·2	1·8	0·4	1·6	0·1	.....	6	.....	40	2·85	16
2	2·2	2·7	.....	0·4	1·6	0·1	.....	6	3·60	50	2·75	13
3	.....	2·4	.....	0·4	.....	0·1	2·45	6	.....	40	2·70	11
4	.....	2·1	.....	0·4	.....	0·2	.....	6	.....	30	2·60	8·6
5	.....	1·8	.....	0·4	.....	0·2	.....	5	.....	20	2·55	7·6
6	.....	1·5	.....	0·4	.....	0·3	.....	4	.....	10	.....	6
7	2·0	1·2	.....	0·5	.....	0·4	.....	4	2·60	8·6	.....	5
8	2·0	1·2	1·84	0·5	1·80	0·4	.....	3	.....	10	2·35	4·5
9	2·0	1·2	.....	0·5	.....	0·4	.....	3	.....	15	2·30	3·7
10	2·0	1·2	1·81	0·4	.....	0·5	2·20	2·7	.....	20	2·30	3·7
11	1·95	0·9	.....	0·4	1·85	0·5	.....	2·7	3·00	22	2·25	3·2
12	.....	0·9	1·80	0·4	.....	1·0	.....	2·7	2·90	18	.....	3·0
13	1·9	0·7	.....	0·4	.....	2	.....	2·7	2·80	14	.....	2·5
14	.....	0·7	.....	0·4	.....	3	.....	2·7	2·70	11	2·15	2·3
15	.....	0·7	1·80	0·4	.....	4	2·20	2·7	.....	10	2·15	2·3
16	1·9	0·7	.....	0·4	.....	5	.....	40	2·60	8·6	2·15	2·3
17	.....	0·7	.....	0·3	.....	10	4·20	80	.....	8·6	2·15	2·3
18	1·91	0·7	1·75	0·3	2·9	18	4·30	85	2·60	8·6	2·10	1·9
19	1·91	0·7	.....	0·3	3·3	36	.....	60	.....	8·6	.....	1·8
20	1·89	0·7	.....	0·2	3·25	34	.....	40	.....	8·6	.....	1·6
21	.....	0·7	.....	0·2	.....	30	.....	20	2·6	8·6	2·05	1·5
22	.....	0·7	1·70	0·2	.....	20	2·80	14	.....	15	2·05	1·5
23	1·89	0·7	.....	0·2	.....	16	.....	10	2·90	18	2·05	1·5
24	.....	0·7	1·70	0·2	.....	14	2·50	6·7	.....	20	.....	1·5
25	1·90	0·7	1·70	0·2	.....	12	.....	6	.....	20	.....	1·6
26	1·94	0·9	.....	0·2	.....	10	.....	5	3·00	22	.....	1·7
27	.....	0·8	.....	0·1	.....	8	.....	4	3·0	22	.....	1·8
28	.....	0·6	1·62	0·1	2·55	7·5	2·30	3·7	3·25	34	2·10	1·9
29	.....	0·5	.....	0·1	.....	7	.....	5	.....	30	2·10	1·9
30	1·8	0·4	1·62	0·1	.....	7	.....	10	.....	20	2·15	2·3
31	1·8	0·4	1·60	0·1	.....	.....	.....	20	.....	.....	2·30	3·7

Monthly Discharge of Norton Creek at Norton Lake, for 1914

Month.	Discharge in Second-Feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
February			4·3	D
March			13·2	D
April			15·5	D
May			61·6	D
June	5·2	2·3	3·7	C
July	3·2	0·4	1·1	C
August	0·5	0·1	0·3	C
September	36	0·1	8·2	D
October	85	2·7	15·1	D
November	50	8·6	19·4	C
December	16	1·5	4·0	C

Seymour Creek (1022).

Location.—Above the Vancouver waterworks intake and about seven miles from the mouth of the creek.

Records available.—Daily discharges since November, 1913.

Drainage Area.—Above intake, 76 square miles, estimated by the engineers of the Provincial Water Rights Branch.

Gauge.—Vertical staff gauge spiked to cribbing at intake.

Channel.—Rocks and boulders; water swift at high stages.

Discharge Measurements.—Seven meter measurements during 1913 and 1914.

Winter Flow.—Open water all year.

Accuracy.—B.

Co-operation.—Gauge readings are made by employees of the Vancouver Waterworks Department.

Discharge Measurements of Seymour Creek above city intake, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 6	H. J. E. Keys	.....	67	133	.....	1·60	282[1]
1914.							
Jan. 6	Keys & McLachlan	1046	155	662	6·7	4·20	4,450
April 30	Keys & Webb	1057	135	368	2·1	2·35	775
May 29	C. G. Cline	1521	100	281	1·6	1·91	430
Aug. 14	do	1933	115	157	0·47	0·60	73[2]
Oct. 15	C. E. Webb	1057	139	355	1·9	2·00	600
Oct. 20	H. C. Hughes	1933	160	588	3·9	3·20	2,290

[1]Station established.

[2]Backwater from small dam.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Seymour Creek at Upper Intake, 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·95	490	1·55	265	3·20	2,140	1·70	330	2·47	970	2·50	1,000
2	2·35	850	1·45	225	2·45	950	1·60	285	2·75	1,325	2·55	1,060
3	2·65	1,185	1·30	175	2·40	900	2·10	620	2·55	1,060	2·45	950
4	6·10	9,210	1·23	158	2·17	682	2·50	1,000	2·25	755	2·12	640
5	3·55	2,810	1·17	144	1·90	450	3·10	1,920	2·15	665	1·90	450
6	5·00	6,460	1·09	128	1·70	330	2·52	1,025	2·20	710	1·75	415
7	3·05	1,825	1·03	116	1·65	307	2·42	925	2·40	900	1·80	380
8	2·70	1,250	1·00	110	1·77	365	2·35	850	2·30	800	2·05	575
9	2·30	800	1·00	110	1·87	430	2·30	800	2·20	710	2·00	530
10	2·12	638	1·02	114	1·70	330	2·45	950	2·10	620	1·95	490
11	2·20	710	1·10	130	1·60	285	2·40	900	2·25	755	2·00	530
12	2·00	530	1·30	175	1·55	265	2·20	710	2·30	800	2·20	710
13	2·10	620	1·50	245	2·57	1,090	2·92	1,595	2·50	1,000	2·20	710
14	2·00	530	1·50	245	3·72	3,300	3·40	2,580	2·70	1,250	2·35	850
15	1·85	415	1·52	253	2·55	1,060	3·45	2,690	2·60	1,120	2·60	1,120
16	2·55	1,060	1·50	245	2·42	925	2·70	1,250	2·40	900	2·32	1,145
17	2·17	683	1·50	245	2·45	950	2·40	900	2·30	800	2·47	970
18	2·05	575	1·45	225	2·45	950	2·25	755	2·20	710	2·30	800
19	1·95	490	1·45	225	2·45	950	2·80	1,400	2·35	850	2·15	665
20	1·77	365	1·45	225	2·60	1,120	2·60	1,120	2·50	1,000	2·00	530
21	1·65	307	1·85	415	2·50	1,000	2·30	800	2·60	1,120	2·00	530
22	1·52	253	2·27	773	2·45	950	2·20	710	2·65	1,185	2·05	575
23	1·45	225	2·25	755	2·25	755	2·10	620	2·50	1,000	1·95	490
24	1·32	181	2·50	1,000	2·10	620	2·00	530	2·55	1,060	2·00	530
25	1·27	168	2·07	593	1·90	450	1·90	450	2·60	1,120	2·50	1,000
26	1·95	490	1·92	466	1·70	330	1·85	415	2·75	1,325	2·25	755
27	1·65	307	2·07	593	1·60	285	1·95	490	2·77	1,355	2·10	630
28	1·45	225	2·10	620	1·50	245	1·90	450	2·20	710	2·05	575
29	1·45	225	.....	.....	1·80	380	1·80	380	1·95	490	2·10	620
30	1·75	355	.....	.....	1·80	380	2·00	530	2·10	620	2·20	710
31	1·45	225	.....	.....	1·70	330	.....	.....	2·30	800	.....	.....

Daily Gauge Height and Discharge of Seymour Creek above Upper Intake, for 1914.—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·20	710	0·90	95	0·35	50	1·85	410	4·70	5,700	2·25	750
2	2·20	710	0·90	95	0·30	50	2·25	750	4·10	4,200	2·10	620
3	2·20	710	0·85	85	0·30	50	1·92	465	2·87	1,500	1·90	450
4	2·10	620	0·85	85	0·30	50	1·70	330	4·20	4,450	1·80	380
5	2·00	530	0·80	80	0·30	50	1·55	265	2·55	1,060	1·70	330
6	1·95	490	0·80	80	0·35	50	1·40	205	2·25	750	1·55	265
7	1·85	415	1·00	110	0·35	50	1·30	175	2·20	710	1·45	225
8	1·85	415	1·10	130	0·85	85	1·25	160	3·95	3,840	1·40	205
9	1·80	380	0·90	95	1·10	130	1·20	150	3·05	1,820	1·30	175
10	1·80	380	0·85	85	1·10	130	1·20	150	2·92	1,600	1·25	160
11	1·80	380	0·80	80	1·15	145	1·30	175	2·65	1,180	1·15	140
12	1·75	355	0·80	80	1·05	120	3·15	2,030	2·30	800	1·10	130
13	1·70	330	0·70	70	0·95	100	3·60	3,020	2·15	660	1·05	120
14	1·75	355	0·62	65	1·02	115	2·45	950	1·95	490	1·00	110
15	1·65	305	0·57	65	1·45	225	2·00	530	1·60	285	1·00	110
16	1·60	285	0·55	60	1·47	235	4·20	4,460	1·50	245	1·00	110
17	1·50	245	0·50	60	2·02	550	4·05	4,080	1·40	205	1·00	110
18	1·60	285	0·50	60	3·50	2,800	4·70	5,710	1·77	365	1·00	110
19	1·55	265	0·40	55	4·30	4,770	4·35	4,840	2·10	620	0·95	100
20	1·50	245	0·40	55	2·87	1,515	3·05	1,820	2·35	850	0·90	95
21	1·20	150	0·40	55	2·20	710	2·70	1,250	2·15	660	0·80	80
22	1·10	130	0·40	55	1·85	415	2·27	775	2·50	1,000	0·80	80
23	1·20	150	0·40	55	1·57	275	1·95	490	3·45	2,700	0·80	80
24	1·20	150	0·45	60	1·40	205	1·80	380	3·10	1,920	0·80	80
25	1·10	130	0·45	60	1·30	175	1·70	330	3·30	2,360	0·85	85
26	1·15	140	0·42	55	1·52	255	1·60	285	2·80	1,400	0·85	85
27	1·05	120	0·42	55	2·50	1,000	1·50	245	3·10	1,920	0·85	85
28	1·00	110	0·40	55	2·30	800	1·40	205	2·72	1,300	1·00	110
29	0·95	100	0·40	55	2·00	530	1·30	175	2·40	900	1·00	110
30	0·95	100	0·42	55	1·90	450	2·35	850	2·20	710	1·05	120
31	0·90	95	0·40	55	.....	.....	3·20	2,140	.....	.....	1·05	120

Monthly Discharge of Seymour Creek, Upper Station, for 1914.

(Drainage area, 76 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	9,210	168	1,115	14·68	16·92	68,500	B
February	1,000	110	320	4·22	4·39	17,800	B
March	3,300	245	758	10·00	11·53	46,600	B
April	2,690	285	933	12·30	13·72	55,500	B
May	1,355	490	919	12·10	13·95	56,500	B
June	1,145	380	697	9·17	10·23	41,500	B
July	710	95	315	4·14	4·77	19,400	B
August	130	55	71	0·94	1·09	4,400	C
September	4,710	50	534	7·03	7·84	31,800	B
October	5,710	150	1,220	16·10	18·56	75,000	B
November	5,700	205	1,540	20·30	22·65	91,600	B
December	750	80	185	2·44	2·81	11,400	B
The year	9,210	50	717	9·45	128·46	520,000	B

Silver-Pitt Creek (1017).

Location.—At lower end of canyon about 2 miles from mouth of creek in section 8, township 4, range 5, west of the 7th meridian.

Records Available.—Continuous since August, 1912.

Drainage Area.—Seventy square miles above gauging station.

Gauge.—Vertical staff gauge readings three times a week.

Channel.—Rocky; uneven bottom but permanent control. Deep still pool just above gauging section.

Discharge Measurements.—Eight meter measurements during 1912, 1913 and 1914.

Winter Flow.—Open water all year.

Accuracy.—C. Gauge readings only three times a week.

Discharge Measurements of Silver-Pitt Creek at mouth of Canyon, 1912-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1912.							
Aug. 9.....	C. G. Cline.....	1046	65	104	2·39	1·50	242
1913.							
May 25.....	C. G. Cline.....	1044	60	121	3·05	2·15	369
July 16.....	K. G. Chisholm.....	1055	62	100	1·83	1·41	190
Sept. 16.....	do	1055	57	68	1·35	0·87	92
Sept. 17.....	do	1055	55	66	1·27	0·90	84
Oct. 25.....	H. J. E. Keys.....	1057	61	73	1·60	0·99	116
1914.							
July 20.....	C. G. Cline	1933	52	60	1·50	0·90	90
Nov. 5.....	H. C. Hughes.....	1933	72	142	3·00	2·19	405

Daily Gauge Height and Discharge of Silver Pitt Creek two miles from mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	200	.....	140	.....	400	1·6	240	1·9	310	1·95	325
2	1·2	155	1·1	135	1·8	285	.....	260	.....	300	.....	300
3	.....	200	.....	120	.....	240	1·8	285	.....	290	1·8	285
4	.....	800	1·0	115	1·4	195	.....	280	1·8	285	.....	270
5	4·8	1,220	.....	140	.....	170	.....	270	.....	270	1·7	260
6	.....	1,200	1·25	165	1·15	145	1·7	260	1·7	260	.....	300
7	4·5	1,130	.....	160	.....	150	.....	270	.....	270	.....	300
8	.....	1,100	.....	160	.....	170	1·8	285	1·8	285	2·05	350
9	4·2	1,040	1·2	155	1·3	175	.....	260	.....	290	.....	320
10	.....	800	.....	170	.....	180	1·6	240	.....	300	1·8	285
11	.....	500	1·4	195	1·4	195	.....	250	1·9	310	.....	270
12	2·2	395	.....	210	.....	240	.....	250	.....	300	1·7	260
13	.....	350	1·55	230	1·8	285	1·7	260	1·8	285	.....	270
14	1·8	285	.....	200	.....	300	.....	400	.....	270	.....	280
15	.....	300	.....	200	.....	400	2·6	530	1·7	260	1·8	285
16	2·0	335	1·3	175	2·3	430	.....	480	.....	250	.....	270
17	.....	350	.....	160	.....	380	2·3	430	1·65	250	1·7	260
18	.....	370	1·15	145	2·0	335	.....	400	.....	260	.....	280
19	2·2	395	.....	130	.....	380	.....	350	.....	270	1·85	300
20	.....	360	1·0	115	2·3	430	2·0	335	1·8	285	.....	360
21	2·0	335	.....	200	.....	450	.....	320	.....	270	2·3	430
22	.....	300	.....	300	.....	500	1·9	310	1·7	260	.....	500
23	1·75	275	2·3	430	2·6	530	.....	390	.....	300	2·75	580
24	.....	250	.....	460	.....	500	1·75	275	.....	330	.....	540
25	.....	200	2·5	495	2·4	460	.....	280	2·1	360	.....	500
26	1·4	195	.....	530	.....	520	.....	280	.....	500	2·4	460
27	.....	180	2·7	565	2·75	580	1·8	285	2·9	630	.....	400
28	1·3	175	.....	500	.....	450	.....	290	.....	500	.....	300
29	.....	170	.....	.....	.....	300	1·85	300	2·3	430	1·55	230
30	1·2	155	.....	.....	1·8	285	.....	300	.....	400	.....	220
31	.....	150	.....	.....	.....	260	.....	.....	.....	370	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Silver Pitt Creek two miles from mouth, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·45	210	.....	60	0·4	35	.....	220	3·0	660	.....	550
2	.....	190	0·6	57	0·4	35	1·4	195	.....	560	2·4	460
3	1·25	165	.....	60	.....	30	.....	200	2·4	460	.....	330
4	.....	160	.....	65	0·35	30	.....	220	3·0	660	1·4	195
5	.....	150	0·7	70	.....	30	1·6	240	2·2	395	.....	150
6	1·15	145	.....	68	.....	35	.....	220	1·8	285	1·0	115
7	.....	140	0·65	63	0·4	35	1·4	195	.....	350	.....	100
8	1·1	135	.....	70	.....	60	.....	170	.....	500	.....	90
9	.....	140	0·75	77	0·8	84	1·2	155	3·0	660	0·7	70
10	1·15	145	.....	70	.....	140	.....	150	.....	800	.....	60
11	.....	140	.....	70	1·4	195	.....	130	3·8	910	0·45	40
12	1·1	135	0·65	63	.....	200	1·05	125	.....	600	.....	40
13	.....	150	.....	60	.....	220	.....	150	2·0	335	0·4	35
14	1·2	155	0·6	57	1·6	240	1·3	175	.....	300	.....	35
15	.....	160	.....	50	.....	350	.....	190	.....	200	.....	30
16	1·3	175	0·5	45	2·4	460	1·45	210	1·2	155	0·35	30
17	.....	150	.....	45	.....	560	.....	220	.....	140	.....	30
18	1·1	135	.....	40	3·0	560	.....	240	1·05	125	0·3	25
19	.....	130	0·45	40	.....	600	1·7	260	.....	200	.....	25
20	0·95	110	.....	40	2·6	530	.....	370	1·8	285	.....	25
21	.....	100	0·4	35	.....	600	2·45	480	.....	400	0·3	25
22	0·9	100	.....	35	.....	600	.....	540	.....	540	.....	30
23	.....	90	0·4	35	3·0	660	2·8	595	3·0	660	0·4	35
24	0·75	77	.....	35	.....	550	.....	700	.....	550	.....	50
25	.....	70	.....	35	2·4	460	.....	800	2·55	410	0·6	57
26	0·65	63	0·4	35	.....	400	3·5	820	.....	600	.....	70
27	.....	60	.....	30	2·0	335	.....	640	3·3	760	.....	80
28	.....	60	0·35	30	.....	300	2·4	460	.....	730	0·9	100
29	0·6	57	.....	30	.....	270	.....	400	.....	700	.....	150
30	.....	60	0·35	30	1·6	240	2·0	335	2·9	630	1·4	195
31	0·65	63	.....	35	.....	.....	.....	500	.....	.....	.....	250

Monthly Discharge of Silver Pitt Creek, two miles from mouth, for 1914.

(Drainage area, 70 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	1,220	150	450	6·43	7·41	27,700	C
February	565	115	240	3·43	3·57	13,300	C
March	580	145	335	4·79	5·52	20,600	C
April	530	240	310	4·43	4·94	18,400	C
May	630	250	320	4·56	5·26	19,700	C
June	580	220	335	4·79	5·34	19,900	C
July	210	57	125	1·78	2·05	7,700	C
August	77	30	50	0·71	0·82	3,100	D
September	660	30	300	4·29	4·79	17,900	C
October	820	125	330	4·71	5·43	20,300	C
November	910	125	485	6·93	7·73	28,900	C
December	550	25	110	1·57	1·81	6,800	C
The year	1,220	25	280	4·04	54·67	204,300	C

Slollicum Creek (1033).

Location.—Near the mouth, in section 19, township 5, range 28 west of the 6th meridian.

Records Available.—Two meter measurements; a few gauge readings have been taken since May, 1914, which will be available when the station has been more fully rated.

Gauge.—Vertical staff; readings irregular.

Channel.—Rocks and gravel.

Discharge Measurements.—Two meter measurements in 1914.

Winter Flow.—Open water all year.

Discharge Measurements of Slollicum Creek near mouth, 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section	Mean Velocity	Gauge Height	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
May 23	C. G. Cline	1521	22	20	1·9	1·60	36·4
Aug. 26	"	1933	17	8·5	0·3	0·82	2·2

South Lillooet River (1018).

Location.—At upper highway bridge, 8 miles from mouth in section 28, township 12, east of Coast meridian.

Records Available.—Daily discharges continuous since October, 1911.

Drainage Area—One hundred square miles.

Gauge.—Chain gauge on bridge; readings daily.

Channel.—Permanent rocky channel.

Discharge Measurements.—Ten measurements during 1911, 1912, 1913 and 1914.

Winter Flow.—Open water all year.

Accuracy.—B.

Discharge Measurements of South Lillooet River 8 miles from mouth, 1911–12–13–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Oct. 26	Cline and Smith	1057	100	113	2·0	1·18	226
Dec. 13	K. H. Smith	1057	120	316	4·3	2·80	1360
1912.							
July 4	C. G. Cline	1046	105	151	2·4	1·50	361
Aug. 17	"	1046	125	288	3·5	2·70	1010
Sept. 10	"	1046	115	234	3·3	2·00	767
Nov. 13	"	1046	125	608	8·1	4·60	4950
1913.							
May 22	"	1044	125	266	4·4	2·45	1180
July 10	Smith and Cline	1055	125	296	3·8	2·40	1120
1914.							
Aug. 21	C. G. Cline	1933	80	80	1·5	0·50	113
Oct. 22	H. C. Hughes	1933	125	371	5·5	3·12	2000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of South Lillooet River eight miles from mouth, 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·7	480	1·9	620	2·7	1,440	1·3	270	2·3	980	1·7	480
2	1·8	550	1·6	420	2·6	1,320	1·4	320	2·1	790	1·7	480
3	1·9	620	1·6	420	2·4	1,080	1·5	370	2·1	790	1·8	550
4	2·8	1,570	1·5	370	2·4	1,080	1·5	370	2·0	700	1·7	480
5	5·0	5,580	1·5	370	2·3	890	1·9	620	1·9	620	1·5	370
6	6·1	8,350	1·4	320	2·2	880	1·9	620	1·7	480	1·4	320
7	5·1	6,050	1·2	230	2·1	790	2·0	700	1·7	480	1·5	370
8	4·4	4,500	1·1	200	2·0	700	1·9	620	1·7	480	1·5	370
9	4·0	3·600	1·0	170	2·2	880	1·8	550	1·7	480	1·7	480
10	3·1	2,000	1·0	170	.....	890	1·8	550	1·6	420	1·6	420
11	2·7	1,440	1·0	170	2·4	1,080	1·7	480	1·6	420	1·5	370
12	2·1	790	1·1	200	2·4	1,080	1·7	480	1·7	480	1·5	370
13	1·9	620	1·2	230	2·8	1,570	1·8	550	1·8	550	1·5	370
14	1·8	550	1·2	230	3·1	2,000	2·2	880	1·8	550	1·5	370
15	1·6	420	1·3	270	2·9	1,710	3·0	1,850	1·8	550	1·6	420
16	1·7	480	1·3	270	2·9	1,710	2·8	1,570	1·7	480	1·6	420
17	1·7	480	1·3	270	2·8	1,570	2·6	1,320	1·7	480	1·6	420
18	2·1	790	1·3	270	2·8	1,570	2·6	1,320	1·7	480	1·6	420
19	2·0	700	1·8	550	2·7	1,440	2·7	1,440	1·6	420	1·4	320
20	1·8	550	2·0	700	2·6	1,320	2·7	1,440	1·6	420	1·3	270
21	1·7	480	2·3	980	2·5	1,200	2·5	1,200	1·5	370	1·3	270
22	1·8	550	2·3	980	2·4	1,080	2·4	1,080	1·7	480	1·4	320
23	1·6	420	2·4	1,080	2·2	880	2·6	1,320	1·6	420	1·4	320
24	1·4	320	2·4	1,080	2·0	700	2·6	1,320	1·7	480	1·3	270
25	1·4	320	2·4	1,080	1·9	620	2·6	1,320	1·8	550	1·4	320
26	1·4	320	2·4	1,080	1·8	550	2·6	1,320	2·1	790	1·3	270
27	1·2	230	2·4	1,080	1·7	480	2·8	1,570	2·6	1,320	1·4	320
28	1·4	320	2·4	1,080	1·6	420	3·1	2,000	2·3	980	1·4	320
29	1·6	420	.....	.....	1·5	370	3·0	1,850	2·1	790	1·3	270
30	1·7	480	.....	.....	1·5	370	2·8	1,570	1·9	620	1·3	270
31	1·9	620	.....	.....	1·4	320	.....	.....	1·8	550	...	

Daily Gauge Height and Discharge of South Lillooet River eight miles from mouth, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·3	270	0·5	110	0·45	105	2·1	790	3·9	3,400	2·9	1,710
2	1·2	230	0·5	110	0·45	105	2·0	700	4·5	4,700	2·7	1,440
3	1·2	230	0·5	110	0·45	105	1·9	620	4·3	4,250	2·5	1,200
4	1·2	230	0·5	110	0·45	105	1·8	550	4·3	4,250	2·35	1,030
5	1·2	230	0·5	110	0·45	105	1·7	480	4·0	3,600	2·1	790
6	1·1	200	0·5	110	0·45	105	1·5	370	3·2	2,150	1·9	620
7	1·1	200	0·6	120	0·5	110	1·4	320	3·1	2,000	1·8	550
8	1·0	170	0·6	120	0·6	120	1·4	320	3·1	2,000	1·7	480
9	1·0	170	0·6	120	0·8	140	1·3	270	3·5	2,640	1·5	370
10	1·0	170	0·5	110	0·9	150	1·2	230	3·2	2,150	1·4	320
11	0·9	150	0·5	110	0·95	160	1·3	270	3·8	3,200	1·3	270
12	0·9	150	0·5	110	1·0	170	1·5	370	3·2	2,150	1·25	250
13	0·9	150	0·5	110	1·0	170	2·2	880	3·2	2,150	1·2	230
14	0·9	150	0·5	110	1·2	230	2·1	790	2·8	1,570	1·1	200
15	1·0	170	0·4	100	1·8	550	2·0	700	2·5	1,200	1·0	170
16	0·9	150	0·4	100	1·8	550	2·2	880	2·3	980	0·95	160
17	0·9	150	0·4	100	2·1	790	3·75	3,100	2·1	790	0·9	150
18	0·9	150	0·4	100	2·8	1,570	4·3	4,250	1·7	480	0·9	150
19	0·8	140	0·4	100	3·2	2,150	4·9	5,600	1·8	550	0·85	145
20	0·8	140	0·4	100	3·2	2,150	4·4	4,500	2·0	700	0·85	145
21	0·8	140	0·5	110	3·0	1,850	3·8	3,200	2·1	790	0·8	140
22	0·7	130	0·5	110	2·7	1,440	3·1	2,000	2·2	880	0·8	140
23	0·7	130	0·5	110	2·3	980	2·6	1,320	3·0	1,850	0·75	135
24	0·7	130	0·5	110	2·0	700	2·3	980	3·3	2,300	0·8	140
25	0·7	130	0·5	110	1·8	550	2·1	790	3·6	2,820	0·75	135
26	0·7	130	0·5	110	1·8	550	1·9	620	3·9	3,400	0·8	140
27	0·6	120	0·45	105	2·0	700	1·7	480	3·4	2,470	0·85	145
28	0·6	120	0·45	105	2·6	1,320	1·5	370	4·0	3,600	0·9	150
29	0·6	120	0·45	105	2·4	1,080	1·5	370	3·8	3,200	0·9	150
30	0·6	120	0·45	105	2·2	880	1·5	370	3·2	2,150	0·9	150
31	0·5	110	0·45	105	.....	.....	2·3	980	.....	.....	1·1	200

Monthly Discharge of South Lillooet River eight miles from mouth, for 1914.

(Drainage area, 100 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	8,350	230	1,450	14·50	16·70	89,200	C
February	1,080	170	532	5·32	5·54	29,500	B
March	2,000	320	1,040	10·40	12·00	63,900	B
April	2,000	270	1,030	10·30	11·50	61,300	B
May	1,320	370	594	5·94	6·85	36,500	B
June	550	270	367	3·67	4·10	21,800	B
July	270	110	161	1·61	1·86	9,900	B
August	120	100	108	1·08	1·24	6,600	B
September	2,150	105	656	6·56	7·32	39,000	B
October	5,600	230	1,210	12·10	13·95	74,400	B
November	4,700	480	2,280	22·80	25·44	135,700	B
December	1,710	135	387	3·87	4·46	23,800	B
The year	8,350	100	818	8·18	110·96	591,600	B

Sumallo River (1056).

Location.—One mile from mouth and just south of the Railway Belt boundary.

Records Available.—Daily discharges beginning July, 1914.

Drainage Area.—Seventy square miles (above mouth).

Gauge.—Vertical Staff.

Channel.—Rocky.

Discharge Measurements.—Six meter measurements by the engineers of the British Columbia Hydrographic Survey and four by L. N. Jensen. One measurement under ice conditions.

Winter Flow.—Stream open all winter, but during very cold weather anchor ice may affect the ordinary relation between gauge height and discharge to some extent.

Co-operation.—Four meter measurements were made during 1913 and 1914 by L. N. Jenssen for MacKenzie & Mann.

Sumallo River.

The Sumallo river rises in the mountains south west of Hope, and flows in a general southeasterly direction to its junction with the Skagit river, some 15 miles north of the international boundary line, and 2 miles from the boundary

Installing metal-faced gauge at metering section on Sumallo river one mile from mouth.

of the Railway Belt. Some of the mountains in its watershed rise to an altitude of 5,000 feet. It has a drainage area of 70 square miles. The precipitation is probably more than 90 inches per annum. In the winter the snow fall is quite heavy.

The pack trail from Hope to Princeton follows the Sumallo river for a distance of 7 or 8 miles. It was proposed at one time to improve it into a wagon road, but the plan was never completely carried through, and of late years the trail has been merely kept in repair for pack horses. When the Pacific highway is completed, it will improve the means of transportation in this part of the country.

There is very little settlement or development in the Sumallo river valley. What little farming land there is is not worked to any great extent. There are some mining prospects, and just recently one mine, near the mouth of the river, has shipped a small quantity of ore. This may lead to some further development.

There is a proposal to divert water from the upper part of the Sumallo river into the lakes which feed the Nicolum river. This would augment the flow of the Nicolum sufficiently to make a power development practicable, but would divert a certain amount of water from the plants which expect to use water from the Skagit river on the American side of the boundary.

This diversion, however, might lead to the most beneficial use of the water, since it could be utilized under a head of something like two thousand feet.

In connection with the above-mentioned plan of development, two gauging stations have been established on the streams. One of these is near the mouth and measures the total flow of the stream. Daily gauge readings are taken at this station. Measurements are made also at a point some 7 miles above the lower station, but gauge readings can be taken only occasionally. The flow at this upper station gives approximately the amount of water which can be diverted into the Nicolum lake and is considerably less than the flow measured at the lower station.

DISCHARGE MEASUREMENTS of Sumallo River at one mile from mouth, 1913-14-15

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 19	L. N. Jenssen	.....	.....	76	2·3	1·00	175
Nov. 11	do	.....	.....	76	2·3	1·00	175
1914.							
June 11	do	.....	.....	130	3·8	2·40	502
July 12	C. G. Cline	1933	44	108	3·4	2·00	355
" 15	do	1933	44	100	3·1	1·72	299
" 18	L. N. Jenssen	.....	.....	90	3·1	1·50	279
Dec. 16	H. C. Hughes	.....	39	57	1·3	0·74	76[1]
1915.							
Mar. 11	Hughes & Cline	1521	30	41	1·3	0·22	54
" 15	do	1521	40	62	1·9	0·77	118
" 29	H. C. Hughes	1521	42	67	2·1	1·00	143

[1] Probably affected by ice.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Sumallo River near mouth, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·9	135	0·5	80	0·5	80	0·9	135	1·5	245
2			0·9	135	0·5	80	0·5	80	1·6	265	1·5	245
3			0·9	135	0·5	80	0·5	80	1·8	310	1·3	205
4			0·9	135	0·5	80	0·4	70	1·7	290	1·3	205
5			0·9	135	0·5	80	0·4	70	1·6	265	1·3	205
6			0·9	135	0·4	70	0·4	70	1·7	290	1·2	185
7			0·9	135	0·4	70	0·4	70	1·7	290	1·1	165
8			0·9	135	0·6	90	0·4	70	1·6	265	1·0	150
9			0·8	120	0·6	90	0·5	80	1·6	265	0·8	120
10			0·8	120	0·7	105	0·5	80	1·6	265	0·6	90
11			0·8	120	0·6	90	0·5	80	1·6	265	0·6	90
12	2·0	360	0·8	120	0·6	90	0·5	80	1·5	245	0·6	90
13			0·8	120	0·6	90	0·5	80	1·5	245	0·5	80
14			0·8	120	0·6	90	0·5	80	1·5	245	0·5	80
15	1·7	290	0·8	120	0·6	90	0·5	80	1·5	245	0·5	80
16	1·6	265	0·8	120	0·5	80	0·5	80	1·5	245	0·5	80
17	1·5	245	0·8	120	0·5	80	0·5	80	1·4	225	0·5	80
18	1·5	245	0·7	105	0·6	90	0·6	90	1·3	205	0·5	80
19	1·6	265	0·7	105	0·7	105	0·6	90	1·3	205	0·5	80
20	1·6	265	0·7	105	0·7	105	0·6	90	1·3	205	0·5	80
21	1·7	290	0·6	90	0·7	105	0·7	105	1·3	205	0·5	80
22	1·4	225	0·6	90	0·7	105	0·7	105	1·4	225	0·5	80
23	1·3	205	0·6	90	0·6	90	0·6	90	1·4	225	0·5	80
24	1·2	185	0·6	90	0·6	90	0·6	90	1·7	290	0·4	70
25	1·1	165	0·6	90	0·6	90	0·6	90	1·7	290	0·4	70
26	1·1	165	0·6	90	0·6	90	0·6	90	1·7	290	0·4	70
27	1·1	165	0·6	90	0·6	90	0·6	90	1·7	290	0·4	70
28	1·0	150	0·6	90	0·6	90	0·6	90	1·6	265	0·4	70
29	1·0	150	0·6	90	0·6	90	0·7	105	1·5	245	0·4	70
30	0·9	135	0·6	90	0·5	80	0·7	105	1·5	245	0·4	70
31	0·9	135	0·6	90			0·7	105			0·4	70

Monthly Discharge of Sumallo River near mouth, for 1914.

(Drainage area, 70 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet
August	135	90	112	1·7	2·0	6,890
September	105	70	88	1·3	1·4	5,240
October	105	70	85	1·2	1·4	5,230
November	310	135	251	3·6	4·0	14,900
December	245	70	111	1·6	1·8	6,820

Accuracy, "B".

Sumallo River (1057).

Location.—Eight miles from mouth in section 28, township 3, range 24, west of 6th meridian.

Records Available.—Irregular records beginning in July, 1914.

Gauge.—Vertical staff.

Channel.—Gravel.

Discharge Measurements.—Five meter measurements, one of them under ice conditions.

Winter Flow.—Station is somewhat affected by ice during very cold weather.

Discharge Measurements of Sumallo River eight miles from mouth, 1914–15

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 16	C. G. Cline	1933	40	73	2·4	1·80	167[1]
Dec. 16	H. C. Hughes	1521	27	15	2·9	1·00	44[2]
1915.							
Mar. 15	Hughes & Cline	1521	36	43	1·3	1·05	59
" 30	H. C. Hughes	1521	37	50	1·6	1·25	80

[1] Station established. [2] Probably affected by ice.

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Sumallo River eight miles from mouth, for 1914.

DAY	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1												
2												
3							1·2	80				
4							1·0	50			1·5	120
5												
6											1·4	105
7												
8							1·2	80				
9												
10												
11												
12			1·3	90								
13											1·3	90
14					1·1	65						
15												
16	1·8	165										
17			1·2	80								
18									1·4	105		
19							1·3	90				
20									1·55	130		
21							1·2	80	1·6	135		
22												
23												
24									1·9	135		
25												
26												
27												
28												
29					1·0	50						
30												
31			1·1	65								

YOUNG CREEK (1020).

Location.—At mouth, in section 10, township 7, range 7, west of 7th meridian.

Records Available.—Continuous since October 20, 1912, but gauge readings were not always taken very frequently.

Drainage Area.—Not known.

Gauge.—Vertical staff.

Channel.—Solid rock.

Discharge Measurements.—Eight meter measurements taken during 1913 and 1914.

Winter Flow.—Heavy snowfall but not much ice, so that open water conditions obtain practically all winter.

Accuracy.—C and D.

Co-operation.—Gauge readings taken by Westminster Power Company.

Discharge Measurements of Young Creek at mouth, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
June 3	H. C. Hughes	1,673	18	21·8	2·5	1·80	53·6[1]
" 10	"	1,673	14	15·4	2·0	1·50	30·0
" 18	"	1,673	13	16·4	2·3	1·65	37·0
July 31	"	1,673	11	7·7	0·8	1·03	6·2
Sept. 18	F. MacLachlan	1,673	10	10·8	0·8	1·01	8·6
1914.							
May 18	F. MacLachlan	1,521	15	15·4	2·0	1·48	29·0
July 31	C. G. Cline	1,933	8			0·92	4·3
Nov. 14	H. C. Hughes	1,933	12	10·9	1·0	1·18	10·9

[1]Several different sections used.

Daily Gauge Height and Discharge of Young Creek at mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·85	4						28		24
2										28		22
3										28		20
4										28	1·35	19
5	1·8	53			1·2	13				28		14
6							1·6	35	1·5	28	1·1	10
7										28		12
8										28		14
9										28		16
10										28		18
11										28	1·35	19
12										28		20
13										28	1·4	22
14										28		22
15										28		22
16										28		22
17										28	1·4	22
18									1·5	28		20
19			1·2	13	1·6	35				30	1·35	19
20										35	1·3	17
21										40		17
22							1·4	22	1·7	44		17
23										42		17
24										40		17
25										38		17
26										38		17
27										36		17
28										34		17
29										32		17
30							1·5	28	1·5	30		17
31					1·2	13				28		17
										26		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Young Creek at mouth, for 1914 —*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		17		6	0·68	2		15		100	1·25	15
2	1·3	17		5		2		15	2·60	130		15
3		16	0·9	5		3	1·2	13		120		15
4		15		5		4		13		110		10
5		14		5		5		12		100	1·10	10
6		13		5		6		12		90		9
7		11		4		7		11	2·10	82		8
8	1·1	10		4	1·00	7		11		70	1·00	7
9		10		4	1·00	7		10		60		7
10	1·1	10	0·8	3·5		10	1·10	10		40	1·00	7
11		10		3·5		10		10	1·50	28		7
12		9		3·5		15		10		25		6
13	1·05	8		3·5		15		20		20		6
14		8	0·8	3·5		20		30	1·20	13	0·95	6
15		9	0·8	3·5		20		40		11		6
16	1·1	10		3·5		60		60	1·10	10		6
17		10		3·5		80		100		20		6
18	1·1	10	0·8	3·5	2·4	110	3·0	170		40	0·95	6
19		9		3·5		80		150		50		6
20	1·05	8	0·8	3·5	1·7	44		100		60		5
21		8		3·5		40		70	2·00	73	0·90	5
22		8	0·8	3·5		40		50		80		5
23		7		3·5		35		15	2·10	82	0·85	4
24	1·0	7		3		35		13		60		4
25		8	0·75	3		30		10		50		4
26		9		3		30		10	1·55	30		5
27	1·08	10	0·73	3		25		10		40		5
28		9		3	1·45	25	1·05	8	1·80	53	0·90	5
29		8	0·72	3		20		20		40		10
30	0·95	7		3		20		40		30	1·30	17
31	0·93	6		3				60				20

Monthly Discharge of Young Creek at mouth, for 1914.

Month.	Discharge in Second-Feet			Accuracy.
	Maximum.	Minimum.	Mean.	
May			31	D
June	24	10	18	D
July	17	6	10	C
August	6	3	3·7	C
September	110	2	27	D
October	170	10	36	D
November	130	10	57	D
December	20	4	8	D

Big Qualicum River (1032).

Location.—One thousand feet upstream from Esquimalt and Nanaimo Railway bridge; 40 miles from Nanaimo.

Records Available.—Gauge readings daily, May 21, 1914, to December 31, 1914.

Drainage Area.—Sixty-two square miles.

Gauge.—Eighteen-foot wooden staff, located on left bank about one hundred feet above Esquimalt and Nanaimo Railway bridge.

Channel.—Gravel bed, very even, straight run for 500 feet on both sides of section.

Discharge Measurements.—One in 1913 by Provincial Water Rights Branch; four in 1914, covering all but high stages.

Winter Flow.—Open all winter.

Accuracy.—Between discharge of 30 and 300 cu. feet per second, accuracy B. Above discharge of 300 cubic feet, per second, accuracy C.

Co-operation.—Gauge installed in 1913 by Provincial Water Rights Branch.

Big Qualicum River (1032).

The Big Qualicum river rises in Horne lake at an elevation of 380 feet, and is about 6 miles in length. It flows in an easterly direction, with a fairly even fall, to its mouth in the strait of Georgia, about 40 miles north from Nanaimo. The drainage area, which covers 62 square miles, is thickly wooded, although some timber has been taken off. The stream is metered about one mile and a half from its mouth. The precipitation varies from 40 to 50 inches. Horne lake covers an area of about 4 square miles, affording good storage possibilities.

For a power development, considerable water would have to be stored in the lake, due to the low flow during the summer months. A long pipeline would be the only possible development on this stream for a fair sized plant.

The Esquimalt and Nanaimo railway and the Island highway both cross the stream near its mouth, and quite a few settlers have recently come into the district.

Discharge Measurements of Big Qualicum River 1½ miles from mouth, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
May 21	Cotton & Webb	1,057	46	105·0	1·33	2·20	140[1]
July 9	" "	1,057	44	51·3	1·39	1·80	71·3
Aug. 30	C. E. Webb	1,057	38	37·5	0·72	1·45	26·9
Dec. 10	"	1,933	61	92·9	2·87	2·60	267

[1]Station established. Cable carrier installed at new section.

Monthly Discharge of Big Qualicum River near mouth, for 1914.

(Drainage area, 62 square miles.)

Month.	Discharge in Second-feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	140	100	114	1·81	2·05	6,780	B
July	100	40	59	0·95	1·10	3,630	B
August	40	30	31	0·56	0·58	1,910	B
September	120	30	55	0·89	0·99	3,270	B
October	1,660	80	572	9·22	10·63	35,200	C
November	1,310	420	730	11·77	13·14	43,400	C
December	690	100	229	3·70	4·27	14,100	C

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Big Qualicum River near mouth, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·1	120	2·0	100	1·6	40	1·5	30	2·1	120
2			2·1	120	2·0	100	1·6	40	1·5	30	2·1	120
3			2·1	120	2·0	100	1·6	40	1·5	30	2·1	120
4			2·2	140	1·9	80	1·6	40	1·5	30	2·1	120
5			2·1	120	1·9	80	1·5	30	1·5	30	2·1	120
6			2·1	120	1·9	80	1·5	30	1·5	30	2·1	120
7			2·2	140	1·8	65	1·5	30	1·5	30	2·0	100
8			2·2	140	1·8	65	1·5	30	1·5	30	2·0	100
9			2·2	140	1·8	65	1·5	30	1·5	30	1·9	80
10			2·1	120	1·8	65	1·5	30	1·5	30	1·9	80
11			2·1	120	1·8	65	1·5	30	1·5	30	1·9	80
12			2·1	120	1·8	65	1·5	30	1·5	30	2·3	170
13			2·1	120	1·8	65	1·5	30	1·5	30	5·2	1,660
14			2·1	120	1·8	65	1·5	30	1·5	30	4·6	1,240
15			2·1	120	1·8	65	1·5	30	1·5	30	4·0	890
16			2·1	120	1·7	50	1·5	30	1·6	40	4·3	1,060
17			2·1	120	1·7	50	1·5	30	1·6	40	4·8	1,380
18			2·0	100	1·7	50	1·5	30	1·6	40	4·8	1,380
19			2·0	100	1·7	50	1·5	30	1·9	80	4·8	1,380
20			2·0	100	1·7	50	1·5	30	1·9	80	4·8	1,380
21	2·4	200	2·0	100	1·7	50	1·5	30	1·9	80	4·4	1,120
22	2·3	170	2·0	100	1·6	40	1·5	30	1·9	80	3·9	840
23	2·2	140	2·0	100	1·6	40	1·5	30	1·9	80	3·6	690
24	2·2	140	2·0	100	1·6	40	1·5	30	1·9	80	3·5	640
25	2·2	140	2·0	100	1·6	40	1·5	30	1·9	80	3·2	500
26	2·2	140	2·0	100	1·6	40	1·5	30	1·9	80	3·1	460
27	2·3	170	2·0	100	1·6	40	1·5	30	2·0	100	3·0	420
28	2·2	140	2·0	100	1·6	40	1·5	30	2·0	100	2·8	340
29	2·2	140	2·0	100	1·6	40	1·5	30	2·1	120	2·7	300
30	2·2	140	2·0	100	1·6	40	1·5	30	2·1	120	2·7	300
31	2·1	120			1·6	40	1·5	30			3·0	420

Daily Gauge Height and Discharge of Big Qualicum River near mouth, for 1914—*Con.*

Day.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·3	540	3·6	690
2	3·7	740	3·4	590
3	3·9	840	3·1	460
4	4·2	1,000	3·0	420
5	4·0	890	2·8	340
6	3·7	740	2·7	300
7	3·7	740	2·7	300
8	3·7	740	2·6	260
9	3·8	790	2·6	260
10	3·8	790	2·6	260
11	3·8	790	2·5	230
12	3·7	740	2·5	230
13	3·7	740	2·4	200
14	3·3	540	2·4	200
15	3·1	460	2·4	200
16	3·0	420	2·3	170
17	3·0	420	2·3	170
18	3·0	420	2·3	170
19	3·0	420	2·3	170
20	3·1	460	2·3	170
21	3·1	460	2·2	140
22	3·7	740	2·2	140
23	3·9	840	2·1	120
24	3·9	840	2·1	120
25	4·7	1,310	2·0	100
26	4·5	1,180	2·0	100
27	4·1	940	2·0	100
28	4·0	890	2·1	120
29	3·8	790	2·1	120
30	3·6	690	2·1	120
31	.....	.....	2·1	120

Campbell River, Vancouver Island (1042).

Location.—At outlet from Campbell lake.

Records Available.—Gauge readings twice daily; June 2—December 31, 1914; Campbell River Power Company have also done work during 1913 and 1914.

Drainage Area.—Seven hundred and eighty square miles.

Gauge.—Twelve-foot enamel staff—in sections located 1,000 feet above measuring section.

Channel.—Gravel and boulder bed; channel straight for 300 feet above section; rapids 100 feet below.

Discharge Measurements.—Four in 1914 covering all stages.

Winter Flow.—Open all winter.

Accuracy.—Between discharge of 1,000 and 12,000 cubic feet per second accuracy B. above discharge 12,000 cubic feet per second, accuracy D.

Campbell River (1042).

Campbell river flows from Campbell lake to the sea in Discovery passage, a distance of about 9 miles. It is the outlet of a chain of lakes which extend from the interior of the island amongst a large group of mountains. Buttles

lake at the upper end drains into Upper Campbell lake, which in turn drains into Campbell lake. The stream is metered at the outlet from Campbell lake, and the drainage area above the metering section is some 780 square miles. The precipitation is high, varying from 80 inches at mouth of river to 130 inches at headwaters. Due to the presence of snow and ice on the mountains, the flow in summer is kept up much better than the streams in the southern parts of the island. The altitude of Campbell lake is about 500 feet.

The river is fast, and the fall fairly even for about 2 miles from Campbell lake. The river then narrows in and falls about 20 feet. With rapids for a quarter of a mile below, it drops another 30 feet, and finally has a sheer fall of 90 feet over a solid rock cliff into a deep, narrow canyon. This makes a good location for a power development. A head of 140 feet may be obtained in less than half a mile.

Another development, which would greatly increase the head, would be a tunnel from McIvor lake to a point below the falls, a distance of approximately 2 miles. McIvor lake is about one-quarter of a mile below Campbell lake, and is practically a bay on the river. It is well situated for the storage of water but the grade of the government road, which runs along one side of this lake, would have to be raised.

The Government at present are constructing a road from the mouth of Campbell river to Strathcona park, which, when completed, will be one of the finest in the country.

The timber which lies in the drainage is excellent and practically none has been cut. There are few settlers at present except at the mouth where some very fine land is under cultivation.

The Campbell River Power Company hold water records on Campbell river, and it is believed they will develope power at the falls in the near future.

DISCHARGE MEASUREMENTS of Campbell River at Campbell Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 2	Cotton & Webb	1,057	180	1,170	4·1	2·95	4,750[1]
July 20	C. P. Cotton	1,057	210	1,250	3·8	3·13	4,710
Sept. 6	C. E. Webb	1,057	95	362	2·7	0·32	977
Nov. 13	"	1,057	240	2,000	6·1	6·58	12,200[2]

[1]Station established. [2]Partly estimated.

MONTHLY DISCHARGE of Campbell River at Campbell Lake, for 1914.

Drainage area 780 square miles.

Month.	Discharge in Second-feet.				Run-Off		Accuracy.
	Maximum	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet	
June	9,900	3,990	5,410	6·94	7·74	322,000	B
July	6,600	2,440	4,700	6·03	6·95	289,000	B
August	2,370	1,300	1,980	2·54	2·93	122,000	B
September	2,820	890	1,550	1·99	2·22	92,200	B
October	21,700	1,160	7,820	10·00	11·50	480,000	D
November	17,600	4,440	10,330	13·25	14·70	615,000	D
December	9,540	860	2,690	3·45	4·00	165,000	B

Daily Gauge Height and Discharge of Campbell River at Campbell Lake, for 1914.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	4,500	3·4	5,330	1·42	2,300	0·58	1,250	1·35	2,200	4·6	7,710
2	2·95	4,570	3·65	5,800	1·4	2,270	0·5	1,160	1·37	2,230	5·07	8,710
3	3·2	4,990	3·85	6,200	1·4	2,270	0·45	1,100	1·27	2,100	5·33	9,280
4	3·45	5,420	4·05	6,600	1·4	2,270	0·43	1,080	1·1	1,880	5·67	10,000
5	3·35	5,250	4·08	6,660	1·4	2,270	0·4	1,050	0·98	1,730	5·65	9·980
6	3·15	4,900	4·02	6,540	1·4	2,270	0·35	990	0·87	1,600	5·33	9·280
7	2·9	4,490	3·82	6,140	1·42	2,300	0·30	940	0·8	1,510	4·8	8,130
8	2·75	4,250	3·58	5,660	1·48	2,370	0·30	940	0·75	1,450	4·75	8,020
9	2·63	4,060	3·35	5,250	1·4	2,270	0·30	940	0·62	1,290	7·15	13,800
10	2·58	3,990	3·2	4,990	1·4	2,270	0·25	890	0·52	1,180	8·57	17,600
11	2·58	3,990	3·13	4,870	1·48	2,370	0·25	890	0·5	1,160	8·55	17,600
12	2·68	4,150	3·08	4,790	1·45	2,340	0·25	890	0·6	1,270	7·62	15,000
13	2·92	4,520	3·08	4,790	1·4	2,270	0·25	890	2·25	3,480	6·83	13,000
14	3·2	4,990	3·22	5,030	1·4	2,270	0·25	890	5·5	9,650	4·82	8,170
15	3·68	5,860	3·25	5,070	1·4	2,270	0·25	890	6·98	13,300	4·37	7,240
16	4·1	6,700	3·23	5,050	1·4	2,270	0·3	940	9·17	19,000	4·07	6,640
17	4·52	7,540	3·2	4,990	1·33	2,180	0·4	1,050	9·77	21,000	3·45	5,420
18	4·72	7,960	3·13	4,870	1·23	2,050	0·7	1,390	10·02	21,700	3·0	4,650
19	4·72	7,960	3·13	4,870	1·13	1,910	1·08	1,850	9·62	20,600	2·87	4,440
20	4·57	7,650	3·12	4,850	1·08	1,850	1·4	2,270	8·93	18,700	3·1	4,820
21	4·3	7,100	3·05	4,740	1·0	1,750	1·62	2,570	8·35	17,000	3·47	5,450
22	3·92	6,340	2·85	4,410	0·95	1,690	1·8	2,820	7·4	14,400	4·22	6,940
23	3·58	5,660	2·62	4,040	0·93	1,660	1·8	2,820	6·5	12,100	5·07	8,700
24	3·15	4,900	2·35	3,620	0·9	1,630	1·73	2,720	5·6	9,870	5·9	10,600
25	3·17	4,930	2·23	3,450	0·85	1,570	1·53	2,440	5·05	8,660	7·05	13,500
26	3·22	5,030	2·12	3,280	0·83	1,540	1·37	2,230	4·45	7,400	8·32	17,000
27	3·30	5,160	2·02	3,130	0·8	1,510	1·3	2,140	3·65	5,800	8·37	17,100
28	3·30	5,160	1·93	3,000	0·75	1,450	1·25	2,080	3·38	5,300	7·92	15,900
29	3·25	5,080	1·78	2,790	0·72	1,420	1·3	2,140	2·9	4,490	7·12	13,700
30	3·28	5,130	1·65	2,610	0·7	1,390	1·35	2,200	2·82	4,360	6·22	11,400
31	.....	.....	1·53	2,440	0·63	1,300	.....	.....	3·6	5,700	.....	.....

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Campbell River at Campbell Lake, for 1914—*Con.*

Day.	December.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	5·45	9,540
2	4·82	8,170
3	4·35	7,200
4	3·87	6,240
5	3·15	4,910
6	2·75	4,250
7	2·55	3,930
8	2·35	3,620
9	2·17	3,350
10	1·95	3,030
11	1·7	2,680
12	1·5	2,400
13	1·22	2,040
14	1·3	2,140
15	1·0	1,750
16	0·9	1,630
17	0·82	1,530
18	0·73	1,430
19	0·62	1,290
20	0·55	1,210
21	0·5	1,160
22	0·45	1,110
23	0·4	1,050
24	0·4	1,050
25	0·35	1,000
26	0·35	1,000
27	0·35	1,000
28	0·3	940
29	0·22	860
30	0·27	910
31	0·37	1,010

CHEMAINUS RIVER (1027).

Location.—Upstream side of Esquimalt and Nanaimo Railway bridge, except for low water stage.

Records Available.—Gauge readings daily, May 13 to December 31, 1914.

Drainage Area.—One hundred and twenty square miles.

Gauge.—Eighteen-foot wooden staff located on left bank 100 feet below railway bridge.

Channel.—Straight for 50 feet above and 300 feet below section; gravel and sand bed.

Discharge Measurements.—Six in 1914 covering all but high stage; one in 1911 and one in 1913 by Provincial Water Rights Branch.

Winter Flow.—Open all winter.

Accuracy.—Between discharge of 10 and 600 cubic feet per second, accuracy A. Between discharge of 600 and 2,000 cubic feet per second, accuracy B. Above discharge of 2,000 cubic feet per second accuracy C.

Co-operation.—Provincial Water Rights Branch installed gauge in 1911.

Chemainus River (1027).

Chemainus river rises in the mountains to the north of Cowichan lake, at an altitude of between four and five thousand feet. It is approximately 30 miles in length, and flows in an easterly direction to its mouth at the sea in Stuart channel.

The drainage area is 120 square miles. The precipitation varies from about 30 inches at mouth to 20 inches in the mountains at source. There are no lakes to control the flow of Chemainus river. The upper reaches of the drainage area are mostly solid rock, hence the stream is very flashy. This is specially noticeable in the fall when warm rains often cause the river to rise several feet in a few hours. The flow data on this stream is of particular importance in the construction of bridges to span it. The stream, being flashy, has a very low flow during most of the summer months.

In the vicinity of the lower part of Chemainus river, the soil is very rich and is practically all under cultivation. This district is especially noted for its dairy products.

Discharge Measurements of Chemainus River at E. & N. Ry. Bridge, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 13	C. E. Webb	1,057	107	530	1·1	3·79	555[1]
July 6	Cotton and Webb	1,057	94	402	0·2	2·58	93·6[2]
July 6	"	1,057	41	37	2·4	2·58	88·3[3]
Aug. 11	C. P. Cotton	1,057	30	19	1·4	2·16	26·2
Aug. 28	C. E. Webb	1,057	31	16	1·0	2·03	16·3
Nov. 26	"	1,933	122	711	2·7	5·20	1,890

[1]Station established. [2]Several sections used. [3]Good measurement.

Monthly Discharge of Chemainus River near mouth, for 1914.

(Drainage area, 120 square miles.)

Month.	Discharge in Second-feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	340	140	200	1·67	1·86	11,900	A
July	140	35	75	0·62	0·72	4,600	A
August	35	15	25	0·21	0·24	1,500	A
September	460	14	110	0·92	1·03	6,500	A
October	5,850	120	1,320	11·00	12·68	81,200	C
November	4,560	520	2,200	18·33	20·45	131,000	C
December	1,760	190	435	3·62	4·17	26,700	B

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Chemainus River near mouth, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3·2	260	2·78	140	2·25	35	2·05	15	3·00	190
2			3·26	280	2·75	130	2·24	34	2·05	15	3·38	330
3			3·1	220	2·72	120	2·22	32	2·04	14	3·2	290
4			3·1	220	2·69	120	2·20	30	2·04	14	3·1	220
5			2·93	170	2·66	110	2·2	30	2·04	14	2·9	160
6			2·99	190	2·6	100	2·2	30	2·04	14	2·88	160
7			3·2	260	2·6	100	2·2	30	2·08	18	2·83	150
8			3·36	320	2·58	100	2·2	20	2·16	26	2·7	120
9			3·3	300	2·55	90	2·2	30	2·28	38		140
10			3·4	340	2·55	90	2·19	29	2·23	33	2·9	160
11			3·25	280	2·53	90	2·19	29	2·24	34	2·86	150
12			3·25	280	2·5	80	2·18	28	2·23	33	4·35	940
13	3·77	520	3·2	260	2·5	80	2·18	28	2·24	34	7·65	5,050
14	3·82	550	3·13	230	2·51	80	2·17	27	2·25	35	5·55	2,320
15	3·8	540	2·9	160	2·5	80	2·17	27	2·28	38	4·75	1,340
16	3·62	440	2·8	140	2·5	90	2·16	26	2·27	37	5·47	2,200
17	3·48	370	2·9	160	2·44	70	2·16	26	2·29	39	7·17	4,330
18	3·46	360	2·85	150	2·43	70	2·15	25	3·66	460	7·99	5,510
19	3·41	340	2·82	140		70	2·13	23	3·33	310	8·25	5,850
20	3·45	360	2·84	150	2·41	60	2·13	23	3·3	300	6·25	3,220
21	3·52	390	2·9	160	2·4	60	2·12	22	3·05	205	5·23	1,920
22	3·57	410	2·85	150	2·38	60	2·1	20	2·93	170	4·62	1,200
23	3·57	400	2·87	150	2·35	50	2·1	20	2·8	140	4·3	900
24	3·5	380	2·85	150	2·34	50	2·1	20	2·72	124	4·1	740
25	3·4	340	3·0	190	2·34	50	2·09	19	2·63	110	3·83	560
26	3·45	360		180	2·33	50	2·08	18	2·65	100	3·6	430
27	3·45	360	2·9	160	2·32	40	2·08	18	2·9	160	3·49	380
28	3·35	320	2·87	150	2·3	40	2·07	17	3·25	280	3·38	330
29	3·15	240	2·8	140	2·3	40	2·06	16	3·12	230	3·3	300
30	3·1	220	2·79	140	2·28	40	2·05	15	3·03	200	3·6	430
31	3·15	240			2·26	35	2·05	15			4·49	1,070

DAILY GAUGE HEIGHT AND DISCHARGE of Chemainus River near mouth, for 1914 —*Con.*

DAY.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	7·28	4,560	5·10	1,760
2	6·95	4,130	4·76	1,360
3	.....	4,060	4·54	1,120
4	6·80	3,940	4·33	920
5	5·4	2,120	4·1	740
6	5·1	1,760	3·94	620
7	5·9	2,760	3·8	540
8	5·65	2,450	3·76	520
9	5·45	2,190	3·72	490
10	5·0	1,640	.....	440
11	5·82	2,660	3·5	380
12	5·0	1,640	3·44	360
13	4·8	1,400	3·4	340
14	4·55	1,130	3·33	310
15	4·3	900	3·28	290
16	4·03	680	3·18	250
17	3·8	540	3·1	220
18	3·76	520	3·0	190
19	4·08	720	3·0	190
20	6·1	3,020	3·0	190
21	5·6	2,380	3·0	190
22	5·2	1,880	3·0	190
23	6·8	3,940	3·0	190
24	7·06	4,270	3·0	190
25	5·98	2,880	3·0	190
26	5·3	2,000	3·0	190
27	5·07	1,720	3·0	190
28	4·85	1,460	3·0	190
29	4·64	1,220	3·0	190
30	4·7	1,280	3·05	200
31	.....	.....	3·42	350

COWICHAN RIVER (1054).

Location.—Near outlet from Cowichan lake, 1,000 feet below Canadian Northern Pacific Railway bridge.

Records Available.—Gauge readings twice daily, January 31, 1913, to December 31, 1913, Provincial Water Rights Branch; January 1, 1914, to December 31, 1914.

Drainage Area.—Two hundred and thirty-five square miles.

Gauge.—Twelve-foot wooden staff, nailed to sixth bent on left down stream side of highway bridge.

Channel.—Gravel and small boulder bed, channel straight 300 feet above and 100 feet below section, one channel at all stages.

Discharge Measurements.—Four in 1914, covering all but highest stage; five in 1913, by Provincial Water Rights Branch.

Winter Flow.—Open all winter.

Accuracy.—Between discharge of 40 and 1,200 cubic feet per second, accuracy A. Above discharge of 1,200 cubic feet per second, accuracy B.

Co-operation.—Provincial Water Rights Branch established station in 1913.

Cowichan River (1054).

Cowichan river rises in Cowichan lake at an altitude of 550 feet. It flows in an easterly direction for 20 miles to the sea in Cowichan bay. The drainage area of Cowichan river is 235 square miles above the metering section, which is located near the outlet from lake. Cowichan lake covers an area of 24 square miles, and is fed by many mountain streams. The precipitation is between 60 and 80 inches.

There are falls on this stream about 10 miles from its mouth from which a fair sized development might be obtained, but in 1914 the river was reserved by the Provincial Government for the preservation of the fish. Near Cowichan lake the Government has a fish hatchery which has been most successful in stocking the river with trout.

The timber in this drainage is exceptionally fine.

The Esquimalt and Nanaimo Railway have a branch line to Cowichan lake from Duncan and the Canadian Northern railway is under construction around the lake. Timber at present is towed by tugs to the railway from different parts of the lake.

Discharge Measurements of Cowichan River near Cowichan Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.				
June 24	Cotton & Webb	1057	183	824	0·8	2·08	667[1]
Aug. 26	C. E. Webb	1057	176	533	0·2	0·70	117
Aug. 27	do	1057	84	104	1·1	0·72	113[2]
Nov. 25	do	1933	198	1,670	2·6	6·20	4,300

[1]Station established.
[2]Low-water section.

Monthly Discharge of Cowichan River at Cowichan lake, for 1914.

(Drainage area, 235 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	10,000	2,150	5,700	24·20	27·90	350,000	B
February	3,680	1,540	2,130	9·06	9·43	118,000	B
March	4,160	2,330	3,400	14·50	16·70	210,000	B
April	3,270	2,150	2,630	11·20	12·50	157,000	B
May	2,060	900	1,390	5·92	6·83	85,500	B
June	900	600	755	3·21	3·58	44,900	A
July	600	240	415	1·77	2·04	25,500	A
August	240	70	150	0·64	0·74	9,220	A
September	400	50	175	0·74	0·83	10,400	A
October	7,170	400	2,900	12·30	14·20	178,000	B
November	6,300	3,800	4,900	20·85	23·30	292,000	B
December	4,160	1,080	2,230	9·50	10·95	137,000	B
The year	10,000	50	2,230	9·50	129·00	1,617,520	B

Daily Gauge Height and Discharge of Cowichan River at Cowichan lake for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·2	2,150	5·7	3,680	5·45	3,380	4·3	2,240	4·1	2,060	2·5	900
2	4·7	2,600	5·4	3,330	5·85	3,860	4·2	2,150	4·05	2,020	2·5	900
3	5·1	3,000	5·15	3,050	6·05	4,100	4·2	2,150	4·0	1,980	2·45	870
4	6·2	4,290	4·85	2,750	6·1	4,160	4·4	2,330	3·9	1,900	2·45	870
5	7·5	6,080	4·7	2,600	6·0	4,040	4·6	2,510	3·8	1,820	2·4	840
6	9·8	9,600	4·55	2,460	5·85	3,860	4·65	2,960	3·7	1,740	2·35	810
7	10·0	10,000	4·4	2,330	5·7	3,680	4·6	2,510	3·6	1,660	2·45	870
8	9·7	9,500	4·3	2,240	5·6	3,560	4·55	2,460	.....	1,660	2·45	870
9	9·5	9,100	4·15	2,100	5·4	3,330	4·5	2,420	.....	1,550	2·45	870
10	9·2	8,700	3·95	1,940	5·2	3,110	4·45	2,370	3·45	1,530	2·4	840
11	9·0	8,400	3·8	1,820	5·1	3,000	4·4	2,330	3·4	1,500	2·35	810
12	8·7	7,950	3·75	1,780	5·0	2,900	4·35	2,280	3·3	1,430	2·35	810
13	8·4	7,480	3·7	1,740	5·2	3,110	4·45	2,370	3·25	1,400	2·3	780
14	8·1	7,000	3·75	1,780	5·75	3,740	4·75	2,650	3·2	1,360	2·3	780
15	8·0	6,860	3·7	1,740	5·85	3,860	5·0	2,900	3·6	1,660	2·3	780
16	7·7	6,380	3·65	1,700	5·95	3,980	5·2	3,110	3·5	1,580	2·25	750
17	7·45	6,000	3·6	1,660	5·9	3,920	5·2	3,110	3·05	1,250	2·25	750
18	7·2	5,640	3·55	1,620	5·85	3,860	5·25	3,160	3·0	1,220	2·2	720
19	7·05	5,430	3·5	1,580	5·75	3,740	5·35	3,270	2·9	1,150	2·15	700
20	6·9	5,220	3·45	1,540	5·7	3,680	5·4	3,330	2·85	1,120	2·1	670
21	6·6	4,810	3·6	1,660	5·65	3,620	5·3	3,220	2·8	1,080	2·15	700
22	6·3	4,420	3·6	1,660	5·55	3,500	5·2	3,110	3·15	1,320	2·1	670
23	6·15	4,230	3·75	1,780	5·45	3,380	5·0	2,900	3·1	1,290	2·1	670
24	5·8	3,800	3·9	1,900	5·35	3,270	4·9	2,800	2·65	990	2·1	670
25	5·7	3,680	4·05	2,020	5·15	3,050	4·8	2,700	2·7	1,020	2·05	650
26	5·9	3,920	4·1	2,060	5·0	2,900	4·6	2,510	2·7	1,020	2·05	650
27	6·0	4,040	4·6	2,510	4·85	2,750	4·55	2,460	2·7	1,020	2·05	650
28	5·8	3,800	4·8	2,700	4·7	2,600	4·4	2,330	2·65	990	2·0	620
29	5·85	3,860	.....	.....	4·6	2,510	4·3	2,240	2·6	960	2·0	620
30	6·35	4,485	.....	.....	4·5	2,420	4·2	2,150	2·55	930	1·95	600
31	6·1	4,160	.....	.....	4·4	2,330	.....	.....	2·5	900	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Cowichan River at Cowichan lake, for 1914—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·95	600	1·1	240	0·60	60	1·5	400	6·2	4,290	6·1	4,160
2	1·95	600	1·05	220	0·60	60	1·6	440	6·8	5,080	5·9	3,920
3	1·9	570	1·05	220	0·60	60	1·6	440	7·2	5,640	5·7	3,650
4	1·9	570	1·0	200	0·60	60	1·6	440	7·65	6,300	5·5	3,440
5	1·83	530	1·0	200	0·60	60	1·6	440	7·65	6,300	5·3	3,220
6	1·8	520	1·0	200	0·55	50	1·6	440	7·5	6,080	5·3	3,220
7	1·8	520	1·0	200	0·55	50	1·6	440	7·4	5,930	5·2	3,110
8	1·75	500	1·0	200	0·6	60	1·6	440	7·35	5,850	5·0	2,900
9	1·75	500	1·0	200	0·6	60	1·6	440	7·45	6,000	4·9	2,800
10	1·7	480	0·98	190	0·6	60	1·6	440	7·4	5,930	4·8	2,700
11	1·67	470	0·95	180	0·6	60	1·6	440	7·4	5,930	4·7	2,600
12	1·65	460	0·95	180	0·6	60	1·75	500	7·4	5,930	4·7	2,600
13	1·6	440	0·9	160	0·6	60	3·60	1,660	7·05	5,430	4·6	2,500
14	1·6	440	0·9	160	0·6	60	4·3	2,240	6·8	5,080	4·5	2,420
15	1·55	420	0·9	160	0·62	65	4·65	2,560	6·5	4,680	4·3	2,240
16	1·5	400	0·9	160	0·8	120	4·9	2,800	6·25	4,350	4·1	2,060
17	1·5	400	0·85	140	1·0	200	5·7	3,680	6·2	4,290	4·0	1,980
18	1·45	380	0·85	140	1·10	240	6·6	4,800	6·0	4,040	3·9	1,900
19	1·45	380	0·85	140	1·2	280	7·65	6,300	5·8	3,800	3·8	1,820
20	1·4	360	0·85	140	1·3	320	8·2	7,170	6·0	4,040	3·6	1,660
21	1·4	360	0·8	120	1·25	300	8·05	6,940	6·0	4,040	3·5	1,580
22	1·35	340	0·8	120	1·2	280	7·85	6,620	6·1	4,160	3·4	1,500
23	1·35	340	0·8	120	1·2	280	7·4	5,930	6·1	4,160	3·3	1,430
24	1·3	320	0·75	100	1·2	280	7·3	5,780	6·0	4,040	3·3	1,430
25	1·3	320	0·75	100	1·2	280	6·8	5,080	6·2	4,290	3·2	1,360
26	1·25	300	0·7	80	1·2	280	6·15	4,220	6·2	4,290	3·1	1,290
27	1·25	300	0·7	80	1·3	320	5·85	3,860	6·2	4,290	3·0	1,220
28	1·2	280	0·7	80	1·4	360	5·7	3,680	6·2	4,290	2·9	1,150
29	1·15	260	0·65	70	1·5	400	5·6	3,560	6·2	4,290	2·8	1,080
30	1·15	260	0·65	70	1·5	400	5·7	3,680	6·2	4,290	2·9	1,150
31	1·1	240	0·65	70	...	...	5·95	3,980	...	...	2·8	1,080

ENGLISHMAN RIVER (1030).

Location.—One-half mile from mouth ; 1,000 feet upstream from Island Highway bridge; 2 miles from Parksville.

Records available.—Gauge readings daily; February 15, 1913, to December 31, 1913, Provincial Water Rights Branch; May 19, 1914, to September 21, 1914; December 9, 1914, to December 31, 1914.

Drainage area.—One hundred and eleven square miles.

Gauge.—Twelve feet of enamel staff, in two 6 foot lengths, located on right bank, 100 feet upstream from measuring section.

Channel.—Even gravel bed, channel straight for 500 feet above and below section, one channel at all stages.

Discharge measurements.—Five in 1914, covering low and medium stages; four in 1913, Provincial Water Rights Branch.

Winter flow.—Open all winter.

Accuracy.—Between discharge of 20 and 400 cubic feet per second, accuracy B. Above discharge of 400 cubic feet per second, accuracy C.

Co-operation.—Provincial Water Rights Branch established station in 1913.

Englishman River (1030).

Englishman river is approximately 20 miles in length. It rises in the mountains at an elevation of some 5,000 feet, and flows in an easterly direction to its mouth in the straits of Georgia near the town of Parksville. The precipitation varies from about 30 inches at mouth to 60 inches in mountains. Having no natural storage, this stream is very flashy. During the summer months the flow is generally small. If artificial storage could be obtained at a reasonable expense, a small development might be made at falls.

The Giant Powder Co., which is located at Powder point, a short distance from the mouth of Englishman river, made surveys in 1912 and 1913 in view of developing power for their works, but gave up the project.

The Esquimalt and Nanaimo railway and the Government highway both cross this stream near its mouth. The district has many settlers, several of whom obtain their domestic supply from the river. The town of Parksville is on the Government highway about 2 miles distant.

The gauging station on Englishman river is located about one-half mile from mouth.

Discharge Measurement of Englishman River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 19	Cotton & Webb	1057	129	160	1·9	2·50	304[1]
July 19	do	1057	110	156	0·8	2·00	127[2]
Aug. 29	C. E. Webb	1057	26	16	1·5	1·47	21·0[3]
Aug. 29	do	1057	106	110	0·2	1·47	19·9
Dec. 10	do	1933	114	227	1·2	2·50	266

[1] Station established.
[2] Cable carrier established.
[3] Low water section.

Monthly Discharge of Englishman River at mouth, for 1914.

(Drainage area, 111 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	320	220	254	2·29	2·56	5,100	B
July	220	48	103	0·93	1·07	6,330	B
August	48	13	37	0·33	0·38	2,280	B

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Englishman River near mouth, for 1914.

DAY.	May.		June.		July.		August.		September.		December	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·3	220	2·3	220	1·6	48	1·4	13		
2			2·4	250	2·3	220	1·6	48	1·4	13		
3			2·4	250	2·2	190	1·6	48	1·4	13		
4			2·5	280	2·2	190	1·6	48	1·3	5		
5			2·5	280	2·1	160	1·6	48	1·3	5		
6			2·4	250	2·0	130	1·6	48	1·3	5		
7			2·4	250	2·0	130	1·6	48	1·3	5		
8			2·5	280	2·0	130	1·6	48	1·3	5		
9			2·5	280	2·0	130	1·6	48	1·3	5	2·6	320
10			2·4	250	1·9	108	1·6	48	1·5	28	2·5	280
11			2·3	220	1·9	108	1·6	48	1·5	28	2·4	250
12			2·3	220	1·9	108	1·6	48	1·5	28	2·35	235
13			2·3	220	1·9	108	1·6	48	1·6	48	2·3	220
14			2·5	280	1·9	108	1·6	48	1·7	68	2·25	205
15			2·6	320	1·8	88	11·5	28	1·7	68	2·2	190
16			2·5	280	1·8	88	1·5	28	1·7	68	2·15	175
17			2·5	280	1·8	88	1·5	28	1·7	68	2·15	175
18			2·5	280	1·8	88	1·5	28	1·9	108	2·2	190
19	2·5	280	2·5	280	1·75	78	1·5	28	3·1	530	2·15	175
20	2·6	320	2·5	280	1·75	78	1·5	28	2·11	165	2·1	160
21	2·7	360	2·5	280	1·7	68	1·5	28	2·1	160	2·1	160
22	2·8	400	2·4	250	1·7	68	1·5	28			2·1	160
23	2·8	400	2·4	250	1·7	68	1·5	28			2·05	145
24	2·9	440	2·4	250	1·7	68	1·5	28			2·05	145
25	2·6	320	2·4	250	1·7	68	1·5	28			2·05	145
26	2·6	320	2·3	220	1·7	68	1·5	28			2·1	160
27	2·6	320	2·3	220	1·6	48	1·5	28			2·1	160
28	2·5	280	2·3	220	1·6	48	1·6	48			2·15	175
29	2·2	190	2·3	220	1·6	48	1·4	13			2·15	175
30	2·2	190	2·3	220	1·6	48	1·4	13			2·5	280
31	2·3	220			1·6	48	1·6	48			2·6	320

HASLAM CREEK (1029).

Location.—Low-water section, 500 feet below Canadian Collieries railway bridge; 6 miles from Ladysmith.

High-water section, downstream side of bridge.

Records available.—Gauge readings twice a week. July 3, 1914, to December 31, 1914.

Drainage area.—Twenty-seven square miles.

Gauge.—Six-foot enamel staff, on piling of railway bridge, downstream side near left bank.

Channel.—Low-water section, gravel bed, channel straight 50 feet above and below section, banks overflow in extreme high water.

High-water section, stream flows at small angle to bridge, bed of stream is gravel.

Discharge measurements.—Four in 1914, covering all but high stage; one in 1913, Provincial Water Rights Branch.

Winter flow.—Open all year.

Accuracy.—Between discharge of 0 and 160 cubic feet per second, accuracy B. Above discharge of 160 cubic feet per second, accuracy C.

Co-operation.—Provincial Water Rights Branch installed gauge in 1913.

Haslam Creek (1029).

Haslam creek is part of the Nanaimo river drainage. It rises in the mountains between the Chemainus and Nanaimo rivers at an elevation of about 4,000 feet. The metering section is located at the Canadian Collieries railway bridge, about 2 miles above mouth of creek. The drainage area, above metering section, is 27 square miles. A large part of the drainage area is covered with second-growth timber.

The precipitation varies from 30 to 50 inches, being most in the higher altitudes. The stream has no natural storage and is flashy.

This stream is of little importance at present, except in effect of the total flow of Nanaimo river which it enters about 4 miles from the sea.

Discharge Measurements of Haslam Creek near Canadian Collieries railway bridge, for 1914.

Date.	Hydrographer.	Meter. No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
May 14	C. E. Webb	1057	58	89	0·9	1·30	83·58
July 7	Cotton & Webb	1057	60	58	0·2	0·47	13·30
Aug. 10	C. P. Cotton	1057	62	43	0·1	0·20	4·70
Nov. 27	C. E. Webb	1933	170	238	2·1	2·20	473·00

Monthly Discharge of Haslam Creek near mouth, for 1914.

(Drainage area, 27 square miles.).

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	68	24	47	1·74	1·94	2,800	B
July	22	4	10	0·37	0·43	610	B
August	4	3	4	0·15	0·17	250	B
September	50	3	16	0·59	0·66	950	B
October	1,360	18	357	13·20	15·20	22,000	C
November	1,420	88	530	19·60	28·90	31,500	C
December	480	32	110	4·08	4·70	6,760	C

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Haslam Creek near mouth, for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				68
2				66
3				63
4			1·1	60
5				60
6				60
7				60
8				60
9			1·1	60
10				60
11				60
12				60
13				60
14	1·3	88		60
15		88	1·1	60
16	1·3	88		54
17		88		48
18	1·3	88	0·9	40
19		84		38
20		78		37
21	1·2	72		35
22		72		33
23		72	0·8	32
24		72		31
25		72		28
26	1·2	72		26
27		72	0·7	24
28		72		24
29		72		24
30	1·2	72	0·7	24
31		72		

DAILY GAUGE HEIGHT AND DISCHARGE of Haslam Creek near mouth, for 1914 —*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		22		4		3		48		800		480
2		20		4		3	1·1	60	3·8	1,420	2·2	480
3	0·6	18	0·2	4		3		50		1,000		400
4		17		4		3	0·9	40		800	1·9	300
5		16	0·2	4	0·1	3		36	2·4	600		220
6		15		4		3		30		560		160
7	0·5	14	0·2	4	0·1	3	0·7	24		520		120
8		12		4		3		22		480	1·3	88
9	0·4	10		4		4		20		440		82
10		10		4	0·2	4	0·6	18	2·1	420		76
11	0·4	10	0·2	4		4	0·6	18		420	1·2	72
12		10		4		4		500	2·1	420		68
13		10	0·2	4		4	3·3	1,130		420		64
14	0·4	10		4		4		700		300		60
15		10	0·2	4	0·2	4	1·9	300		200		55
16	0·4	10		4		14		700		100	1·0	50
17		8		3		23	3·2	1,070	1·3	88		47
18	0·3	6	0·1	3	0·8	32		1,150		280		43
19		6		3		41	3·7	1,360	2·2	480	0·9	40
20	0·3	6		3	1·0	50		1,300		500		40
21		6	0·1	3		40		800		600		40
22	0·3	6		3		32		400		700	0·9	40
23		6		3	0·7	24		200	2·7	770		36
24		6	0·1	3		19		150		650	0·8	32
25	0·3	6		3	0·5	14		100		550		32
26		6		3		20	1·2	72	2·2	480		32
27	0·3	6	0·1	3		24		64		480		32
28		5		3		28		56		480		32
29	0·2	4	0·1	3	0·8	32	1·0	50		480	0·8	32
30		4		3	0·8	32		100		480		45
31	0·2	4		3				500			1·1	60

KOKSILAH RIVER (1026).

Location.—Two miles from mouth, upstream side of Esquimalt and Nanaimo railway bridge, 2 miles south from Duncan.

Records available.—Gauge readings daily, May 12, 1914, to December 31, 1914.

Drainage area.—One hundred and twenty-four square miles.

Gauge.—Fourteen foot staff on left bank, 600 feet above bridge.

Channel.—Gravel bed, two channels in low water, channel straight for 100 feet above section and for 300 feet below, good control.

Discharge measurements.—Six in 1914, covering all but highest stage; one in 1911 and one in 1913, by Provincial Water Rights Branch.

Winter flow.—Open all year.

Accuracy.—B.

Co-operation.—Provincial Water Rights Branch installed gauge in 1911.

KOKSILAH RIVER (1026).

Koksilah river rises in the mountains at an altitude of about 3,000 feet, and flows in an easterly direction to the sea, in Cowichan bay. It is approximately 20 miles in length, and has a drainage area of 124 square miles above

gauging station. The gauging station is located about 2 miles from mouth. The precipitation varies from 30 inches at mouth to about 70 inches at headwaters. There is no natural storage on this stream, and hence its flow is very irregular. In the summer months the flow is small.

There are some very fine farms in this district. The town of Duncan is located about 2 miles from Koksilah river on the Esquimalt and Nanaimo railway.

Discharge Measurements of Koksilah River near E. & N. Ry. bridge, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 12	C. E. Webb	1057	95	87	1·3	1·73	110·0[1]
July 5	Webb & Cottoa	1057	34	18	1·8	1·23	33·9[2]
Aug. 12	C. P. Cottor	1057	71	94	0·2	1·00	14·4
" 12	do	1057	37	14	1·1	1·15	16·2
" 27	C. E. Webb	1057	30	12	0·9	1·00	10·1
Nov. 25	do	1933	122	462	3·6	4·92	1,650·0

[1] Station established. [2] Different sections used.

Monthly Discharge of Koksilah River near mouth, for 1914.

(Drainage area, 124 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	140	40	59	0·48	0·54	3,500
July	38	25	28	0·23	0·27	1,720
August	25	10	14	0·11	0·13	860
September	115	10	40	0·32	0·36	2,380
October	2,220	40	375	3·03	3·49	23,100
November	2,310	290	780	6·28	7·01	46,400
December	790	115	280	2·26	2·61	17,200

Accuracy "B".

Daily Gauge Height and Discharge of Koksilah River near mouth, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·4	50	1·28	38	1·15	25	1·0	10	1·4	50
2			1·4	50	1·25	35	1·15	25	1·0	10	1·4	50
3			1·4	50	1·23	33	1·12	22	1·0	10	1·4	50
4			1·38	48	1·23	33	1·1	20	1·0	10	1·4	50
5			1·35	45	1·2	30	1·1	20	1·0	10	1·37	47
6			1·32	42	1·2	30	1·08	18	1·0	10	1·35	45
7			1·4	50	1·2	30	1·08	18	1·05	15	1·35	45
8			1·7	115	1·2	30	1·08	18	1·1	20	1·35	45
9			1·8	140	1·2	30	1·08	18	1·15	25	1·32	42
10			1·7	115	1·2	30	1·05	15	1·2	30	1·3	40
11			1·6	90	1·2	30	1·05	15	1·15	25	1·4	50
12	1·7	115	1·5	70	1·2	30	1·05	15	1·1	20	1·6	90
13	1·7	115	1·5	70	1·2	30	1·05	15	1·2	30	1·7	115
14	1·65	105	1·5	70	1·2	30	1·05	15	1·4	50	1·9	165
15	1·63	100	1·48	65	1·18	28	1·05	15	1·6	90	2·0	190
16	1·6	90	1·45	60	1·15	25	1·0	10	1·7	115	2·4	290
17	1·6	90	1·4	50	1·15	25	1·0	10	1·7	115	3·0	500
18	1·57	85	1·4	50	1·15	25	1·0	10	1·5	70	4·0	1,000
19	1·55	80	1·4	50	1·15	25	1·0	10	1·5	70	5·5	2,220
20	1·52	75	1·4	50	1·15	25	1·0	10	1·45	60	4·5	1,32 0
21	1·5	70	1·37	47	1·15	25	1·0	10	1·4	50	3·6	790
22	1·45	60	1·35	45	1·15	25	1·0	10	1·3	40	3·0	500
23	1·4	50	1·35	45	1·15	25	1·0	10	1·3	40	2·8	420
24	1·4	50	1·35	45	1·15	25	1·0	10	1·3	40	2·6	350
25	1·45	60	1·35	45	1·15	25	1·0	10	1·3	40	2·4	290
26	1·5	70	1·35	45	1·15	25	1·0	10	1·3	40	2·4	290
27	1·55	80	1·35	45	1·15	25	1·0	10	1·3	40	2·4	290
28	1·55	80	1·32	42	1·15	25	1·0	10	1·3	40	2·4	290
29	1·5	70	1·32	42	1·15	25	1·0	10	1·3	40	2·6	350
30	1·45	60	1·3	40	1·15	25	1·0	10	1·35	45	2·7	380
31	1·43	55			1·15	25	1·0	10			4·4	1,250

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Koksilah River near mouth, for 1914. —*Con.*

DAY.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·8	1,560	3·4	690
2	5·5	2,220	3·6	790
3	5·6	2,310	3·4	690
4	5·3	2,020	3·2	590
5	3·0	500	3·0	500
6	3·0	500	2·9	460
7	2·9	460	2·7	380
8	3·3	640	2·6	350
9	4·0	1,000	2·5	320
10	4·6	1,400	2·4	290
11	4·0	1,000	2·4	290
12	3·3	640	2·3	265
13	3·0	500	2·2	240
14	2·8	420	2·1	215
15	2·6	350	2·0	190
16	2·6	350	2·0	190
17	2·4	290	1·9	165
18	2·4	290	1·9	165
19	2·4	290	1·8	140
20	2·4	290	1·7	115
21	2·4	290	1·7	115
22	3·0	500	1·7	115
23	3·2	590	1·7	115
24	3·6	790	1·7	115
25	4·2	1,120	1·7	115
26	3·8	890	1·7	115
27	3·2	590	1·8	140
28	3·0	500	1·9	165
29	3·0	500	2·0	190
30	3·2	590	2·0	190
31	.....	.....	2·0	190

LITTLE QUALICUM RIVER (1031).

Location.—At outlet from Cameron lake, downstream side of highway bridge.

Records available.—Gauge readings daily, February 27, 1913, to December 31, 1913. Provincial Water Rights Branch, January 1, 1914, to December 31, 1914.

Drainage area.—Fifty-four square miles.

Gauge.—Twelve-foot wooden staff nailed to crib on shore of lake, 500 feet from head of river.

Channel.—Straight on both sides of section for 100 feet, gravel and small boulder bed, confined by bridge abutments in high water, one channel at all stages.

Discharge measurments.—Six in 1913 by Provincial Water Rights Branch, and five in 1914.

Winter flow.—Open all winter.

Accuracy.—Between discharge of 30 and 400 cubic feet per second, accuracy A. Below discharge of 30 and above 400 cubic feet per second, accuracy B.

Co-operation.—Station established by Provincial Water Rights Branch in 1913.

Little Qualicum River (1031).

Little Qualicum river is approximately 6 miles in length. Rising in Cameron lake at an altitude of 600 feet, it flows in an easterly direction to its mouth in the strait of Georgia near Qualicum beach.

The drainage area above the metering section, which is located at the outlet from Cameron lake, is 54 square miles. The Cameron river, which flows into Cameron lake, is about 16 miles long and rises in Labour Day lake.

The precipitation varies from about 40 inches on the coast to 60 inches at the headwaters. Considerable snow falls in the mountains of this drainage.

There is a good location for a hydro-electric development on Little Qualicum river at the falls, about 3 miles below Cameron lake. At this point the river drops some 100 feet in a series of three falls into a solid rock box canyon.

Owing to the low flow during the summer months, it would be necessary to store water for that period. Cameron lake offers good storage possibilities but the grade of the government road around the south side of the lake would have to be raised, as at present it is not far above high water.

The district has been opened up considerably for settlement in the last few years. At Qualicum beach a considerable amount of capital has been invested clearing a large tract of land. A fine tourist hotel has been built near the sea. At Cameron lake the Canadian Pacific Railway Company have a delightful chalet for the accommodation of tourist traffic.

Discharge Measurements of Little Qualicum River near Cameron Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20	Webb & Cotton	1057	58	143	2·4	2·40	340[1]
July 10	C. P. Cotton	1057	53	80	1·9	1·40	149
Sept. 1	C. E. Webb	1057	46	33	1·1	0·49	35·3
" 2	do	1057	46	32	1·0	0·47	33·5
Dec. 16	do	1933	58	116	2·3	2·05	269

[1] Station established.

Monthly Discharge of Little Qualicum River at Cameron Lake, for 1914.

(Drainage area, 54 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	1,910	215	632	11·70	13·49	38,860	B
February	535	165	242	4·48	4·67	13,400	A
March	855	290	498	9·23	10·64	30,600	B
April	840	255	495	9·17	10·30	29,540	B
May	445	315	382	7·08	8·16	23,509	A
June	375	235	278	5·15	5·75	16,500	A
July	230	68	134	2·48	2·86	8,240	A
August	68	45	54	1·00	1·15	3,320	A
September	192	38	91	1·69	1·89	5,400	A
October	2,030	150	655	12·13	13·99	40,300	B
November	1,300	375	824	15·25	17·02	49,000	B
December	650	130	259	4·80	5·53	16,000	B
The year	2,030	38	379	7·01	95·45	274,660	

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Little Qualicum River at Cameron lake, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec. ft.	Feet.	Sec.-ft.
1	1·79	215	2·3	315	4·02	735	2·07	270	2·69	400	2·28	310
2	1·88	230	2·25	305	4·41	855	2·0	255	2·84	430	2·29	315
3	2·34	325	2·19	295	4·12	765	2·0	255	2·89	445	2·28	310
4	4·33	830	2·11	275	3·87	690	2·15	285	2·89	445	2·3	315
5	6·71	1,600	2·06	265	3·54	595	3·1	490	2·84	430	2·28	310
6	7·51	1,910	1·99	255	3·20	510	3·27	530	2·61	375	2·2	295
7	6·79	1,630	1·89	235	3·03	475	5·16	505	2·69	100	2·6	375
8	5·75	1,270	1·82	220	2·79	420	3·0	470	2·6	375	2·16	285
9	4·85	985	1·73	205	2·66	390	2·89	445	2·64	385	2·12	280
10	4·26	810	1·69	200	2·56	365	2·83	425	2·62	380	2·14	285
11	4·11	765	1·65	190	2·46	345	2·8	420	2·68	395	2·09	275
12	4·47	870	1·59	185	2·4	335	2·8	420	2·68	395	2·08	270
13	4·26	810	1·57	180	2·49	355	2·86	430	2·68	395	2·08	270
14	3·99	730	1·51	170	2·75	410	3·84	680	2·7	400	2·16	285
15	3·67	630	1·5	170	4·09	755	4·36	840	2·73	405	2·18	290
16	3·44	570	1·49	170	3·85	685	4·29	820	2·69	400	2·18	290
17	3·23	520	1·48	165	3·62	645	3·95	715	2·6	375	2·17	285
18	3·60	610	1·48	165	3·44	570	3·68	635	2·51	355	2·11	275
19	2·94	455	1·48	165	3·3	535	3·95	715	2·48	350	2·08	270
20	2·8	420	1·48	165	3·3	535	4·02	735	2·46	345	2·08	270
21	2·66	390	1·56	180	3·3	535	3·8	670	2·48	350	1·98	250
22	2·55	365	1·73	205	3·3	535	3·39	560	2·55	365	1·99	255
23	2·41	335	1·88	230	3·23	520	3·08	485	2·59	375	1·99	255
24	2·3	315	2·07	270	2·97	465	2·93	450	2·66	390	1·98	250
25	2·23	300	2·17	290	2·89	445	2·73	405	2·65	385	1·98	250
26	2·17	290	2·28	310	2·72	405	2·57	370	2·71	400	1·98	250
27	2·08	270	2·97	465	2·55	365	2·63	380	2·63	380	1·98	250
28	2·0	255	3·29	535	2·44	345	2·69	400	2·5	355	1·96	245
29	2·05	265	.....	.....	2·28	310	2·68	395	2·43	340	1·89	235
30	2·23	300	.....	.....	2·23	300	2·68	395	2·3	315	1·89	235
31	2·3	315	.....	.....	2·17	290	.....	.....	2·29	315	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Little Qualicum River at Cameron lake, for 1914—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·88	230	0·78	68	0·54	44	1·82	220	3·48	580	3·74	650
2	1·81	215	0·75	65	0·52	42	1·88	230	4·78	965	3·44	570
3	1·8	215	0·71	61	0·5	40	1·86	225	4·35	835	3·17	505
4	1·77	210	0·72	62	0·49	39	1·8	215	5·85	1,300	2·98	465
5	1·72	205	0·73	63	0·48	38	1·74	205	5·4	1,150	2·81	420
6	1·7	200	0·71	61	0·48	38	1·66	190	4·9	1,000	2·63	385
7	1·67	195	0·71	61	0·49	39	1·58	180	5·15	1,075	2·48	350
8	1·51	170	0·70	60	0·50	40	1·49	170	5·0	1,130	2·39	335
9	1·48	170	0·70	60	0·51	41	1·42	160	4·72	945	2·33	320
10	1·46	165	0·70	60	0·51	41	1·37	150	4·49	875	2·14	285
11	1·4	155	0·69	59	0·56	46	1·37	150	4·44	860	2·3	315
12	1·37	150	0·68	58	0·55	45	1·6	185	4·15	775	1·97	250
13	1·34	145	0·68	58	0·55	45	4·7	940	3·84	680	1·89	235
14	1·29	140	0·67	57	0·57	47	5·84	1,290	3·52	590	1·82	220
15	1·25	135	0·66	56	0·61	51	5·13	1,070	3·24	520	1·75	210
16	1·19	125	0·65	55	0·66	56	5·18	1,080	2·99	470	1·7	200
17	1·18	120	0·6	50	0·69	59	6·4	1,500	2·76	410	1·67	195
18	1·15	115	0·59	49	0·70	60	7·8	2,030	2·61	375	1·59	185
19	1·13	115	0·60	50	1·15	117	7·2	1,790	2·68	395	1·55	180
20	1·10	110	0·60	50	1·48	167	6·98	1,700	3·1	490	1·49	170
21	1·03	103	0·59	49	1·60	185	6·05	1,370	3·35	545	1·46	165
22	1·0	100	0·59	49	1·58	180	5·05	1,045	3·38	555	1·39	155
23	0·89	83	0·58	48	1·52	173	4·3	820	4·54	890	1·39	155
24	0·85	78	0·58	48	1·43	160	3·64	620	5·5	1,180	1·37	150
25	0·82	73	0·57	47	1·31	140	3·32	540	5·74	1,260	1·32	145
26	0·82	73	0·56	46	1·3	140	2·97	460	5·7	1,250	1·31	140
27	0·82	73	0·55	45	1·3	140	2·7	400	5·11	1,060	1·29	140
28	0·85	78	0·55	45	1·42	158	2·48	380	4·95	1,015	1·28	135
29	0·81	71	0·55	45	1·49	170	2·19	295	4·51	880	1·25	130
30	0·79	69	0·55	45	1·65	192	2·26	305	4·1	760	1·29	140
31	0·78	68	0·55	45	.....	.....	3·04	480	.....	.....	1·3	140

NANAIMO RIVER (1028).

Location.—Six miles from mouth; 800 feet upstream from Canadian Collieries railway bridge; 8 miles from Ladysmith.

Records available.—Gauge readings daily, February 11, 1913, to December 31, 1913, Provincial Water Rights Branch; January 1, 1914, to March 31, 1914, Provincial Water Rights Branch; April 1, 1914, to December 31, 1914.

Drainage area.—Two hundred and forty-nine square miles.

Gauge.—Twelve-foot wooden staff nailed to tree, left bank, 50 feet upstream from section.

Channel.—Straight 200 feet on each side of section, even gravel bed, good control 400 feet downstream.

Discharge measurements.—One in 1911, four in 1913 by Provincial Water Rights Branch; two in 1914, covering all but high stages.

Winter flow.—Open all winter.

Accuracy.—Between discharge of 20 and 3,000 cubic feet per second accuracy B. Above discharge of 3,000 cubic feet per second, accuracy C.

Co-operation.—Provincial Water Rights Branch established station in 1913.

Nanaimo River (1025).

The Nanaimo river rises in the mountains at an altitude of some 5,000 feet, and flows in an easterly direction to its mouth, about 2 miles south of Nanaimo, in the strait of Georgia. Nanaimo river is some 35 miles in length. It is fed by many streams, the larger of which are Jump creek, which enters near the Nanaimo lakes, and Haslam creek which enters about 4 miles from the mouth.

The gauging station is located near the Canadian Collieries railway bridge, about 6 miles from mouth. The drainage area above gauging station is 249 square miles. There are two lakes, covering an area of 2 square miles, known as the Nanaimo lakes, at an altitude of 700 feet on the Nanaimo river about 12 miles above gauging station.

The precipitation varies from 30 inches at mouth of river to about 60 inches at headwaters.

The power possibilities of the Nanaimo river were investigated during 1914 by the engineers of the Provincial Water Rights Branch.

The following is taken from the Water Rights Branch report for 1914:—

"There do not appear to be any concentrated falls, but apparently with storage in the two lakes, four power sites might be developed namely,—

Power Site.	Head.	Available H P.
Cassiday Canyon to Wellington Collieries Bridge	110	5,000
Wellington Collieries Bridge to South Fork Road Bridge	230	11,300
South Fork Road Bridge to South Fork	150	6,800
South Fork to storage dam	80	3,000
	570	26,100

The Nanaimo river flows through a large coal mining district. The towns of Ladysmith and Nanaimo are also both within a reasonable distance. These should offer a good market for hydro-electric power.

Discharge Measurements of Nanaimo River near Canadian Collieries Ry. bridge, for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity	Gauge Height	Discharge
1914.			Feet.	Sq. ft	Ft. per sec	Feet	Sec-ft.
July 8	Webb and Cotton	1057	128	240	0·3	1·60	317*
Aug. 10. .	C. P. Cotton	1057	120	179	0·7	0·80	93

* Station established

Monthly Discharge of Nanaimo River six miles from mouth, for 1914.

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	25,300	770	3,840	15·40	17·80	236,000	C
February	4,980	570	1,240	4·98	5·19	68,900	B
March	8,320	980	2,520	10·10	11·60	155,000	C
April	6,510	980	2,430	9·75	10·90	145,000	C
May	1,650	690	1,070	4·30	4·96	65,600	B
June	840	500	650	2·61	2·91	38,700	B
July	485	130	265	1·06	1·22	16,300	B
August	130	70	93	0·37	0·43	5,700	B
September	1,220	68	335	1·35	1·51	19,900	B
October	11,600	360	3,290	13·20	15·20	202,000	C
November	10,650	880	4,390	17·60	19·60	261,000	C
December	3,140	330	740	2·98	3·44	45,500	B
The year	25,300	68	1,739	6·98	94·76	1,259,600	C

Daily Gauge Height and Discharge of Nanaimo River six miles from mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·01	1,210	3·2	1,400	6·64	8,320	2·77	1,010	3·09	1,290	2·42	770
2	3·91	2,275	3·01	1,210	5·64	6,020	2·8	1,040	3·44	1,650	2·53	840
3	5·3	5,250	2·8	1,040	4·94	4,440	3·54	1,770	3·39	1,590	2·5	820
4	13·8	25,300	2·68	950	4·43	3,300	4·58	3,630	3·09	1,290	2·33	720
5	9·29	14,500	2·51	830	3·92	2,290	5·4	5,480	2·89	1,110	2·15	610
6	8·99	13,800	2·39	750	3·52	1,750	4·61	3,690	2·78	1,020	2·03	540
7	6·77	8,620	2·29	690	3·25	1,450	4·01	2,420	2·77	1,010	2·07	560
8	5·25	5,140	2·21	650	3·2	1,400	3·69	1,970	2·9	1,120	2·31	710
9	4·35	3,135	2·12	590	3·19	1,390	3·58	1,820	2·93	1,140	2·36	740
10	3·93	2,300	2·11	590	3·09	1,290	3·62	1,880	2·94	1,150	2·38	750
11	4·79	4,100	2·1	580	2·93	1,140	3·6	1,850	2·96	1,160	2·27	680
12	4·72	3,940	2·09	570	1·93	485	3·48	1,700	2·93	1,140	2·26	670
13	4·6	3,670	2·16	620	3·81	2,130	3·78	2,090	2·98	1,180	2·29	690
14	4·19	2,800	2·22	650	6·36	7,680	5·17	4,960	3·03	1,230	2·34	720
15	3·55	1,790	2·3	700	5·25	5,140	5·85	6,510	2·99	1,190	2·41	770
16	3·88	2,230	2·35	730	4·44	3,320	4·85	4,240	2·82	1,060	2·43	780
17	3·59	1,840	2·41	770	4·22	2,860	4·04	2,480	2·69	950	2·36	740
18	3·41	1,610	2·48	810	4·03	2,460	4·33	3,090	2·59	880	2·27	680
19	3·42	1,620	2·51	830	3·94	2,320	5·04	4,660	2·56	860	2·23	660
20	3·32	1,520	2·54	850	4·09	2,590	4·58	3,630	2·59	880	2·03	540
21	3·24	1,440	2·73	980	4·06	2,520	3·89	2,250	2·7	960	1·98	500
22	3·08	1,280	3·28	1,480	3·99	2,380	3·41	1,610	2·84	1,070	2·01	530
23	2·98	1,180	3·43	1,640	3·69	1,970	3·14	1,340	2·9	1,120	2·03	540
24	2·75	1,000	3·83	2,160	3·4	1,600	2·94	1,150	2·85	1,080	2·04	540
25	2·69	950	3·69	1,970	3·19	1,390	2·81	1,050	2·8	1,040	2·14	620
26	2·68	940	3·48	1,700	2·93	1,140	2·72	980	2·82	1,060	2·2	640
27	2·59	880	5·18	4,980	2·79	1,030	2·92	1,140	2·79	1,030	2·13	600
28	2·42	770	4·75	4,000	2·74	990	2·94	1,150	2·58	880	2·07	560
29	2·59	880	.....	.....	2·72	980	2·88	1,100	2·36	740	2·0	520
30	3·31	1,510	.....	.....	2·83	1,060	2·84	1,070	2·28	690	2·01	530
31	3·33	1,530	.....	.....	2·84	1,070	.....	.....	2·31	710	.....	.....

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Nanaimo River six miles from mouth, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·93	485	0·88	130	0·50	70	2·43	780	6·6	8,230	4·35	3,140
2	1·91	475	0·85	120	0·50	70	2·61	900	7·65	10,650	3·79	2,110
3	1·88	460	0·83	115	0·51	71	2·51	830	6·47	7,930	3·47	1,680
4	1·8	420	0·82	115	0·49	69	2·38	750	6·55	8,120	3·23	1,430
5	1·73	390	0·8	110	0·48	68	2·15	610	5·7	6,160	3·05	1,250
6	1·65	360	0·78	105	0·49	69	2·0	520	4·35	3,140	2·84	1,070
7	1·6	340	0·76	100	0·58	78	1·87	455	3·85	2,190	2·68	950
8	1·6	340	0·78	105	0·62	82	1·74	395	4·65	3,780	2·57	870
9	1·51	305	0·79	110	0·65	85	1·65	360	5·44	5,570	2·42	770
10	1·5	300	0·8	110	0·64	84	1·75	400	4·65	3,780	2·31	710
11	1·49	295	0·76	100	0·67	87	1·71	380	4·8	4,120	2·22	650
12	1·47	290	0·75	100	0·67	87	3·83	..160	4·22	2,860	2·13	600
13	1·44	280	0·74	100	0·69	89	7·97	11,500	3·83	2,160	2·05	550
14	1·43	280	0·72	95	0·7	90	6·15	7,200	3·41	1,610	1·99	510
15	1·39	265	0·71	90	0·74	100	4·7	3,890	3·26	1,460	1·94	490
16	1·34	250	0·67	87	0·8	110	7·5	10,300	2·91	1,130	1·88	460
17	1·31	245	0·69	89	1·01	155	7·86	11,200	2·73	980	1·8	420
18	1·3	240	0·67	87	1·56	325	8·05	11,600	2·58	880	1·75	400
19	1·29	235	0·65	85	2·75	1,000	7·73	10,900	3·88	2,230	1·77	400
20	1·2	210	0·64	84	3·02	1,220	6·55	8,120	4·54	3,540	1·69	375
21	1·16	200	0·64	84	2·68	950	5·13	4,870	4·64	3,760	1·69	375
22	1·12	185	0·62	82	2·28	690	4·19	2,800	5·15	4,920	1·64	360
23	1·1	180	0·6	80	2·0	520	3·6	1,850	5·95	6,730	1·6	340
24	1·09	175	0·59	79	1·78	410	3·18	1,380	6·28	7,490	1·59	335
25	1·07	170	0·58	78	1·6	340	2·91	1,130	6·98	9,100	1·58	330
26	1·04	160	0·56	76	1·68	370	2·66	930	5·48	5,650	1·6	340
27	1·01	155	0·55	75	1·86	450	2·48	810	4·85	4,230	1·6	340
28	0·99	150	0·54	74	2·33	720	2·32	710	4·84	4,210	1·61	345
29	0·96	140	0·52	72	2·4	760	2·2	640	4·25	2,930	1·63	350
30	0·92	135	0·52	72	2·53	840	2·63	910	3·82	2,150	1·71	385
31	0·9	130	0·5	70			4·06	2,520			2·16	620

OYSTER RIVER VANCOUVER ISLAND (1040).

Location.—One mile from mouth, upstream side of Island highway bridge, 18 miles from Courtenay.

Records available.—Gauge readings twice daily, June 1, 1914, to December 31, 1914.

Drainage area.—Seventy square miles.

Gauge.—Twelve-foot enamel staff, nailed to cribbing on right bank, 20 feet downstream from bridge.

Channel.—Straight for 150 feet upstream and 400 feet downstream, gravel bed, good control.

Extreme low water measurements taken 1,000 feet upstream from bridge.

Discharge measurements.—Four in 1914, covering all but high stage.

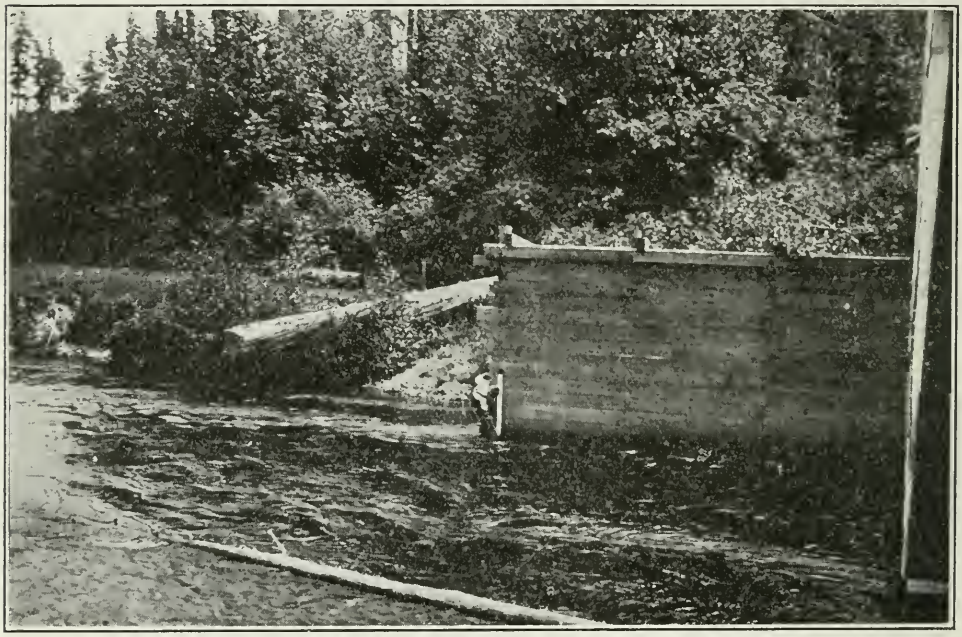
Winter flow.—Open all year.

Accuracy.—Between discharge of 80 and 1,400 cubic feet per second, accuracy B. Above discharge of 1,400 cubic feet per second, accuracy C.

Oyster River (1040).

Oyster river rises in the mountains at an elevation of over 4,000 feet, and flows in an easterly direction to its mouth in the strait of Georgia, about 12 miles south of Campbell river. Oyster river is some 18 miles in length. Many branches from the mountains make up the main stream.

The river is fast and flashy. In the summer months the flow is small, as there is no natural storage. The valleys are still thickly wooded, although considerable timber has been taken out. There are several fine farms near its mouth.



Installing metal faced gauge at metering section on Oyster river, Vancouver Island.

The metering station is at the Island highway bridge. This highway crosses the river about 1 mile from mouth.

The precipitation is heavy, varying from 80 inches at the mouth of river to over 100 inches at headwaters. The power possibilities on this stream as yet have not been investigated by this survey.

Discharge Measurements of Oyster River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
June 1	Webb & Cotton	1,057	135	298	3·5	2·70	1,040[1]
July 18	C. P. Cotton	1,057	137	262	2·6	2·10	689
Sept. 5	C. E. Webb	1,057	67	66	1·3	0·92	86·6[2]
Nov. 11	"	1,057	134	358	3·9	3·50	1,380

[1]Station established.
[2]Low-water section.

SESSIONAL PAPER No. 25e

Monthly Discharge of Oyster River one mile from mouth, for 1914.

(Drainage area, 70 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	1,330	710	950	13·60	15·20	56,500	B
July	1,080	340	700	10·00	11·50	43,000	B
August	410	140	275	3·93	4·53	16,900	B
September	1,470	90	350	5·00	5·58	20,800	B
October	3,000	270	1,040	14·80	17·06	64,000	C
November	2,170	540	1,280	18·30	20·40	76,200	C
December	1,030	140	460	6·57	7·56	28,300	B

Daily Gauge Height and Discharge of Oyster River one mile from mouth, for 1914.

Day.	June.		July.		August		September.		October.		November.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1	2·7	980	2·8	1,030	1·4	340	1·0	140	1·7	490	3·52	1,390
2	2·9	1,080	2·9	1,080	1·48	380	1·0	140	1·7	490	3·6	1,420
3	2·85	1,050	2·85	1,050	1·5	390	1·0	140	1·65	470	3·55	1,400
4	2·65	960	2·7	980	1·5	390	1·0	140	1·6	440	3·65	1,450
5	2·35	800	2·5	880	1·45	360	0·95	115	1·55	410	3·4	1,330
6	2·15	710	2·35	810	1·47	370	0·9	90	1·45	370	2·85	1,050
7	2·2	730	2·25	750	1·52	400	0·9	90	1·35	310	2·6	930
8	2·5	880	2·3	780	1·53	410	0·9	90	1·3	290	4·8	2,020
9	2·4	830	2·25	760	1·5	390	0·9	90	1·25	270	4·8	2,020
10	2·55	900	2·3	780	1·4	340	0·9	90	1·4	340	3·55	1,400
11	2·55	900	2·4	830	1·4	340	0·9	90	1·58	430	3·5	1,380
12	2·65	950	2·35	810	1·4	340	0·9	90	2·55	930	3·0	1,130
13	2·8	1,030	2·35	800	1·4	340	0·9	90	6·4	2,820	2·65	950
14	3·0	1,130	2·35	810	1·35	310	0·9	90	5·0	2,120	2·45	860
15	3·25	1,250	2·25	750	1·33	300	0·9	90	3·45	1,350	2·25	750
16	3·4	1,330	2·2	730	1·3	290	1·13	205	6·75	3,000	2·0	640
17	3·15	1,210	2·25	750	1·25	270	1·33	305	5·45	2,350	1·9	590
18	3·1	1,180	2·2	730	1·2	240	1·35	315	4·45	1,840	1·8	540
19	2·75	1,000	2·2	730	1·2	240	3·7	1,470	4·6	1,920		800
20	2·55	910	2·2	730	1·15	220	2·95	1,100	3·65	1,450		1,000
21	2·35	800	1·95	620	1·15	210	2·25	760	3·85	1,540	3·3	1,280
22	2·25	750	1·75	510	1·1	190	2·05	660	3·85	1,550	4·1	1,670
23	2·25	760	1·7	490	1·1	190	1·85	570	3·0	1,130	4·1	1,670
24	2·25	750	1·75	520	1·1	190	1·73	500	2·35	800	4·8	2,020
25	2·85	1,050	1·7	490	1·0	190	1·6	440	2·05	660	5·1	2,170
26	2·7	980	1·7	490	1·05	160	1·6	440	1·85	560	3·75	1,500
27	2·55	910	1·65	470	1·05	170	1·75	510	1·9	590	3·6	1,420
28	2·45	850	1·55	410	1·05	160	1·8	540	1·8	540	3·6	1,420
29	2·5	880	1·5	390	1·05	170	1·8	540	1·7	490	3·05	1,150
30	2·65	960	1·48	380	1·0	140	1·7	490	2·75	1,000	2·8	1,030
31	....	....	1·4	340	1·0	140	..		3·5	1,380		

DAILY GAUGE HEIGHT AND DISCHARGE of Oyster River one mile from mouth, for 1914—*Con.*

DAY.	December.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	2·55	900
2	2·45	860
3	2·8	1,030
4	2·6	930
5	2·4	830
6	2·25	750
7	2·2	730
8	2·1	680
9	2·0	640
10	1·85	570
11	1·65	460
12	1·6	440
13	1·6	440
14	1·5	390
15	1·4	340
16	1·4	340
17	1·25	260
18	1·25	270
19	1·3	290
20	1·2	240
21	1·2	240
22	1·2	240
23	1·1	190
24	1·1	190
25	1·0	140
26	1·1	190
27	1·15	210
28	1·15	220
29	1·15	210
30	1·45	370
31	.....	640

PUNTLEDGE RIVER, VANCOUVER ISLAND (1036).

Location.—One mile from mouth, downstream side of highway bridge, 1 mile from Courtenay.

Records available.—Gauge readings twice a day, May 30 1914, to December 31, 1914.

Drainage area.—Two hundred square miles.

Gauge.—Fourteen-foot wooden staff nailed to piling of right abutment of trussed span of railway bridge, downstream side.

Channel.—Straight for 800 feet upstream, and 200 feet downstream, even gravel bed; good control; one channel, except in extreme high water when there is one small side channel.

Discharge Measurements.—Four in 1914, covering all but highest stage.

Winter flow.—Open all year.

Accuracy.—Between discharge of 400 and 4,000 cubic feet per second, accuracy B. Below discharge of 400 and above 4,000 cubic feet per second, accuracy C.

PUNTLEDGE RIVER (1036).

The Puntledge river flows from Comox lake to the sea in Comox harbour, a distance of about 8 miles. Comox lake covers an area of about 9 square miles, and lies at an altitude of some 430 feet. The lake is fed from the mountains by several large creeks, the most important of which are the Cruikshank river and Trout creek. The drainage area of Puntledge river is 200 square miles.

The precipitation is heavy, varying from 70 inches at mouth to over 100 inches at headwaters.

The Canadian Collieries (Dunsmuir), Limited, have installed a hydro-electric development for 25,000 horse-power on this river about 5 miles below Comox lake. A brief description of this development may be found under the heading of "Hydro-Electric Developments in Operation."

Brown river, a tributary entering the Puntledge river from the north, is being investigated with a view of obtaining a water supply for the town of Courtenay.

Another small development may be made on the Puntledge river, about half a mile below the power-house of the Canadian Collieries plant, by the erection of a dam.

Discharge Measurements of Puntledge River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
1914.			Feet.	Sq. ft	Ft. per sec.	Feet.	Sec.-ft.
May 30	Webb & Cotton	1057	186	463	5·3	3·58	2,450*
July 17	C. P. Cotton	1057	146	378	4·8	3·50	1,820
Sept. 4	C. E. Webb	1057	127	159	2·9	1·80	457
Nov. 10	do	1057	324	631	5·5	4·68	3,490

*Station established.

Monthly Discharge of Puntledge River one mile from mouth, for 1914.

(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	2,250	1,570	1,840	9·20	10·30	109,000	B
July	2,310	800	1,400	7·00	8·07	86,100	B
August	840	480	610	3·05	3·52	37,500	B
September	2,550	450	750	3·75	4·18	44,600	B
October	13,000	680	3,950	19·75	22·75	243,000	C
November	3,810	2,550	3,220	16·10	18·00	192,000	B
December	3,180	510	1,380	6·90	8·00	84,900	B

Daily Gauge Height and Discharge of Puntledge River one mile from mouth, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3·7	2,190	3·42	1,870	2·25	800	1·8	480	2·6	1,090
2			3·75	2,250	3·55	2,010	2·3	840	1·8	480	2·57	1,060
3			3·75	2,250	3·6	2,070	2·27	820	1·8	480	2·55	1,040
4			3·65	2,130	3·65	2,130	2·2	760	1·8	480	2·5	1,000
5			3·5	1,950	3·8	2,310	2·15	720	1·8	480	2·5	1,000
6			3·4	1,850	3·8	2,310	2·15	720	1·8	480	2·45	960
7			3·5	1,950	3·5	1,950	2·2	760	1·8	480	2·4	920
8			3·55	2,010	3·1	1,550	2·2	760	1·8	480	2·3	840
9			3·5	1,950	2·95	1,410	2·2	760	1·8	480	2·15	720
10			3·5	1,950	2·8	1,270	2·15	720	1·8	480	2·1	680
11			3·53	1,990	2·8	1,270	2·05	640	1·8	480	3·3	1,750
12			3·58	2,050	2·84	1,310	1·95	570	1·8	480	5·45	4,810
13			3·58	2,050	2·87	1,330	1·9	540	1·8	480	5·6	5,100
14			3·55	2,010	2·95	1,410	1·9	540	1·8	480	5·4	4,720
15			3·3	1,750	3·13	1,580	1·9	540	1·75	450	7·65	9,880
16			3·25	1,700	3·4	1,850	1·95	570	1·8	480	8·9	13,000
17			3·2	1,650	3·0	1,450	1·9	540	1·95	570	7·7	10,000
18			3·2	1,650	2·6	1,090	1·9	540	2·17	740	7·4	9,250
19			3·2	1,650	2·48	980	1·9	540	4·0	2,550	6·75	7,650
20			3·25	1,700	2·85	1,310	1·9	540	2·55	1,050	6·5	7,050
21			3·2	1,650	3·1	1,550	1·9	540	2·45	960	6·05	6,020
22			3·15	1,600	3·05	1,500	1·9	540	2·4	920	5·45	4,810
23			3·12	1,570	2·75	1,230	1·9	540	2·35	880	4·9	3,860
24			3·15	1,600	2·38	900	1·9	540	2·3	840	4·65	3,480
25			3·17	1,620	2·32	860	1·9	540	2·35	880	4·53	3,290
26			3·17	1,620	2·3	840	1·9	540	2·37	890	4·43	3,150
27			3·2	1,650	2·3	840	1·85	510	2·47	970	4·33	3,010
28			3·22	1,670	2·3	840	1·85	510	2·65	1,140	4·3	2,970
29			3·32	1,770	2·27	820	1·85	510	2·85	1,310	4·3	2,970
30	3·6	2,070	3·37	1,820	2·25	800	1·8	480	2·68	1,160	4·35	3,040
31	3·65	2,130			2·25	800	1·8	480			4·48	3,220

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Puntledge River one mile from mouth, for 1914—*Con.*

Day.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·5	3,250	4·45	3,180
2	4·57	3,350	4·37	3,070
3	4·6	3,400	3·27	2,930
4	4·52	3,280	4·17	2,790
5	4·5	3,250	4·07	2,650
6	4·57	3,350	4·0	2,550
7	4·67	3,500	3·9	2,430
8	4·77	3,650	3·82	2,330
9	4·8	3,700	3·65	2,130
10	4·72	3,580	3·45	1,900
11	4·72	3,580	3·32	1,770
12	4·57	3,350	3·17	1,620
13	4·42	3,140	2·95	1,400
14	4·27	2,930	2·75	1,230
15	4·17	2,800	2·58	1,070
16	4·12	2,720	2·4	920
17	4·1	2,690	2·12	700
18	4·02	2,580	2·1	680
19	4·0	2,550	2·1	680
20	4·0	2,550	2·05	640
21	4·12	2,720	2·0	600
22	4·22	2,860	2·0	600
23	4·37	3,070	2·0	600
24	4·52	3,280	1·95	570
25	4·62	3,430	1·9	540
26	4·75	3,620	1·9	540
27	4·87	3,810	1·85	510
28	4·85	3,780	1·85	510
29	4·75	3,620	1·9	540
30	4·55	3,330	1·92	550
31	.....	.....	2·05	640

PUNTLEDGE RIVER (1063) AT DIVERSION DAM.

Location.—At diversion dam of Puntledge river, hydro-electric installation, Canadian Collieries (Dunsmuir), Limited.

Records available.—June 7 to December 31, 1913; January 1 to December 31, 1914.

Drainage area.—175 square miles.

Gauge.—Wooden staff located on right bank fifty feet above diversion dam.

Channel.—Very even flow.

Discharge measurements.—Daily discharge obtained by weir measurements over diversion dam plus water to flume.

Winter flow.—Open all year.

Co-operation.—All data on this station supplied through the kindness of Mr. L. Netland, resident Engineer for Canadian Collieries (Dunsmuir) Ltd.

PUNTLEDGE RIVER (1063) AT DIVERSION DAM OF PUNTLEDGE RIVER HYDRO-ELECTRIC INSTALLATION.

The diversion dam of the Puntledge river hydro-electric installation is located about 2½ miles below Comox lake. The drainage area above dam is 175 square miles.

The station was established in June, 1913, by the Canadian Collieries (Dunsmuir), Limited, and daily discharges are obtained by gauge readings at crest of weir at diversion dam. The flow into flume to intake is added to the discharge over dam.

Mr. L. Netland, resident engineer of the Canadian Collieries Company has kindly supplied all the data on this station.

For climatic conditions, etc., see description of Puntledge river, No. 1036, near mouth.

Monthly Discharge of Puntledge River at Diversion dam for Power plant, for 1914.

(Drainage area, 175 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	3,200	380	1,890	10·8	12·5	116,000
February	860	440	540	3·1	3·2	30,000
March	1,850	700	770	4·4	5·1	47,000
April	2,900	1,850	2,420	13·8	15·4	144,000
May	2,080	1,440	1,700	9·7	11·2	105,000
June	4,640	800	2,390	13·7	15·3	142,000
July	2,300	400	880	5·0	5·8	54,100
August	400	240	330	1·9	2·2	20,300
September	1,650	240	510	2·9	3·2	30,300
October	5,780	360	2,740	15·7	18·1	168,000
November	2,160	2,200	2,660	25·2	28·1	158,000
December	2,600	340	1,060	6·1	7·0	65,200
The year	5,780	240	1,490	9·4	127·1	1,079,900

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Puntledge River at Diversion Dam, Puntledge River Hydro-electric Installation, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		380		560		860		1,850		2,080		3,500
2		600		600		860		1,850		1,440		5,400
3		800		560		800		1,850		1,840		5,100
4		960		560		800		2,000		1,840		4,640
5		1,200		560		760		2,000		1,760		4,480
6		1,480		560		700		2,050		1,760		4,200
7		2,200		480		700		2,050		1,750		4,060
8		3,200		480		700		2,300		1,650		3,900
9		2,200		500		700		2,300		1,650		3,400
10		3,000		500		700		2,300		1,650		3,100
11		3,000		500		700		2,300		1,650		2,750
12		3,200		500		700		2,380		1,520		2,640
13		3,180		440		760		2,480		1,520		2,520
14		3,000		440		800		2,750		1,650		2,320
15		2,900		440		800		2,900		1,750		1,850
16		2,800		460		800		2,760		1,740		920
17		2,600		460		760		2,600		1,740		800
18		2,500		460		1,200		2,600		1,740		1,280
19		2,400		460		800		3,100		1,740		1,300
20		2,200		460		800		3,100		1,740		1,240
21		2,100		460		800		2,740		1,740		1,240
22		1,960		460		880		2,800		1,740		1,240
23		1,760		520		1,800		2,720		1,730		1,240
24		1,650		650		1,800		2,600		1,730		1,160
25		1,480		700		1,850		2,600		1,730		1,240
26		1,300		700		1,850		2,500		1,730		1,240
27		1,150		780		1,850		2,400		1,730		1,240
28		1,000		860		1,850		2,300		1,720		1,240
29		660				1,850		2,200		1,650		1,240
30		400				1,850		2,200		1,560		1,240
31		460				1,850				1,560		

DAILY GAUGE HEIGHT AND DISCHARGE of Puntledge River at Diversion Dam Puntledge River Hydro-electric Installation, for 1914—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	1,440	.....	360	.....	240	.....	900	.....	2,500	.....	2,600
2	.....	1,580	.....	360	.....	240	.....	800	.....	2,900	.....	2,600
3	.....	1,580	.....	360	.....	240	.....	600	.....	2,760	.....	2,500
4	.....	1,590	.....	361	.....	240	.....	560	.....	3,000	.....	2,300
5	.....	1,780	.....	360	.....	240	.....	560	.....	2,720	.....	2,050
6	.....	2,300	.....	360	.....	240	.....	560	.....	2,720	.....	2,050
7	.....	2,050	.....	360	.....	240	.....	500	.....	2,720	.....	2,050
8	.....	1,400	.....	360	.....	240	.....	450	.....	2,720	.....	2,000
9	.....	700	.....	400	.....	240	.....	450	.....	3,000	.....	1,750
10	.....	700	.....	400	.....	240	.....	360	.....	3,160	.....	1,550
11	.....	700	.....	360	.....	240	.....	2,500	.....	3,160	.....	1,450
12	.....	700	.....	349	.....	240	.....	3,200	.....	2,750	.....	1,200
13	.....	700	.....	340	.....	240	.....	2,850	.....	2,750	.....	800
14	.....	700	.....	340	.....	240	.....	4,800	.....	2,750	.....	560
15	.....	700	.....	340	.....	240	.....	5,760	.....	2,600	.....	480
16	.....	700	.....	340	.....	240	.....	5,780	.....	2,500	.....	460
17	.....	660	.....	340	.....	240	.....	5,760	.....	2,500	.....	500
18	.....	660	.....	340	.....	240	.....	5,300	.....	2,300	.....	500
19	.....	660	.....	340	.....	250	.....	4,960	.....	2,200	.....	500
20	.....	560	.....	340	.....	260	.....	5,250	.....	2,200	.....	500
21	.....	560	.....	340	.....	790	.....	5,250	.....	2,200	.....	460
22	.....	560	.....	340	.....	880	.....	4,200	.....	2,200	.....	460
23	.....	560	.....	340	.....	880	.....	2,760	.....	2,300	.....	470
24	.....	560	.....	340	.....	880	.....	2,760	.....	2,400	.....	420
25	.....	560	.....	300	.....	950	.....	2,760	.....	2,550	.....	420
26	.....	500	.....	260	.....	950	.....	2,280	.....	2,700	.....	360
27	.....	460	.....	250	.....	950	.....	2,280	.....	3,000	.....	360
28	.....	460	.....	240	.....	950	.....	2,400	.....	3,000	.....	340
29	.....	400	.....	240	.....	1,650	.....	2,400	.....	2,990	.....	340
30	.....	400	.....	240	.....	1,600	.....	2,400	.....	2,660	.....	380
31	.....	400	.....	240	.....	.....	.....	2,500	.....	.....	.....	420

SHAWNIGAN CREEK (1025).

Location.—Five hundred feet from outlet of Shawnigan lake, upstream side of Esquimalt and Nanaimo Railway bridge, 300 yards from Koenigs station.

Records Available.—Gauge readings daily, May 11, 1914 to December 31, 1914.

Drainage Area.—Twenty-two square miles.

Gauge.—Six-foot enamel staff nailed to piling on left downstream side of highway bridge at outlet from lake.

Channel.—Straight for 50 feet on both sides of section; gravel and sand bed; one channel only.

Discharge Measurements.—One in 1913, Provincial Water Rights Branch; four in 1914, covering all stages.

Winter Flow.—Open all year.

Accuracy.—Between discharge of 0 and 280 cubic feet per second, accuracy A. Above discharge of 280 cubic feet per second, accuracy B.

Co-operation.—Provincial Water Rights Branch.

SESSIONAL PAPER No. 25e

Shawnigan Creek (1025).

Shawnigan creek is the outlet of Shawnigan lake to the sea in Mill bay on Saanich inlet. It is some 4 miles in length. The drainage area above the metering section, which is located at the outlet of Shawnigan lake, is 22 square miles.

Shawnigan lake lies at an altitude of 381 feet and covers an area of 3 square miles. The Esquimalt and Nanaimo railway is located along the east shore, and the Canadian Northern railway along the west shore. There are several large sawmills located on Shawnigan lake. The lake is popular with the tourists, there being two hotels, and many fine summer homes along its shores.

The precipitation averages about 40 inches. July and August are dry months, and the water goes very low. In the summer of 1914 Shawnigan creek had no flow for several weeks.

The principal use for the water of this lake would be for municipal supply; with an impounding dam at its outlet, considerable water could be stored.

Discharge Measurements of Shawnigan River near Shawnigan Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 11	C. E. Webb	1057	19	41	0·6	1·71	25·2[1]
July 5	Webb and Cotton	1057	18	11	0·3	1·05	3·3[2]
Aug. 8	C. P. Cotton	1057	3	1	0·3	0·43	0·3
Sept. 16	C. E. Webb	1057	.....	.....	.....	0·00	0·0
Nov 24	"	1933	32	98	2·5	4·33	245·0

[1] Station established. [2] Several different sections used.

Monthly Discharge of Shawnigan Creek near Shawnigan Lake, for 1914.

(Drainage area, 22 square miles.)

Month.	Discharge in Second-Feet.				Run Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	10·0	5·0	8·0	0·36	0·40	476
July	5·0	1·2	31·0	1·41	1·63	1,910
August	1·2	0·0	0·2	0·01	0·01	12
September	0·0	0·0	0·0	0·00	0·00	0
October	22·0	0·0	8·0	0·36	0·42	492
November	210·0	39·0	180·0	8·18	9·13	10,700
December	264·0	59·0	117·0	5·32	6·13	7,190

Accuracy "A."

Daily Gauge Height and Discharge of Shawnigan Creek at Shawnigan lake, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·3	10	1·1	5·0	0·65	1·2	.....	0·0	0·0	0·0
2	.....	.....	1·3	10	1·1	5·0	0·5	0·6	.....	0·0	0·0	0·0
3	.....	.....	1·3	10	1·1	5·0	0·5	0·6	.....	0·0	0·0	0·0
4	.....	.....	1·3	10	1·1	5·0	0·5	0·6	.....	0·0	.....	0·0
5	.....	.....	1·3	10	1·1	5·0	0·55	0·8	.....	0·0	.....	0·0
6	.....	.....	1·3	10	1·05	4·0	0·45	0·5	.....	0·0	.....	0·0
7	.....	.....	1·3	10	1·05	4·0	0·4	0·3	.....	0·0	.....	0·0
8	.....	.....	1·3	10	1·05	4·0	0·4	0·3	.....	0·0	0·0	0·0
9	.....	.....	1·3	10	1·0	3·0	0·4	0·3	0·0	0·0	0·05	0·0
10	.....	.....	1·3	10	1·0	3·0	0·4	0·3	0·0	0·0	0·10	0·0
11	1·7	24	1·3	10	1·0	3·0	0·35	0·2	0·0	0·0	0·20	0·1
12	1·7	24	1·3	10	1·0	3·0	0·30	0·2	.....	0·0	0·40	0·3
13	1·7	24	1·3	10	1·0	3·0	0·25	0·2	.....	0·0	0·4	0·3
14	1·65	22	1·25	9	1·0	3·0	0·2	0·1	.....	0·0	0·4	0·3
15	1·65	22	1·25	9	1·0	3·0	0·15	0·1	.....	0·0	0·5	0·6
16	1·6	20	1·25	8	1·05	4·0	0·15	0·1	0·0	0·0	0·6	1·0
17	1·6	20	1·2	7	1·05	4·0	0·10	0·0	.....	0·0	0·8	2·0
18	1·6	20	1·2	7	1·05	4·0	0·10	0·0	.....	0·0	1·0	3·0
19	1·55	18	1·2	7	0·9	2·5	0·05	0·0	.....	0·0	1·2	7·0
20	1·55	18	1·15	6	0·9	2·5	0·0	0·0	.....	0·0	1·4	13·0
21	1·5	16	1·15	6	0·85	2·3	.....	0·0	0·0	0·0	1·5	16·0
22	1·5	16	1·1	5	0·85	2·3	.....	0·0	.....	0·0	1·55	18·0
23	1·5	16	1·1	5	0·8	2·0	.....	0·0	.....	0·0	1·6	20·0
24	1·45	15	1·1	5	0·8	2·0	.....	0·0	.....	0·0	1·6	20·0
25	1·45	15	1·1	5	0·8	2·0	.....	0·0	.....	0·0	1·6	20·0
26	1·45	15	1·1	5	0·75	1·8	.....	0·0	0·0	0·0	1·6	20·0
27	1·4	13	1·1	5	0·75	1·8	.....	0·0	.....	0·0	1·6	20·0
28	1·4	13	1·1	5	0·7	1·5	.....	0·0	.....	0·0	1·6	20·0
29	1·35	12	1·1	5	0·7	1·5	.....	0·0	.....	0·0	1·6	20·0
30	1·35	11	1·1	5	0·65	1·3	.....	0·0	0·0	0·0	1·6	20·0
31	1·3	10	.....	.....	0·65	1·2	.....	0·0	.....	.....	1·65	22·0

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Shawnigan Creek at Shawnigan lake, for 1914.—*Con.*

DAY.	November.		December.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·00	39	4·50	264
2	2·7	89	4·0	210
3	2·8	97	3·8	190
4	3·0	114	3·6	170
5	3·1	123	3·4	150
6	3·3	141	3·5	160
7	3·4	150	3·6	170
8	3·5	160	3·65	175
9	3·5	160	3·5	160
10	3·5	160	3·4	150
11	3·55	165	3·3	141
12	3·55	165	3·2	132
13	3·65	175	3·15	128
14	3·8	190	3·1	123
15	3·8	190	3·05	118
16	3·85	195	3·0	114
17	3·9	200	2·9	105
18	3·95	205	2·8	97
19	4·0	210	2·7	89
20	4·0	210	2·65	85
21	4·0	210	2·5	73
22	4·1	220	2·45	70
23	4·2	230	2·4	66
24	4·25	235	2·4	66
25	4·3	240	2·3	59
26	4·3	240	2·35	63
27	4·3	240	2·3	59
28	4·2	230	2·3	59
29	4·1	220	2·3	59
30	4·05	215	2·3	59
31			2·3	59

SPROAT RIVER, VANCOUVER ISLAND, (1051).

Location.—Eight hundred feet below outlet from Sproat lake, 8 miles from Alberni.

Records Available.—Gauge readings four times a week; March 1, 1913, to December 31, 1913, Provincial Water Rights Branch; January 1, 1914, to May 31, 1914, Provincial Water Rights Branch; June 1, 1914, to December 31, 1914.

Drainage Area.—One hundred and twenty-eight square miles.

Gauge.—Twelve-foot wooden staff nailed to crib on lake shore, 300 feet to right of outlet

Channel.—Slight curve at section, straight for 500 feet above and below, gravel and boulder bed, solid rock on left side, good control, rapids and falls below section.

Discharge Measurements.—Six in 1913 by Provincial Water Rights Branch; four in 1914, covering all but highest stage.

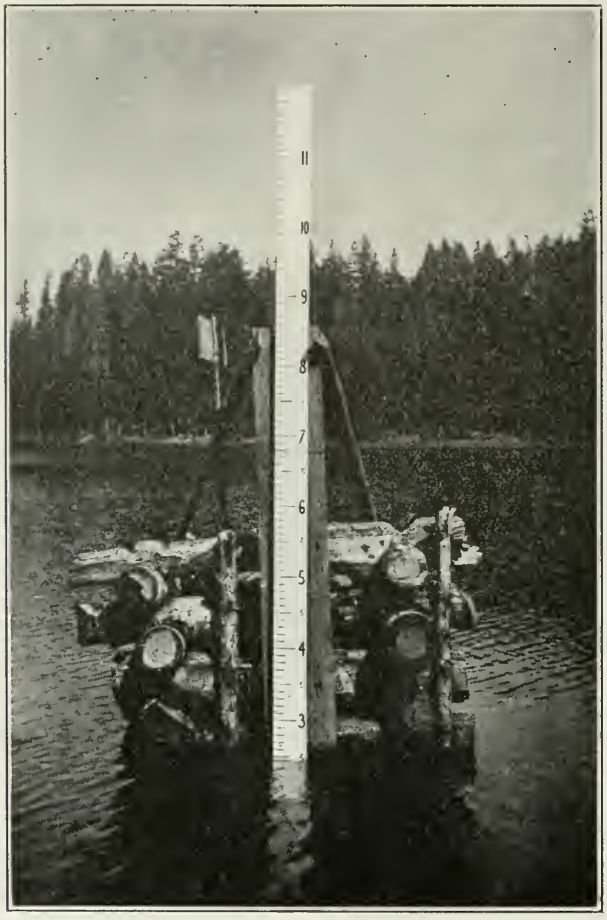
Winter Flow.—Open all winter.

Accuracy.—Between discha ge of 700 and 2,100 cubic feet per second, accuracy A. Below discharge of 700 and above 2,100 cubic feet per second, accuracy B.

Co-operation.—Station established in 1913 by Provincial Water Rights Branch.

Sproat River (1051).

Sproat river is the outlet of Sproat lake, which lies at an altitude of about 80 feet. Sproat river flows in an easterly direction, and is some 3 miles in length. At its mouth it joins the Stamp river. The combined flow of these two streams is known as the Somass river, and is about 4 miles in length. The Somass river empties into the Alberni canal at Alberni.



Wooden Staff Gauge on Sproat lake near outlet, attached to rock filled crib.

The gauging station on Sproat river is located near the outlet from Sproat lake. The drainage area above station is 128 square miles. Sproat lake itself covers an area of 17 square miles.

This drainage is thickly timbered except, of course, in the highest altitudes. The precipitation is heavy in this district. It varies from about 70 inches at mouth of Sproat river to 110 inches in mountains at headwaters in Clayoquot divide.

Sproat river offers good possibilities for a hydro-electric development at falls, about half a mile from lake. The river drops 44 feet at this point, and in rapids below it drops another 15 feet in half a mile. It would be feasible to build an impounding dam at outlet from lake to raise water level of lake some 40 feet. By this means a head of nearly 100 feet might be obtained in a distance of 1 mile, and the regulation of the flow of stream.

Metering Section on Sproat river near outlet from Sproat lake.

Another larger development would be to bring water from Great Central lake, a distance of some $3\frac{1}{2}$ miles, by means of a tunnel and pipe line. A head of about 170 feet may be obtained.

DISCHARGE MEASUREMENTS of Sproat River near Sproat Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 18	Webb and Cotton	1057	98	434	2·3	4·03	977[1]
July 30	C. P. Cotton	1057	86	308	1·4	2·48	435
Sept. 10	C. E. Webb	1057	77	212	0·8	1·43	160
Dec. 12	"	1933	122	596	2·9	5·39	1 700

[1] Station established.

Monthly Discharge of Sproat River at Sproat lake, for 1914.

(Drainage area, 128 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	5,900	1,750	3,470	27·10	31·20	213,000	B
February	1,840	960	1,260	9·85	10·26	70,000	B
March	3,370	1,750	2,360	18·40	21·20	145,000	B
April	4,560	1,720	2,950	23·02	25·68	176,000	B
May	2,100	1,200	1,540	12·05	13·89	94,700	B
June	1,206	830	985	7·69	8·58	58,600	B
July	820	440	625	4·88	5·63	38,400	B
August	420	200	295	2·30	2·65	18,100	B
September	680	160	355	2·77	3·09	21,100	B
October	8,100	610	3,440	26·90	31·00	212,000	C
November	5,600	2,440	4,120	32·20	35·90	245,000	B
December	4,230	740	1,650	12·90	14·90	101,000	B
The year	8,100	160	1,920	15·00	203·98	1,392,900	B

Daily Gauge Height and Discharge of Sproat River at Sproat Lake, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·65	820	2·4	420	1·52	200	3·25	680	7·48	3,350	8·3	4,230
2	3·64	820	2·35	400	1·5	190	3·3	690	7·89	3,780	7·91	3,800
3	3·5	760	.....	390	.....	190	3·29	680	8·1	4,000	7·55	3,400
4	.....	760	2·25	380	1·45	180	3·25	670	8·6	4,560	7·15	3,050
5	.....	770	2·23	370	.....	180	.....	660	8·4	4,340	6·8	2,730
6	3·55	780	.....	370	1·42	180	3·18	650	8·18	4,100	6·61	2,570
7	.....	750	2·21	360	1·41	170	3·12	640	8·66	4,600	6·4	2,400
8	3·42	730	2·21	360	1·5	190	3·08	620	9·25	5,300	6·18	2,220
9	.....	710	.....	360	1·45	180	3·02	610	9·49	5,570	5·95	2,050
10	3·3	690	2·2	360	1·45	180	3·08	620	9·02	5,000	5·75	1,930
11	.....	680	2·15	350	.....	180	3·05	620	8·78	4,760	5·57	1,800
12	3·21	660	.....	330	1·45	180	3·65	820	8·62	4,580	5·3	1,660
13	3·19	660	2·05	310	1·45	180	6·95	2,860	8·35	4,300	5·1	1,540
14	3·15	650	2·0	300	.....	180	8·6	4,560	8·0	3,900	4·95	1,450
15	3·1	630	.....	290	1·4	170	8·55	4,500	7·55	3,400	4·75	1,330
16	3·03	610	1·95	280	1·38	160	9·83	6,000	7·2	3,090	4·69	1,300
17	3·0	600	1·93	280	1·38	160	10·80	7,260	6·78	2,700	4·55	1,230
18	3·0	600	1·9	270	1·7	230	11·28	8,000	6·56	2,500	4·39	1,150
19	2·98	590	1·88	270	2·39	410	11·39	8,100	6·55	2,500	4·24	1,080
20	2·95	580	.....	260	3·1	630	11·39	8,100	6·45	2,440	4·2	1,050
21	2·9	570	1·8	250	3·15	650	11·00	7,500	6·58	2,540	4·05	990
22	.....	550	.....	250	3·1	630	10·20	6,500	7·07	3,000	3·97	950
23	2·8	540	1·8	250	3·05	610	9·50	5,600	7·67	3,550	3·87	900
24	2·72	510	1·76	240	3·02	600	9·11	5,100	8·8	4,780	3·8	880
25	2·71	510	1·68	220	2·95	580	8·5	4,450	.....	4,990	3·7	840
26	2·7	510	.....	220	2·98	590	7·98	3,900	9·25	5,300	3·62	810
27	.....	500	1·65	220	3·0	600	7·6	3,470	9·35	5,400	3·5	760
28	2·6	480	.....	220	3·2	660	7·42	3,300	9·5	5,600	3·45	740
29	2·55	470	1·6	210	3·29	680	7·2	3,090	8·88	4,970	3·45	740
30	2·5	450	1·58	200	3·28	680	7·25	3,130	8·65	4,600	3·49	750
31	2·45	440	1·55	200	.....	.....	7·35	3,220	.....	.....	3·5	760

DAILY GAUGE HEIGHT AND DISCHARGE of Sproat River at Sproat Lake, for 1914 —*Con.*

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	2,000	5·5	1,780	6·9	2,820	5·4	1,720	6·0	2,100	4·5	1,200
2	.....	2,100	5·47	1,750	.....	2,860	5·4	1,720	5·8	1,960	.....	1,190
3	6·55	2,500	5·25	1,630	7·10	3,000	5·8	1,960	5·78	1,950	4·48	1,170
4	7·1	3,000	.....	1,550	7·5	3,370	6·2	2,240	.....	1,880	.....	1,150
5	8·42	4,350	5·0	1,480	7·1	3,000	6·9	2,820	5·52	1,800	4·35	1,130
6	9·75	5,900	4·85	1,400	6·85	2,770	.....	2,800	.....	1,780	4·31	1,110
7	.....	5,550	4·79	1,350	6·7	2,640	6·85	2,770	5·48	1,760	.....	1,080
8	9·2	5,220	4·65	1,270	.....	2,400	.....	2,600	5·48	1,760	4·25	1,070
9	8·6	4,560	4·57	1,230	.....	2,300	6·5	2,480	.....	1,710	4·2	1,050
10	.....	4,700	4·5	1,200	6·1	2,170	6·4	2,400	5·3	1,660	.....	1,030
11	8·89	4,980	4·42	1,160	.....	2,050	.....	2,300	.....	1,630	4·1	1,000
12	9·54	5,640	4·36	1,130	5·8	1,960	6·2	2,240	5·2	1,600	4·1	1,000
13	.....	5,300	4·28	1,090	6·1	2,170	6·6	2,560	.....	1,570	4·0	960
14	9·01	5,000	4·22	1,060	6·8	2,730	7·6	3,470	5·1	1,540	.....	960
15	8·75	4,700	.....	1,040	6·8	2,730	.....	3,570	.....	1,500	4·0	960
16	8·4	4,340	.....	1,000	6·7	2,640	7·8	3,680	5·0	1,480	.....	960
17	7·99	3,900	.....	1,000	6·65	2,600	.....	3,720	4·8	1,360	.....	970
18	.....	3,600	.....	1,000	6·6	2,560	7·9	3,790	.....	1,360	4·05	980
19	7·52	3,400	.....	1,000	6·5	2,480	8·6	4,560	4·8	1,360	4·0	960
20	.....	3,150	.....	1,000	6·5	2,480	8·4	4,340	.....	1,360	3·95	940
21	7·0	2,900	.....	980	6·4	2,400	8·0	3,900	4·8	1,360	.....	930
22	6·68	2,600	.....	980	6·3	2,320	.....	3,600	.....	1,360	3·88	910
23	6·41	2,400	4·0	960	6·1	2,170	7·5	3,370	4·8	1,360	3·85	900
24	6·29	2,300	.....	1,100	5·85	2,000	.....	3,470	.....	1,360	.....	890
25	6·1	2,170	4·6	1,250	5·75	1,930	7·7	3,570	4·8	1,360	3·8	880
26	5·98	2,100	5·0	1,480	5·7	1,900	7·7	3,570	4·8	1,360	3·77	860
27	5·75	1,930	5·3	1,660	5·7	1,900	6·98	2,820	.....	1,330	.....	850
28	.....	1,800	5·6	1,840	5·5	1,780	6·35	2,360	4·7	1,300	3·7	840
29	5·42	1,750	.....	.....	.....	1,760	6·05	2,130	4·65	1,270	3·7	840
30	5·75	1,930	.....	.....	5·45	1,750	.....	2,110	4·6	1,250	3·68	830
31	.....	1,850	.....	.....	.....	1,730	.....	.....	4·5	1,200		

STAMP RIVER, VANCOUVER ISLAND (1052) AT GREAT CENTRAL LAKE.

Location.—Three hundred feet below outlet from Great Central lake, 16 miles from Alberni.

Records Available.—Gauge readings twice daily; February 20, 1913, to December 31, 1913, Provincial Water Rights Branch; January 1, 1914, to May 31, 1914, Provincial Water Rights Branch; June 1, 1914, to December 31, 1914.

Drainage Area.—One hundred and seventy-seven square miles.

Gauge.—Twelve-foot wooden staff nailed to crib in lake, 300 feet to right of outlet, near the "Ark."

Channel.—Straight for 300 feet above and 100 feet below; rocky bed, some boulders; one channel at all stages; at extreme high stage there is a discharge from slough 1,000 feet to right of stream.

Discharge Measurements.—Seven in 1913, Provincial Water Rights Branch; four in 1914, covering all but highest stages.

Winter Flow.—Open all winter.

Accuracy.—Between discharge of 90 and 6,000 cubic feet per second, accuracy B. Above discharge of 6,000 cubic feet per second, accuracy C.

Co-operation.—Station established by Provincial Water Rights Branch.

Stamp River (1052) at Great Central Lake.

Stamp river is the outlet from Great Central lake, It flows in a northerly direction for a distance of about 3 miles, where it is entered on the left by the Ash river. From this point Stamp river flows south till it enters the Somass river, 4 miles from the Alberni Canal.

This gauging station is located on the river at outlet from Great Central lake. The gauge is situated in the lake close to head of river. The drainage area above gauging station is 177 square miles. Great Central lake covers an area of 19 square miles. It is about 270 feet above sea-level. Two good-sized mountain-fed streams—McBride creek and Drinkwater creek—enter the lake at the western end.

A hydro-electric development, giving a head of some 170 feet, is possible by the construction of a short tunnel through the divide between Great Central lake and Sproat lake, feeding a pipeline to a power-house located at Sproat lake. The total distance is about $3\frac{1}{2}$ miles.

The precipitation is high, varying from about 80 inches at head of river to over 120 inches in mountains at head of lake.

The drainage is thickly timbered except on the higher mountains.

Discharge Measurements of Stamp River near Great Central Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
June 19	Webb & Cotton	1057	140	680	2·9	4·00	1980[1]
July 30	C. P. Cotton	1057	130	502	1·8	2·32	919
Sept. 10	C. E. Webb	1057	107	333	1·2	1·28	410
Dec. 12	do	1057	136	642	2·8	3·70	1,770

[1]Station established.

Monthly Discharge of Stamp River at Great Central Lake, for 1914.

(Drainage area, 177 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	4,850	1,820	3,208	18·12	20·90	197,000	B
February	1,870	900	1,240	7·01	7·30	68,900	A
March	2,760	1,900	2,436	13·75	15·85	150,000	B
April	4,820	2,030	3,316	18·72	20·90	197,000	B
May	2,540	2,050	2,317	13·08	15·08	143,000	B
June	2,070	1,700	1,848	10·44	11·65	110,000	A
July	1,750	880	1,368	7·73	8·91	84,200	A
August	850	450	437	3·60	4·15	39,200	B
September	1,310	340	707	4·00	4·46	42,100	B
October	8,300	1,010	3,793	21·42	24·70	233,000	B
November	5,370	2,570	4,113	23·24	25·95	245,000	B
December	4,200	720	1,731	9·78	11·28	106,000	B
The year	8,300	340	2,230	12·60	171·13	1,615,400	B

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Stamp River at Great Central Lake, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·76	1,820	3·74	1,800	4·20	2,130	4·27	2,180	4·61	2,460	4·04	2,020
2	3·8	1,850	3·62	1,750	4·60	2,450	4·06	2,030	4·71	2,540	4·1	2,060
3	4·24	2,170	3·51	1,650	4·76	2,570	4·24	2,160	4·7	2,530	4·1	2,070
4	5·39	3,100	3·39	1,560	4·87	2,660	4·58	2,430	4·67	2,500	4·09	2,050
5	6·24	3,900	3·28	1,480	4·78	2,600	4·83	2,640	4·54	2,400	3·99	1,980
6	6·91	4,600	3·12	1,380	4·6	2,450	5·35	3,070	4·41	2,300	3·89	1,910
7	6·87	4,550	3·0	1,300	4·49	2,360	5·47	3,180	4·39	2,280	3·79	1,840
8	6·67	4,330	2·92	1,250	4·36	2,270	5·38	3,100	4·46	2,330	3·75	1,800
9	6·35	4,000	3·83	1,870	4·28	2,200	5·29	3,020	4·49	2,360	3·69	1,770
10	6·13	3,800	2·78	1,150	4·08	2,050	5·24	2,980	4·49	2,360	3·66	1,750
11	6·58	4,200	2·7	1,120	3·97	1,970	5·2	2,940	4·48	2,350	3·62	1,720
12	7·13	4,850	2·66	1,100	3·88	1,900	5·19	2,930	4·5	2,370	3·61	1,710
13	7·05	4,750	2·54	1,030	3·95	1,960	5·38	3,100	4·49	2,360	3·66	1,750
14	6·76	4,400	2·49	1,000	4·68	2,500	6·2	3,850	4·48	2,350	3·75	1,800
15	6·49	4,140	2·49	1,000	4·98	2,750	6·86	4,550	4·48	2,350	3·86	1,890
16	6·29	3,900	2·45	970	4·99	2,760	6·86	4,550	4·42	2,300	3·9	1,920
17	5·95	3,600	2·42	950	4·94	2,730	6·66	4,320	4·38	2,270	3·94	1,950
18	5·78	3,450	2·4	940	4·93	2,720	6·73	4,400	4·3	2,210	3·99	1,980
19	5·52	3,250	2·38	930	4·88	2,670	7·1	4,820	4·26	2,170	4·01	2,000
20	5·3	3,030	2·34	900	4·88	2,670	6·98	4,680	4·22	2,150	3·98	1,970
21	5·06	2,800	2·39	930	4·92	2,620	6·79	4,470	4·27	2,190	3·88	1,900
22	5·85	3,500	2·4	940	4·97	2,750	6·38	4,030	4·3	2,210	3·76	1,800
23	5·57	3,300	2·53	1,020	4·96	2,750	5·95	3,600	4·4	2,290	3·67	1,750
24	4·38	2,250	2·73	1,140	4·88	2,670	5·67	3,370	4·52	2,400	3·65	1,740
25	4·28	2,200	2·8	1,180	4·78	2,600	5·44	3,160	4·58	2,430	3·64	1,730
26	4·27	2,200	2·93	1,250	4·71	2,540	5·23	2,970	4·6	2,450	3·62	1,720
27	4·03	2,000	3·25	1,460	4·58	2,430	5·22	2,960	4·5	2,370	3·65	1,740
28	3·87	1,900	3·53	1,670	4·39	2,280	5·02	2,800	4·32	2,230	3·61	1,720
29	3·83	1,880	.....	.....	4·24	2,170	4·83	2,640	4·26	2,170	3·58	1,700
30	3·81	1,860	.....	.....	4·25	2,160	4·73	2,550	4·18	2,110	3·6	1,710
31	3·8	1,850	.....	.....	4·29	2,200	.....	.....	4·08	2,050	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Stamp River at Great Central Lake, for 1914—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Heigth.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·58	1,700	2·25	850	1·37	440	2·96	1,270	6·0	3,660	6·54	4,200
2	3·61	1,720	2·19	820	1·32	420	3·00	1,300	6·14	3,800	6·19	3,840
3	3·67	1,750	2·13	800	1·3	410	2·96	1,270	6·31	3,960	5·89	3,560
4	3·67	1,750	2·1	780	1·26	390	2·88	1,230	6·58	4,240	5·56	3,260
5	3·67	1,750	2·07	750	1·22	380	2·83	1,200	6·51	4,160	5·23	2,970
6	3·64	1,750	2·1	780	1·2	370	2·72	1,130	6·28	3,920	5·0	2,770
7	3·54	1,670	2·07	750	1·22	380	2·66	1,100	6·01	3,670	4·76	2,580
8	3·43	1,600	2·06	750	1·26	390	2·59	1,050	7·19	4,930	4·56	2,400
9	3·32	1,520	2·07	750	1·21	370	2·54	1,020	7·57	5,370	4·28	2,200
10	3·35	1,530	2·01	740	1·22	380	2·51	1,010	7·53	5,340	4·1	2,060
11	3·31	1,510	1·99	720	1·25	390	2·51	1,010	7·42	5,200	3·93	1,950
12	3·24	1,470	1·97	710	1·19	370	3·1	1,360	7·05	4,760	3·74	1,820
13	3·19	1,420	1·95	700	1·17	360	5·98	3,650	6·71	4,380	3·54	1,670
14	3·1	1,360	1·9	680	1·09	340	7·51	5,300	6·34	4,000	3·4	1,570
15	3·17	1,400	1·87	660	1·10	340	7·44	5,210	5·9	3,570	3·23	1,450
16	3·15	1,390	1·83	650	1·14	350	8·48	6,630	5·55	3,250	3·13	1,380
17	3·10	1,360	1·8	630	1·18	370	9·42	7,960	5·39	3,110	3·0	1,300
18	3·09	1,350	1·78	610	1·39	440	9·67	8,300	4·74	2,570	2·83	1,200
19	3·07	1,340	1·76	600	2·32	900	9·56	8,150	4·82	2,630	2·78	1,170
20	3·04	1,330	1·71	590	2·9	1,240	9·56	8,150	4·86	2,660	2·71	1,130
21	2·99	1,300	1·69	580	2·94	1,260	9·1	7,500	4·86	2,660	2·6	1,060
22	2·92	1,250	1·61	540	2·9	1,240	8·51	6,650	5·58	3,280	2·58	1,050
23	2·83	1,200	1·58	510	2·86	1,200	7·86	5,760	5·91	3,580	2·44	960
24	2·76	1,150	1·58	510	2·8	1,180	7·28	5,000	6·72	4,400	2·3	880
25	2·71	1,130	1·52	500	2·76	1,150	6·76	4,440	7·41	5,200	2·1	780
26	2·6	1,060	1·5	490	2·7	1,120	6·39	4,040	7·54	5,360	2·08	770
27	2·54	1,020	1·48	480	2·82	1,200	5·99	3,650	7·54	5,360	2·08	770
28	2·44	960	1·46	470	2·9	1,240	5·63	3,330	7·36	5,130	2·07	760
29	2·34	900	1·41	450	3·02	1,310	5·37	3,100	7·09	4,800	1·99	720
30	2·33	900	1·43	460	2·98	1,300	5·51	3,220	6·78	4,450	2·09	770
31	2·3	880	1·4	450	.....	.....	5·92	3,600	.....	.....	2·11	780

STAMP RIVER, VANCOUVER ISLAND (1053), AT STAMP FALLS.

Location.—One-quarter mile above falls; 8 miles from Alberni on Beaver Creek road.

Records available.—Gauge readings daily, March, 1913, to December 31, 1913, Messrs. Ritchie, Agnew Co., Engineers, Victoria; January 1, 1914, to May 31, 1914, Messrs. Ritchie, Agnew Co., Engineers, Victoria; June 1, 1914, to December 31, 1914.

Drainage area.—Three hundred and thirty-six square miles.

Gauge.—Fourteen-foot wooden staff on left bank 80 feet below measuring section.

Channel.—Straight for 600 feet above section and for 300 feet below. Rock bed with gravel. Good control.

Discharge measurements.—Measurements in 1913 by Messrs. Ritchie, Agnew Co.; measurements in 1914 by Messrs. Ritchie, Agnew Co.; three measurements in 1914 covering all but high stage.

Winter flow.—Open all winter.

Co-operation.—Station established in 1913 by Messrs. Ritchie, Agnew Co.

Stamp River (1053).

This metering station is located on Stamp river about a quarter of a mile above Stamp falls. Stamp falls are some 3 miles above the junction of the Stamp and Sproat rivers.

At Stamp falls the river has the combined flow of the Ash river and Stamp river from Great Central lake. The drainage area above metering section is 336 square miles. The precipitation varies from about 70 inches at falls to over 100 inches at headwaters.

The Ritchie Agnew Power Company have made extensive surveys and obtained considerable stream data in this locality. It is understood they intend to install a hydro-electric plant at Stamp falls to develop 35,000 horse-power. A head of 110 feet may be obtained by the erection of a dam above the falls.

The towns of Alberni and Port Alberni are about 10 and 12 miles distant respectively, from Stamp falls.

Discharge Measurements of Stamp River near Stamp Falls, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
June 22	Webb & Cotton	1,057	155	1,130	2·3	2·48	2,630[1]
July 31	C. P. Cotton	1,057	150	944	1·2	1·40	1,130
Sept. 11	C. E. Webb	1,057	141	750	0·7	0·69	500

[1]Station established.

Monthly Discharge of Stamp River at Stamp Falls, for 1914.

(Drainage area, 336 square miles.)

Month.	Discharge in Second-feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet.	
June	3,190	2,200	2,630	7·8	8·7	157,000	B
July	2,510	1,040	1,840	5·5	6·3	113,000	B
August	1,040	560	830	2·5	2·9	51,000	B
September	1,930	410	1,070	3·2	3·6	63,700	B
October	15,100	1,340	5,980	17·8	20·5	358,000	C
November	14,400	1,930	7,440	22·1	24·7	443,000	C
December	5,530	880	2,100	6·3	7·3	129,000	B

Note.—Discharge measurements supplied by Messrs. Ritchie, Agnew Co., of Victoria, B.C.

Daily Gauge Height and Discharge of Stamp River at Falls, for 1914.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·0	3,190	2·6	2,510	1·4	1,040	0·7	560	1·9	1,560	4·6	7,540
2	3·0	3,190	2·6	2,510	1·4	1,040	0·7	560	1·8	1,450	4·6	7,540
3	2·9	3,020	2·6	2,510	1·3	960	0·6	510	1·8	1,450	4·75	8,110
4	2·8	2,850	2·5	2,340	1·3	960	0·6	510	1·9	1,560	5·1	9,520
5	2·7	2,680	2·5	2,340	1·2	880	0·5	460	1·9	1,560	4·7	7,920
6	2·6	2,510	2·5	2,340	1·2	880	0·4	410	1·9	1,560	4·1	5,800
7	2·6	2,510	2·3	2,060	1·2	880	0·4	410	1·8	1,450	4·0	5,530
8	2·5	2,340	2·3	2,060	1·2	880	0·4	410	1·8	1,450	5·4	10,800
9	2·4	2,200	2·3	2,060	1·3	960	0·6	510	1·7	1,340	6·25	14,400
10	2·4	2,200	2·3	2,060	1·4	1,040	0·6	510	1·7	1,340	5·4	10,800
11	2·5	2,340	2·2	1,930	1·3	960	0·6	510	1·7	1,340	5·1	9,520
12	2·6	2,510	2·2	1,930	1·2	880	0·6	510	3·6	4,490	4·6	7,540
13	2·6	2,510	2·2	1,930	1·2	880	0·9	660	5·1	9,520	4·2	6,100
14	2·6	2,510	2·3	2,060	1·2	880	0·9	660	6·0	13,400	3·75	4,880
15	2·8	2,850	2·3	2,060	1·2	880	1·0	720	6·4	15,100	3·5	4,240
16	2·8	2,850	2·2	1,930	1·2	880	1·3	960	6·4	15,100	3·3	3,800
17	2·9	3,020	2·1	1,800	1·2	880	1·1	800	6·1	13,800	3·1	3,390
18	3·0	3,190	2·1	1,800	1·2	880	2·0	1,670	5·8	12,500	2·2	1,930
19	3·0	3,190	2·1	1,800	1·2	880	2·0	1,670	5·6	11,700	2·25	2,000
20	2·8	2,850	2·0	1,670	1·1	800	2·0	1,670	5·4	10,800	3·2	3,590
21	2·7	2,680	2·0	1,670	1·1	800	2·2	1,930	5·3	10,400	3·25	3,700
22	2·5	2,340	2·0	1,670	1·1	800	2·2	1,930	4·8	8,320	4·2	6,100
23	2·5	2,340	1·9	1,560	1·1	800	2·1	1,800	4·7	7,920	4·8	8,320
24	2·5	2,340	1·8	1,450	0·9	660	2·0	1,670	4·5	7,160	5·3	10,400
25	2·6	2,510	1·8	1,450	0·9	660	2·0	1,670	4·0	5,530	5·6	11,700
26	2·6	2,510	1·8	1,450	0·9	660	2·0	1,670	3·7	4,750	5·8	12,500
27	2·5	2,340	1·8	1,450	0·9	660	2·0	1,670	3·5	4,240	5·25	10,160
28	2·5	2,340	1·7	1,340	0·9	660	2·1	1,800	3·25	3,700	5·4	10,800
29	2·5	2,340	1·6	1,230	0·8	610	2·1	1,800	3·05	3,290	4·75	8,110
30	2·6	2,510	1·5	1,130	0·8	610	1·9	1,560	3·30	3,800	4·3	6,430
31	.....	.....	1·4	1,040	0·7	560	.....	.....	3·30	3,800	.....	.....

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Stamp River at Falls, for 1914—*Con.*

DAY.	December.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	4·0	5,530
2	3·8	5,010
3	3·6	4,490
4	3·4	4,020
5	3·2	3,590
6	3·0	3,190
7	2·8	2,850
8	2·7	2,680
9	2·6	2,510
10	2·45	2,270
11	2·35	2,130
12	2·20	1,930
13	2·10	1,800
14	2·00	1,670
15	1·8	1,450
16	1·8	1,450
17	1·8	1,450
18	1·7	1,340
19	1·6	1,230
20	1·6	1,230
21	1·6	1,230
22	1·5	1,130
23	1·5	1,130
24	1·4	1,040
25	1·4	1,040
26	1·2	880
27	1·2	880
28	1·2	880
29	1·6	1,230
30	1·8	1,450
31	2·5	2,340

TSOLUM RIVER, VANCOUVER ISLAND, (1039).

Location.—Upstream side of footbridge, 2 miles from Sandwick.

Records available.—Gauge readings twice daily, May 31, 1914, to December 31, 1914.

Drainage area.—One hundred and fifty square miles.

Gauge.—Twelve-foot enamel staff, 20 feet downstream from bridge, right bank.

Channel.—Straight for 500 feet above and 300 feet below section; gravel bed; good control; stream confined in cribbing, both banks, in high water.

Discharge measurements.—One in 1912, Provincial Water Rights Branch; one in 1913, Provincial Water Rights Branch; four in 1914, covering all but high stage.

Winter flow.—Open all winter.

Accuracy.—B.

Co-operation.—Gauge installed by Provincial Water Rights Branch in 1912.

TSOLUM RIVER (1039).

Tsolum river rises in the mountains on the east coast, and flows in a south-easterly direction to its mouth in Comox harbour at Courtenay. It is some 20 miles in length, and has a drainage area of 150 square miles above the gauging station, which is located about 2 miles from mouth.

The precipitation varies from about 70 inches at mouth to 90 inches in mountains at headwaters. Wolfe lake, covering an area of about 1 square mile, drains into the Tsolum river about 7 miles from mouth.

The flow of Tsolum river has a large range. Having practically no storage, it is very flashy. From the records available for 1914 it shows a minimum discharge of 3 cubic feet per second on September 4 to a maximum of 2,100 cubic feet per second on September 18. The gauge was washed out during a freshet in October, but was replaced at the first opportunity.

A large proportion of the lower valley of the river is under cultivation. Dairying has been encouraged by the installation of a cream condenser at Courtenay, which takes all the milk available.

Discharge Measurements of Tsolum River near Sandwick, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 31	Webb & Cotton	1057	65	127	1·4	3·78	171[1]
July 17	C. P. Cotton	1057	64	98	0·6	3·28	60
Sept. 8	C. E. Webb	1057	6	2	0·9	2·58	1·8[2]
Nov. 10	do	1057	98	291	3·0	5·30	882

[1] Station established. [2] Low-water section.

Monthly Discharge of Tsolum River three miles from mouth, for 1914.

(Drainage area, 150 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	520	95	230	1·53	1·71	13,700
July	195	18	63	0·42	0·48	3,870
August	28	4	11	0·07	0·08	675
September	2,100	3	310	2·06	2·30	18,400
October						
November	1,330	280	875	5·83	6·50	52,100
December	900	115	375	2·50	2·88	23,100

Accuracy "B".

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Tsolum River three miles from mouth, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	4·0	260	3·85	195	2·9	18	2·6	4	3·65	130
2	.....	.....	4·1	300	3·75	160	2·9	18	2·6	4	3·9	215
3	.....	.....	4·1	300	3·7	145	2·9	18	2·6	4	3·8	175
4	.....	.....	3·95	230	3·55	105	2·85	15	2·55	3	3·7	145
5	.....	.....	3·75	160	3·5	95	2·8	12	2·5	3	3·7	145
6	.....	.....	3·65	130	3·45	85	2·8	12	2·5	3	3·7	145
7	.....	.....	3·75	160	3·4	75	2·8	12	2·65	6	3·6	115
8	.....	.....	4·15	320	3·4	75	3·0	28	2·7	8	3·6	115
9	.....	.....	3·8	175	3·4	75	2·95	23	2·8	12	3·6	115
10	.....	.....	4·0	260	3·4	75	2·9	18	2·8	12	3·7	145
11	.....	.....	4·0	260	3·4	75	2·9	18	2·8	12	3·7	145
12	.....	.....	4·0	260	3·4	75	2·85	15	2·8	12	6·45	1,430
13	.....	.....	4·05	280	3·4	75	2·8	12	2·8	12	.....	.....
14	.....	.....	4·0	260	3·35	68	2·8	12	2·8	12	.....	.....
15	.....	.....	4·15	320	3·25	54	2·8	12	3·15	43	.....	.....
16	.....	.....	4·3	400	3·2	48	2·8	12	3·75	160	.....	.....
17	.....	.....	4·15	320	3·25	54	2·75	10	4·25	370	.....	.....
18	.....	.....	3·85	195	3·2	48	2·7	8	7·8	2,100	.....	.....
19	.....	.....	3·65	130	3·2	48	2·7	8	7·25	1,820	.....	.....
20	.....	.....	3·6	115	3·2	48	2·7	8	6·2	1,310	.....	.....
21	.....	.....	3·65	130	3·1	38	2·7	8	5·8	1,120	.....	.....
22	.....	.....	3·65	130	3·0	28	2·7	8	4·9	690	.....	.....
23	.....	.....	3·5	95	3·0	28	2·7	8	4·25	370	.....	.....
24	.....	.....	3·75	160	3·0	28	2·7	8	4·0	260	.....	.....
25	.....	.....	4·55	520	3·0	28	2·7	8	3·75	160	4·3	400
26	.....	.....	4·1	300	3·0	28	2·6	4	3·75	160	4·2	350
27	.....	.....	4·0	260	3·0	28	2·6	4	3·85	195	4·1	300
28	.....	.....	3·85	195	2·95	23	2·6	4	3·85	195	4·0	260
29	.....	.....	3·7	145	2·9	18	2·6	4	3·7	145	3·9	215
30	.....	.....	3·7	145	2·9	18	2·6	4	.....	140	4·0	260
31	3·8	176	.....	.....	2·9	18	2·6	4	.....	.....	4·3	400

DAILY GAUGE HEIGHT AND DISCHARGE of Tsolum River three miles from mouth, for 1914—*Con.*

Day.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·0	740	5·35	900
2	5·2	830	5·0	740
3	5·35	900	4·9	690
4	5·35	900	4·8	640
5	5·35	900	4·8	640
6	4·9	690	4·9	690
7	5·05	760	5·0	740
8	5·75	1,100	5·0	740
9	6·15	1,280	4·9	690
10	5·8	1,120	4·7	590
11	5·35	900	4·35	420
12	4·95	710	4·0	260
13	4·6	540	4·0	260
14	4·5	500	3·9	215
15	4·45	470	3·9	215
16	4·35	420	3·9	215
17	4·2	350	3·9	215
18	4·05	280	3·9	215
19	4·45	470	3·8	175
20	4·85	660	3·8	175
21	5·8	1,120	3·8	175
22	6·4	1,410	3·8	175
23	6·1	1,260	3·8	175
24	5·9	1,170	3·8	175
25	6·0	1,220	3·7	145
26	6·0	1,220	3·6	115
27	5·85	1,150	3·6	115
28	6·25	1,330	3·6	115
29	5·5	980	3·7	145
30	5·3	880	3·9	215
31	.....	.....	4·7	590

BRIDGE RIVER (1045).

Location.—Highway bridge on road to Bridge river from Mission on Seton lake. Ten miles from Mission.

Records available.—Daily discharges, October 7 to December 31, 1913; January 1 to December 31, 1914.

Drainage area.—The 1912 provincial map (scale 17.75 miles to 1 inch) shows a drainage area of 2,400 miles for the whole stream. About 1,900 miles of this is above the gauging station, which is near the site of the intake for the proposed hydro-electric plant.

Channel.—Wide and deep, sand and mud bottom, an excellent measuring section.

Discharge measurements.—Seven meter measurements were taken during 1913 and 1914. The rating curve is well defined.

Winter flow.—The stream is open all winter.

Accuracy.—A good rating curve and gauge readings twice a day, should give very accurate results, "A".

Co-operation.—Readings taken in co-operation with Bridge River Power Company.

SESSIONAL PAPER No. 25e

Discharge Measurements of Bridge River 30 miles from mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
Oct. 7	Cline & Keys	1,057	156	1,050	1·8	2·38	1,890[1]
1914.							
April 17	H. J. E. Keys	1,046	156	912	2·05	2·25	1,865
" 19	"	1,046	156	932	2·25	2·43	2,101
June 9	Keys & Hughes	1,046	156	1,422	3·56	4·75	5,130
" 20	H. C. Hughes	1,046	156	2,120	5·54	8·10	11,750
Aug. 3	"	1,046	156	1,826	4·83	6·80	8,820
Sept. 21	"	1,046	156	1,044	1·97	2·55	2,060

[1]Station established.

Monthly Discharge of Bridge River 30 miles from mouth, for 1914.

(Drainage area, 1,900 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	860	520	667	0·35	0·40	41,000	A
February	580	580	580	0·30	0·31	32,200	A
March	1,110	580	766	0·40	0·46	47,100	A
April	2,140	790	1,620	0·85	0·95	96,400	A
May	9,900	2,400	5,530	2·91	3·36	340,000	A
June	18,800	5,100	9,180	4·83	5·40	546,000	C
July	14,900	6,400	12,200	6·42	7·40	750,000	C
August	9,200	5,300	7,760	4·08	4·70	477,000	A
September	5,700	2,100	3,520	1·85	2·06	209,000	A
October	11,100	2,000	3,790	1·99	2·29	233,000	A
November	3,650	1,570	2,010	1·06	1·18	120,000	A
December	2,970	720	1,770	0·93	1·07	109,000	A
The year	18,800	520	4,116	2·17	29·58	3,000,700	B

Daily Gauge Height and Discharge of Bridge River 30 miles from mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·1	790	0·8	580	0·8	580	1·1	790	2·75	2,400	4·75	5,100
2	1·1	790	0·8	580	0·8	580	1·1	790	3·35	3,100	5·75	6,800
3	1·1	790	0·8	580	0·8	580	1·15	820	3·95	3,900	6·75	8,700
4	1·1	790	0·8	580	0·8	580	1·15	830	3·7	3,600	7·00	9,300
5	1·1	790	0·8	580	0·8	580	1·25	900	3·55	3,400	6·0	7,300
6	1·1	790	0·8	580	0·8	580	1·55	1,150	3·4	3,200	5·35	6,100
7	1·15	820	0·8	580	0·8	580	1·75	1,340	3·4	3,200	5·15	5,800
8	1·2	860	0·8	580	0·8	580	1·85	1,420	3·4	3,200	5·0	5,500
9	1·2	860	0·8	580	0·8	580	1·90	1,470	3·45	3,200	4·8	5,200
10	1·2	860	0·8	580	0·8	580	2·1	1,670	3·8	3,700	5·05	5,600
11	1·1	790	0·8	580	0·8	580	2·15	1,720	4·35	4,500	5·55	6,400
12	1·1	790	0·8	580	0·8	580	2·20	1,770	4·95	5,400	6·1	7,500
13	1·1	790	0·8	580	0·8	580	2·25	1,820	5·35	6,100	6·95	9,200
14	0·9	650	0·8	580	0·85	610	2·3	1,870	5·9	7,100	7·55	10,500
15	0·8	580	0·8	580	1·1	790	2·35	1,930	6·5	8,200	8·5	12,700
16	0·8	580	0·8	580	1·1	790	2·4	1,980	6·4	8,000	9·15	14,400
17	0·8	580	0·8	580	1·1	790	2·3	1,870	5·8	6,900	9·65	15,800
18	0·8	580	0·8	580	1·15	830	2·2	1,770	5·5	6,400	9·7	18,800
19	0·8	580	0·8	580	1·3	940	2·4	1,980	5·35	6,100	9·2	14,500
20	0·8	580	0·8	580	1·45	1,060	2·55	2,140	5·3	6,000	8·3	12,300
21	0·8	580	0·8	580	1·5	1,110	2·45	2,040	5·55	6,400	7·35	10,000
22	0·8	580	0·8	580	1·5	1,110	2·3	1,870	6·1	7,500	6·4	8,000
23	0·8	580	0·8	580	1·5	1,110	2·35	1,920	6·7	8,600	5·8	6,900
24	0·75	550	0·8	580	1·35	980	2·3	1,870	7·3	9,900	5·7	6,700
25	0·7	520	0·8	580	1·35	980	2·25	1,820	7·15	9,600	6·05	7,400
26	0·7	520	0·8	580	1·2	860	2·2	1,770	6·35	7,900	6·65	8,500
27	0·7	520	0·8	580	1·2	860	2·2	1,770	5·45	6,300	7·1	9,500
28	0·7	520	0·8	580	1·2	860	2·2	1,770	4·7	5,000	7·2	9,700
29	0·7	520	.....	.....	1·2	860	2·2	1,770	4·1	4,100	7·45	10,300
30	0·8	580	.....	.....	1·2	860	2·35	1,920	4·1	4,100	7·7	10,800
31	0·8	580	.....	.....	1·15	820	.....	.....	4·2	4,300	.....	.....

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Bridge River 30 miles from mouth, for 1914—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	8·4	12,500	5·8	6,900	5·0	5,500	3·35	3,100	3·75	3,650	2·0	1,570
2	8·95	13,300	6·6	8,400	5,0	5,500	2·95	2,600	3·5	3,300	2·0	1,570
3	9·35	14,900	6·75	8,700	5·1	5,700	2·65	2,300	3·25	2,970	2·0	1,570
4	9·7	18,800	6·8	8,800	4·45	4,600	2·50	2,100	2·0	1,570	1·9	1,470
5	9·6	15,600	6·85	8,900	4·6	4,900	2·4	2,000	2·0	1,570	1·75	1,340
6	9·35	14,900	6·9	9,000	4·6	4,900	2·4	2,000	2·75	2,370	1·7	1,290
7	8·7	13,200	6·95	9,200	4·75	5,100	2·4	2,000	2·7	2,310	1·6	1,200
8	8·5	12,700	6·25	7,700	4·8	5,200	2·45	2,000	2·7	2,310	1·6	1,200
9	8·25	12,100	5·5	6,400	4·4	4,600	2·55	2,100	2·8	2,430	1·45	1,060
10	8·55	12,900	5·35	6,100	4·0	4,000	2·75	2,400	2·75	2,370	1·35	980
11	9·0	14,000	5·8	6,900	3·65	3,500	2·7	2,300	2·65	2,260	0·7	520
12	9·35	14,900	6·35	7,900	3·85	3,800	2·55	2,100	2·45	2,030	1·0	720
13	9·35	14,900	6·2	7,600	3·2	2,900	2·8	2,400	2·4	1,980	1·2	860
14	9·25	14,600	6·65	8,500	3·15	2,800	6·6	8,400	2·15	1,720	1·5	1,110
15	9·20	14,500	6·9	9,000	3·1	2,800	7·8	11,100	2·0	1,570	1·6	1,200
16	9·0	14,000	6·75	8,700	3·1	2,800	7·02	9,300	2·0	1,570	1·65	1,250
17	8·65	13,100	6·55	8,300	2·75	2,400	6·95	9,200	2·0	1,570	1·65	1,250
18	8·75	13,300	6·15	7,500	2·6	2,200	6·25	7,700	2·0	1,570	1·95	1,520
19	8·95	13,900	6·3	7,800	2·7	2,300	5·0	5,500	2·1	1,670	2·35	1,930
20	9·3	14,800	6·5	8,800	2·85	2,500	4·3	4,400	2·25	1,820	3·0	2,670
21	8·85	13,600	6·65	8,500	2·7	2,300	3·8	3,700	2·15	1,720	3·25	2,970
22	7·4	10,100	6·55	8,300	2·5	2,100	3·45	3,200	2·1	1,670	3·2	2,910
23	6·95	9,200	6·15	7,500	2·6	2,200	3·25	3,000	2·1	1,670	3·2	2,910
24	7·0	9,300	5·85	6,800	2·75	2,400	3·05	2,700	2·0	1,570	3·0	2,670
25	7·0	9,300	5·8	6,900	2·9	2,500	3·0	2,700	2·2	1,770	3·0	2,670
26	6·95	9,200	5·85	6,800	3·35	3,100	2·9	2,500	2·6	2,200	3·0	2,670
27	6·75	8,700	6·0	7,300	3·55	3,400	2·9	2,500	2·45	2,040	3·0	2,670
28	5·8	6,900	6·15	7,500	3·4	3,200	2·9	2,500	2·3	1,870	3·0	2,670
29	5·55	6,400	6·0	7,300	3·2	2,900	2·9	2,500	2·05	1,620	2·8	2,430
30	5·55	6,400	5·65	6,600	3·6	3,400	3·2	2,900	2·0	1,570	2·8	2,430
31	5·7	6,700	5·2	5,800	.....	.....	4·26	4,400	.....	.....	2·15	1,720

CAYUSE CREEK (1048).

Location.—At the Pacific Great Eastern Railway trestle, 2 miles from the mouth and 2½ miles from Lillooet.

Records Available.—Daily discharges from April 8, 1914, to December 31, 1914.

Drainage Area.—Three hundred and fifty square miles (measured from the provincial map of 1912, scale 12 miles to 1 inch.)

Gauge.—Vertical staff on pile in the trestle; refereneed to three bench-marks. Daily readings.

Channel.—Wide and of moderate depth, strewn with boulders and coarse gravel. The current is very swift, especially at the higher stages. The metering section is a good one.

Discharge Measurements.—Four discharge measurements in 1914 define the rating curve very well, except for extremely high and low stages of the water.

Winter Flow.—Open water conditions all winter.

Accuracy.—Daily gauge readings combined with a well-defined rating curve should insure a reasonable degree of accuracy except possibly at extremely high stages.

Cayuse Creek (1048).

Cayuse creek rises in Duffy lake and discharges into the Fraser river, 1 mile below Lillooet, at an elevation of about 740 feet. The drainage area is about 350 square miles.

The climate in the Cayuse creek watershed is much similar to that in the Lillooet district. The summers are quite hot, and the winters rather severe. At the mouth the mean annual precipitation is probably about 15 inches, and this may increase to 30 inches or more at the higher altitudes near the headwaters.

The discharge figures indicate that there is a considerable quantity of water flowing in Cayuse creek. This water could be made use of for irrigation or for water-power.

A very small fraction of the water is being used at present for irrigation purposes on a few ranches near the mouth. The water could be used very extensively on the Fraser River benches across from Lillooet. The water could be carried, in a flume, from the stream to a point on the Fraser river about 1 mile above Lillooet and taken across the river at this point. This would be a large undertaking, but would reclaim a large tract of first-class fruit-growing land.

The stream falls very rapidly and there is a large fall about 3 miles from the mouth. Water-power could be developed by running a pipe from the head of the falls to the flats below; or the water could be carried around the hill in a flume to a point above Seton lake, and the power-house located beside the lake. The second plan would give a little less head than the first. At present there is little or no market for power in the vicinity.

The main line of the Pacific Great Eastern railway crosses the stream about 2 miles from its mouth and follows it to the Fraser river.

Discharge Measurements of Cayuse Creek above Seton Creek, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
April 8	H. J. E. Keys	1,046	67	171	2·29	0·70	392[1]
June 13	Keys & Hughes	1,046	80	326	6·53	2·30	2,131
" 19	H. C. Hughes	1,046	90	410	8·30	2·70	3,410
Aug. 1	"	1,046	73	275	3·49	1·60	957
Sept. 17	"	1,046	70	213	1·93	0·79	412

[1]Station established.

SESSIONAL PAPER No. 25e

Monthly Discharge of Cayuse Creek above Seton Creek, for 1914.

(Drainage area, 350 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	3,400	480	1,616	4·6	5·3	99,300	B
June	6,550	1,350	2,833	8·1	9·0	168,600	B
July	6,000	850	2,915	8·3	9·6	179,000	B
August	1,050	640	818	2·3	2·7	50,300	B
September	780	420	548	1·6	1·8	32,600	B
October	1,000	470	603	1·7	2·0	37,100	B
November	630	380	475	1·4	1·5	28,300	B
December	420	240	298	0·8	0·9	18,300	B

Daily Gauge Height and Discharge of Cayuse Creek above Seton Creek, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·9	480	2·3	2,150	2·9	4,150	1·5	850	1·2	640
2			1·2	630	2·3	2,150	3·1	4,850	1·5	850	1·15	600
3			1·4	780	2·4	2,400	3·2	5,250	1·6	950	1·1	580
4			1·5	850	2·5	2,700	3·4	6,000	1·7	1,050	1·1	580
5			1·4	780	2·4	2,400	3·3	5,600	1·7	1,050	1·1	530
6			1·3	700	2·3	2,150	3·1	4,850	1·7	1,050	0·9	470
7			1·3	700	2·2	1,900	2·8	3,750	1·7	1,050	0·9	470
8			1·3	700	2·0	1,500	2·6	3,050	1·6	950	0·9	470
9			1·3	700	1·9	1,350	2·7	3,400	1·4	780	0·95	500
10			1·5	850	1·9	1,350	2·8	3,750	1·5	850	1·0	530
11			1·6	950	2·0	1,500	2·9	4,150	1·5	850	1·0	530
12			1·75	1,100	2·1	1,700	2·8	3,750	1·5	850	0·9	470
13			2·0	1,500	2·3	2,150	2·8	3,750	1·6	950	0·9	470
14			2·3	2,150	2·9	4,150	2·7	3,400	1·6	950	0·85	450
15			2·5	2,700	3·15	5,050	2·6	3,050	1·5	850	0·85	450
16			2·3	2,150	3·45	6,180	2·5	2,700	1·5	850	0·8	420
17	0·85	450	2·1	1,700	3·55	6,550	2·4	2,400	1·45	800	0·8	420
18	0·85	450	2·2	1,900	3·40	5,980	2·5	2,700	1·4	780	1·0	530
19	0·8	420	2·1	1,700	3·15	5,050	2·6	3,050	1·4	780	1·1	580
20	0·8	420	2·2	1,900	2·85	3,950	2·4	2,400	1·4	780	1·1	580
21	0·8	420	2·2	1,900	2·5	2,700	2·1	1,700	1·4	780	1·15	600
22	0·75	400	2·3	2,150	2·2	1,900	2·1	1,700	1·4	780	1·0	530
23	0·75	400	2·4	2,400	2·0	1,500	2·0	1,500	1·3	700	1·0	530
24	0·75	400	2·7	3,400	1·9	1,350	2·0	1,500	1·3	700	1·1	580
25	0·75	400	2·5	2,700	2·1	1,700	2·0	1,500	1·3	700	1·2	640
26	0·75	400	2·4	2,400	2·2	1,900	1·9	1,350	1·2	640	1·2	640
27	0·75	400	2·3	2,150	2·3	2,150	1·8	1,200	1·2	640	1·2	640
28	0·7	390	2·3	2,150	2·5	2,700	1·8	1,200	1·2	640	1·1	580
29	0·65	370	2·2	1,900	2·6	3,050	1·7	1,050	1·2	640	1·2	640
30	0·9	480	2·2	1,900	2·8	3,750	1·5	850	1·25	660	1·4	780
31			2·3	2,150			1·5	850	1·2	640		

DAILY GAUGE HEIGHT AND DISCHARGE of Cayuse Creek above Seton Creek, for 1914—*Con.*

Day.	October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·2	640	1·2	630	0·8	420
2	1·2	640	1·2	630	0·7	380
3	1·15	600	1·2	630	0·7	380
4	1·1	570	1·2	630	0·7	380
5	1·0	530	1·1	570	0·7	380
6	1·0	535	1·0	530	0·7	380
7	1·0	530	1·0	530	0·6	350
8	0·95	500	1·0	530	0·6	350
9	0·9	480	1·0	530	0·6	350
10	0·9	480	1·0	530	0·6	350
11	0·9	480	1·0	530	0·5	320
12	0·9	480	1·0	530	0·4	290
13	0·95	500	0·9	480	0·3	260
14	1·0	530	0·7	380	0·2	240
15	1·1	570	0·7	380	0·2	240
16	1·3	700	0·7	380	0·3	260
17	1·65	1,000	0·7	380	0·3	260
18	1·6	950	0·7	380	0·2	240
19	1·5	850	0·7	380	0·2	240
20	1·4	780	0·7	380	0·3	260
21	1·3	700	0·7	380	0·4	290
22	1·2	640	0·7	380	0·4	290
23	1·2	640	0·7	380	0·4	290
24	1·0	530	0·7	380	0·4	290
25	1·0	530	0·7	380	0·3	260
26	1·0	530	0·9	480	0·3	260
27	1·0	530	0·9	480	0·3	260
28	1·0	530	0·9	480	0·3	260
29	0·9	470	0·9	480	0·2	240
30	1·2	630	0·9	480	0·2	240
31	1·2	630	.....	.....	0·2	240

CHEKAMUS RIVER (1034).

Location.—Highway bridge about 1 mile from the mouth and 10 miles from Squamish.

Records Available.—Daily discharges from March 11 to December 31, 1914.

Drainage Area.—Measured from Provincial map dated 1912 (scale 17.75 miles to 1 inch). Area above measuring section is 250 square miles.

Gauge.—Chain gauge from highway bridge. Referenced to three bench-marks. Readings daily.

Channel.—Wide and shallow. The bed is rough and strewn with boulders.

Discharge Measurements.—Seven discharge measurements were taken during 1914 and the winter of 1915.

Winter Flow.—Open water conditions.

Accuracy.—B. and C.

SESSIONAL PAPER No. 25e

Discharge Measurements of Cheakamus River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 21	Keys and Hughes	1046	140	555	7·87	4·30	4,370
June 23	C. G. Cline	1933	140	490	5·80	3·60	2,840
Sept. 2	H. C. Hughes	1152	140	383	5·38	3·28	2,060
Oct. 8	"	1933	140	300	4·67	2·35	1,400
Nov.24	Dobbie and Hughes	1056	140	473	2·96	3·75	2,410 *

* Channel may have changed during freshet in October.

Monthly Discharge of Cheakamus River at one mile from mouth, for 1914.

(Drainage area, 250 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
April	5,550	1,150	2,618	10·4	11·6	156,000	B
May	6,750	2,450	4,250	17·0	19·6	261,000	B
June	8,120	2,080	4,333	17·3	19·3	258,000	C
July	8,250	2,450	5,020	20·1	23·2	309,000	C
August	4,600	2,300	3,200	12·8	14·8	197,000	B
September	6,170	1,190	2,011	8·0	9·0	120,000	B
October	14,500	1,070	4,080	16·3	18·8	251,000	C
November	8,620	950	3,338	13·3	14·8	198,000	B
December	1,770	550	790	3·2	3·6	48,600	C

Daily Gauge Height and Discharge of Cheakamus River at one mile from mouth, for 1914.

Day.	March.		April.		May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	2·8	1,770	3·4	2,600	4·55	4,960	5·2	6,500	3·3	2,450
2	.....	.....	2·6	1,530	4·0	3,750	4·55	4,960	5·4	7,000	3·4	2,600
3	.....	.....	2·4	1,330	4·3	4,400	4·35	4,520	5·7	7,750	3·9	3,550
4	.....	.....	2·2	1,150	3·8	3,350	3·95	3,650	5·9	8,250	3·9	3,550
5	.....	.....	4·4	4,600	3·8	3,350	3·55	2,880	5·4	7,000	3·7	3,150
6	.....	.....	3·8	3,350	3·6	2,950	3·45	2,690	5·4	7,000	3·7	3,150
7	.....	.....	3·1	2,150	3·5	2,800	3·45	2,690	4·9	5,800	3·9	3,550
8	.....	.....	3·1	2,150	3·5	2,800	3·05	2,080	4·9	5,800	3·9	3,550
9	.....	.....	3·1	2,150	3·6	2,950	3·05	2,080	4·5	4,850	3·9	3,550
10	.....	.....	3·1	2,150	4·0	3,750	3·05	2,080	4·9	5,800	3·9	3,550
11	1·7	800	3·1	2,150	4·0	3,750	3·25	2,370	4·9	5,800	3·8	3,550
12	1·7	800	3·0	2,020	4·4	4,600	3·75	3,250	4·9	5,800	4·2	4,150
13	2·5	1,430	3·2	2,300	4·7	5,300	4·35	4,520	4·9	5,800	4·4	4,600
14	4·2	4,150	4·8	5,550	4·9	5,800	4·75	5,420	4·9	5,800	4·4	4,600
15	3·0	2,020	4·8	5,550	5·3	6,750	5·05	6,170	4·4	4,600	4·4	4,600
16	3·5	2,800	4·0	3,750	5·3	6,750	5·25	6,630	4·4	4,600	3·9	3,550
17	2·7	1,650	3·7	3,150	4·4	4,600	5·85	8,120	4·9	5,800	3·9	3,550
18	2·8	1,770	3·0	2,020	4·4	4,600	4·95	5,920	4·8	5,550	3·7	3,150
19	3·0	2,020	6·0	8,520	4·4	4,600	4·95	5,920	4·8	5,550	3·7	3,150
20	3·0	2,020	4·0	3,750	4·4	4,600	4·55	4,960	4·3	4,400	3·5	2,800
21	3·0	2,020	3·6	2,950	4·6	5,100	4·25	4,260	4·1	3,950	3·5	2,800
22	3·0	2,020	3·0	2,020	4·8	5,550	3·55	2,880	3·9	3,550	3·4	2,600
23	3·0	2,020	2·9	1,890	5·1	6,250	3·55	2,880	3·9	3,550	3·4	2,600
24	2·7	1,650	2·5	1,430	5·0	6,050	3·65	5,220	3·9	3,550	3·4	2,600
25	2·5	1,430	2·4	1,330	4·6	5,100	4·25	4,260	3·9	3,550	3·5	2,800
26	2·4	1,330	2·3	1,230	4·2	4,150	3·95	3,650	4·2	4,150	3·5	2,800
27	2·3	1,230	2·4	1,330	4·0	3,750	4·45	4,720	3·9	3,550	3·5	2,800
28	2·0	990	2·5	1,430	3·8	3,350	4·75	5,420	3·6	2,950	3·4	2,600
29	2·2	1,150	2·6	1,530	3·6	2,950	4·75	5,420	3·4	2,600	3·3	2,450
30	2·2	1,150	3·2	2,300	3·3	2,450	4·75	5,420	3·3	2,450	3·3	2,450
31	2·0	990	.....	.....	3·6	2,950	.....	.....	3·3	2,450	3·2	2,300

DAILY GAUGE HEIGHT AND DISCHARGE of Cheakamus River at one mile from mouth, for 1914—*Con.*

DAY.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·05	2,080	3·3	2,450	5·75	7,880	2·8	1,770
2	3·05	2,080	3·3	2,450	6·05	8,620	2·6	1,530
3	3·05	2,080	2·5	1,430	5·35	6,880	2·5	1,450
4	3·05	2,080	2·4	1,330	5·55	7,380	2·4	1,330
5	2·95	1,950	2·1	1,070	4·05	3,050	2·2	1,150
6	2·65	1,590	2·1	1,070	4·05	3,850	2·1	1,070
7	2·65	1,590	2·1	1·070	4·25	4,260	1·9	920
8	2·75	1,720	2·1	1,070	4·55	4,960	1·8	860
9	2·65	1,590	2·2	1,150	4·35	4,520	1·8	860
10	2·55	1,480	2·4	1,330	4·15	4,060	1·7	800
11	2·55	1,480	2·2	1,150	3·95	3,650	1·6	750
12	2·55	1,480	2·3	1,230	3·35	2,530	1·5	700
13	2·25	1,190	8·4	14,500	3·05	2,080	1·5	700
14	2·35	1,280	6·9	10,750	2·75	1,720	1·4	650
15	2·35	1,280	4·7	5,300	2·55	1,480	1·4	650
16	2·25	1,190	7·2	11,500	2·45	1,380	1·3	600
17	2·25	1,190	8·4	14,500	2·25	1,190	1·3	600
18	5·05	6,170	6·4	9,500	2·15	1,110	1·3	600
19	4·05	3,850	6·4	9,500	2·35	1,280	1·3	600
20	3·55	2,890	4·9	5,800	2·15	1,110	1·3	600
21	3·35	2,530	4·2	4,150	1·95	950	1·3	600
22	3·25	2,380	3·8	3,350	2·35	1,280	1·3	600
23	2·85	1,830	3·3	2,450	3·35	2,530	1·3	600
24	2·65	1,590	3·0	2,020	3·45	2,680	1·3	600
25	2·45	1,380	3·0	2,020	4·05	3,850	1·3	600
26	2·25	1,190	2·9	1,890	3·75	3,250	1·3	600
27	2·45	1,380	2·8	1,770	3·75	3,250	1·2	550
28	3·65	3,050	2·6	1,530	3·95	3,650	1·2	550
29	3·25	2,380	2·6	1,530	3·45	2,680	1·2	550
30	3·25	2,380	3·8	3,350	3·15	2,220	1·2	550
31	.....	.....	4·4	4,600	.....	.....	1·2	550

FOUNTAIN CREEK (1047).

Location.—About 100 yards above irrigation ditches, 1½ miles from the mouth, and 10 miles from Lillooet.

Records Available.—Daily discharges from June 11, 1914, to October 10, 1914, (irrigation season).

Drainage Area.—Twenty square miles (measured from the provincial map of 1913, scale 12 miles to 1 inch).

Gauge.—Vertical staff nailed to tree about 100 yards above ditches. Referenced to three bench-marks. Readings daily.

Channel.—Wide and shallow, gravel bottom. The current is fairly fast. The metering section is a good one.

Discharge Measurements.—Two discharge measurements in 1914 define the rating curve fairly well for the variations during the irrigation season.

Winter Flow.—Measurements made only during the irrigation season.

Accuracy.—D.

Fountain Creek (1047).

Fountain creek has its source in Fountain lake, and discharges into the Fraser river, about 9 miles above Lillooet, at an elevation of some 760 feet. The drainage area is about 20 square miles.

The climate in the Fountain Creek valley is much similar to that of the Lillooet district generally. The summers are hot and the winters rather severe. The mean annual precipitation in the watershed is about 10 inches.

The valley of Fountain creek and the adjacent benches on the Fraser river are well adapted to cultivation, when irrigated, and the water from the creek is used for this purpose. Some attempt has been made to regulate the normal flow to give sufficient water in the low-water season. A small timber dam was installed at the outlet of the lake. In this way the spring and early summer freshets are stored to be used in the late summer when the normal flow is very small. The dam has a sluice-gate in it, and when it is opened the water flows down the natural channel of the stream to the irrigation ditches. This storage scheme could be enlarged upon to a considerable extent.

There is a large ranch at the mouth of the creek called Fountain ranch. It is a splendid place, and a good example of the agricultural possibilities of the surrounding valley.

There is some good timber in the upper part of the valley. A small saw-mill has been built on the lake.

The gauging station was established on June 11, 1914. The regulated flow of the stream is at it. Several water leases have been applied for to divert water from the stream above the gauge. These diversions, will in all probability, be made next spring, so the gauging station may have to be changed.

Discharge Measurements of Fountain Creek above intake on irrigation ditch, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 11[1]	Keys & Hughes	.....	.....	.....	.....	.....	.....
Aug. 2	H. C. Hughes	1046	10	5·35	2·57	1·00	14·0
Sept. 20	"	1046	10	3·50	1·99	0·87	6·96

[1]Station established.

Monthly Discharge of Fountain Creek above irrigation ditches, for 1914.

(Drainage area, 20 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
July	20	4	16·6	0·8	0·9	1,020
August	20	4	10·5	0·5	0·6	650
September	8	1	6·0	0·3	0·3	360

Accuracy " D."

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Fountain Creek above irrigation ditches, for 1914.

DAY.	June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
2	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
3	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
4	.....	.....	1·0	14	1·1	20	0·8	4	0·9	8
5	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
6	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
7	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
8	.....	.....	1·1	20	1·0	14	0·8	4	0·9	8
9	.....	.....	1·1	20	0·8	4	0·8	4	0·9	8
10	.....	.....	1·1	20	1·1	20	0·7	1	0·9	8
11	.....	.....	1·1	20	1·0	14	0·7	1	.....	.....
12	1·3	32	1·0	14	1·0	14	0·7	1	.....	.....
13	1·3	32	1·0	14	1·0	14	0·8	4	.....	.....
14	1·4	39	1·0	14	0·9	8	0·9	8	.....	.....
15	1·3	32	1·0	14	0·9	8	0·9	8	.....	.....
16	1·2	26	1·0	14	0·9	8	0·9	8	.....	.....
17	1·3	32	0·9	8	0·9	8	0·9	8	.....	.....
18	1·3	32	1·2	26	1·0	14	0·9	8	.....	.....
19	1·1	20	1·0	14	1·0	14	0·9	8	.....	.....
20	1·1	20	1·0	14	1·0	14	0·9	8	.....	.....
21	1·1	20	1·0	14	0·9	8	0·9	8	.....	.....
22	1·1	20	1·0	14	0·9	8	0·9	8	.....	.....
23	1·2	26	1·2	26	0·9	8	0·9	8	.....	.....
24	1·2	26	1·1	20	0·9	8	0·9	8	.....	.....
25	1·1	20	1·0	14	0·9	8	0·9	8	.....	.....
26	1·1	20	1·0	14	0·9	8	0·9	8	.....	.....
27	1·1	20	1·0	14	0·8	5	0·9	8	.....	.....
28	1·2	26	0·8	4	0·8	4	0·9	8	.....	.....
29	1·2	26	1·1	20	0·8	4	0·9	8	.....	.....
30	1·2	26	1·0	14	0·8	4	0·9	8	.....	.....
31	.....	.....	1·0	14	0·8	4	.....	.....	.....	.....

GREEN RIVER AT NAIRN FALLS (1035).

Location.—Five miles from the mouth, and 46 miles from Cheakamus.

Records available.—Daily discharges, November and December, 1913; January to December, 1914.

Drainage area.—Drainage areas are measured from the provincial map of 1912 (scale 17·7 miles to 1 inch). Area above gauging station is 180 square miles.

Gauge.—Sloping staff gauge bolted to rocks about 150 yards above falls on left bank. Referenced to three bench-marks. Readings taken daily.

Channel.—Wide and fairly deep. Rock and gravel bottom, a good metering section.

Discharge measurements.—Twelve meter measurements taken during 1913, 1914 and 1915 defining the curve quite well for all except the very highest stages.

Winter flow.—Stream is open all year. Slight ice effect in very cold weather.

Accuracy.—Curve fairly well defined; daily gauge readings.

Discharge Measurements of Green River above Nairn Falls, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 18	Keys & Cline	1046	84	264	3·4	3·80	918[1]
1914.							
June 1	Keys & Hughes	1046	100	566	4·4	6·50	2,530
July 16	H. C. Hughes	1046	105	827	5·7	8·75	4,710
Aug. 11	do	1046	98	658	4·2	6·60	2,780
Sept. 8	do	1046	92	533	3·6	5·88	1,938
Nov. 26	Dobbie & Hughes	1057	87	503	4·7	6·20	2,390
Dec. 28	E. C. Dobbie	1057	73	203	1·6	2·60	370[2]
1915.							
Jan. 21	E. C. Dobbie	1057	78	185	1·2	2·10	231
Feb. 6	Hughes & Dobbie	1057	78	167	1·4	2·15	238
Mar. 9	E. C. Dobbie	1057	78	202	1·6	2·35	327
Mar. 14	do	1057	78	230	1·9	2·68	441
Mar 15	do	1057	78	354	3·2	4·25	1,140

[1]Station established.

[2]Section probably affected by ice conditions.

Daily Gauge Height and Discharge of Green River at Nairn Falls, for 1913.

Day.	November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·1	240
2			2·3	300
3			2·3	300
4			2·2	270
5			2·1	240
6			2·0	210
7			2·1	240
8			2·0	210
9			1·7	120
10			1·7	120
11			1·8	150
12			1·8	150
13			1·9	180
14			2·0	210
15			2·3	300
16			2·4	330
17			2·4	330
18			2·3	300
19			2·2	270
20	2·4	330	1·9	180
21	2·4	330	1·8	150
22	2·5	360	1·8	150
23	2·5	360	1·8	150
24	2·3	300	1·8	150
25	2·1	240	1·8	150
26	2·2	270	1·8	150
27	2·1	240	1·8	150
28	2·3	300	1·8	150
29	2·3	300	1·7	120
30	2·3	300	1·7	120
31			1·7	120

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Green River at Nairn Falls, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·7	120	1·7	120	2·2	270	3·5	750	6·0	2,200	6·3	2,440
2	1·7	120	1·7	120	2·2	270	3·5	750	.....	.....	5·9	2,120
3	1·8	150	1·7	120	2·4	330	3·6	800	.....	.....	5·7	1,980
4	2·1	240	1·7	120	2·4	330	3·9	940	.....	.....	5·5	1,850
5	2·6	400	1·7	120	2·4	330	5·5	1,850	.....	.....	3·8	890
6	4·0	990	1·7	120	2·5	360	5·6	1,910	.....	.....	3·1	580
7	3·8	890	1·7	120	2·6	400	5·6	1,910	.....	.....	3·9	940
8	3·5	750	1·7	120	2·6	400	5·6	1,910	.....	.....	4·3	1,150
9	2·9	500	1·7	120	2·6	400	5·7	1,980	.....	.....	6·3	2,440
10	2·6	400	1·7	120	2·6	400	5·7	1,980	.....	.....	6·5	2,600
11	2·5	360	1·7	120	2·6	400	5·7	1,980	.....	.....	6·9	2,950
12	2·5	360	1·7	120	2·7	430	5·9	2,120	.....	.....	7·2	3,200
13	2·4	330	1·8	150	3·5	750	6·0	2,200	.....	.....	9·1	5,050
14	2·4	330	1·9	180	4·1	1,050	6·1	2,280	.....	.....	9·2	5,150
15	2·1	240	1·9	180	3·6	800	6·1	2,280	.....	.....	9·9	5,850
16	2·0	210	1·9	180	3·8	890	6·0	2,200	.....	.....	10·1	6,000
17	2·0	210	1·9	180	3·7	850	6·0	2,200	5·9	2,120	10·2	6,100
18	2·0	210	1·9	180	4·4	1,200	6·0	2,200	6·0	2,200	10·1	6,000
19	2·0	210	2·0	210	4·7	1,350	6·0	2,200	4·5	1,250	8·9	4,900
20	1·9	180	2·0	210	5·1	1,580	6·0	2,200	3·8	890	8·3	4,300
21	1·9	180	2·0	210	5·1	1,580	5·9	2,120	4·3	1,150	7·3	3,300
22	1·8	150	2·0	210	5·1	1,580	5·8	2,050	4·1	1,050	7·3	3,300
23	1·8	150	2·0	210	5·3	1,710	5·7	1,980	4·1	1,050	7·0	3,050
24	1·8	150	2·1	240	5·0	1,520	5·6	1,910	5·3	1,710	6·9	2,950
25	1·8	150	2·1	240	4·7	1,350	5·5	1,850	6·3	2,440	7·8	3,800
26	1·7	120	2·2	270	4·4	1,200	5·5	1,850	5·8	2,050	8·0	4,000
27	1·7	120	2·2	270	4·1	1,050	5·5	1,850	4·5	1,250	8·0	4,000
28	1·7	120	2·2	270	4·0	990	5·0	1,520	4·1	1,050	8·3	4,300
29	1·7	120	.....	.....	3·9	940	5·2	1,650	4·6	1,300	8·7	4,700
30	1·7	120	.....	.....	3·8	890	5·3	1,710	5·3	1,710	9·9	5,850
31	1·7	120	.....	.....	3·6	800	.....	.....	5·7	1,980	.....	.....

Daily Gauge Height and Discharge of Green River at Nairn Falls, for 1914 —*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	10·1	6,000	6·3	2,440	6·3	2,440	5·9	2,120	7·5	3,500	5·1	1,580
2	10·1	6,000	6·3	2,440	6·3	2,440	5·2	1,650	6·8	2,850	.....	.....
3	10·9	6,800	6·4	2,510	6·3	2,440	4·7	1,350	5·9	2,120	4·5	1,250
4	11·0	6,900	6·9	2,950	6·3	2,440	4·1	1,050	5·5	1,850	3·9	940
5	10·7	6,600	7·0	3,050	6·3	2,440	3·9	940	5·0	1,520	.....	.....
6	9·1	5,050	7·4	3,400	6·3	2,440	3·6	800	4·8	1,400	.....	.....
7	8·7	4,700	7·3	3,300	5·3	1,710	3·4	710	4·7	1,350	.....	.....
8	8·3	4,300	6·9	2,950	5·3	1,710	3·2	620	4·8	1,400	.....	.....
9	8·3	4,300	6·7	2,760	5·2	1,650	4·3	1,150	4·9	1,460	.....	.....
10	9·1	5,050	6·7	2,760	5·5	1,850	4·6	1,300	4·7	1,350	.....	.....
11	9·2	5,150	6·6	2,670	5,7	1,980	4·3	1,150	4·6	1,300	.....	.....
12	9·3	5,250	6·6	2,670	5·2	1,650	4·0	990	4·5	1,250	.....	.....
13	9·3	5,250	7·2	3,200	5·0	1,520	10·5	6,400	4·5	1,250	2·9	500
14	9·3	5,250	7·4	3,400	5·0	1,520	10·0	5,900	4·4	1,200	2·95	520
15	9·3	5,250	7·2	3,200	4·8	1,400	12·3	8,200	4·3	1,150	2·9	500
16	8·9	4,900	7·2	3,200	.....	.....	13·8	9,700	4·1	1,050	2,85	480
17	8·9	4,900	6·9	2,950	.....	.....	12·5	8,400	4·0	990	3·0	540
18	8·9	4,900	6·9	2,950	.....	.....	8·5	4,500	3·9	940	3·2	620
19	8·9	4,900	6·9	2,950	.....	.....	8·0	4,000	4·0	990	3·0	540
20	8·9	4,900	6·9	2,950	.....	.....	7·3	3,300	4·2	1,100	3·0	540
21	8·1	4,100	6·9	2,950	.....	.....	6·5	2,600	4·3	1,150	3·0	540
22	7·3	3,300	6·9	2,950	.....	.....	5·5	1,850	4·5	1,250	2·9	500
23	7·3	3,300	6·9	2,950	.....	.....	4·7	1,350	4·5	1,250	2·85	480
24	7·4	3,400	6·9	2,950	.....	.....	4·1	1,050	4·6	1,300	2·8	470
25	7·3	3,300	6·7	2,760	.....	.....	4·8	1,400	8·6	4,600	2·8	470
26	7·3	3,300	6·5	2,600	.....	.....	4·9	1,460	6·3	2,440	2·7	430
27	7·1	3,150	6·7	2,760	.....	.....	5·1	1,580	3·7	850	2·6	400
28	6·3	2,440	6·7	2,760	.....	.....	5·9	2,120	3·8	890	2·6	400
29	6·3	2,440	6·3	2,440	.....	.....	7·5	3,500	3·7	850	2·5	360
30	6·3	2,440	6·3	2,440	.....	.....	6·8	2,850	4·6	1,300	2·5	360
31	6·3	2,440	6·3	2,440	.....	.....	6·7	2,760	.....	.....	2·5	360

Monthly Discharge of Green River at Nairn Falls, for 1913.

(Drainage area, 180 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
December	330	120	200	1·1	1·3	12,300

Accuracy "B".

SESSIONAL PAPER No. 25e

Monthly Discharge of Green River at Nairn Falls, for 1914.

(Drainage area, 180 square miles.)

Month.	Discharge in Second-feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	990	120	280	1·5	1·7	17,200	B
February	270	120	172	0·9	1·0	9,550	B
March	1,710	270	851	4·7	5·4	52,300	B
April	2,280	750	1,838	10·2	11·4	109,000	B
May							
June	6,100	580	3,524	19·6	21·9	209,000	B
July	6,900	2,440	4,515	25·1	28·9	277,000	B
August	3,400	2,440	2,861	15·9	18·3	176,000	B
September							
October	9,700	620	2,800	15·6	17·9	172,000	C
November	4,600	850	1,530	8·5	9·5	91,000	B
The period	9,700	120					

Green River at Green Lake (1041).

Location.—Highway bridge at mouth of the lake, 42 miles from Squamish.

Records available.—Daily discharges from January to December, 1914.

Drainage area.—Twenty-four square miles; measured from the provincial map of 1912 (scale 3 miles to 1 inch).

Gauge.—Graduated staff. Readings taken by measuring to water surface, from permanent point on the bridge.

Channel.—Narrow and fairly deep. Strewn with boulders.

Discharge measurements.—Six discharge measurements define the rating curve fairly well.

Winter flow.—Open all winter.

Accuracy.—C and D; change in section ——

Discharge Measurements of Green River at Green Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
Nov. 22	H. J. E. Keyes	1,046	26	51·3	3·00	1·32	152[1]
1914.							
March 17	do	1,046	33	58·0	2·71	1·47	157[2]
May 28	Keys & Hughes	1,046	37	96·6	4·37	2·00	422
July 21	H. C. Hughes	1,046	39	93·0	5·62	2·32	522
Aug. 15	do	1,046	39	89·2	4·90	2·15	435
Sept. 10	do	1,046	34	73·1	2·92	1·35	215
Dec. 5	Dobbie & Hughes	1,057	40	102·0	2·38	1·80	243[3]

[1]Station established, gauge not referenced. [2]Surface measurement, former gauge gone; new gauge put in and referenced [3]Channel changed by frostbet and logs wedged under bridge.

Monthly Discharge of Green River at Green Lake, for 1914.

(Drainage area, 24 square miles.)

Month.	Discharge in Second-feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total acre-feet.	
January	700	145	245	10·2	11·8	15,100	C
February	180	120	137	5·7	6·0	7,610	D
March	520	145	270	11·2	12·9	16,600	C
April	1,000	220	598	24·9	27·8	35,580	D
May	850	310	635	26·2	30·3	39,000	D
June	1,150	400	648	27·0	30·1	38,600	D
July	1,150	440	764	31·9	36·8	47,000	D
August	560	310	399	16·6	19·1	24,500	C
September	600	160	267	11·1	12·4	15,900	C
October	1,650	160	567	23·6	27·2	34,900	D
November	1,080	220	440	18·3	20·4	26,200	D
December	530	90	154	6·4	7·4	9,500	C
The year	1,650	90	427	17·8	242·2	310,490	C

Daily Gauge Height and Discharge of Green River at Green Lake, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Helght.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·10	160	1·20	180	1·00	145	1·60	280	2·80	750	2·30	520
2	1·10	160	1·20	180	1·00	145	1·50	250	2·70	700	2·70	700
3	1·20	180	1·10	160	1·00	145	1·40	220	2·80	750	2·80	750
4	1·30	200	1·10	160	1·00	145	1·40	220	2·60	650	2·60	650
5	1·60	280	1·00	145	1·00	145	1·10	310	2·60	650	2·30	520
6	2·10	440	1·00	145	1·00	145	2·40	560	2·70	700	2·10	440
7	2·60	650	1·10	160	1·00	145	2·30	520	2·80	750	2·10	440
8	2·70	700	0·90	130	1·00	145	2·30	520	2·80	750	2·00	400
9	2·50	600	0·90	130	1·00	145	2·30	520	2·90	800	2·00	400
10	1·90	370	0·90	130	1·10	160	2·40	560	2·90	800	2·00	400
11	1·70	310	0·90	130	1·20	180	2·50	600	2·90	800	2·00	400
12	1·40	220	0·90	130	1·20	180	2·50	600	3·00	850	2·30	520
13	1·30	200	0·80	120	1·30	200	2·50	600	3·00	850	2·60	650
14	1·30	200	0·90	130	1·40	220	2·60	650	2·80	750	2·70	700
15	1·30	200	0·90	130	1·40	220	2·60	650	2·80	750	3·00	850
16	1·30	200	0·90	130	1·40	220	2·50	600	2·60	650	3·30	1,000
17	1·20	180	0·90	130	1·50	250	2·85	780	2·50	600	3·60	1,150
18	1·20	180	0·90	130	1·60	280	2·70	700	2·50	600	3·30	1,000
19	1·20	180	0·90	130	1·80	340	3·30	1,000	2·50	600	3·10	900
20	1·10	160	0·90	130	2·00	400	3·05	870	2·45	580	2·80	750
21	1·10	160	0·90	130	2·10	440	3·05	870	2·45	580	2·50	600
22	1·20	180	0·80	120	2·10	440	2·90	800	2·45	580	2·40	560
23	1·20	180	0·80	120	2·30	520	2·80	750	2·40	560	2·30	520
24	1·10	160	0·80	120	2·20	480	2·80	750	2·40	560	2·30	520
25	1·10	160	0·90	130	2·10	440	2·60	650	2·40	560	2·50	600
26	1·10	160	0·90	130	2·10	440	2·60	650	2·30	520	2·50	600
27	1·00	145	1·00	145	2·00	400	2·60	650	2·00	480	2·50	600
28	1·00	145	1·00	145	1·90	370	2·50	600	2·00	480	2·70	700
29	1·10	160	.....	.....	1·80	340	2·50	600	1·70	310	2·80	750
30	1·20	180	.....	.....	1·70	310	2·50	600	1·80	340	3·00	850
31	1·20	180	.....	.....	1·60	280	.....	.....	1·90	370	.....	.....

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Green River at Green Lake, for 1914 —*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·90	800	2·10	440	1·10	160	1·60	280	3·20	950	2·05	310
2	3·10	900	2·10	440	1·20	180	1·90	370	3·45	1,080	2·65	530
3	3·50	1,100	2·10	440	1·10	160	2·50	600	3·05	690	2·35	410
4	3·60	1,150	2·00	400	1·10	160	2·30	520	2·65	530	2·15	340
5	3·60	1,150	2·00	400	1·20	180	2·10	440	2·45	450	1·80	240
6	3·10	900	2·10	440	1·10	160	1·40	220	2·35	410	1·60	190
7	3·00	850	2·30	520	1·20	180	0·90	130	2·35	410	1·60	190
8	2·90	800	2·40	560	1·30	200	1·30	200	2·45	450	1·50	170
9	2·90	800	2·30	520	1·40	220	1·30	200	2·45	450	1·50	170
10	3·00	850	2·30	520	1·30	200	1·10	160	2·25	380	1·40	150
11	3·00	850	2·20	480	1·30	200	1·20	180	2·25	380	1·20	110
12	2·90	800	2·20	480	1·30	200	2·00	400	2·15	340	1·20	110
13	3·20	950	2·10	440	1·10	160	2·60	650	2·25	380	1·10	90
14	3·40	1,050	2·10	440	1·10	160	3·20	950	2·05	310	1·30	130
15	3·10	900	2·10	440	1·10	160	2·60	650	2·05	310	1·30	130
16	3·00	850	2·00	400	1·10	160	3·30	1,000	2·05	310	1·30	130
17	3·00	850	2·00	400	1·70	310	4·60	1,650	1·95	280	1·20	110
18	3·10	900	1·90	370	2·30	520	3·60	1,150	1·85	260	1·20	110
19	3·10	900	1·90	370	2·50	600	3·40	1,050	1·85	260	1·20	110
20	2·90	800	1·80	340	2·20	480	3·10	900	1·75	220	1·10	90
21	2·60	650	1·80	340	1·80	340	2·80	750	1·75	220	1·00	75
22	2·30	520	1·90	370	1·60	280	2·30	520	1·95	280	1·00	75
23	2·30	520	1·70	310	1·50	250	2·40	560	2·35	410	1·10	90
24	2·30	520	1·70	310	1·50	250	2·20	480	2·65	530	1·10	90
25	2·20	480	1·80	340	1·50	250	2·30	520	2·95	650	1·10	90
26	2·20	480	1·70	310	1·60	280	2·20	480	3·05	690	1·10	90
27	2·20	480	1·70	310	1·70	310	2·30	520	2·65	530	1·10	90
28	2·10	440	1·80	340	1·80	340	2·20	480	2·25	380	1·10	90
29	2·20	480	1·80	340	1·90	370	2·10	410	2·15	340	1·10	90
30	2·20	480	1·70	310	2·50	600	2·20	480	2·05	310	1·10	90
31	2·20	480	1·50	250	....	....	2·60	650	....	....	1·10	90

LALUWISSIN CREEK (1050).

Location.—Above the irrigation ditches about 1 mile from the mouth and 26 miles from Lillooet.

Records available.—Daily discharges from June 17, 1914, to September 30, 1914, discontinued at end of irrigation season.

Drainage Area.—Twenty square miles (measured from the provincial map of 1913, scale 12 miles to 1 inch).

Gauge.—Vertical staff gauge about 200 yards above irrigation ditches, referenced to three bench-marks. Readings daily.

Channel.—Wide and shallow, strewn with boulders and coarse gravel. The current is fairly swift. The metering section is quite a good one.

Discharge Measurements.—Three discharge measurements in 1914 define the rating curve fairly well for the two and intermediate stages of the water.

Winter Flow. Measurements made only during the irrigation season.

Accuracy.—Daily gauge readings combined with a fairly well-defined rating curve should ensure a fair degree of accuracy for the variation during the irrigation season.

Laluwissin Creek (1050).

Laluwissin creek has its source in the mountains to the south-east of Lillooet. Some of the peaks in its vicinity attain an altitude of 6,800 feet. It discharges into the Fraser river 26 miles below Lillooet at an elevation of 450 feet. The drainage area is 25 square miles.

The climate in the Laluwissin creek watershed is much similar to that of the Lillooet district generally. The summers are quite hot and the winters rather severe. The mean annual precipitation in the valley is about 10 inches.

The Fraser river benches near the mouth of Laluwissin creek are well suited to cultivation. At present most of the normal flow of the stream is being used to irrigate these benches. No attempt has yet been made to store the high-water flow which occurs during the spring and early summer. It is reported that the upper part of the stream runs through large swamps and meadows, and it is very probable that these meadows could be utilized as storage reservoirs; a pack trail follows the stream up to the meadows.

Discharge Measurements of Laluwissin Creek above intake at irrigation ditches, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
June 17	Keys and Hughes	1,046	6·0	7·95	1·62	1·40	12·9[1]
July 31	H. C. Hughes	1,046	6·0	6·20	1·05	1·00	6·5
Sept. 13	do	1,046	6·0	5·35	·88	1·00	4·7

[1]Station established.

Monthly Discharge of Laluwissin Creek above irrigation ditches, for 1914.

(Drainage area, 25 square miles.)

Month.'	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
July	11	6	7·9	0·3	0·3	490
August	6	5	5·3	0·2	0·2	330
September	6	5	5·4	0·2	0·2	320

Accuracy "D."

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of Laluwissin Creek above irrigation ditches, for 1914.

DAY.	June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·3	11	1·0	6	0·9	5
2			1·3	11	1·0	6	0·9	5
3			1·3	11	1·0	6	0·9	5
4			1·3	11	1·0	6	0·9	5
5			1·3	11	1·0	6	0·9	5
6			1·3	11	1·0	6	0·9	
7			1·3	11	1·0	6	0·9	5
8			1·2	9	1·0	6	0·9	5
9			1·2	9	1·0	6	0·9	5
10			1·2	9	1·0	6	1·0	6
11			1·1	7	0·9	5	1·0	6
12			1·1	7	0·9	5	1·0	6
13			1·1	7	0·9	5	1·0	6
14			1·1	7	0·9	5	1·0	6
15			1·1	7	0·9	5	1·0	6
16			1·1	7	0·9	5	1·0	6
17			1·1	7	0·9	5	1·0	6
18	1·4	13	1·1	7	0·9	5	1·0	6
19	1·4	13	1·1	7	0·9	5	0·9	5
20	1·4	13	1·1	7	0·9	5	1·0	6
21	1·4	13	1·1	7	0·9	5	1·0	6
22	1·3	11	1·1	7	0·9	5	1·0	6
23	1·3	11	1·1	7	0·9	5	0·9	5
24	1·3	11	1·1	7	0·9	5	0·9	5
25	1·4	13	1·0	6	0·9	5	0·9	5
26	1·4	13	1·0	6	0·9	5	0·9	5
27	1·4	13	1·0	6	0·9	5	0·9	5
28	1·4	13	1·0	6	0·9	5	0·9	5
29	1·3	11	1·0	6	0·9	5	0·9	5
30	1·3	11	1·0	6	0·9	5	0·9	5
31			1·0	6	0·9	5		

LILLOOET RIVER (1038).

Location.—Government highway bridge at Agerton, 57 miles from Cheakamus, 8 miles above Lillooet lake, and 2 miles above the mouth of Green river.

Records Available.—Daily discharges.—November 16 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—Above mouth is 2,200 square miles; above the lower end of Lillooet lake, 1,600 square miles; above upper end of lake, 1,300 square miles; above gauging station, 800 square miles.

Gauge.—Vertical staff gauge nailed to central pier of bridge. Referenced to three bench-marks. Gauge readings taken daily.

Channel.—Wide and deep, smooth, sandy bed. An excellent measuring section.

Discharge Measurements.—Five discharge measurements taken during 1914 define the curve very well for all stages of the water.

Winter Flow.—The stream is sometimes frozen over in winter.

Accuracy.—Rating curve well defined and daily gauge readings give good accuracy.

Discharge Measurements of Lillooet River near Agerton above lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 16.....	Keys & Cline.....	1046	168	645	2·63	1·83	1,693[1]
1914.							
March 28.....	H. J. E. Keys.....	1046	174	636	2·42	1·97	1,540
May 31.....	Keys & Hughes.....	1046	185	1,380	3·54	4·92	4,880
June 28.....	Hughes.....	1046	188	2,063	4·37	7·60	9,000
Aug. 10.....	do	1046	187	1,831	4·00	6·76	7,400
July 15.....	do	1046	188	2,692	6·15	10·4	16,500

[1]Station established.

Monthly Discharge of Lillooet River 6 miles above Lillooet Lake, for 1914.

(Drainage area, 800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January.....	1,480	950	1,280	1·60	1·84	79,000	B
February.....	980	950	960	1·20	1·25	53,000	B
March.....	2,670	980	1,770	2·21	2·55	109,000	B
April.....	3,750	1,730	2,860	3·57	3·98	170,000	B
May.....	9,250	3,750	5,870	7·34	8·46	361,000	B
June.....	16,500	4,930	9,140	11·42	12·74	544,000	B
July.....	18,300	6,800	13,010	16·25	19·98	799,000	C
August.....	14,700	7,500	10,560	13·20	15·22	648,000	B
September.....	7,850	3,200	5,030	6·29	7·02	299,000	B
October.....	19,200	2,670	6,590	8·24	9·50	405,000	B
November.....	4,930	2,470	3,540	4·42	4·93	211,000	B
December.....	3,200	1,480	1,890	2·36	2·71	116,000	B
The year.....	19,200	950	5,270	6·51	90·18	3,794,000	B

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Lillooet River 6 miles above Lillooet Lake, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·5	1,330	Frozen	950	1·0	980	2·0	1,730	4·0	3,750	6·0	6,250
2	1·6	1,400	.....	950	1·4	1,260	2·0	1,730	4·8	4,690	7·5	8,820
3	1·6	1,400	.....	950	1·4	1,260	2·0	1,730	4·6	4,440	8·0	9,970
4	1·6	1,400	.....	950	1·4	1,260	2·0	1,730	4·5	4,320	7,5	8,820
5	1·6	1,400	.....	950	1·4	1,260	2·0	1,730	4·5	4,320	6·9	7,660
6	1·6	1,400	.....	950	1·4	1,260	3·0	2,670	4·5	4,320	6·5	6,690
7	1·7	1,480	.....	950	1·4	1,260	3·2	2,870	4·5	4,320	5·5	5,570
8	1·7	1,480	.....	950	1·4	1,260	3·2	2,870	4·5	4,320	5·0	4,930
9	1·7	1,480	.....	950	1·4	1·260	3·2	2,870	4·8	4,690	5·0	4,930
10	1·7	1,480	.....	950	1·4	1,260	3·5	3,200	5·0	4,930	5·8	5,970
11	1·7	1,480	.....	950	1·4	1,260	3·5	3,200	5·5	5,570	6·4	6,840
12	1·7	1,480	.....	950	1·5	1,330	3·5	3,200	5·5	5,570	6·8	7,480
13	1·6	1,400	.....	950	1·5	1,330	3·8	3,530	6·0	6,250	7·7	9,250
14	1·6	1,400	.....	950	2·0	1,730	3·8	3,530	7·0	7,850	8·2	10,500
15	1·6	1,400	Frozen	950	2·0	1,730	4·0	3,750	7·0	7,850	9·5	13,900
16	1·6	1,400	.....	950	2·0	1,730	4·0	3,750	6·5	6,990	10·1	15,600
17	1·6	1,400	.....	950	2·4	2,090	3·8	3,530	5·9	6,110	10·4	16,500
18	1·6	1,400	.....	950	2·0	1,730	3·5	3,200	5·7	5,830	9·7	14,500
19	1·6	1,400	.....	950	2·2	1,900	3·5	3,200	5·7	5,830	9·0	12,500
20	1·5	1,330	.....	950	2·6	2,280	3·5	3,200	6·2	5,540	8·3	10,700
21	1·4	1,260	.....	950	2·8	2,470	3·6	3,310	7·0	7,850	7·8	9,500
22	1·4	1,260	1·0	980	2·8	2,470	3·5	3,200	7·0	7,850	7·2	8,230
23	1·2	1,110	1·0	980	3·0	2,670	3·2	2,870	7·5	8,820	6·8	7,480
24	1·0	980	1·0	980	3·0	2,670	3·2	2,870	7·7	9,250	6·5	6,990
25	1·0	980	1·0	980	3·0	2,670	3·2	2,870	7·0	7,850	6·8	7,480
26	Frozen	950	1·0	980	2·8	2,470	3·0	2,670	6·7	7,310	7·4	8,620
27	.....	950	1·0	980	2·8	2,470	3·0	2,670	6·0	6,250	7·4	8,620
28	.....	950	1·0	980	2·8	2,470	3·0	2,670	5·0	4,930	7·8	9,490
29	.....	950	.....	.....	2·0	1,730	3·0	2,670	4·8	4,690	8·0	9,970
30	.....	950	.....	.....	2·0	1,730	3·2	2,870	4·8	4,690	8·2	10,400
31	.....	950	.....	.....	2·0	1,730	.....	.....	5·0	4,930	...	...

DAILY GAUGE HEIGHT AND DISCHARGE of Lillooet River 6 miles from Lillooet Lake, for 1914—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	9·4	13,600	8·0	10,000	6·8	7,500	4·0	3,750	5·0	4,930	3·5	3,200
2	9·9	15,000	8·5	11,200	6·8	7,500	3·8	3,530	5·0	4,930	3·2	2,870
3	10·8	17,700	9·2	13,100	7·0	7,850	3·5	3,200	4·6	4,440	3·0	2,670
4	10·8	17,700	9·6	14,200	6·8	7,500	3·0	2,670	4·5	4,320	3·0	2,670
5	9·8	14,700	9·0	12,500	6·7	7,300	3·2	2,870	4·5	4,320	2·8	2,470
6	9·4	13,600	8·9	12,300	6·4	6,840	3·4	2,990	4·0	3,750	2·7	2,380
7	8·7	11,700	7·6	9,000	6·0	6,250	3·4	2,990	3·8	3,530	2·7	2,380
8	8·7	11,700	6·6	7,200	6·5	7,000	3·8	3,530	3·7	3,420	2·8	2,470
9	8·8	12,000	7·4	8,600	6·0	6,250	3·9	3,640	4·7	4,570	2·6	2,280
10	9·5	13,900	7·8	9,500	5·8	5,970	4·0	3,750	4·0	3,750	2·3	2,000
11	10·0	15,300	8·2	10,400	5·2	5,180	4·0	3,750	4·2	3,970	2·0	1,730
12	9·8	14,700	8·6	11,500	5·0	4,930	5·0	4,930	3·8	3,530	2·0	1,730
13	10·6	17,100	9·0	12,500	4·4	4,200	8·55	11,300	3·8	3,530	2·0	1,730
14	10·5	16,800	9·8	14,700	4·2	3,970	11·3	19,200	3·6	3,310	1·8	1,570
15	10·0	15,300	9·2	13,100	4·1	3,860	10·8	17,700	3·3	2,980	1·8	1,570
16	9·2	13,100	9·0	12,500	3·5	3,200	11·0	18,300	3·0	2,670	1·8	1,570
17	9·5	13,900	8·6	11,500	3·8	3,530	11·2	18,900	3·0	2,670	1·8	1,570
18	10·0	15,300	8·0	10,000	4·0	3,750	7·8	9,500	2·8	2,470	1·7	1,480
19	10·8	17,700	8·5	11,200	3·8	3,530	6·4	6,840	2·8	2,470	1·7	1,480
20	11·0	18,300	9·0	12,500	3·5	3,200	5·8	6,000	2·8	2,470	1·7	1,480
21	9·0	12,500	9·0	12,500	3·5	3,200	5·4	5,440	2·8	2,470	1·7	1,480
22	7·5	8,800	9·0	12,500	3·8	3,530	4·8	4,690	3·0	2,670	1·7	1,480
23	7·5	8,820	8·4	11,000	3·8	3,530	4·5	4,320	3·0	2,670	1·8	1,570
24	8·0	10,000	7·8	9,500	4·0	3,750	4·0	3,750	3·2	2,870	1·8	1,570
25	8·4	10,900	7·8	9,500	4·5	4,320	4·0	3,750	4·4	4,200	1·8	1,570
26	8·7	11,700	7·5	8,280	5·0	4,930	4·2	3,970	4·8	4,700	1·8	1,570
27	8·0	10,000	7·8	9,500	5·0	4,930	4·3	4,080	4·2	3,970	1·9	1,650
28	6·4	6,800	7·6	9,000	4·8	4,700	4·2	3,970	4·2	3,970	1·9	1,650
29	6·8	7,500	6·8	7,500	4·5	4,320	5·0	4,930	3·8	3,530	1·8	1,570
30	7·2	8,200	6·8	7,500	4·5	4,320	7·6	7,850	3·5	3,200	1·8	1,570
31	7·5	8,800	6·8	7·500	.....	.....	7·2	8,230	.....	.....	1·8	1,570

RILEY CREEK (1043).

Location.—Above irrigation ditches, about half a mile from the mouth and 9 miles from Lillooet.

Records Available.—Daily discharges from July 28, 1914, to October 14, 1914,(irrigation season).

Drainage Area.—Five square miles (measured from provincial map of 1913, scale 3 miles to 1 inch).

Gauge.—Vertical staff gauge nailed to old flume just below the falls. Readings every second day.

Channel.—Fairly wide and shallow. The bed consists mainly of solid rock and gravel. The current is swift. The metering section is a good one.

Discharge Measurements.—Two discharge measurements in 1914 define the rating curve fairly well for the variations during the irrigation season.

Winter Flow.—Measurements made only during the irrigation season.

Accuracy.—*D.*

Riley Creek (1043).

Riley creek rises in the mountains to the south of Lillooet and discharges into the Fraser river about 9 miles below Lillooet at an elevation of about 620 feet. The drainage area is about 5 square miles.

The climate in the Riley Creek basin is much similar to that of the Lillooet district generally. The summers are quite hot and the winters rather severe. The mean annual precipitation in the valley is about 20 inches.

A large fraction of the water flowing in Riley creek is used to irrigate the benches on the Fraser river near the mouth of the stream. It is very probable the remaining flow could be utilized to advantage on these benches. The possibilities of conserving the high-water flow have never been fully investigated.

Discharge Measurements of Riley Creek above intake of irrigation ditch, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 28	H. C. Hughes	1046	13	11·6	1·84	1·35	21·4[1]
Sept. 16	do	1046	13	6·9	1·08	1·25	7·5

[1] Station established.

Monthly Discharge of Riley Creek above irrigation ditches, for 1914.

(Drainage area, 5 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet
August	21	4	10·4	2·1	2·4	640
September	13	8	11·0	2·2	2·5	650

Accuracy "D".

DAILY GAUGE HEIGHT AND DISCHARGE of Riley Creek above irrigation ditches, for 1914.—*Con.*

DAY.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·3	13	.....	13	.....	13
2	.....	.....	.....	17	1·3	13	1·3	13
3	.....	.....	1·35	21	.....	13	.....	13
4	.....	.....	.....	17	1·3	13	1·3	13
5	.....	.....	1·30	13	.....	13	.....	13
6	.....	.....	.....	13	1·3	13	1·3	13
7	.....	.....	1·30	13	.....	10	.....	13
8	.....	.....	.....	13	1·25	8	1·3	13
9	.....	.....	1·30	13	.....	8	.....	13
10	.....	.....	.....	13	1·25	8	1·3	13
11	.....	.....	1·30	13	.....	8	.....	13
12	.....	.....	.....	10	1·25	8	1·3	13
13	.....	.....	1·25	8	.....	8	.....	13
14	.....	.....	.....	8	1·25	8	1·3	13
15	.....	.....	1·25	8	.....	8	.....	.....
16	.....	.....	.....	8	1·25	8	.....	.....
17	.....	.....	1·25	8	.....	8	.....	.....
18	.....	.....	.....	.....	1·25	8	.....	.....
19	.....	.....	1·25	8	.....	10	.....	.....
20	.....	.....	.....	8	1·3	13	.....	.....
21	.....	.....	1·20	4	.....	13	.....	.....
22	.....	.....	.....	4	1·3	13	.....	.....
23	.....	.....	1·20	4	.....	13	.....	.....
24	.....	.....	.....	6	1·3	13	.....	.....
25	.....	.....	1·25	8	.....	13	.....	.....
26	.....	.....	.....	8	1·3	13	.....	.....
27	.....	.....	1·25	8	.....	13	.....	.....
28	1·3	13	.....	10	1·3	13	.....	.....
29	.....	13	1·30	13	.....	13	.....	.....
30	1·3	13	1·30	13	1·3	13	.....	.....
31	.....	13	.....	13	.....	.....	.....	.....

SETON CREEK (1049).

Location.—At footbridge at provincial hatchery, about half a mile below Seton lake, and three miles from Lillooet.

Records Available.—Daily discharges from April 6 to December 31, 1914.

Drainage Area.—460 square miles (measured from provincial map of 1912, scale 12 miles to 1 inch.)

Gauge.—Vertical staff on bridge pier, referenced to three bench-marks. Daily readings.

Channel.—Wide and shallow, and strewn with boulders. The current is quite swift. The measuring section is hardly an ideal one, though about the best obtainable on the stream.

Discharge Measurements.—Four discharge measurements taken in 1914 define the rating curve fairly well except for extremely low or extremely high stages.

Winter Flow.—Open water conditions all year.

Accuracy.—Daily gauge readings combined with a fairly well-defined rating curve should insure a reasonable degree of accuracy, except possibly at the extreme stages.

Seton Creek (1049).

Seton Creek has its source in Seton lake at an elevation of 800 feet, and discharges into Cayuse creek at an elevation of 750 feet. The stream itself is only about 1½ miles in length, but the lakes which feed it have a drainage area of some 460 square miles.

Seton creek itself is in the dry belt, though some of the territory it drains is outside. The mean annual precipitation at Lillooet is probably about 15 inches, while it may be as high as 30 or even 40 at the headwaters of some of the tributaries. The general climatic conditions vary in a similar manner.

Seton creek forms part of quite an interesting system of waterways. Anderson river rises near the divide which separates it from the Birkenhead, and flows into Anderson lake, which has a number of other rather important streams tributary to it. Anderson lake discharges through Portage creek into Seton lake, which in its turn is drained by Seton creek. The two lakes at one time formed part of quite an important route into the Lillooet and Cariboo country by Harrison lake and the Lillooet river. The construction of the Yale-Cariboo wagon road caused the practical abandonment of this route years ago, but now the country is being opened up again by the construction of the Pacific Great Eastern railway. The railroad, coming up from Squamish to Pemberton, crosses the divide from the Birkenhead, runs along the shores of Anderson and Seton lakes, follows Seton and Cayuse creeks and then crosses the Fraser river below Lillooet on its way to Clinton and Fort George. During the railroad construction the lakes were used extensively for the transportation of supplies.

The country surrounding Seton and Anderson lakes is very picturesque, and should be a good place for a summer resort. There is plenty of good hunting and fishing in the vicinity in addition to the numerous attractions which the lakes themselves afford.

The Provincial Fisheries Department is operating a fish hatchery on Seton creek. The Salmon coming up from the Fraser river are taken in the creek just below Seton lake. The spawn are hatched and the fry are kept for a time in the tanks at the hatchery. The supply of fresh water required for this purpose is taken from Seton lake.

Owing to the comparatively small fall in Seton creek and the low elevation of Seton lake, there is not much opportunity for using the water for developing water-power or even for irrigation.

There is a considerable quantity of timber on the hills surrounding the two lakes. It is generally fairly easy to get the logs down to the water, and then they can be towed to the saw-mills. There is a saw-mill on each lake.

On account of the proximity of Bridge river to Seton lake, and the great difference in altitude, there is a splendid chance to develop a large amount of water-power. By driving a tunnel through the intervening ridge, water could be diverted from Bridge river and conveyed to a point on the hillside above Seton lake, whence penstocks could be laid to a power-house situated beside the lake. Such an installation could make use of the whole minimum flow of Bridge river at a head of about 2,000 feet. If storage could be obtained on Bridge river, the available flow at low water could be increased. Such a development might mean the addition of more than 500 cubic feet per second to the natural flow of Seton creek and it would be necessary to enlarge its channel in order that it might carry off this greatly increased discharge without damage to the surrounding property. The tunnel portal and the penstocks for such a plant would be located on the hillside above the Pacific Great Eastern railway, and it would be necessary to take extra precautions to prevent leaks or breaks which might wash out the track.

There are three creeks of some importance flowing into Anderson lake, and brief descriptions of them are added here. As yet no measurements have been taken on them by the engineers of this survey, partly on account of the poor transportation facilities. Next season, however, measurements will probably be made on some or all of them.

ANDERSON RIVER.

Anderson river rises in Summit lake at an elevation of 1,600 feet and discharges into the southern end of Anderson lake at an elevation of 850 feet. Cedar, Spruce and Little Blackwater creeks are tributaries of Anderson river.

The climatic conditions in the Anderson Creek valley differ considerably from those around Lillooet. The summers are milder and the winters are not quite as cold. The mean annual precipitation is considerably greater, being between 30 and 40 inches. Irrigation is practised to some extent, but is not so necessary, as in the country immediately surrounding Lillooet.

The soil in the Anderson river valley is very fertile, and much of the best land has been taken up for settlement. This development will probably be increased on account of greatly improved transportation facilities afforded by the railroad. There is a good growth of timber in many parts of the valley. The surrounding hills are rich in minerals, and many claims have been staked, though comparatively little development has been done as yet.

LITTLE BLACKWATER.

Little Blackwater creek, which is a tributary of Anderson river, rises in Little Blackwater lake. About 3 miles of swampy land separate this lake from Big Blackwater lake, which is said to be at a somewhat higher elevation. Little Blackwater creek is quite small itself, but by diverting water into it from Big Blackwater lake, it is possible that a considerable amount of water-power might be developed by a pipeline down the valley of Little Blackwater creek.

MCGILLIVRAY CREEK.

McGillivray creek rises in the hills northwest of Anderson lake, into which it discharges.

Near the mouth of the creek there is a falls about 60 feet high at which a considerable amount of water-power might be developed. A small fraction of the water is being used at present to run a saw-mill which is situated at the mouth. Water is led from the head of the falls through a 6-inch wooden stave pipe to the turbines which drive the mill.

There are gravel deposits on this stream which contain small quantities of gold, and they are being worked to a certain extent.

ROARING CREEK.

This stream empties into Anderson lake about 7 miles from its southern end. It has quite a high water fall on it at which water-power could probably be developed.

SESSIONAL PAPER No. 25e

Discharge Measurements of Seton Creek near Seton Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 6	H. J. E. Keys	1046	66	112	3·23	1·72	362[1]
June 13	Keys & Hughes	1046	78	231	6·73	3·30	1,556
" 19	H. C. Hughes	1046	78	261	7·50	3·70	1,967
Sept. 17	do	1046	73	134	3·64	2·20	488

[1] Station established.

Monthly Discharge of Seton Creek below Seton Lake, for 1914.

(Drainage area, 460 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	450	300	362	0·8	0·9	21,500
May	1,760	420	1,013	2·2	2·5	62,300
June	2,280	1,660	1,848	4·0	4·5	110,000
July	2,800	1,760	2,390	5·2	6·0	147,000
August	1,760	700	952	2·1	2·4	58,500
September	610	450	492	1·1	1·2	29,300
October	610	450	510	1·1	1·3	31,400
November	610	450	509	1·1	1·2	30,300
December	450	340	382	0·8	0·9	23,500

Accuracy "C".

Daily Gauge Height and Discharge of Seton Creek below Seton Lake, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	2·0	420	3·4	1,660	3·7	1,970	3·5	1,760	2·4	610
2	.....	.....	2·0	420	3·4	1,660	3·7	1,970	3·4	1,660	2·4	610
3	.....	.....	2·0	420	3·4	1,660	3·7	1,970	3·3	1,550	2·4	610
4	.....	.....	2·0	420	3·4	1,660	4·0	2,280	3·2	1,440	2·4	610
5	1·4	320	2·0	420	3·4	1,660	4·2	2,490	2·8	1,030	2·3	540
6	1·3	310	2·1	450	3·4	1,660	4·2	2,490	2·8	1,030	2·3	540
7	1·5	330	2·1	450	3·4	1,660	4·1	2,390	2·8	1,030	2·2	490
8	1·5	330	2·1	450	3·4	1,660	4·2	2,490	2·8	1,030	2·3	540
9	1·5	330	2·2	490	3·4	1,660	4·2	2,490	2·6	810	2·3	540
10	1·6	340	2·2	490	3·4	1,660	4·3	2,600	2·7	920	2·2	490
11	1·6	340	2·3	540	3·4	1,660	4·3	2,600	2·7	920	2·2	490
12	1·6	340	2·4	610	3·4	1,660	4·2	2,490	2·7	920	2·2	490
13	1·7	350	2·5	700	3·4	1,660	4·3	2,600	2·7	920	2·1	450
14	1·7	350	2·6	810	3·4	1,660	4·2	2,490	2·7	920	2·1	450
15	1·7	350	2·7	920	3·5	1,760	4·2	2,490	2·7	920	2·1	450
16	1·7	350	2·8	1,030	3·5	1,760	4·3	2,600	2·7	920	2·0	420
17	1·7	350	2·8	1,030	3·7	1,970	4·4	2,700	2·7	920	2·0	420
18	1·7	350	2·9	1,140	3·8	2,070	4·4	2,700	2·7	920	2·2	490
19	1·7	350	2·9	1,140	3·7	1,970	4·5	2,800	2·6	810	2·2	490
20	1·8	370	3·0	1,250	3·8	2,070	4·5	2,800	2·6	810	2·2	490
21	1·8	370	3·1	1,340	3·9	2,180	4·5	2,800	2·6	810	2·2	490
22	2·1	450	3·2	1,440	4·0	2,280	4·4	2,700	2·6	810	2·1	450
23	2·1	450	3·3	1,550	3·9	2,180	4·3	2,600	2·6	810	2·1	450
24	2·0	420	3·4	1,660	3·9	2,180	4·2	2,490	2·6	810	2·1	450
25	2·0	420	3·4	1,660	3·8	2,070	4·1	2,390	2·6	810	2·1	450
26	2·0	420	3·4	1,660	3·8	2,070	4·1	2,390	2·5	700	2·1	450
27	2·0	420	3·4	1,660	3·7	1,970	3·8	2,070	2·5	700	2·1	450
28	2·0	420	3·5	1,760	3·6	1,860	3·7	1,970	2·5	700	2·1	450
29	2·0	420	3·5	1,760	3·6	1,860	3·6	1,860	2·5	700	2·1	450
30	2·0	420	3·4	1,660	3·7	1,970	3·6	1,860	2·5	700	2·1	450
31	.....	.....	3·4	1,660	.....	.....	3·5	1,760	2·5	700	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Seton Creek below Seton Lake, for 1914—*Con.*

DAY.	October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·2	490	2·2	490	2·1	450
2	2·2	490	2·3	540	2·1	450
3	2·2	490	2·4	610	2·1	450
4	2·2	490	2·4	610	2·0	420
5	2·2	490	2·4	610	2·0	420
6	2·2	490	2·4	610	2·0	420
7	2·2	490	2·4	610	2·0	420
8	2·2	490	2·4	610	2·0	420
9	2·2	490	2·4	610	2·0	420
10	2·2	490	2·3	540	2·0	420
11	2·2	490	2·3	540	1·9	390
12	2·2	490	2·3	540	1·9	390
13	2·2	490	2·3	540	1·9	390
14	2·1	450	2·3	540	1·9	390
15	2·1	450	2·2	490	1·8	370
16	2·1	450	2·2	490	1·8	370
17	2·2	490	2·1	450	1·8	370
18	2·2	490	2·1	450	1·8	370
19	2·2	490	2·1	450	1·8	370
20	2·3	540	2·1	450	1·7	350
21	2·3	540	2·1	450	1·7	350
22	2·3	540	2·1	450	1·7	350
23	2·4	610	2·1	450	1·7	350
24	2·4	610	2·1	450	1·7	350
25	2·4	610	2·1	450	1·7	350
26	2·4	610	2·1	450	1·7	350
27	2·3	540	2·1	450	1·6	340
28	2·3	540	2·1	450	1·6	340
29	2·2	490	2·1	450	1·6	340
30	2·2	490	2·1	450	1·6	340
31	2·2	490	.....	...	1·6	340

SIX-MILE CREEK (1061).

Location.—At Highway bridge—1 mile from the mouth, 5 miles from Pemberton, and 56 miles from Squamish.

Records Available.—Daily discharges from June 2, 1914, to December 31, 1914.

Drainage Area.—Thirty square miles (measured from the provincial map of 1913, scale 3 miles to 1 inch).

Gauge.—Vertical staff on bridge pier, referenced to three bench-marks. Daily readings.

Channel.—Wide and shallow and strewn with boulders and coarse gravel. The current is very swift. The measuring section is hardly an ideal one, though about the best obtainable on the stream.

Discharge Measurements.—Five discharge measurements in 1914-15 define the rating curve fairly well, except for extremely high stages.

Winter Flow.—Open water conditions all winter.

Accuracy.—Daily gauge readings combined with a fairly well-defined rating curve should insure a reasonable degree of accuracy, except possibly at extremely high stages.

Six-mile Creek (1061).

Six-mile creek has its source in the mountains to the southwest of Pemberton and discharges into the Green river at an elevation of about 1,400 feet. It has a drainage area of something like 30 square miles.

The climate in the Six-mile creek watershed is much similar to that of Pemberton meadows and the Green river valley. The range of temperature is not very great. There is a fairly heavy snowfall. The mean annual precipitation of the watershed is about 75 inches.

Six-mile creek is the second largest tributary of Green river. The stream has a very rapid fall, and considerable power might be developed on it. If a suitable strap site can be found on it, it would assist in regulating the flow in Green river for use at the proposed development at Nairn falls. Its value in this capacity has never been fully investigated.

The main line of the Pacific Great Eastern railway crosses the stream about three-quarters of a mile from the mouth. A flag-station, Tisdall, near this point, affords easy access to the gauging station.

There is some good farming land on the benches near the mouth of the stream, but it is little developed as yet.

Discharge Measurements of Six-mile Creek at mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 21[1]	Keys & Hughes	1046	.....	.....	.....	.....	.....
Aug. 12	H. C. Hughes	1046	48	123	6·8	3·32	840
Sept. 9	do	1046	45	66	4·43	2·28	292
" 10	do	1046	45	86·4	5·13	2·80	446
Nov. 27	Dobbie & Hughes	1057	45	67·8	5·18	2·40	346[2]

[1] Stations established. [2] Channel probably changed by freshet.

Monthly Discharge of Six-mile Creek, 5 miles from Pemberton, for 1914.

(Drainage area, 30 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	1,720	390	866	28·9	32·2	52,000	C
July	1,900	540	1,170	39·0	45·0	71,900	C
August	1,090	390	717	23·9	27·6	44,100	B
September	.....	.....	.....	.....	.....	.....	.....
October	6,580	40	1,620	5·4	6·2	99,600	D
November	1,850	100	590	2·0	2·2	35,000	B

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Six-mile Creek at Highway Bridge, for 1914.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·4	910	3·9	1,360	3·0	600	2·65	410	2·6	390	4·45	1,850
2	3·4	910	4·2	1,630	3·2	750	2·6	390	2·4	320	4·25	1,680
3	3·4	910	4·4	1,810	3·3	830	2·6	390	2·2	260	4·15	1,580
4	3·0	600	4·3	1,720	3·4	910	2·6	390	2·1	230	3·95	1,400
5	2·9	540	4·0	1,450	3·3	830	2·6	390	2·1	230	3·65	1,130
6	2·7	440	3·8	1,270	3·3	830	2·6	390	1·9	180	3·35	870
7	2·7	440	3·7	1,180	3·2	750	2·6	390	1·6	120	3·05	640
8	2·6	390	3·5	1,000	3·2	750	2·6	390	1·1	40	3·25	790
9	2·7	440	3·5	1,000	3·0	600	2·5	350	2·2	260	3·45	950
10	2·8	490	3·4	910	3·0	600	2·3	290	2·7	440	3·15	710
11	2·9	540	4·2	1,630	3·1	670	2·8	490	2·2	260	2·95	570
12	3·1	670	4·5	1,900	3·2	750	2·8	490	2·1	230	2·75	469
13	3·3	830	4·3	1,720	3·6	1,090	2·3	290	6·3	3,520	2·65	420
14	3·8	1,270	4·4	1,810	3·4	910	2·3	290	6·0	3,250	2·45	330
15	3·9	1,360	4·5	1,900	3·2	750	2·1	230	8·9	5,860	2·35	300
16	4·2	1,630	4·3	1,720	3·2	750	2·0	200	9·7	6,580	2·35	300
17	4·3	1,720	3·7	1,180	3·0	600				6,000	2·15	240
18	4·0	1,450	3·8	1,270	2·9	540				4,000	1·95	190
19	3·8	1,270	3·8	1,270	3·3	830			4·55	1,950	2·05	220
20	3·4	910	3·5	1,000	3·5	1,000			4·15	1,580	2·15	240
21	3·1	670	3·2	750	3·1	670			3·75	1,220	2·25	280
22	3·0	600	3·1	670	3·5	1,000			3·45	960	2·15	240
23	3·1	670	3·3	830	2·9	540			3·25	790	2·35	300
24	3·0	600	3·3	830	2·9	540			2·95	570	2·35	300
25	3·4	910	3·3	830	3·1	670			3·15	710	3·25	790
26	3·4	910	3·3	830	3·0	600			3·15	710	2·65	420
27	3·3	830	3·1	670	3·0	600			3·55	1,040	1·70	140
28	3·4	910	3·0	600	3·1	670			4·45	1,850	1·80	160
29	3·5	1,000	2·9	540	3·0	600			5·55	2,850	1·60	120
30	3·7	1,180	3·0	600	3·0	600			4·85	2,220	1·50	100
31			3·0	600	2·6	390			4·25	1,680		

DAILY GAUGE HEIGHT AND DISCHARGE of Six-mile Creek at Highway Bridge, for 1914—*Con.*

DAY.	December.	
	Gauge Height.	Discharge
	Feet.	Sec.-ft.
1	2·05	220
2	2·00	200
3	1·95	190
4	.....	.....
5	.....	.....
6	.....	.....
7	.....	.....
8	.....	.....
9	.....	.....
10	.....	.....
11	.....	.....
12	.....	.....
13	1·45	90
14	1·30	60
15	1·30	60
16	1·35	70
17	.....	60
18	1·20	50
19	1·25	50
20	.....	50
21	.....	50
22	1·25	50
23	.....	50
24	.....	60
25	1·30	60
26	1·20	50
27	1·30	60
28	.....	70
29	1·40	80
30	1·40	80
31	1·40	80

Soo River (1037).

Location.—At Highway bridge, 2 miles from the mouth; 6½ miles from Pemberton, and 56 miles from Squamish.

Records Available.—Six meter measurements. Gauge readings are available from December 5, 1914. These can be used to get discharges when the curve is more thoroughly defined.

Drainage Area.—Seventy-five square miles (measured from the Provincial map of 1912, scale 3 miles to 1 inch).

Gauge.—Vertical staff on bridge pier, referenced to three bench-marks. Readings daily.

Channel.—Wide and shallow, strewn with boulders, gravel and silt. The current is fairly swift. The metering section is an excellent one.

Discharge Measurements.—Six meter measurements.

Winter Flow.—The measuring section is usually frozen over and the channel is affected by ice at times during the winter.

Soo River (1037).

Soo river has its source in the mountains to the northwest of Green lake, and discharges into the Green river about 11 miles from its mouth, at an elevation of some 1,500 feet. It has a drainage area of something like 75 square miles.

The climate in the Soo river watershed is much similar to that of Pemberton meadows and the Green river valley. The range of temperature is not very great, and there is a fairly heavy snowfall. The mean annual precipitation for the whole watershed is about 75 inches.

The discharge figures indicate that there is a considerable quantity of water flowing in Soo river. This could be used to develop power in a small canyon about 2 miles from the mouth, in which there is a large fall. The stream could also be used to good advantage as a storage reservoir for power development on Green river at Nairn falls. About 20 miles from the mouth there is a string of fair-sized lakes and several large meadows which are well adapted for this purpose. A pack trail follows the stream up to the lakes.

The main line of the Pacific Great Eastern railway follows along the right bank for about 2 miles, and crosses 4 miles from the mouth.

There is some good farming land on the flats near the mouth of the stream.

The Soo river is fairly well-timbered.

Discharge Measurements of Soo River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
March 24[1]	H. J. E. Keys						
May 30	Keys & Hughes	1046	107	320	2·67	2·93	853
July 19	H. C. Hughes	1046	115	426	4·42	3·87	1,880
Aug. 13	do	1046	110	366	3·60	3·50	1,320
Dec. 3	Dobbie & Hughes	1057	90	223	1·61	1·10	357[2]

[1] Station established. [2] Channel probably changed by freshet.

Texas Creek (1044).

Location.—At the highway bridge, 14 miles from Lillooet, and on the west side of the Fraser river.

Records Available.—Daily discharges from April 14 to September 14, 1914 (irrigation season).

Drainage Area.—Fifty square miles (measured from the provincial map of 1912, scale 12 miles to 1 inch).

Gauge.—Vertical staff gauge nailed to bridge pier, and referenced to three bench-marks. Gauge readings taken three times a week.

Channel.—Wide and shallow, covered with boulders. The measuring section on the lower side of the bridge is rather poor but is the best obtainable.

Discharge Measurements.—Four meter measurements taken during the spring and summer of 1914 define the rating curve fairly well for all but the highest stages.

Winter Flow.—Measurements made only during the irrigation season.

Accuracy.—The four meter measurements agree fairly well and cover all but the highest stages. The gauge readings were taken only three times a week.

Texas Creek (1044).

Texas creek has its source in the mountains to the south of Lillooet. Some of the mountain peaks in its vicinity attain an altitude of 8,000 feet. It discharges into the Fraser river some 14 miles below Lillooet, at an elevation of about 600 feet. It has a drainage area of something like 50 square miles.

The climate in the Texas creek watershed is much similar to that of the Lillooet district generally; the summers are quite hot and the winters rather severe. At the mouth the mean annual precipitation is probably about 20 inches, and this may increase to 30 inches or more at the higher altitudes near the head-waters.

The discharge figures indicate that there is a considerable quantity of water flowing in Texas creek during the irrigation season, and in a dry part of the country like the Lillooet district, this water should be quite valuable. Unfortunately, the benches near the mouth are so high above the stream that it would be very costly to get the water up to them. There are large areas of good land on the opposite side of the Fraser river which might be irrigated from Texas creek, though the expense of conveying the water across the river would be quite high.

DISCHARGE MEASUREMENTS of Texas Creek one mile from mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 14	H. J. E. Keys	1046	19	29·7	3·60	1·20	107[1]
June 7	Keys & Hughes	1046	22	42·7	5·47	2·00	233
July 29	H. C. Hughes	1046	22	43·0	2·96	1·50	137
Sept. 16	do	1046	20	26·3	2·39	1·00	63

[1] Station established, gauge referenced to bench-marks.

MONTHLY DISCHARGE of Texas Creek one mile from mouth, for 1914.

(Drainage area, 50 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	340	120	247	4·9	5·6	15,200
June	560	210	337	6·7	7·5	20,000
July	280	140	211	4·2	4·8	13,000
August	130	70	100	2·0	2·3	6,100
September	100	50	71	1·4	1·6	4,200

Accuracy "C".

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Texas Creek one mile from mouth, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·4	120	2·6	360	2·1	250		130	1·05	70
2			1·4	120		390		250	1·45	130		70
3			1·7	170	2·8	410	2·1	250		130	1·05	70
4			1·6	160		390		240	1·45	130		70
5			1·5	140	2·6	360	2·0	230		120	1·0	60
6			1·5	140		320		230	1·4	120		60
7			1·5	140	2·2	280	2·0	230		120	1·0	60
8			1·5	140		250		240	1·4	120		60
9			1·7	170	2·0	230	2·1	250		120	0·9	50
10			1·8	190		240		260	1·35	110		50
11				220	2·1	250	2·2	280		110	0·9	50
12			2·1	250		280		260	1·3	100		60
13				260	2·3	300	2·1	250		100	1·0	60
14			2·2	280		360		240	1·3	100		70
15	1·3	100		280	2·9	440	2·0	230		100	1·05	70
16	1·3	100	2·2	280		480		220	1·25	100		70
17	1·4	120		290	3·2	510	1·9	210		100	1·0	60
18	1·4	120	2·3	300		540		220	1·25	100		60
19	1·4	120		300	3·4	560	2·0	230		90	1·0	60
20	1·4	120	2·3	300		390		220	1·2	90		70
21	1·3	100		310	1·9	210	1·9	210		90	1·05	70
22	1·3	100	2·4	320		240		190	1·2	90		80
23	1·3	100		330	2·2	280	1·7	170		90	1·1	70
24	1·5	140	2·5	340		280		160	1·15	80		80
25	1·5	140		320	2·2	280	1·6	150		80	1·2	90
26	1·4	120	2·3	300		290		150	1·15	80		90
27	1·4	120		290	2·3	300	1·55	150		80	1·25	100
28	1·4	120	2·2	280		300		140	1·1	70		100
29	1·4	120		290	2·3	300	1·5	140		70	1·3	100
30	1·4	120	2·3	300		280		140	1·05	70		100
31				330			1·5	140		70		

Daily Gauge Height and Discharge of Texas Creek, one mile from mouth, for 1914—*Con.*

Day.	October.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	.....	100
2	1·3	100
3	.....	100
4	1·25	100
5	.....	90
6	1·2	90
7	.....	90
8	1·15	80
9	.....	80
10	1·1	70
11	.....	70
12	1·05	70
13	.....	70
14	1·0	60
15	.....	.....
16	.....	.....
17	.....	.....
18	.....	.....
19	.....	.....
20	.....	.....
21	.....	.....
22	.....	.....
23	.....	.....
24	.....	.....
25	.....	.....
26	.....	.....
27	.....	.....
28	.....	.....
29	.....	.....
30	.....	.....
31	.....	.....

Miscellaneous Metering Stations.

Date.	Stream.	Tributary to—	Locality.	Gauge Height.	Discharge.
		Southern District.		Feet.	Sec.-ft.
Aug. 26	Black	Howe sound	Above intake	0·49	1·40
May 22	Trout—east	Trout lake	Hastings townsite	.....	1·6
	Trout—west	"	"	.....	0·8
July 14	Skagit	Gulf of Georgia	International boundary	2·68	1,240
Aug. 12	Windermere	Burrard inlet	Bidwell bay	0·31	0·34
" 14	"	"	"	0·31	0·25
Sept. 21	Capilano intake from Capilano creek	.....	.....	.....	40·2
	Overflow from intake	.....	.....	.....	12·9
	Amount entering city pipes	.....	.....	.....	27·3
		Vancouver Island.			
June 11	Sooke	Sooke inlet	Two miles from mouth	.....	57
July 31	Ash	Mouth	.....	2·00	247
Sept. 11	"	"	.....	1·68	141
Dec. 14	"	"	.....	2·30	382

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER 6

Kamloops Division—Hydrographic Data

CHAPTER VI.

KAMLOOPS DIVISION—HYDROGRAPHIC DATA.

REGULAR METERING STATION.

Bolean Creek (2002).

Location.—Section 10, township 18, range 12, west 6th meridian.

Records Available.—May 23 to December 31, 1911; January 1 to September 16, 1912; April 27 to September 19, 1913; April 1 to December 8, 1914.

Drainage Area.—Eighty square miles.

Gauge.—Vertical staff gauge. Read by Clement Stickney, Falkland, B.C.

Channel.—Gravel, sandy and clean. One permanent channel. Average width about 20 feet.

Discharge Measurements.—In freshet, measurements are made with a stay line and 6½ pound weight from a log. Low-water measurements are made by wading. Gauge-height discharge curve is fairly well defined from twelve meterings.

Winter Flow.—Partial ice conditions usually prevail during December and January.

Accuracy.—Fairly high, being probably within 10 per cent of obtaining conditions.

Discharge Measurements of Bolean Creek near Falkland, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 22	C. Corbould	1915	26·0	26·0	2·4	1·8	63·0[1]
July 23	"	1915	20·0	15·1	1·38	1·3	20·8
Sept. 24	"	1915	16·5	6·8	1·13	1·15	7·7

[1]See meterings 1911 and 1912, Water Resources Paper No. 1.

For further hydrographic data see Water Resources Papers Nos. 1 and 8.

Daily Gauge Height and Discharge of Bolean Creek near Stickney's Ranch, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·25	15·6	2·24	148·4	2·42	210·8
2	1·30	18·2	2·47	230·3	2·40	203·0
3	1·30	18·2	2·67	311·4	2·42	210·8
4	1·40	24·0	2·57	270·6	2·32	174·2
5	1·42	25·3	2·50	242·0	2·25	151·5
6	1·47	28·5	2·30	167·0	2·20	136·0
7	1·57	35·7	2·30	167·0	2·15	122·5
8	1·55	34·2	2·35	185·0	2·15	122·5
9	1·57	35·7	2·75	345·0	2·10	109·0
10	1·60	38·0	2·85	387·0	2·20	136·0
11	1·60	38·0	2·80	366·0	2·30	167·0
12	1·65	42·5	2·90	408·0	2·25	151·5
13	1·75	52·0	2·87	395·4	2·22	142·2
14	1·90	71·0	3·05	470·0	2·17	127·9
15	1·97	82·9	3·02	457·4	2·10	109·0
16	2·00	88·0	2·95	428·5	2·10	109·0
17	1·92	74·4	2·80	366·0	2·05	98·5
18	1·87	66·8	2·72	332·4	2·00	88·0
19	1·85	64·0	2·66	307·2	1·90	71·0
20	2·00	88·0	2·60	282·0	1 85	64·0
21	1·95	79·5	2·60	282·0	1·80	57·0
22	1·90	71·0	2·60	282·0	1·80	57·0
23	1·85	64·0	2·67	311·4	1·82	59·8
24	1·90	71·0	2·70	324·0	1·82	59·8
25	1·90	71·0	2·57	270·0	1·90	71·0
26	1·90	71·0	2·52	250·0	1·82	59·8
27	1·95	79·5	2·42	210·8	1·72	49·0
28	2·00	88·0	2·37	192·2	1·70	47·0
29	2·00	88·0	2·30	167·0	1·70	47·0
30	2·05	98·5	2·27	157·7	1·65	42·5
31	.....	.....	2·3	167·0	.....	.....

Daily Gauge Height and Discharge of Bolean Creek near Stickney's Ranch for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·60	38·0	1·15	10·5	1·00	3·0	1·30	18·2	1·32	19·4	1·25	15·6
2	1·52	32·0	1·15	10·5	·97	2·1	1·25	15·6	1·40	24·0	1·25	15·6
3	1·47	28·5	1·10	8·0	1·00	3·0	1·25	15·6	1·35	21·1	1·30	18·2
4	1·42	25·3	1·10	8·0	·97	2·1	1·25	15·6	1·30	18·2	1·25	15·6
5	1·40	24·0	1·10	8·0	1·00	3·0	1·22	14·4	1·32	19·4	1·20	13·0
6	1·40	24·0	1·10	8·0	·97	2·1	1·20	13·0	1·35	21·1	1·20	13·0
7	1·35	21·1	1·10	8·0	·97	2·1	1·20	13·0	1·35	21·1	1·27	16·6
8	1·30	18·2	1·10	8·0	1·00	3·0	1·20	13·0	1·30	18·2	1·35	21·1
9	1·30	18·2	1·10	8·0	1·00	3·0	1·20	13·0	1·30	18·2		
10	1·30	18·2	1·10	8·0	1·00	3·0	1·20	13·0	1·30	18·2		
11	1·30	18·2	1·10	8·0	1·00	3·0	1·20	13·0	1·30	18·2		
12	1·32	19·4	1·10	8·0	1·07	6·5	1·27	16·6	1·30	18·2		
13	1·52	32·0	1·05	5·5	1·10	8·0	1·40	24·0	1·30	18·2		
14	1·77	54·0	1·05	5·5	1·15	10·5	1·32	19·4	1·25	15·6		
15	1·65	42·5	1·02	4·0	1·20	13·0	1·30	18·2	1·25	15·6		
16	1·47	28·5	1·00	3·0	1·15	10·5	1·30	18·2	1·30	18·2		
17	1·40	24·0	1·00	3·0	1·20	13·0	1·30	18·2	1·25	15·6		
18	1·37	22·3	1·00	3·0	1·25	15·6	1·30	18·2	1·25	15·6		
19	1·35	21·1	1·00	3·0	1·25	15·6	1·30	18·2	1·30	18·2		
20	1·35	21·1	1·00	3·0	1·22	14·4	1·30	18·2	1·30	18·2		
21	1·40	24·0	1·00	3·0	1·20	13·0	1·30	18·2	1·30	18·2		
22	1·30	18·2	1·00	3·0	1·20	13·0	1·30	18·2	1·27	16·6		
23	1·30	18·2	1·00	3·0	1·20	13·0	1·30	18·2	1·25	15·6		
24	1·30	18·2	1·00	3·0	1·15	10·5	1·24	15·0	1·27	16·6		
25	1·30	18·2	1·00	3·0	1·15	10·5	1·25	15·6	1·30	18·2		
26	1·25	15·6	1·00	3·0	1·20	13·0	1·25	15·6	1·30	18·2		
27	1·25	15·6	1·00	3·0	1·70	47·0	1·25	15·6	1·30	18·2		
28	1·20	13·0	1·00	3·0	1·45	27·2	1·25	15·6	1·30	18·2		
29	1·20	13·0	1·00	3·0	1·35	21·1	1·20	13·0	1·30	18·2		
30	1·20	13·0	1·00	3·0	1·30	18·2	1·20	13·0	1·25	15·6		
31	1·20	13·0	1·00	3·0			1·20	13·0				

Monthly Discharge of Bolean Creek near Stickney's Ranch, for 1914.

(Drainage area, 80 square miles.)

Month.	Discharge in Second-Feet				Run-Off	
	Maximum.	Minimum.	Mean	Per square mile	Depth in inches on Drainage area	Total in acre-feet
April	98·5	15·6	57·4	0·7	0·8	3,415
May	470·0	148·4	286·4	3·6	4·1	17,610
June	210·8	42·5	108·5	1·3	1·4	6,456
July	54·0	13·0	22·9	0·3	0·3	1,408
August	10·5	3·0	5·3	0·6	0·06	326
September	47·0	2·1	10·8	0·13	0·14	643
October	24·0	13·0	16·0	0·2	0·2	984
November	24·0	15·6	18·1	0·23	0·26	1,077
December						
The period	470·0	2·1	65·7	0·81	7·26	31,919

Note.—Winter conditions obtained after December 8.

Campbell Creek (2004).

Location.—Section 26, township 19, range 16, west 6th meridian.

Records Available.—May 27 to October 4, 1911; April 1 to September 16, 1912; May 1 to August 31, 1913; April 1 to August 31, 1914.

Drainage Area.—Two hundred square miles.

Gauge.—Vertical staff gauge read by A. Holt of Barnhart Vale.

Channel.—Straight for about 100 feet at measuring section. Bed of stream sandy and fairly permanent. Average width of channel about 10 feet.

Discharge Measurements.—Gauge height discharge curve is very well defined from seven meterings taken during 1914. Measurements in high water taken from bridge with 6-pound weight. In low water, measurements taken by wading. Flow in this stream ceased altogether on August 23.

Winter Flow.—Ice conditions prevail during December, January, and February.

Accuracy.—High; results compiled from a well-rated curve.

Discharge Measurements of Campbell Creek at Todd's Corners, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 17	E. M. Dann	1505	9	6·7	0·83	0·88	5·5[1]
May 5	E. M. Dann & E. H. Tredcroft	1055	9	17·0	1·75	1·6	29·7
May 15	do do	1055	20	33·9	2·13	2·6	72·0
June 20	C. B. Corbould	1915	9	10·0	1·1	1·05	11·0
June 25	do	1915	7	8·4	1·7	1·5	14·0
July 16	do	1915	11	12·1	1·56	1·25	19·0[2]
July 21	do	1915	11	10·7	1·29	1·15	13·8
Sept. 26	do	1915	5	1·1	0·7	0·55	0·8

Meterings not all made at same sections.

[1]Dam at Campbell Lake closed.

[2]The only ranchers diverting water above station on this date were Messrs Pratt & Blackwell. The former using about 0·7 sec.-ft. and the latter about 1·2 sec.-ft.

For further hydrographic data see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Campbell Creek at Todd's Corners, for 1914.

Day.	April.		May.		June.	
	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·20	15·5	1·12	13·1	1·75	35·5
2	1·20	15·5	1·17	14·6	1·67	32·4
3	1·20	15·5	1·25	17·2	1·62	30·5
4	1·20	15·5	1·31	19·2	1·51	26·4
5	1·21	15·8	1·52	26·8	1·45	24·2
6	1·15	14·0	1·83	38·7	1·45	24·2
7	1·11	12·8	1·87	40·3	1·45	24·2
8	1·10	12·5	1·92	42·3	1·42	23·1
9	1·01	10·1	1·97	44·4	1·40	22·4
10	1·01	10·1	2·00	45·7	1·40	22·4
11	1·01	10·1	2·10	50·0	1·35	20·6
12	1·00	9·8	2·25	56·6	1·30	18·9
13	0·99	9·3	2·45	65·5	1·30	18·9
14	0·96	8·7	2·60	72·2	1·27	17·9
15	0·95	8·4	2·60	72·2	1·20	15·5
16	0·91	7·5	2·60	72·2	1·20	15·5
17	0·90	7·3	2·60	72·2	1·25	17·2
18	0·86	6·4	2·55	70·0	1·25	17·2
19	0·85	6·2	2·50	67·7	1·15	14·0
20	0·95	8·4	2·40	63·3	1·06	11·4
21	1·00	9·8	2·32	59·7	1·03	10·6
22	1·00	9·8	2·28	57·9	1·05	11·1
23	0·95	8·4	2·22	55·3	1·02	10·3
24	0·90	7·3	2·18	53·6	1·02	10·3
25	1·00	9·8	2·02	46·5	1·00	9·8
26	1·05	11·1	2·00	45·7	0·97	8·9
27	1·05	11·1	1·95	43·6	0·95	8·4
28	1·05	11·1	1·91	41·9	0·97	8·9
29	1·05	11·1	1·90	41·5	0·92	7·8
30	1·10	12·5	1·86	39·9	0·92	7·8
31			1·81	37·9		

Daily Gauge Height and Discharge of Campbell Creek near Todd's Corners, for 1914—*Con.*

Day.	July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·90	7·3	0·70	3·2
2	0·90	7·3	0·70	3·2
3	0·90	7·3	0·66	2·6
4	0·82	5·5	0·72	3·6
5	0·87	6·6	0·72	3·6
6	0·87	6·6	0·70	3·2
7	0·85	6·2	0·70	3·2
8	0·77	4·5	0·66	2·6
9	0·67	2·7	0·65	2·4
10	0·77	4·5	0·65	2·4
11	0·82	5·5	0·65	2·4
12	0·90	7·3	0·65	2·4
13	0·95	8·4	0·65	2·4
14	1·00	9·8	0·65	2·4
15	1·30	18·9	0·65	2·4
16	1·25	17·2	0·65	2·4
17	1·20	15·5	0·62	1·9
18	1·15	14·0	0·60	1·6
19	1·12	13·1	0·60	1·6
20	1·02	10·3	0·60	1·6
21	1·02	10·3	0·60	1·6
22	1·02	10·3	0·60	1·6
23	1·02	10·3	.....	.....
24	0·87	6·6	.....	.....
25	0·75	4·2	.....	.....
26	0·75	4·2	.....	.....
27	0·75	4·2	.....	.....
28	0·80	5·1	.....	.....
29	0·80	5·1	.....	.....
30	0·71	3·4	.....	.....
31	0·70	3·2	.....	.....

Monthly Discharge of Campbell Creek near Todd's Corners, for 1914.

(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	15·8	6·2	10·7	0·05	0·06	637·0
May	72·2	13·1	48·0	0·24	0·28	2,951·0
June	35·5	7·8	17·5	0·09	0·10	1,041·0
July	18·9	2·7	8·0	0·04	0·05	492·0
August	3·6	0·0	1·7	0·01	0·01	104·5
The period	72·2	0·0	17·2	0·09	0·50	5,225·0

Note.—No water coming down the creek at the station after August 22.

Precipitation is low (probably 12 inches per annum), and evaporation from lake surfaces near headwaters large.

Canyon Creek (2057).

Location.—Section 32, township 21, range 15, west 6th meridian.

Records Available.—June 7 to August 28, 1914.

Drainage Area.—Seven square miles.

Gauge.—Standard staff gauge read daily by D. A. McKenzie.

Channel.—Channel straight at measuring section, banks very heavily timbered, velocity fairly swift, bed of stream rocky with several channels at high water.

Discharge Measurements.—Four discharge measurements were obtained during 1914 at various stages. Stream generally runs dry during end of August, and remains so until following spring.

Winter Flow.—Ice conditions always exist on this stream throughout the winter.

Accuracy.—The accuracy of returns will eventually be high but more data are required before the stream can be properly rated.

Discharge Measurements of Canyon Creek above Heffley Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 2.....	C. B. Corbould.....	1,915	5	2·7	1·44	.....	3·9
June 7.....	do	1,915	5	5·45	0·72	1·8	3·9
June 30.....	do	1,915	4·5	3·5	0·33	1·45	1·17
Aug. 13.....	do	.....	.....	.....	.....	0·15	0·0[1]

[1]Water standing in pools.

Daily Gauge Height and Discharge of Canyon Creek above Heffley Lake, for 1914.

Day.	June.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	.....	.....
2	.....	.....
3	.....	.....
4	.....	.....
5	.....	.....
6	.....	.....
7	1·80	3·9
8	1·80	3·9
9	1·80	3·9
10	1·80	3·9
11	1·76	3·5
12	.....	.....
13	1·72	3·1
14	1·70	2·8
15	.....	.....
16	1·60	2·0
17	.....	.....
18	.....	.....
19	1·50	1·4
20	.....	.....
21	.....	.....
22	1·40	1·1
23	.....	.....
24	1·45	1·3
25	.....	.....
26	1·55	1·7
27	.....	.....
28	.....	.....
29	1·50	1·4
30	1·45	1·3

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Canyon Creek above Heffley Lake, for 1914—*Con.*

Day.	July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	0·45	0·1
2	.....	.....	.....	.....
3	1·35	0·9	.....	.....
4	.....	.....	0·40	0·1
5	.....	.....	.....	.....
6	.....	.....	0·35	0·1
7	1·20	0·7	.....	.....
8	.....	.....	.....	.....
9	1·10	0·6	.....	.....
10	.....	.....	0·25	0·05
11	.....	.....	.....	.....
12	.....	.....	.....	.....
13	0·95	0·4	0·1	0·0
14	.....	.....	.....	.....
15	.....	.....	.....	.....
16	.....	.....	.....	.....
17	.....	.....	.....	.....
18	0·75	0·3	.....	0·0
19	.....	.....	.....	.....
20	.....	.....	.....	.....
21	0·70	0·3	.....	.....
22	.....	.....	.....	.....
23	.....	.....	.....	.....
24	.....	.....	.....	.....
25	0·60	0·2	.....	.....
26	.....	.....	.....	0·0
27	.....	.....	.....	.....
28	0·50	0·2	.....	.....
29	.....	.....	.....	.....
30	.....	.....	.....	.....
31	.....	.....	.....	.....

Monthly Discharge of Canyon Creek above Heffley Lake, for 1914.

(Drainage area, 7 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet.
June	3·9	1·1	2·6	0·4	0·4	155
July	0·9	0·2	0·4	0·06	0·07	24·6
August	0·1	0·0	0·05	0·01	0·01	3·0

Note.—Station was established on June 7. Creek stopped running on August 10. No precipitation records available

Clearwater River (2047).

Location.—Near Raft River; Water District No. 2.

Records Available.—August 12 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—2,400 square miles.

Gauge.—Standard chain gauge graduated in feet and tenths, and read by Theo. Brookfield, rancher.

Measuring Section.—500 feet above gauge; width of channel 230 feet. Bed of stream rocky and permanent. Deepest point in measuring section at highest recorded water level 22 feet. Highest mean velocity 7.78 feet per second.

Methods of Gauging.—Discharge measurements are made from car suspended from $\frac{3}{4}$ inch steel cable.

Channel.—The channel varies in width throughout its course from 100 to 400 feet, and passes over several small falls and rapids.

Winter Flow.—The Clearwater river is seldom frozen during winter to the extent of materially affecting the accuracy of returns.

Accuracy.—The accuracy on the whole will be high, the curve being well rated, and the only possibility of error being in the present chain gauge which it is proposed to replace early in the spring of 1915.

Confluence of Myrtle and Clearwater rivers.

Photograph by F. R. Archibald

The Myrtle river is in the foreground flowing north-westerly. The Clearwater, flowing south swings to the south-west at its junction with the Myrtle. Both rivers have storage facilities for power purposes.

CLEARWATER RIVER.

Twenty-four miles above its confluence with the North Thomspon the two principal component tributaries of the Clearwater river join. The more westerly stream of the two, geographers have named the Clearwater, while the other, which is probably the more important, is known as the Myrtle.

The Clearwater river above its junction with the Myrtle.—The Clearwater river rises in the steep hills and glaciers surrounding Upper Clearwater lake, a sheet of water with a superficial area of some 15 square miles, distant about 5½ miles by trail from the head of Quesnel lake. Mr. F. C. Green, B.C.L.S., places the elevation of Upper Clearwater lake at 405 feet above Quesnel lake, whose altitude the Geological Survey gives as 2,250 feet above sea-level. Clearwater river, discharging from its south end is said to fall 600 feet in a distance of 7 miles in its tumultuous course to Lower Clearwater lake. (This amount is thought to be overestimated since it makes the elevation of Lower Clearwater lake coincide with the elevation of the confluence of the Myrtle and Clearwater as determined by Mr. R. H. Lee, B.C.L.S.) Two tributaries join from the east in this distance Goat creek about a mile and a half south of the Upper lake, and the outlet of Blue lake about 4 miles farther down. Blue lake lies but a quarter of a mile east, and is represented as being a beautiful rockbound sportsman's paradise, with rainbow trout and cariboo in abundance. It is said to be about 15 miles long and 1 mile wide. Navigation by canoe is possible between Blue lake and Lower Clearwater lake, which is about 17 miles long and a mile wide. The Clearwater river, draining from its south end joins the Myrtle about 13 miles below at an elevation of about 2,000 feet above the sea. Little information could be obtained regarding the course of the Clearwater between Lower Clearwater lake and the Myrtle river.

The Myrtle river.—(see description Myrtle river.)

The Clearwater river below its junction with the Myrtle.—In the twenty-four miles of its course to the North Thompson, the Clearwater river drops about 675 feet at a rate of about 31 feet to the mile. It passes through a series of rocky canyons in its course, but so far as is known there is no large natural concentrated fall. The width of the river in this part is from 200 to 500 feet.

The principal tributaries are:—

FROM THE WEST.

Mahood river (or Bridge creek).—This stream drains Canim and Mahood lakes and enters about 4 miles below the Myrtle. It is said to be a small stream "about the size of the Little Clearwater." Its drainage area is very large, though the probable low precipitation, and evaporation losses from the two large regulating lakes are contributing causes to a low run-off.

FROM THE EAST.

Little Clearwater river joins the Clearwater about 15 miles above its confluence with the Thompson. (See hydrographic data, Little Clearwater river.)

Beaver creek.—A small mountain torrent, 40 to 50 feet wide and a reported fall of 750 feet in three quarters of a mile. (June 10, 1914, 190 second-feet high water.) Joins Clearwater about 14 miles above North Thompson.

Bear creek, which joins the Clearwater about 8 miles from its mouth, is said to fall 800 feet in its last mile. (On June 11, 1914, its flow was 162 second-feet and on September 4, 1914, it was 7·4 second-feet.

Candle creek, joining about 4 miles from the river's mouth had a flow of 49·7 second-feet on June 11, and on 0·3 second-feet on August 29, 1914.

The station on the Clearwater was established by Mr. K. G. Chisholm in March, 1914, and cable station installed from which numerous meterings covering the range of stream-flow have been obtained. (See report British Columbian Minister of Lands for 1913 and, in particular articles on the Clearwater valley by Messrs. Green and Lee, British Columbia Land Surveyors.)

DISCHARGE MEASUREMENTS of Clearwater River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 16	K. G. Chisholm	1055	200	2,043	2·04	0·57	4,170
May 30	E. Tredcroft	1923	234·5	2,778	5·84	4·8	16,227[1]
" 31	"	1923	234	2,735	5·75	4·6	15,739[1]
June 1	"	1923	234	2,667	5·56	4·1	14,854[1]
" 12	"	1923	236	2,890	6·8	5·3	19,650[1]
" 15	"	1923	238	3,049	7·63	6·0	23,292[1]
" 16	"	1923	239	3,174	7·93	6·5	25,165[1]
" 17	"	1923	240	3,300	7·78	7·0	25,703[1]
" 25	"	1923	234	2,599	5·66	4·2	14,717[1]
Sept. 19	E. M. Dann and E. H. Tredcroft	1923	201·5	2,022	2·61	1·29	5,283

[1]Surface velocity; coefficient 0·89.

DAILY GAUGE HEIGHT AND DISCHARGE of Clearwater River near mouth, for 1914.

(Drainage area, 2,400 square miles.)

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·50	5,650	1·70	6,100	4·10	14,475
2	1·50	5,650	1·90	6,600	4·70	17,000
3	1·40	5,450	2·60	8,700	5·40	19,975
4	1·40	5,450	2·60	8,700	6·05	22,825
5	1·40	5,450	2·70	9,050	6·20	23,500
6	1·30	5,275	2·70	9,050	5·90	22,150
7	1·20	5,100	2·70	9,050	5·75	21,475
8	1·10	4,950	2·70	9,050	5·50	20,400
9	1·00	4,800	2·90	9,775	5·30	19,550
10	0·70	4,360	3·10	10,525	5·30	19,550
11	0·60	4,230	3·40	11,675	5·30	19,550
12	0·50	4,110	3·60	12,475	5·30	19,550
13	0·20	3,750	3·90	13,675	5·30	19,550
14	0·00	3,590	4·20	14,875	5·50	20,400
15	0·40	3,990	5·30	19,550	6·00	22,600
16	0·60	4,230	5·66	20,825	6·60	25,250
17	0·70	4,360	5·50	20,400	7·10	27,500
18	0·80	4,490	5·50	20,400	7·20	27,950
19	0·90	4,640	5·40	19,975	7·05	27,275
20	1·00	4,800	5·30	19,550	6·80	26,150
21	1·00	4,800	5·30	19,550	6·60	25,250
22	1·10	4,950	5,40	19,975	6·30	23,950
23	1·10	4,950	5·50	20,400	6·00	22,600
24	1·10	4,950	5·90	22,150	5·60	20,825
25	1·20	5,100	6·00	22,600	5·30	19,550
26	1·20	5,100	5·90	22,150	5·20	19,125
27	1·20	5,100	5·65	21,037	5·20	19,125
28	1·30	5,275	5·35	19,762	5·30	19,550
29	1·40	5,450	5·10	18,700	5·40	19,975
30	1·50	5,650	4·80	17,425	5·50	20,400
31	.....	.....	4·60	16,575	.....	.....
Total	.....	145,650	.....	480,324	.....	647,025

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Clearwater River near mouth, for 1914 —*Con.*

(Drainage area, 2,400 square miles.)

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·60	20,825	3·80	13,225	2·05	7,012	3·00	10,150	1·10	4,950	0·00	3,590
2	5·90	22,150	3·70	12,875	2·05	7,012	3·00	10,150	1·20	5,100	−0·10	3,490
3	6·00	22,600	3·70	12,875	1·95	6,737	2·80	9,400	1·30	5,275	−0·10	3,490
4	6·00	22,600	3·60	12,475	1·85	6,475	2·60	8,700	1·20	5,100	−0·10	3,490
5	6·10	23,050	3·60	12,475	1·75	6,225	2·30	7,725	1·10	4,950	−0·10	3,490
6	6·10	23,050	3·50	12,075	1·75	6,225	2·10	7,150	1·00	4,800	−0·20	3,400
7	5·90	22,150	3·50	12,075	1·75	6,225	1·90	6,600	0·90	4,640	−0·20	3,400
8	5·70	21,250	3·50	12,075	1·75	6,225	1·70	6,100	0·90	4,640	−0·30	3,300
9	5·40	19,975	3·40	11,675	1·85	6,475	1·60	5,850	0·80	4,490	−0·40	3,200
10	5·30	19,550	3·10	10,525	1·85	6,475	1·50	5,650	0·80	4,490	−0·50	3,110
11	5·30	19,550	3·00	10,150	1·95	6,737	1·40	5,450	0·70	4,360	−0·60	3,020
12	5·30	19,550	2·80	9,400	1·75	6,225	1·30	5,275	0·70	4,360	−0·60	3,020
13	5·50	20,400	2·60	8,700	1·55	5,750	1·20	5,100	0·60	4,230	−0·60	3,020
14	5·70	21,250	2·50	8,350	1·35	5,362	1·10	4,950	0·50	4,110	−0·60	3,020
15	6·00	22,600	2·50	8,350	1·15	5,025	1·00	4,800	0·40	3,990	−0·70	2,920
16	6·00	22,600	2·50	8,350	1·05	4,875	0·90	4,640	0·30	3,870	−0·70	2,920
17	5·70	21,250	2·50	8,350	1·05	4,875	1·00	4,800	0·30	3,870	−0·70	2,920
18	5·30	19,550	2·30	7,725	1·10	4,950	1·20	5,100	0·20	3,750	−0·70	2,920
19	5·10	18,700	2·45	8,187	1·40	5,540	1·40	5,450	0·20	3,750	−0·70	2,920
20	4·90	17,850	2·45	8,187	1·60	5,850	1·50	5,650	0·10	3,640	−0·70	2,920
21	4·80	17,425	2·35	7,875	1·70	6,100	1·50	5,650	0·10	3,640	−0·70	2,920
22	4·60	16,575	2·35	7,875	1·70	6,100	1·40	5,450	0·10	3,640	−0·60	3,020
23	4·60	16,575	2·25	7,575	1·70	6,100	1·30	5,275	0·10	3,640	−0·60	3,020
24	4·60	16,575	2·25	7,575	1·80	6,350	1·30	5,275	0·10	3,640	−0·70	2,920
25	4·50	16,150	2·15	7,287	1·80	6,350	1·20	5,100	0·10	3,640	−0·70	2,920
26	4·50	16,150	2·05	7,012	2·00	6,875	1·20	5,100	0·00	3,590	−0·80	2,820
27	4·40	15,725	2·05	7,012	2·20	7,425	1·10	4,950	0·00	3,590	−0·80	2,820
28	4·20	14,875	2·15	7,287	2·40	8,025	1·00	4,800	0·00	3,590	−0·90	2,720
29	4·10	14,475	2·15	7,287	2·80	9,400	0·90	4,640	0·10	3,640	−0·90	2,720
30	4·00	14,075	2·15	7,287	3·00	10,150	0·90	4,640	0·10	3,640	−0·90	2,720
31	3·90	13,675	2·05	7,012	.....	.....	0·90	4,640	.....	.....	−0·90	2,720
Total	.....	592,775	.....	289,183	.....	193,060	.....	184,210	.....	124,615	.....	94,880

Monthly Discharge of Clearwater River near mouth, for 1914.

(Drainage area, 2,400 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	5,650	3,590	4,855	2·0	2·3	288,895
May	22,600	6,100	15,494	6·5	7·5	953,000
June	27,950	14,475	21,567	9·0	10·0	1,283,320
July	23,050	13,675	19,122	8·0	9·2	1,175,764
August	13,225	7,012	9,328	3·9	4·5	568,026
September	10,150	4,875	6,435	2·7	3·0	382,900
October	10,150	4,649	5,942	2·5	2·9	365,362
November	5,275	3,590	4,154	1·7	1·9	247,186
December	3,590	2,720	3,061	1·3	1·5	188,212
The period	27,950	2,720	9,995	4·1	42·8	5,452,659

Note.—There are no available precipitation records of the Clearwater catchment basin. Maps are unreliable, and it would appear from the run-off figures shown that the drainage area given is not as large as the actual drainage area of the river. Since it was taken off the most reliable map available, however, it has been thought best not to alter it merely on the evidence of run-off figures for a period of one year.

Little Clearwater Creek (2056).

Location.—Near Raft River, Water District No. 2.

Records Available.—June 17 to December 31, 1914.

Drainage Area.—One hundred square miles.

Gauge.—Standard vertical staff gauge set near footbridge at crossing of Myrtle River trail, and read by P. McDougal, rancher.

Channel.—Average width 40 feet. The velocities are low even at high water, seldom exceeding 2·0 feet per second. Maximum flow recorded during 1914, 272 second-feet. Bed of stream at measuring section composed of mud and silt.

Winter Flow.—Partial ice conditions exist during latter end of January and beginning of February.

Accuracy.—The accuracy of returns will eventually be high, but owing to the lateness of the season when the station was established, and the difficult means of access to this stream, especially during the winter months, only two discharge measurements were obtained during 1914.

LITTLE CLEARWATER RIVER.

The Little Clearwater is tributary to the Clearwater river at a point about 15 miles north of the latter's junction with the North Thompson. It rises in the Raft River range of mountains and flows in a southwesterly direction. It is probably about 12 miles in length, its average width about 50 feet, and its depth during ordinary stages about 3 or 4 feet. Its flow at the gauging station on McDougall's ranch (lot 3188), is somewhat sluggish, but in the lowest 4 miles of its course it falls at the rate of about 50 feet to the mile. High water occurs in June, and during January and February and sometimes part of December and March the stream is frozen over. A station was established by Mr. E. H. Tredcroft on June 6, 1915, on lot 3188, which is about 7 miles from the Clearwater junction.

SESSIONAL PAPER No. 25e

Discharge Measurements of Little Clearwater River near Green Mountain, for 1914.

Date.	Hydrographer.	Meter. No.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
June 6	E. H. Trederoft	1923	41	147	1·8	2·5	272
Sept. 3	E. H. Trederoft and C. B. Corbould	1923	37	68	0·2	0·6	13·7

An effort will be made to completely rate this station during 1915.

Daily Gauge Height and Discharge of Little Clearwater River near Green Mountain for 1914.

Day.	June.	
	Gauge Height	Discharge
	Feet.	Sec.-ft.
17	2·7	306
18	2·8	32
19	2·6	289
20	2·5	272
21	2·2	221
22	2·8	323
23	2·6	289
24	2·4	255
25	2·6	289
26	2·8	323
27	2·5	272
28	2·4	255
29	2·3	238
30	2·1	205

Daily Gauge Height and Discharge of Little Clearwater River near Green Mountain, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·0	188	1·0	46	0·6	13	1·3	81	1·0	46	0·8	27
2	1·9	172	1·0	46	0·6	13	1·2	68	1·1	56	0·8	27
3	1·8	156	1·0	46	0·6	13	1·2	68	1·0	46	0·8	27
4	1·7	140	1·0	46	0·6	13	1·2	68	1·0	46	0·7	20
5	1·6	124	0·9	36	0·6	13	1·1	56	0·9	36	0·7	20
6	1·5	109	1·4	94	0·6	13	1·1	56	0·9	36	0·7	20
7	1·4	94	1·1	56	0·6	13	1·0	46	0·9	36	0·7	20
8	1·3	81	1·0	46	0·7	20	1·0	46	0·9	36	0·7	20
9	1·2	68	0·9	36	0·9	36	1·0	46	0·9	36	0·7	20
10	1·2	68	0·9	36	0·9	36	1·0	46	0·9	36	0·6	13
11	1·2	68	0·9	36	1·2	68	1·0	46	0·9	36	0·6	13
12	1·2	68	0·9	36	1·2	68	0·9	36	0·9	36	0·6	13
13	1·2	68	0·9	36	1·2	68	1·1	56	0·9	36	0·6	13
14	1·9	172	0·8	27	1·0	46	1·0	46	1·0	46	0·7	20
15	2·5	272	0·8	27	0·9	36	1·0	46	0·9	36	0·7	20
16	1·6	124	0·8	27	0·9	36	1·0	46	0·9	36	0·7	20
17	1·7	140	0·8	27	1·1	56	1·7	140	0·9	36	0·7	20
18	1·6	124	0·8	27	1·6	124	1·4	94	0·9	36	0·7	20
19	1·4	94	0·7	20	1·2	68	1·2	68	0·9	36	0·7	20
20	1·6	124	0·7	20	1·2	68	1·1	56	0·8	27	0·7	20
21	1·6	124	0·8	27	1·1	56	1·1	56	0·8	27	0·7	20
22	1·4	94	0·8	27	1·1	56	1·0	46	0·8	27	0·7	20
23	1·4	94	0·8	27	1·2	68	1·0	46	0·8	27	0·7	20
24	1·6	124	0·8	27	1·1	56	0·9	36	0·9	36	0·7	20
25	1·4	94	0·7	20	1·1	56	0·9	36	0·9	36	0·7	20
26	1·3	81	0·7	20	1·1	56	0·9	36	0·9	36	0·7	20
27	1·9	172	0·7	20	1·9	172	0·9	36	0·8	27	0·7	20
28	1·6	124	0·7	20	1·6	124	0·9	36	0·8	27	0·6	13
29	1·4	94	0·6	13	1·6	124	0·9	36	0·8	27	0·6	13
30	1·2	68	0·6	13	1·5	109	1·0	46	0·8	27	0·6	13
31	1·1	56	0·6	13	.....	.....	1·0	46	.....	.....	0·6	13

Monthly Discharge of Little Clearwater River near Green Mountain, for 1914.

(Drainage area, 100 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	323	205	276	2·76	3·08	16,423[1]
July	272	56	115	1·15	1·32	7,071
August	94	13	32	0·32	0·37	1,967
September	172	13	57	0·57	0·63	3,391
October	140	36	54	0·54	0·62	3,320
November	56	27	36	0·36	0·39	2,142
December	27	13	19	0·19	0·22	1,168
The period	323	13	84·1	0·84	6·63	35,482

[1]Station was established on June 17; results for June are therefore only approximate.
No precipitation records available.

Cherry Creek (2005).

Location.—Section 14, township 19, range 19, west 6th Meridian.

Records Available.—June 5 to September 1, 1911; April 24 to September 15, 1912; April 19 to October 19, 1913; May 1 to August 19, 1914.

Drainage Area.—Sixty-two square miles.

Gauge.—Standard chain gauge installed during 1914 in canyon, and read daily by F. Bowers, during high water, and twice weekly during low water. To replace station at Cornwall's ranch.

Channel.—Is straight at measuring section. Velocity swift at all stages. Control is fairly good.

Discharge Measurements.—Three discharge measurements were obtained during 1914 by wading at all stages.

Winter Flow.—Stream generally runs dry during August or September.

Accuracy.—Owing to shifting channel, too much reliance cannot be placed on returns from old station, but returns for new station established 1914 point to an exceptionally high degree of accuracy eventually being obtained.

Discharge Measurements of Cherry Creek above Bower's Ranch, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 13.....	E. H. Tredcroft.....	1055	14	14	5·02	1·7	70·3
June 11.....	C. Corbould.....	1915	12	5·1	1·8	0·7	9·0
July 3.....	do	1915	7	1·7	0·8	0·5	1·5

An effort will be made to completely rate this station during 1915. See meterings listed under miscellaneous measurements taken at Cornwall's ranch above diversion.

Daily Gauge Height and Discharge of Cherry Creek near Bower's Ranch, for 1914.

Day.	May.		June.	
	Gauge Height	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	14·5	0·65	6·9
2	.....	15·8	0·65	6·9
3	.....	17·2	0·60	4·9
4	.....	18·5	0·60	4·9
5	.....	19·9	0·60	4·9
6	.....	21·2	0·60	4·9
7	.....	22·6	0·60	4·9
8	.....	24·0	0·65	6·9
9	.....	44·0	0·65	6·9
10	.....	65·0	0·65	6·9
11	.....	86·0	0·70	9·0
12	.....	78·2	0·70	9·0
13	1·70	70·3	0·70	9·0
14	1·70	70·3	0·65	6·9
15	1·60	62·8	0·65	6·9
16	1·55	59·1	0·65	6·9
17	1·45	51·9	0·60	4·9
18	1·40	48·5	0·60	4·9
19	1·40	48·5	0·55	3·2
20	.....	38·4	0·55	3·2
21	.....	28·2	0·55	3·2
22	0·90	18·0	0·50	1·4
23	0·90	18·0	0·55	3·2
24	0·85	15·5	0·55	3·2
25	0·80	13·0	0·60	4·9
26	0·80	13·0	0·55	3·2
27	0·75	11·0	0·55	3·2
28	0·70	9·0	0·55	3·2
29	0·70	9·0	0·55	3·2
30	0·65	6·9	0·55	3·2
31	0·65	6·9	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Cherry Creek near Bower's Ranch, for 1914—*Con.*

Day.	July.		August.	
	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·50	1·4	.....	0·4
2	0·50	1·4	.....	0·3
3	0·50	1·4	0·30	0·3
4	0·45	1·1	.....	0·3
5	0·45	1·1	0·30	0·3
6	0·40	0·8	.....	0·3
7	0·40	0·8	0·30	0·3
8	0·40	0·8	.....	0·3
9	0·35	0·5	.....	0·3
10	0·35	0·5	0·30	0·3
11	0·35	0·5	.....	0·3
12	0·35	0·5	0·30	0·3
13	0·35	0·5	.....	0·3
14	0·30	0·3	0·30	0·3
15	0·30	0·3	.....	0·3
16	0·30	0·3	.....	0·2
17	0·30	0·3	0·25	0·2
18	0·30	0·3	.....	0·2
19	0·30	0·3	0·25	0·2
20	.....	1·8	.....	.....
21	0·55	3·2	.....	.....
22	.....	6·1	.....	.....
23	0·70	9·0	.....	.....
24	.....	8·0	.....	.....
25	0·65	6·9	.....	.....
26	.....	5·9	.....	.....
27	0·60	4·9	.....	.....
28	.....	2·8	.....	.....
29	0·40	0·8	.....	.....
30	.....	0·7	.....	.....
31	0·35	0·5	.....	.....

Monthly Discharge of Cherry Creek near Bower's Ranch, for 1914.

(Drainage area, 30 square miles.)

Month.	Discharge in Second-Feet.				Run-Off	
	Maximum.	Minimum	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet
May	86	6·9	33·1	1·10	1·12	2 035
June	9	1·4	5·2	0·17	0·19	307
July	9	0·3	2·05	0·07	0·08	126·3
August	0·4	0·0	0·17	0·006	0·007	10·4
The period	86	0·0	10·13	0·34	1·397	2 478 7

Note.—Station established May 13 to replace station at Cornwall's ranch, where a constantly shifting channel made results unreliable. It was also alleged that a very large loss by seepage occurred between the present station and Cornwall's ranch. Data acquired during 1914 disprove this allegation.

From May 1 to May 13, figures shown have been compiled from miscellaneous measurements at Cornwall's ranch on April 27, May 8, and May 11, by interpolation.

The creek stopped flowing at the gauge on August 19.

Essell Creek (2011).

Location.—Section 36, township 17, range 14, west 6th meridian.

Records Available.—May 25 to September 30, 1911; April 1 to September 7, 1912; April 16 to September 14, 1913; April 1 to December 4, 1914.

Drainage Area.—Six square miles.

Gauge.—Standard staff gauge read tri-weekly by T. F. Teagle.

Channel.—The channel is gravelly and permanent. Control is good, and velocities are not excessive.

Discharge Measurements.—Well-distributed meterings have been taken at all stages of water.

Winter Flow.—Winter conditions are not, as a rule, severe; the stream is usually dry during the winter months.

A storage dam on Summit lake controls its flow, which is augmented by a diversion from Monte creek.

Accuracy.—The accuracy of results on the whole is fairly high, and should fall within ten per cent.

Discharge Measurements of Essell Creek below Summit Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 7.....	E. M. Dann & E. H. Tredcroft.....	1055	17	11·5	3·06	1·47	35·4
June 24.....	C. B. Corbould.....	1915	11	9·1	2·47	1·30	22·5
July 22.....	"	1915	9·5	5·23	0·80	0·95	4·2
Sept. 25.....	"	1915	5·5	1·03	0·56	0·70	0·6

For further measurements see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Essell Creek below Summit Lake, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·90	3·2	.....	25·8	.....	35·0
2	.....	3·3	1·38	28·5	.....	34·5
3	.....	3·4	.....	32·6	1·45	34·0
4	0·91	3·5	.....	36·7	.....	36·7
5	.....	3·4	.....	40·8	.....	39·5
6	.....	3·4	1·58	44·8	1·55	42·2
7	.....	3·3	.....	48·3	.....	42·7
8	0·90	3·2	.....	51·8	.....	43·1
9	.....	3·8	1·70	55·3	.....	43·5
10	.....	4·4	.....	55·3	1·57	44·0
11	0·97	5·0	.....	55·3	.....	42·5
12	.....	4·6	.....	55·3	.....	41·1
13	.....	4·1	1·70	55·3	1·52	39·7
14	.....	3·6	.....	66·3	.....	38·6
15	0·90	3·2	.....	77·3	.....	37·6
16	.....	3·4	2·05	88·3	.....	36·6
17	.....	3·6	.....	82·4	1·47	35·6
18	0·92	3·7	.....	76·4	.....	33·0
19	.....	3·9	.....	70·4	.....	30·4
20	.....	4·1	1·86	64·4	1·37	27·8
21	.....	4·3	.....	62·0	.....	27·4
22	0·95	4·5	.....	59·5	.....	27·0
23	.....	4·7	1·72	57·1	.....	26·6
24	.....	4·8	.....	55·0	1·35	26·2
25	0·97	5·0	.....	52·8	.....	27·5
26	.....	8·9	.....	50·7	.....	28·8
27	.....	12·8	.....	48·6	1·40	30·0
28	.....	16·7	1·60	46·5	.....	30·0
29	1·27	20·5	.....	42·8	.....	30·0
30	.....	23·2	.....	39·2	.....	30·0
31	.....	.....	1·47	35·6	.....	.....

Daily Gauge Height and Discharge of Essell Creek below Summit Lake, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·40	30·0	1·10	10·2		1·7		0·9		2·5	0·82	2·0
2		28·8		9·1	0·80	1·7		1·0		2·5		2·1
3		27·5		8·0		1·6	0·75	1·2		2·5		2·3
4	1·35	26·2		6·9		1·4		1·1	0·85	2·5	0·85	2·5
5		24·8	1·00	5·8	0·75	1·2		1·0		2·5		
6		23·4		5·6		1·2		0·9		2·6		
7		22·0		5·3		1·2	0·72	0·8	0·87	2·7		
8	1·27	20·5	0·97	5·0		1·2		0·7		2·7		
9		21·2		5·2	0·75	1·2		0·6		2·6		
10		21·8		5·4		1·0	0·70	0·6		2·6		
11	1·30	22·5		5·6		0·8		0·8	0·85	2·5		
12		22·0	1·00	5·8	0·70	0·6		1·0		2·3		
13		21·5		4·9		0·6		1·2		2·0		
14		21·0		4·0		0·6	0·77	1·4	0·80	1·7		
15	1·27	20·5	0·90	3·2		0·6		1·5		1·9		
16		17·0		3·2	0·70	0·6		1·6		2·2		
17		13·6		3·2		0·6	0·80	1·7		2·4		
18	1·10	10·2		3·2		0·6		1·7	0·87	2·7		
19		8·9	0·90	3·2	0·70	0·6		1·7		2·7		
20		7·6		3·6		0·6		1·7		2·6		
21		6·3		4·0		0·6	0·80	1·7	0·85	2·5		
22	0·97	5·0	0·95	4·5		0·6		2·0		2·5		
23		4·4		3·8	0·70	0·6		2·2		2·6		
24		3·8		3·1		0·8	0·85	2·5		2·7		
25	0·90	3·2		2·4		1·0		2·5	0·87	2·7		
26		5·2	0·80	1·7	0·75	1·2		2·5		2·7		
27		7·2		1·7		1·1		2·5		2·6		
28		9·2		1·7		1·0	0·85	2·5	0·85	2·5		
29	1·12	11·3	0·80	1·7		0·9		2·5		2·3		
30		11·0		1·7	0·72	0·8		2·5		2·1		
31		10·6		1·7			0·85	2·5				

Monthly Discharge of Essell Creek below Summit Lake, for 1914.

(Drainage area, 6 square miles.)

Month.	Discharge in Second-Feet.			Run-Off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
April	23·2	3·2	6·0	356·5
May	88·3	25·5	53·6	3,295·1
June	44·0	26·2	34·7	2,066·0
July	30·0	3·2	15·7	965·4
August	10·2	1·7	4·3	264·4
September	1·7	0·6	0·9	53·5
October	2·5	0·6	1·6	98·4
November	2·7	1·7	2·5	149·0
December	2·5	2·0	For period Dec. 4th.	Dec. 1st to
The period	88·3	0·6	14·9	7,248·3

Note.—Winter conditions obtained after December 4.

The indicated run-off of Essell creek is not a true function of the drainage area, since its natural flow is augmented by a diversion from Monte creek to Summit lake. The flow out of Summit lake is also artificially controlled by a dam at its outlet.

No precipitation records available.

Guichon Creek (2014).

Location.—Near Mamit lake, Water District No. 3.

Records Available. — June 3 to December 31, 1911; January 1 to November 14, 1912; April 26 to September 29, 1913; April 1 to November 30, 1914.

Drainage Area.—Three hundred and fifteen square miles.

Gauge.—Standard vertical staff gauge read daily by O. Quenville.

Channel.—Channel is straight at measuring section. Velocities fairly high. Bed of stream composed of sand and gravel, and considered permanent.

Discharge Measurements.—Twenty three discharge measurements have been taken on this creek. Curve is well defined,

Winter Flow.—Ice conditions generally prevail on this stream throughout January and February.

Accuracy.—Curve has been well defined and results should fall within 10 per cent.

Discharge Measurements of Guichon Creek above Mamit Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 16	C. B. Corbould	1,915	26·0	58·4	1·7	2·9	98·9

For further meterings made at other points on Guichon creek during 1914, see list of miscellaneous measurements. For other hydrographic data see Water Resources Papers Nos. 1 and 8.

Daily Gauge Height and Discharge of Guichon Creek near Mamit Lake, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·52	28·9	4·85	229·5	3·55	139·5
2	1·40	23·0	5·35	277·7	3·35	126·7
3	1·45	25·5	5·80	355·0	3·25	126·7
4	1·90	46·0	5·82	360·0	3·05	108·2
5	2·90	98·5	5·97	397·4	3·00	105·0
6	3·15	114·5	6·00	405·0	2·85	95·8
7	3·05	108·2	5·00	405·0	2·80	93·0
8	2·95	101·7	5·90	379·0	2·80	93·0
9	3·02	106·3	5·92	384·2	2·85	95·8
10	2·92	99·8	6·25	483·7	3·05	108·2
11	3·10	111·5	6·32	506·8	3·10	111·5
12	3·22	118·8	6·17	454·7	3·10	111·5
13	3·60	142·5	6·12	441·5	3·00	105·0
14	3·77	153·2	6·15	451·2	2·95	101·7
15	3·95	165·2	6·15	451·2	2·95	101·7
16	4·15	178·7	6·10	435·0	2·85	95·8
17	4·07	173·0	6·10	435·0	2·75	90·2
18	4·10	175·0	6·10	435·0	2·50	76·5
19	4·15	178·7	6·07	426·0	2·32	66·6
20	4·50	203·0	5·95	392·0	2·32	66·6
21	4·57	208·0	5·85	367·0	2·30	65·5
22	4·40	195·2	5·75	344·2	2·30	65·5
23	4·40	195·2	5·65	323·7	2·30	65·5
24	4·40	195·2	5·35	277·7	2·30	65·5
25	4·40	195·2	5·20	261·5	2·30	65·5
26	4·32	190·2	4·70	218·0	2·30	65·5
27	4·35	192·1	4·70	218·0	2·30	65·5
28	4·30	189·0	4·60	210·1	2·30	65·5
29	4·27	187·0	4·60	210·1	2·30	65·5
30	4·32	190·2	3·95	165·2	2·30	65·5
31	.....	.....	3·70	149·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Guichon Creek near Mamit Lake, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·30	65·5	1·50	28·0	1·10	12·0	1·15	14·0	1·20	16·0
2	2·20	60·5	1·47	26·5	1·10	12·0	1·15	14·0	1·20	16·0
3	2·10	55·5	1·45	25·5	1·10	12·0	1·15	14·0	1·20	16·0
4	2·00	50·5	1·45	25·5	1·10	12·0	1·15	14·0	1·20	16·0
5	1·92	46·9	1·45	25·5	1·10	12·0	1·15	14·0	1·20	16·0
6	1·90	46·0	1·45	25·5	1·05	10·0	1·15	14·0	1·20	16·0
7	1·90	46·0	1·45	25·5	1·07	10·8	1·15	14·0	1·37	21·8
8	1·90	46·0	1·50	28·0	1·10	12·0	1·15	14·0	1·30	19·0
9	1·80	41·0	1·55	30·2	1·15	14·0	1·15	14·0	1·25	17·5
10	1·80	41·0	1·60	32·5	1·20	16·0	1·17	14·8	1·25	17·5
11	1·80	41·0	1·52	28·9	1·20	16·0	1·20	16·0	1·20	16·0
12	1·75	39·0	1·42	24·0	1·20	16·0	1·20	16·0	1·20	16·0
13	1·70	37·0	1·30	19·0	1·20	16·0	1·20	16·0	1·20	16·0
14	1·65	34·7	1·30	19·0	1·25	17·5	1·40	23·0	1·20	16·0
15	1·62	33·4	1·30	19·0	1·30	19·0	1·37	21·8	1·20	16·0
16	1·60	32·5	1·30	19·0	1·30	19·0	1·25	17·5	1·20	16·0
17	1·60	32·5	1·30	19·0	1·30	19·0	1·25	17·5	1·20	16·0
18	1·60	32·5	1·30	19·0	1·30	19·0	1·22	16·6	1·20	16·0
19	1·60	32·5	1·27	18·1	1·35	21·0	1·20	16·0	1·20	16·0
20	1·50	28·0	1·25	17·5	1·35	21·0	1·20	16·0	1·20	16·0
21	1·50	28·0	1·25	17·5	1·25	17·5	1·20	16·0	1·25	17·5
22	1·50	28·0	1·25	17·5	1·20	16·0	1·20	16·0	1·25	17·5
23	1·50	28·0	1·25	17·5	1·20	16·0	1·20	16·0	1·25	17·5
24	1·50	28·0	1·20	16·0	1·20	16·0	1·20	16·0	1·25	17·5
25	1·50	28·0	1·20	16·0	1·20	16·0	1·20	16·0	1·25	17·5
26	1·50	28·0	1·20	16·0	1·20	16·0	1·20	16·0	1·25	16·9
27	1·40	23·0	1·10	12·0	1·20	16·0	1·20	16·0	1·25	17·5
28	1·40	23·0	1·10	12·0	1·17	14·8	1·20	16·0	1·20	16·0
29	1·40	23·0	1·20	16·0	1·15	14·0	1·20	16·0	1·20	16·0
30	1·40	23·0	1·15	14·0	1·15	14·0	1·20	16·0	1·20	16·0
31	1·40	23·0	1·15	14·0	.....	.....	1·20	16·0	.....	.....

Monthly Discharge of Guichon Creek near Mamit Lake, for 1914.

(Drainage area, 315 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	208·0	23·0	142·9	0·45	0·5	8,503
May	506·8	149·0	346·7	1·1	1·2	21,317
June	139·5	65·5	89·4	0·28	0·31	5,320
July	65·5	23·0	36·3	0·11	0·13	2,232
August	32·5	12·0	20·7	0·07	0·08	1,273
September	21·0	12·0	15·4	0·05	0·06	916
October	21·8	14·0	15·9	0·05	0·06	978
November	21·8	16·0	16·7	0·05	0·06	994
December	.....	.....	.....	.....	.....	.....
The period	506·8	12·0	85·5	0·27	2·40	41,533

Note.—No precipitation data are available, but the total rainfall (including snowfall expressed in terms of rainfall) is probably 15 inches.

Heffley Creek—Upper (2019).

Location.—Section 9, township 22, range 16, west 6th meridian.

Records Available.—May 25 to December 8, 1911; April 1 to September 20, 1912; May 11 to September 19, 1913; May 1 to December 9, 1914.

Drainage Area.—Twenty-eight square miles.

Gauge.—Standard vertical staff gauge read daily by F. S. Lawrence.

Channel.—Straight at measuring section and permanent bed.

Discharge Measurements.—Curve is well defined with series of meterings at all stages.

Winter Flow.—Ice conditions generally prevail during January and February. A dam at Heffley lake regulates the flow.

Accuracy.—The accuracy is considered to be fairly high, results should fall within 10 per cent at all stages.

Discharge Measurements of Heffley Creek below Heffley Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 28	K. G. Chisholm	1,055	8·0	5·30	0·77	3·75	4·1
June 3	C. B. Corbould	1,915	10·0	7·03	0·90	3·92	6·3
June 30	do	1,915	10·0	6·50	0·91	3·90	5·9
Aug. 11	do	1,915	10·0	10·60	2·10	4·24	22·3
Oct. 29	do	1,673	8·0	3·47	0·28	3·40	1·0

For further measurements during 1914 on this stream, see Heffley Creek Lower Station, and for further hydrographic data see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Heffley Creek below Heffley Lake, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	3·80	4·5	3·90	5·9
2	.....	.....	3·90	5·9	3·90	5·9
3	.....	3·1	4·00	8·3	3·90	5·9
4	.....	4·4	4·00	8·3	3·92	6·3
5	.....	5·7	4·00	8·3	3·95	7·1
6	.....	4·4	3·90	5·9	3·95	7·1
7	.....	4·4	3·90	5·9	4·05	10·2
8	.....	4·4	3·90	5·9	4·04	10·2
9	.....	4·4	3·95	7·1	4·10	12·2
10	.....	4·4	4·00	8·3	4·10	12·2
11	.....	4·4	4·05	10·2	4·10	12·2
12	.....	4·4	4·25	23·2	4·05	10·2
13	.....	4·4	4·30	27·8	4·05	10·2
14	.....	5·7	4·30	27·8	4·05	10·2
15	.....	5·7	4·40	38·1	4·00	8·3
16	.....	5·7	4·55	56·5	4·00	8·3
17	.....	5·7	4·55	56·5	4·00	8·3
18	.....	5·7	4·55	56·5	4·00	8·3
19	.....	5·7	4·50	49·8	3·95	7·1
20	.....	5·7	4·50	49·8	3·95	7·1
21	.....	3·6	4·45	43·9	3·90	5·9
22	.....	2·8	4·30	27·8	3·85	5·2
23	.....	2·8	4·05	10·2	3·90	5·9
24	.....	2·8	4·00	8·3	3·95	7·1
25	.....	3·3	3·95	7·1	4·00	8·3
26	.....	3·3	3·95	7·1	3·95	7·1
27	.....	2·9	3·90	5·9	3·90	5·9
28	.....	4·0	3·95	7·1	3·90	5·9
29	.....	4·0	3·90	5·9	3·90	5·9
30	.....	4·5	3·90	5·9	3·90	5·9
31	.....	.....	3·90	5·9	.....	.....

Daily Gauge Height and Discharge of Heffley Creek below Heffley Lake, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·85	5·2	4·25	23·2	3·65	3·1	·50	2·2	3·49	2·2	3·45	2·0
2	3·85	5·2	4·25	23·2	3·65	3·1	3·50	2·2	3·45	2·0	3·45	2·0
3	3·80	4·5	4·25	23·2	3·60	2·8	3·50	2·2	3·45	2·0	3·45	2·0
4	3·90	5·9	4·25	23·2	3·58	2·7	3·50	2·2	3·45	2·0	3·45	2·0
5	3·90	5·9	4·25	23·2	3·55	2·5	3·50	2·2	3·45	2·0	3·45	2·0
6	3·90	5·9	4·25	23·2	3·55	2·5	3·50	2·2	3·45	2·0	3·45	2·0
7	4·00	8·3	4·25	23·2	3·55	2·5	3·50	2·2	3·45	2·0	3·42	1·9
8	4·00	8·3	4·20	18·7	3·55	2·5	3·47	2·1	3·48	2·1	3·40	1·8
9	4·00	8·3	4·15	15·4	3·55	2·5	3·45	2·0	3·46	2·0	.....	.....
10	4·00	8·3	4·10	12·2	3·55	2·5	3·43	1·9	3·46	2·0	.....	.....
11	3·95	7·1	4·25	23·2	3·55	2·5	3·43	1·9	3·47	2·1	.....	.....
12	3·90	5·9	4·20	18·7	3·55	2·5	3·45	2·0	3·48	2·1	.....	.....
13	3·85	5·2	4·15	15·1	3·55	2·5	3·45	2·0	3·48	2·1	.....	.....
14	3·85	5·2	4·15	15·1	3·58	2·7	3·45	2·0	3·48	2·1	.....	.....
15	3·90	5·9	4·10	12·2	3·58	2·7	3·45	2·0	3·48	2·1	.....	.....
16	3·85	5·2	4·05	10·2	3·55	2·5	3·45	2·0	3·47	2·1	.....	.....
17	3·80	4·5	4·00	8·3	3·55	2·5	3·46	2·1	3·46	2·0	.....	.....
18	3·80	4·5	4·00	8·3	3·55	2·5	3·48	2·1	3·45	2·0	.....	.....
19	3·75	4·0	4·00	8·3	3·55	2·5	3·49	2·2	3·45	2·0	.....	.....
20	3·80	4·5	3·95	7·1	3·55	2·5	3·49	2·2	3·45	2·0	.....	.....
21	4·00	8·3	3·95	7·1	3·55	2·5	3·45	2·0	3·43	1·9	.....	.....
22	4·00	8·3	3·90	5·9	3·55	2·5	3·45	2·0	3·43	1·9	.....	.....
23	4·05	10·2	3·85	5·2	3·55	2·5	3·45	2·0	3·42	1·9	.....	.....
24	4·20	18·7	3·80	4·5	3·55	2·5	3·42	1·9	3·42	1·9	.....	.....
25	4·20	18·7	3·75	4·0	3·55	2·5	3·41	1·8	3·45	2·0	.....	.....
26	4·20	18·7	3·75	4·0	3·55	2·5	3·41	1·8	3·45	2·0	.....	.....
27	4·20	18·7	3·75	4·0	3·55	2·5	3·41	1·8	3·45	2·0	.....	.....
28	4·20	18·7	3·75	4·0	3·51	2·3	3·40	1·8	3·45	2·0	.....	.....
29	4·20	18·7	3·75	4·0	3·50	2·2	3·40	1·8	3·45	2·0	.....	.....
30	4·20	18·7	3·65	3·1	3·50	2·2	3·40	1·8	3·45	2·0	.....	.....
31	4·25	23·2	3·60	2·8	.....	.....	3·40	1·8	.....	.....	.....	.....

Monthly Discharge of Heffley Creek below Heffley Lake, for 1914.

(Drainage area, 28 square miles.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	5·7	2·8	4·4	0·15	0·17	262
May	56·5	4·5	19·3	0·7	0·8	1,187
June	12·2	5·9	7·9	0·3	0·33	470
July	23·2	4·0	9·6	0·3	0·35	590
August	23·2	2·8	12·3	0·4	0·46	756
September	3·1	2·2	2·5	0·09	0·10	149
October	2·2	1·8	2·0	0·07	0·08	123
November	2·2	1·9	2·0	0·07	0·08	119
December	2·0	1·8	(for period December 1 to December 8.)			
The period	56·5	1·8	7·5	0·26	2·37	3,656

Note.—Ice conditions after December 8.

April flow compiled from flow at Heffley Creek (upper station) plus the flow in Anderson's and Crawshaw's diversions of Heffley creek.

Regular station established at outlet of Heffly lake on April 27 to replace the three former stations mentioned above. The flow at this station is artificially controlled to some extent by a dam on Heffley Lake.

Heffley Creek, Lower (2018).

Location.—Section 11, township 22, range 17, west 6th meridian.

Records Available.—August 19 to October 31, 1911; April 3 to September 15, 1912; April 13 to September 15, 1913; April 1 to December 6, 1914.

Drainage Area.—65 square miles.

Gauge.—Vertical staff gauge read daily by Mrs J. Austin.

Channel.—About 15 feet wide with rocky bed. The flow varies from a minimum of zero to a maximum of 55 cubic feet per second. The flow is partly subject to artificial regulation by a dam on Heffley lake.

Discharge Measurements.—Stream is well rated by well-distributed meterings.

Winter Flow.—Stream usually frozen over during winter months.

Accuracy.—High. Results computed from a well-rated curve.

Discharge Measurements of Heffley Creek (Lower) at mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft	Ft. per sec.	Feet.	Sec.-ft.
June 1	C. B. Corbould	1915	10	5·75	1·30	1·20	7·5
" 29	"	1915	8	5·50	1·21	1·10	6·7
Aug. 14	"	1915	8	5·70	1·21	1·15	6·9
Sept. 8	E. H. Tredcroft and C. B. Corbould	1923	7·0	2·50	0·30	0·80	0·8
Oct. 29	C. B. Corbould	1673	7·5	4·60	0·57	1·00	2·6

For further measurements during 1914 on this stream, see Heffley Creek Upper Station, and for further hydrographic data see Water Resources Papers Nos. 1 and 8.

Daily Gauge Height and Discharge of Heffley Creek (Lower) near mouth, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet	Sec.-ft	Feet.	Sec.-ft.
1	1·05	4·3	1·50	18·4	1·20	8·1
2	1·05	4·3	1·50	18·4	1·17	7·3
3	1·05	4·3	1·75	31·7	1·12	5·9
4	1·10	5·4	1·75	31·7	1·12	5·9
5	1·20	8·1	1·65	25·6	1·12	5·9
6	1·20	8·1	1·60	23·3	1·10	5·4
7	1·20	8·1	1·60	23·3	1·20	8·1
8	1·20	8·1	1·57	21·8	1·25	9·5
9	1·15	6·7	1·57	21·8	1·30	11·0
10	1·15	6·7	1·75	31·7	1·37	13·3
11	1·12	5·9	1·75	31·7	1·37	13·3
12	1·15	6·7	1·80	35·5	1·35	12·6
13	1·20	8·1	1·90	42·6	1·35	12·6
14	1·20	8·1	1·90	42·6	1·35	12·6
15	1·22	8·7	2·00	50·3	1·32	11·6
16	1·35	12·6	2·00	50·3	1·32	11·6
17	1·50	18·4	2·05	54·5	1·30	11·0
18	1·50	18·4	2·05	54·5	1·25	9·5
19	1·50	18·4	2·00	50·3	1·25	9·5
20	1·50	18·4	1·90	42·6	1·15	6·7
21	1·47	17·2	1·85	39·1	1·05	4·3
22	1·40	14·3	1·80	35·5	1·05	4·3
23	1·40	14·3	1·70	27·9	1·07	4·7
24	1·40	14·3	1·55	20·8	1·10	5·4
25	1·40	14·3	1·40	14·3	1·15	6·7
26	1·40	14·3	1·35	12·6	1·20	8·1
27	1·40	14·3	1·35	12·6	1·20	8·1
28	1·40	14·3	1·30	11·0	1·15	6·7
29	1·40	14·3	1·30	11·0	1·15	6·7
30	1·40	14·3	1·30	11·0	1·10	5·4
31	.....	.....	1·30	11·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Heffley Creek (Lower) at mouth, for 1914.—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft.
1	1·07	4·7	1·20	8·1	0·77	0·7	0·95	2·5	1·00	3·2	1·05	4·3
2	1·05	4·3	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2	1·05	4·3
3	1·05	4·3	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2	1·07	4·7
4	1·05	4·3	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2	1·07	4·7
5	1·02	3·6	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2	1·07	4·7
6	1·00	3·2	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2	1·07	4·7
7	1·00	3·2	1·30	11·0	0·80	0·8	0·95	2·5	0·90	1·7		
8	1·02	3·6	1·20	8·1	0·80	0·8	0·95	2·5	1·00	3·2		
9	1·00	3·2	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2		
10	1·00	3·2	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2		
11	1·00	3·2	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2		
12	1·00	3·2	1·25	9·5	0·80	0·8	0·95	2·5	0·97	2·7		
13	0·97	2·7	1·20	8·1	0·80	0·8	0·95	2·5	0·97	2·7		
14	0·97	2·7	1·15	6·7	0·85	1·3	0·95	2·5	0·97	2·7		
15	0·97	2·7	1·15	6·7	0·90	1·7	0·97	2·7	0·97	2·7		
16	0·95	2·5	1·10	8·1	0·90	1·7	0·97	2·7	0·97	2·7		
17	0·95	2·5	1·05	4·3	0·90	1·7	0·97	2·7	1·00	3·2		
18	0·95	2·5	1·02	3·6	0·90	1·7	0·97	2·7	1·02	3·6		
19	0·90	1·7	1·00	3·2	0·90	1·7	0·97	2·7	1·02	3·6		
20	0·90	1·7	0·95	2·5	0·95	2·5	0·97	2·7	1·07	4·7		
21	1·07	4·7	0·90	1·7	0·95	2·5	0·97	2·7	1·00	3·2		
22	1·10	5·4	0·87	1·5	0·92	2·0	1·00	3·2	1·00	3·2		
23	1·10	5·4	0·80	0·8	0·92	2·0	1·00	3·2	1·02	3·6		
24	1·15	6·7	0·80	0·8	0·92	2·0	1·00	3·2	1·07	4·7		
25	1·30	11·0	0·80	0·8	0·92	2·0	1·00	3·2	1·07	4·7		
26	1·30	11·0	0·80	0·8	0·95	2·5	1·00	3·2	1·05	4·3		
27	1·27	10·1	0·82	0·9	0·95	2·5	1·00	3·2	1·07	4·7		
28	1·27	10·1	0·80	0·8	0·95	2·5	1·00	3·2	1·07	4·7		
29	1·25	9·5	0·80	0·8	0·95	2·5	1·00	3·2	1·00	4·7		
30	1·25	9·5	0·80	0·8	0·95	2·5	1·00	3·2	1·00	3·2		
31	1·20	8·1	0·77	0·7			1·00	3·2				

Monthly Discharge of Heffley Creek (Lower) near mouth, for 1914.

(Drainage area, 65 square miles.)

Month.	Discharge in Second Feet		
	Maximum	Minimum	Mean
April	18·4	4·3	11·1
May	54·5	11·0	29·3
June	13·3	4·3	8·4
July	11·0	1·7	5·0
August	11·0	0·7	5·7
September	2·5	0·7	1·5
October	3·2	2·5	2·8
November	4·7	1·7	3·4
December	4·7	4·3	
The period	54·5	0·7	8·4

Note.—The flow of Heffley creek at mouth is not the natural discharge, since several large diversions are made above this point, and the run-off is regulated; also by a dam on Heffley lake.

Precipitation is low, varying probably from 10 to 15 inches per annum. There is probably some evaporation loss from Heffley lakes

Ingram Creek (2020).

Location.—Section 23, township 17, range 13, west 6th meridian.

Records Available.—April 1 to October 4, 1911; April 1 to August 31, 1912; April 1 to September 16, 1913.

Drainage Area.—Twenty-five square miles.

Gauge.—The gauge is a vertical staff gauge read daily by Miss M. King during high water, and tri-weekly at low stages.

Channel.—Channel is straight at measuring section. Bed of stream is rocky and permanent, only one channel at all stages.

Discharge Measurements.—The curve is well defined, measurements having been taken at all stages.

Winter Flow.—Ice conditions usually exist during December, January and February.

Accuracy.—The general accuracy of results is considered high.

Discharge Measurements of Ingram Creek near Grand Prairie, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 6.....	E. M. Dann & E. H. Tredcroft.....	1055	18	13·95	3·14	1·92	43·9
June 23.....	C. B. Corbould.....	1915	17	7·10	1·70	1·25	12·2
July 23.....	do	1915	8	4·90	0·65	1·00	3·2
Sept. 24.....	do	1915	7	2·80	0·40	0·88	1·1

For further hydrographic data see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Ingram Creek near Grand Prairie, for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·50	22·0
2	.....	.....	1·40	17·75
3	.....	.....	1·50	22·0
4	.....	.....	1·40	17·75
5	.....	.....	1·40	17·75
6	1·92	43·9	1·50	22·0
7	.....	.....	1·40	17·75
8	.....	.....	1·40	17·75
9	2·20	61·2	1·35	15·75
10	2·40	74·4	1·35	15·75
11	2·30	67·6	1·40	17·75
12	2·40	74·4	1·40	17·75
13	2·30	67·6	1·30	13·75
14	2·20	61·2	1·30	13·75
15	2·40	74·4	1·25	11·8
16	2·50	81·1	1·20	9·8
17	2·45	77·7	1·20	9·8
18	2·30	67·6	2·20	9·8
19	2·10	54·7	1·20	9·8
20	2·00	48·5	1·20	9·8
21	1·90	42·5	1·20	9·8
22	1·90	42·5	1·15	8·1
23	1·90	42·5	1·20	9·8
24	1·90	42·5	1·20	9·8
25	1·90	42·5	1·20	9·8
26	1·80	36·8	1·20	9·8
27	1·80	36·8	1·20	9·8
28	1·70	31·5	1·15	8·1
29	1·65	29·0	1·10	6·4
30	1·60	26·5	1·10	6·4
31	1·55	24·2	.....	.....

Daily Gauge Height and Discharge of Ingram Creek near Grand Prairie, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·10	6·4	0·80	0·70	.....	1·1	.....	2·6	0·55	0·20
2	1·05	5·0	.....	0·9	0·85	1·1	.....	3·8	.....	0·20
3	1·05	5·0	.....	1·1	.....	0·95	1·05	5·0	.....	0·20
4	1·05	5·0	.....	1·3	.....	0·80	1·00	3·5	0·55	0·20
5	1·00	3·5	0·90	1·5	0·80	0·70	.....	3·2	.....	0·21
6	1·00	3·5	.....	1·3	0·80	0·70	.....	2·8	.....	0·23
7	1·00	3·5	.....	1·3	.....	1·30	0·95	2·5	0·60	0·25
8	1·05	5·0	0·85	1·1	.....	1·90	.....	2·2	0·50	0·15
9	1·05	5·0	0·80	0·7	0·95	2·50	.....	1·9	.....	0·17
10	1·00	3·5	.....	0·7	.....	2·80	0·9	1·5	.....	0·19
11	1·05	5·0	.....	0·7	.....	3·1	0·9	1·5	0·55	0·20
12	1·10	6·4	0·80	0·7	1·0	3·5	.....	2·6	.....	.....
13	1·25	11·8	.....	1·0	1·0	3·5	.....	3·8	.....	.....
14	1·30	13·75	.....	1·2	.....	4·4	1·05	5·0	.....	.....
15	1·00	3·5	0·90	1·5	.....	5·4	.....	3·8	.....	.....
16	1·00	3·5	0·75	0·55	1·1	6·4	.....	2·6	.....	.....
17	1·05	5·0	0·75	0·55	.....	7·0	.....	1·4	.....	.....
18	1·00	3·5	.....	0·55	.....	7·5	0·60	0·25	.....	.....
19	1·00	3·5	0·75	0·55	1·15	8·1	.....	0·23	.....	.....
20	1·25	11·8	.....	0·75	1·00	3·5	.....	0·21	.....	.....
21	1·10	6·4	.....	0·95	.....	2·8	0·55	0·20	.....	.....
22	1·00	3·5	0·85	1·10	.....	2·0	.....	0·19	.....	.....
23	1·00	3·5	.....	0·90	0·90	1·5	.....	0·17	.....	.....
24	1·00	3·5	0·80	0·70	.....	2·75	0·50	0·15	.....	.....
25	1·00	3·5	.....	0·70	.....	3·90	0·55	0·20	.....	.....
26	0·95	2·5	0·80	0·70	1·05	5·00	.....	0·20	.....	.....
27	0·95	2·5	.....	0·80	1·05	5·0	.....	0·20	.....	.....
28	0·90	1·5	.....	0·9	.....	3·9	.....	0·20	.....	.....
29	0·90	1·5	0·85	1·1	.....	2·7	.....	0·20	.....	.....
30	0·90	1·5	0·85	1·1	0·90	1·5	.....	0·20	.....	.....
31	0·85	1·1	.....	1·1	.....	.....	0·55	0·20	.....	.....

Monthly Discharge of Ingram Creek near Grand Prairie, for 1914.

(Drainage area, 25 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	81·1	24·2	52·1	2·08	2·40	3,203
June	22·0	6·4	13·2	0·53	0·59	785
July	13·7	1·1	4·6	0·18	0·21	285·9
August	1·5	0·55	0·92	0·04	0·05	57·1
September	8·1	0·7	3·2	0·13	0·14	190
October	5·0	0·15	1·7	0·07	0·08	104
November	0·25	0·20	(for period	November	1 to Novem	ber 11.)
December	.....	.....	.....	.....	.....	.....
The period	81·1	0·15	12·6	0·50	3·47	4,625

Note.—Creek became frozen up on November 12, when water ceased running.
No precipitation records available.

JAMIESON CREEK (2022).

Location.—Section 21, township 22, range 17, west of the 6th meridian.

Records Available.—June 22 to October 30,1911; April 3 to October 30, 1912; May 1 to October 1, 1913; January 1 to January 24, and April 1 to December 9, 1914.

Drainage Area.—Sixty-six square miles.

Gauge.—Vertical staff gauge situated above British Columbia Fruitlands Diversion, and read daily by J. Crack, rancher.

Channel.—Is approximately 30 feet in width, with rocky bed.

Discharge Measurements.—Are made from Highway bridge at high water and by wading at low water.

Accuracy.—The accuracy of the returns are considered fairly high, having been compiled from a well-defined curve; meterings have been procured at all stages.

Winter Flow.—Ice conditions on this stream vary considerably. Some years obtaining for two months (January and February) and some years remaining open.

DISCHARGE MEASUREMENTS of Jamieson Creek near Black Pines, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 10	E. H. Tredcroft	1055	28	63·3	7·50	3·80	490[1]
" 25	E. H. Tredcroft & C. Corbould	1923	30	54·1	5·61	3·50	343[1]
June 30	E. H. Tredcroft	1923	35	34·0	1·90	2·36	65·5
Aug. 5	C. B. Corbould	1915	24	39·6	0·60	2·00	26·0
" 26	E. H. Tredcroft & C. B. Corbould	1923	20	18·4	0·46	1·81	8·6

[1] Measurements made at highway bridge and added to flow of div.

For further hydrographic data see Water Resources Papers Nos. 1 and 8.

Daily Gauge Height and Discharge of Jamieson Creek near Black Pine, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·90	13·0					2·00	20	3·30	251	3·00	172
2	1·90	13·0					2·00	20	3·60	375	2·90	150
3	1·80	8·0					2·00	20	3·90	570	2·90	150
4	1·70	4·5					2·00	20	3·60	375	2·80	130
5	1·60	3·0					2·10	29	3·60	375	2·60	97
6	1·55	2·2					2·10	29	3·50	325	2·60	97
7	1·55	2·2					2·20	40	3·45	305	2·65	104
8	1·45	1·0					2·30	53	3·45	305	2·60	97
9	1·45	1·0					2·40	67	3·60	375	2·55	89
10	1·40	0·5					2·40	67	3·80	500	2·55	89
11	1·40	0·5					2·45	74	4·10	730	2·55	89
12	1·40	0·5					2·45	74	4·20	810	2·45	74
13	1·40	0·5					2·50	82	4·25	852	2·45	74
14	1·45	1·0					2·50	82	4·30	895	2·45	74
15	1·45	1·0					2·60	97	4·40	980	2·40	67
16	1·45	1·0					2·75	121	4·60	1,155	2·35	60
17	1·45	1·0					2·80	130	4·40	980	2·40	67
18	1·45	1·0					2·90	150	4·25	852	2·35	60
19	1·45	1·0					2·80	130	3·80	500	2·20	40
20	1·40	0·5					2·75	121	3·90	570	2·20	40
21	1·40	0·5					2·75	121	3·80	500	2·20	40
22	1·40	0·5					2·75	121	3·80	500	2·30	53
23	1·40	0·5					2·75	121	3·70	432	2·40	67
24	1·40	0·5					2·75	121	3·70	432	2·45	74
25	1·40	0·5					2·75	121	3·50	325	2·50	82
26							2·80	130	3·40	285	2·55	89
27							2·85	140	3·40	285	2·60	97
28							2·90	150	3·30	251	2·65	104
29							2·95	161	3·20	222	2·60	97
30							3·20	222	3·10	196	2·50	82
31									3·00	172		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Jamieson Creek near Black Pines, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·35	60	1·95	16	1·72	4·5	1·77	6·0	1·87	10·5	1·77	6·0
2	2·35	60	1·95	16	1·67	3·7	1·77	6·0	1·92	13·0	1·82	8·0
3	2·30	53	1·95	16	1·67	3·7	1·77	6·0	1·92	13·0	1·82	8·0
4	2·30	53	1·95	16	1·67	3·7	1·77	6·0	1·92	13·0	1·82	8·0
5	2·25	46	1·95	16	1·67	3·7	1·77	6·0	1·87	10·5	1·87	10·5
6	2·20	40	1·95	16	1·67	3·7	1·77	6·0	1·87	10·5	1·92	13·0
7	2·20	40	1·95	16	1·67	3·7	1·77	6·0	1·87	10·5	1·92	13·0
8	2·15	34	1·95	16	1·72	4·5	1·77	6·0	1·87	10·5	1·87	10·5
9	2·10	29	1·95	16	1·77	6·0	1·72	4·5	1·82	8·0	1·87	10·5
10	2·10	29	1·90	13	1·87	10·5	1·72	4·5	1·82	8·0	.....	.....
11	2·05	24	1·90	13	1·77	6·0	1·77	6·0	1·82	8·0	.....	.....
12	2·05	24	1·90	13	1·72	4·5	1·82	8·0	1·87	10·5	.....	.....
13	1·95	16	1·85	10	1·72	4·5	1·87	10·5	1·92	13·0	.....	.....
14	2·10	29	1·85	10	1·77	6·0	1·82	8·0	1·97	16·0	.....	.....
15	2·40	67	1·90	13	1·82	8·0	1·77	6·0	1·97	16·0	.....	.....
16	2·40	67	1·90	13	1·77	6·0	1·77	6·0	1·92	13·0	.....	.....
17	2·30	53	1·90	13	1·82	8·0	1·77	6·0	1·87	10·5	.....	.....
18	2·25	46	1·85	10	1·87	10·5	1·82	8·0	1·82	8·0	.....	.....
19	2·20	40	1·85	10	1·87	10·5	1·87	10·5	1·87	10·5	.....	.....
20	2·20	40	1·85	10	1·87	10·5	1·97	16·0	1·82	8·0	.....	.....
21	2·10	29	1·85	10	1·87	10·5	1·92	13·0	1·82	8·0	.....	.....
22	2·20	40	1·85	10	1·87	10·5	1·92	13·0	1·82	8·0	.....	.....
23	2·30	53	1·85	10	2·07	24·0	1·87	10·5	1·82	8·0	.....	.....
24	2·40	67	1·85	10	1·92	13·0	1·87	10·5	1·82	8·0	.....	.....
25	2·40	67	1·75	6	1·87	10·5	1·87	10·5	1·87	10·5	.....	.....
26	2·30	53	1·80	8	1·87	10·5	1·82	8·0	1·87	10·5	.....	.....
27	2·20	40	1·75	6	1·82	8·0	1·82	8·0	1·82	8·0	.....	.....
28	2·05	25	1·75	6	1·82	8·0	1·82	8·0	1·82	8·0	.....	.....
29	2·05	25	1·80	8	1·77	6·0	1·82	8·0	1·77	6·0	.....	.....
30	1·95	16	1·75	6	1·77	6·0	1·82	8·0	1·77	6·0	.....	.....
31	1·90	13	1·75	6	.....	.....	1·82	8·0	.....	.....	.....	.....

Monthly Discharge of Jamieson Creek near Black Pines, for 1914.

(Drainage area, 66 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet
April	222	20	94	1·4	1·6	5,593
May	1,155	172	506	7·7	8·9	31,113
June	172	40	87	1·3	1·4	5,176
July	67	13	41	0·6	0·7	2,521
August	16	6	11	0·2	0·3	676
September	24	3·7	7	0·1	0·1	416
October	16	4·5	8	0·1	0·1	492
November	10	6·0	10	0·2	0·2	595
The period	1,155	3·7	95	1·45	13·3	46,582

Note.—Summary given under "the period" covers only the months of April to November inclusive
Precipitation probably varies from about 10 inches at the mouth to 30 inches in the higher altitudes

Louis Creek (2023).

Location.—Section 33, township 23, range 15, west 6th meridian.

Records Available.—July 16 to October 31, 1911; April 1 to November 16, 1912; May 1 to October 14, 1913; April 1 to December 11, 1914.

Drainage Area.—One hundred square miles.

Gauge.—Standard vertical staff gauge read daily during high water, and tri-weekly during low water, by D. G. McKnight.

Channel.—The width of stream averages 25 to 35 feet at measuring section. Control is good.

Discharge Measurements.—Nine well-distributed meterings have been taken on this stream, and curve is well defined.

Winter Flow.—Ice conditions obtain on this stream usually throughout January, February and March.

Accuracy.—Accuracy of returns on the whole is high, and results should fall within 10 per cent.

Discharge Measurements of Louis Creek at Leslie's Ranch, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 13	C. B. Corbould	1,915	21·0	27·3	1·0	0·59	28·0

For further hydrographic data see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Louis Creek at Leslie's Ranch, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·45	89	2·50	230
2	0·55	26	1·80	130	2·80	278
3			2·05	165	3·10	326
4	0·55	26	1·90	144	2·90	294
5			1·80	130	2·60	246
6	0·65	30	1·75	123	2·40	215
7			1·70	117	2·45	222
8			1·75	123	2·35	207
9			1·90	144	2·30	200
10	0·75	35	2·20	186	2·55	238
11			2·30	200	2·90	294
12			2·45	222	2·95	302
13	0·85	40	2·50	230	2·80	278
14			3·10	326	2·80	278
15			3·55	398	2·85	286
16			3·55	398	2·90	294
17	1·10	57	3·30	358	2·90	294
18			3·05	318	2·70	262
19			2·90	294	2·50	230
20	1·05	53	2·75	270	2·50	230
21			2·75	270	2·10	172
22			2·85	286	1·95	151
23			3·00	310	2·05	165
24	1·10	57	3·20	342	2·00	158
25			3·15	334	2·15	179
26			2·85	286	2·05	165
27	1·15	61	2·60	246	1·95	151
28			2·40	215	1·85	137
29			2·30	200	2·05	165
30			2·20	186	1·80	130
31			2·30	200		

Daily Gauge Height and Discharge of Louis Creek at Leslie's Ranch, for 1914.—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·70	117										
2	1·60	105					0·55	26	0·70	32		
3	1·50	94	0·60	28								
4	1·45	89			0·45	22					0·50	24
5	1·30	74					0·50	24				
6	1·25	69							0·60	28		
7			0·60	28	0·40	20					0·50	24
8												
9							0·50	24	0·55	26		
10	1·05	53	0·65	30								
11					0·50	24					0·50	24
12							0·50	24				
13	0·90	43							0·55	26		
14			0·55	26	0·50	24						
15	1·40	84										
16							0·50	24	0·55	26		
17	1·10	57	0·55	26								
18					0·55	26						
19							0·60	28				
20												
21			0·50	24	0·55	26			0·50	24		
22	0·90	43										
23							0·55	26				
24			0·50	24					0·50	24		
25	0·80	37			0·50	24						
26							0·50	24				
27												
28			0·45	22	0·60	28			0·50	24		
29	0·70	32										
30							0·50	24	0·50	24		
31	0·65	30	0·45	22								

Monthly Discharge of Louis Creek near mouth, for 1914.

(Drainage area, 100 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage. area.	Total in acre-feet.
April	61	26	43·0	0·4	0·4	2,559
May	398	89	233·0	2·3	2·6	14,327
June	326	130	225·9	2·2	2·4	13,442
July	117	30	66·2	0·7	0·8	4,070
August	30	22	25·5	0·2	0·2	1,568
September	28	20	24·2	0·2	0·2	1,440
October	28	24	24·9	0·2	0·2	1,531
November	32	24	26·0	0·3	0·3	1,547
December						
The period	398	20	83·6	0·8	7·1	46,484

Note.—No precipitation data available, but it is probable that it has an annual variation from 15 to 20 inches. Ice conditions existed subsequent to December 11.

Monte Creek, Div. to Summit Lake (2026).

Location.—At Graham's ranch.

Records Available.—May 25 to October 2, 1911; June 20 to September 30, 1913; April 1 to November 17, 1914.

Gauge.—Vertical staff gauge read daily by E. C. Lewis.

Channel.—About 10 feet in width, with gravelly bed. This diversion supplements the natural run-off of Summit lake (or Essell creek).

Discharge Measurements.—Gauge height discharge curve, only fairly well defined by three meterings in 1914.

Winter Flow.—Stream frozen up during the winter months.

Accuracy.—Fairly good, within about 10 per cent of true accuracy.

Discharge Measurements of Monte Creek Diversion to Summit Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 7.....	E. M. Dann & E. H. Tredcroft.....	1,055	9·0	7·35	3·15	1·19	24·7
June 22.....	C. B. Corbould.....	1,915	8·0	5·00	2·24	1·00	11·2[1]
July 22.....	do	1,915	3·5	0·90	0·63	0·20	0·6
Sept. 23.....	do	.....	.....	.....	.....	0·10	0·2[2]

[1]New gauge installed on this date. Old gauge reading 0·65.
[2]Estimated.
For further hydrographic data see Water Resources Papers Nos. 1 and 8.

Daily Gauge Height and Discharge of Monte Creek Diversion to Summit Lake, for 1914.

Up to June 22nd: old gauge used.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·55	3·1	1·20	25·1	.....	11·0
2	0·55	3·1	1·40	35·9	.....	11·0
3	0·62	4·3	1·50	41·6	.....	11·0
4	0·72	6·5	1·40	35·9	.....	11·0
5	0·80	8·7	1·30	30·4	.....	11·0
6	0·92	12·7	1·30	30·4	.....	11·0
7	1·00	15·9	1·20	25·1	.....	11·0
8	1·10	20·1	1·20	25·1	.....	11·0
9	1·25	27·7	1·30	30·4	.....	11·0
10	1·30	30·4	1·40	35·9	.....	11·0
11	1·35	33·1	1·40	35·9	.....	11·0
12	1·40	35·9	1·30	30·4	.....	11·0
13	1·45	38·7	1·10	20·1	.....	11·0
14	1·50	41·6	1·20	25·1	.....	11·0
15	1·50	41·6	1·20	25·1	.....	11·0
16	1·50	41·6	1·00	15·9	.....	11·0
17	1·50	41·6	0·90	12·0	.....	11·0
18	1·50	41·6	0·90	12·6	.....	11·0
19	1·50	41·6	0·90	12·0	.....	11·0
20	1·50	41·6		11·0	.....	11·0
21	1·50	41·6	.....	11·0	.....	11·0
22	1·50	41·6	.....	11·0	1·00	11·0
23	1·50	41·6	.....	11·0	1·00	11·0
24	1·40	35·9	.....	11·0	1·05	12·4
25	1·40	35·9	.....	11·0	1·10	13·7
26	1·30	30·4	.....	11·0	1·05	12·4
27	1·20	25·1	.....	11·0	1·00	11·0
28	1·20	25·1	.....	11·0	1·00	11·0
29	1·20	25·1	.....	11·0	1·00	11·0
30	1·20	25·1	.....	11·0	1·00	11·0
31	.....	.....	.....	11·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Monte Creek River Div. to Summit Lake, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·90	8·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
2	0·90	8·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
3	0·90	8·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
4	0·80	6·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
5	0·80	6·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
6	0·80	6·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
7	0·80	6·8	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
8	0·70	5·2	0·20	0·7	0·05	0·1	0·1	0·3	0·3	1·2
9	0·70	5·2	0·20	0·7	0·05	0·1	0·15	0·5	0·3	1·2
10	0·70	5·2	0·10	0·3	0·05	0·1	0·2	0·7	0·3	1·2
11	0·60	3·9	0·10	0·3	0·05	0·1	0·2	0·7	0·3	1·2
12	0·50	2·8	0·10	0·3	0·05	0·1	0·2	0·7	0·3	1·2
13	0·30	1·2	0·10	0·3	0·05	0·1	0·2	0·7	0·2	0·7
14	0·30	1·2	0·10	0·3	0·05	0·1	0·2	0·7	0·2	0·7
15	0·20	0·7	0·10	0·3	0·05	0·1	0·2	0·7	0·2	0·7
16	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7	0·2	0·7
17	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7	0·3	1·2
18	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7		
19	0·20	0·7	0·10	0·3	0·22	0·8	0·2	0·7		
20	0·20	0·7	0·10	0·3	0·20	0·7	0·3	1·2		
21	0·30	1·2	0·10	0·3	0·20	0·7	0·3	1·2		
22	0·20	0·7	0·10	0·3	0·10	0·3	0·3	1·2		
23	0·20	0·7	0·10	0·3	0·10	0·3	0·5	2·8		
24	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7		
25	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7		
26	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7		
27	0·20	0·7	0·10	0·3	0·10	0·3	0·2	0·7		
28	0·20	0·7	0·10	0·3	0·10	0·3	0·3	1·2		
29	0·20	0·7	0·10	0·3	0·10	0·3	0·3	1·2		
30	0·20	0·7	0·10	0·3	0·10	0·3	0·3	1·2		
31	0·20	0·7	0·10	0·3			0·3	1·2		

Monthly Discharge of Monte Creek Div. to Summit Lake, for 1914.

(Drainage area, — square miles.)

Month.	Discharge in Second-Feet.			Run-off.
	Maximum.	Minimum.	Mean	Total in acre-feet
April	41·6	3·1	28·6	1 702
May	41·6	11·0	20·5	1 260
June	13·7	11·0	11·2	666
July	8·8	0·7	2·9	178
August	0·7	0·3	0·4	25
September	0·8	0·1	0·2	12
October	2·8	0·3	0·7	43
November	1·2	0·7	(For period Nov. 16	Nov. 1 to
The period	41·6	0·1	9·2	3 886

Note.—This diversion carries Monte Creek water to Summit lake, where it is stored—being used, when needed, upon lands in the Salmon river valley, near Grand Prairie.

MONTE CREEK, BELOW DIV. TO SUMMIT LAKE (2025).

Location.—Section 22, township 13, range 14, west 6th meridian.

Records Available.—May 25 to September 30, 1911; April 1 to September 17, 1912; June 20 to September 30, 1913; April 1 to November 17, 1914.

Drainage Area.—Forty-five square miles.

Gauge.—Standard vertical gauge read daily by E. C. Lewis.

Channel.—Width of channel averages 10 feet. Bed of stream gravelly and permanent.

Discharge Measurements.—The curve is well defined, with measurements taken at varying stages.

Winter Flow.—Ice conditions generally prevail throughout winter months.

Accuracy.—Accuracy on the whole is fairly high, and is probably within 10 per cent.

DISCHARGE MEASUREMENTS of Monte Creek below Summit Lake Div., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 22	C. B. Corbould	1915	13	8·7	0·54	4·00	4·7
July 22	do	1915	12	7·5	0·41	3·93	3·11
Sept. 23	do	1915	11	5·8	0·15	3·83	0·90

For further hydrographic data see Water Resources Paper Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Monte Creek below Div. Summit Lake, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·8	1·9	4·6	59·0	4·3	20·7
2	3·82	2·0	4·7	73·3	4·3	20·7
3	3·9	2·7	4·8	90·4	4·3	20·7
4	3·97	4·1	4·6	59·0	4·3	20·7
5	4·05	6·4	4·7	73·3	4·3	20·7
6	4·1	8·0	4·6	59·0	4·25	16·8
7	4·1	8·0	4·5	44·5	4·2	13·0
8	4·12	9·0	4·5	44·5	4·2	13·0
9	4·1	8·0	4·7	73·3	4·2	13·0
10	4·12	9·00	4·9	107·4	4·3	20·7
11	4·2	13·0	5·0	125·5	4·3	20·7
12	4·2	13·0	5·0	125·5	4·4	31·5
13	4·3	20·7	4·7	73·3	4·35	26·0
14	4·25	16·8	4·6	59·0	4·3	20·7
15	4·2	13·0	4·7	73·3	4·3	20·7
16	4·2	13·0	4·85	98·5	4·3	20·7
17	4·1	8·0	4·8	90·4	4·2	13·0
18	4·07	6·9	4·7	73·3	4·2	13·0
19	4·0	4·7	4·6	59·0	4·2	13·0
20	4·1	8·0	4·6	59·0	4·15	10·5
21	4·1	8·0	4·55	51·7	4·1	8·0
22	4·02	5·3	4·50	44·5	4·05	6·4
23	4·0	4·8	4·5	44·5	4·0	4·7
24	4·0	4·8	4·5	44·5	4·0	4·7
25	4·0	4·8	4·47	40·5	4·1	8·0
26	4·1	8·0	4·4	31·5	40·5	6·4
27	4·2	13·0	4·4	31·5	4·0	4·7
28	4·2	13·0	4·4	31·5	3·9	2·7
29	4·35	26·0	4·4	31·5	4·0	4·7
30	4·5	44·5	4·35	26·0	4·0	4·7
31			4·3	20·7		

Daily Gauge Height and Discharge of Monte Creek below Div. to Summit Lake, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·0	4·7	3·8	1·9	3·7	1·5	3·9	2·7	4·1	8·0
2	4·0	4·7	3·8	1·9	3·7	1·5	3·9	2·7	4·9	4·75
3	4·0	4·7	3·8	1·9	3·7	1·5	3·9	2·7	4·0	4·75
4	4·0	4·7	3·8	1·9	3·7	1·5	3·9	2·7	4·0	4·75
5	4·0	4·7	3·8	1·9	3·7	1·5	3·9	2·7	4·0	4·75
6	3·9	2·7	3·8	1·9	3·7	1·5	3·9	2·7	4·0	4·75
7	3·9	2·7	3·8	1·9	3·8	1·9	3·9	2·7	4·0	4·75
8	4·0	4·7	3·8	1·9	3·8	1·9	3·9	2·7	4·0	4·75
9	4·0	4·7	3·8	1·9	3·8	1·9	4·0	4·7	4·0	4·75
10	4·0	4·7	3·7	1·5	3·8	1·9	4·0	4·7	4·0	4·75
11	3·9	2·7	3·7	1·5	3·9	2·7	4·0	4·7	4·0	4·75
12	3·85	2·3	3·7	1·5	3·9	2·7	4·0	4·7	3·9	2·7
13	3·8	1·9	3·8	1·9	3·9	2·7	4·0	4·7	3·9	2·7
14	4·0	4·7	3·8	1·9	3·9	2·7	4·0	4·7	3·95	3·7
15	4·0	4·7	3·8	1·9	3·9	2·7	4·0	4·7	4·0	4·75
16	4·0	4·7	3·8	1·9	3·9	2·7	4·05	6·4	.....	.....
17	4·0	4·7	3·8	1·9	3·9	2·7	4·1	8·0	.....	.....
18	3·9	2·7	3·7	1·5	3·9	2·7	4·0	4·7	.....	.....
19	3·9	2·7	3·7	1·5	3·9	2·7	4·0	4·7	.....	.....
20	4·0	4·7	3·7	1·5	3·9	2·7	4·0	4·7	.....	.....
21	3·95	3·7	3·7	1·5	3·8	1·9	4·0	4·7	.....	.....
22	3·9	2·7	3·7	1·5	3·8	1·9	3·9	2·7	.....	.....
23	3·9	2·7	3·8	1·9	3·8	1·9	3·85	2·3	.....	.....
24	3·9	2·7	3·75	1·7	3·8	1·9	4·0	4·7	.....	.....
25	3·9	2·7	3·7	1·5	3·8	1·9	4·1	8·0	.....	.....
26	3·9	2·7	3·7	1·5	3·8	1·9	4·1	8·0	.....	.....
27	3·9	2·7	3·7	1·5	3·8	1·9	4·05	6·4	.....	.....
28	3·9	2·7	3·7	1·5	3·8	1·9	4·0	4·7	.....	.....
29	3·9	2·7	3·7	1·5	3·8	1·9	4·0	4·7	.....	.....
30	3·9	2·7	3·7	1·5	3·8	1·9	4·1	8·0	.....	.....
31	3·8	1·9	3·7	1·5	.....	.....	4·1	8·0	.....	.....

Monthly Discharge of Monte Creek below Summit Lake Div., for 1914.

(Drainage area, 45 square miles.)

Month.	Discharge in Second-Feet.		
	Maximum.	Minimum.	Mean.
April	41·5	1·9	10·3
May	125·5	20·7	61·9
June	31·5	2·7	14·2
July	4·7	1·9	3·5
August	1·9	1·5	1·7
September	2·7	1·5	2·1
October	8·0	2·3	4·7
November	8·0	2·7	.....
December	.....	.....	.....
The year	125·5	1·5	14·6

Note.—The run-off is not a function of the drainage area since a large diversion is made above this station which carries water to Summit lake. During April to November, 1914, 3,886 acre-feet were so diverted.

Rainfall probably varies to a maximum of 20 inches annually.

Monte Creek, above Bostock's Diversion (2024).

Location.—Section 25, township 19, range 15, west 6th meridian.

Records Available.—May 20 to June 30, 1911; August 8, 1911; April 8 to September 7, 1912; April 16 to September 13, 1913; April 1 to December 4, 1914.

Drainage Area.—One hundred and ten square miles.

Gauge.—Standard vertical gauge read semi-weekly by T. F. Teagle.

Channel.—About 15 feet wide, with rocky bed. Flow varies from zero to about 100 cubic feet per second.

Discharge Measurements.—Gauge-height discharge curve is very well defined.

Winter Flow.—Ice conditions prevail during December, January and February.

Accuracy.—High. Results computed from a well-rated curve.

Discharge Measurements of Monte Creek above Bostock's Diversion, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 7	E. H. Trederoft	1055	22	28·4	1·71	1·70	48·6
June 21	C. B. Corbould	1915	10	11·4	0·54	0·90	6·2
July 21	do	1915	8	7·6	0·32	0·70	2·5
Sept. 22	do	1915	7	2·9	0·66	0·59	1·9

For further hydrographic data see Water Resources Paper Nos. 1 and 8.

Daily Gauge Height and Discharge of Monte Creek above Bostock's Diversion, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·99	8·6	.....	37·1	.....	20·0
2	.....	8·7	1·59	40·3	.....	18·7
3	.....	8·8	.....	44·0	1·22	17·4
4	1·00	8·9	.....	47·8	.....	17·9
5	.....	10·2	.....	51·5	.....	18·4
6	.....	11·5	1·78	55·3	1·25	18·9
7	.....	12·8	.....	50·8	.....	17·2
8	1·14	14·0	.....	46·3	.....	15·6
9	.....	15·6	1·61	41·8	.....	14·0
10	.....	17·2	.....	50·1	1·10	12·3
11	1·25	18·9	.....	58·4	.....	12·6
12	.....	21·0	.....	66·7	.....	12·9
13	.....	23·1	1·97	75·0	1·12	13·1
14	.....	25·2	.....	71·2	.....	12·4
15	1·40	27·3	.....	67·5	.....	11·8
16	.....	28·0	1·87	63·8	.....	11·2
17	.....	28·6	.....	59·7	1·05	10·6
18	1·43	29·2	.....	55·5	.....	10·0
19	.....	28·8	.....	51·3	.....	9·4
20	.....	28·5	1·68	47·1	1·00	8·9
21	.....	28·2	.....	42·8	.....	8·3
22	1·41	27·9	.....	38·6	.....	7·7
23	.....	27·3	1·51	34·4	.....	7·1
24	.....	26·7	.....	34·6	0·91	6·5
25	1·38	26·1	.....	34·7	.....	6·2
26	.....	27·2	.....	34·8	.....	5·9
27	.....	28·3	.....	35·0	0·87	5·6
28	.....	29·4	1·52	35·2	.....	5·3
29	1·45	30·5	.....	30·6	.....	4·9
30	.....	33·8	.....	26·0	.....	4·5
31	.....	.....	1·30	21·3	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Monte Creek above Bostock's Diversion, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·80	4·2	0·60	1·8	.....	0·3	.....	1·4	.....	2·7	0·70	2·8
2	.....	4·1	.....	1·8	0·40	0·2	.....	1·5	.....	2·7	.....	2·9
3	.....	3·9	.....	1·7	.....	0·4	0·57	1·5	.....	2·6	.....	3·0
4	0·77	3·8	.....	1·6	.....	0·6	.....	1·5	0·67	2·5	0·72	3·1
5	.....	3·5	0·57	1·5	0·50	0·8	.....	1·6	.....	2·6	.....	.....
6	.....	3·3	.....	1·5	.....	0·8	.....	1·7	.....	2·7	.....	.....
7	.....	3·0	.....	1·6	.....	0·8	0·60	1·8	0·70	2·8	.....	.....
8	0·70	2·8	.....	1·7	.....	0·9	.....	1·8	.....	2·8	.....	.....
9	.....	2·8	0·60	1·8	0·51	0·9	.....	1·9	.....	2·8	.....	.....
10	.....	2·8	.....	1·7	.....	0·9	0·62	2·0	.....	2·8	.....	.....
11	0·70	2·8	.....	1·5	.....	0·8	.....	2·0	0·70	2·8	.....	.....
12	.....	3·1	0·55	1·3	0·50	0·8	.....	2·0	.....	2·7	.....	.....
13	.....	3·5	.....	1·2	.....	1·0	.....	2·0	.....	2·6	.....	.....
14	.....	3·9	.....	1·0	.....	1·1	0·62	2·0	0·67	2·5	.....	.....
15	0·80	4·2	0·50	0·8	.....	1·2	.....	2·2	.....	2·5	.....	.....
16	.....	4·0	.....	0·8	0·55	1·3	.....	2·4	.....	2·6	.....	.....
17	.....	3·9	.....	0·8	.....	1·3	0·67	2·5	.....	2·7	.....	.....
18	0·77	3·8	.....	0·8	.....	1·3	.....	2·5	0·70	2·8	.....	.....
19	.....	3·6	0·50	0·8	0·55	1·3	.....	2·4	.....	2·7	.....	.....
20	.....	3·3	.....	0·8	.....	1·3	.....	2·3	.....	2·6	.....	.....
21	.....	3·0	.....	0·8	.....	1·3	0·65	2·3	0 ·67	2·5	.....	.....
22	0·70	2·8	0·50	0·8	.....	1·3	.....	2·3	.....	2·8	.....	.....
23	.....	2·7	.....	0·8	0·55	1·3	.....	2·4	.....	3·2	.....	.....
24	.....	2·5	.....	0·7	.....	1·3	0·67	2·5	.....	3·5	.....	.....
25	0·65	2·3	.....	0·6	.....	1·4	.....	2·5	0·77	3·8	.....	.....
26	.....	2·1	0·45	0·5	0·57	1·5	.....	2·5	.....	3·5	.....	.....
27	.....	2·0	.....	0·5	.....	1·4	.....	2·5	.....	3·1	.....	.....
28	.....	1·9	.....	0·5	.....	1·4	0·67	2·5	0·70	2·8	.....	.....
29	0·60	1·8	0·45	0·5	.....	1·3	.....	2·6	.....	2·8	.....	.....
30	.....	1·8	.....	0·5	0·55	1·3	.....	2·7	.....	2·8	.....	.....
31	.....	1·8	.....	0·4	.....	.....	0·70	2·8	.....	.....	.....	.....

Monthly Discharge of Monte Creek above Bostock's Diversion, for 1914.

(Drainage area, 110 square miles.)

Month.	Discharge in Second-Feet.		
	Maximum.	Minimum.	Mean.
April	33·8	8·6	22·0
May	75·0	21·3	46·7
June	20·0	4·5	11·5
July	4·2	1·8	3·1
August	1·8	0·4	1·1
September	1·5	0·2	1·0
October	2·8	1·4	2·1
November	3·8	2·5	2·8
December	.....	.....	.....
The period	75·0	0·2	11·3

Note.—Summary for "the period" covers April to November (inclusive).

The run-off (not given in table) is not a direct function of the drainage area, since there is a large diversion from Monte Creek to Summit lake.

Rainfall varies from 10 to 20 inches annually.

Myrtle River.

The Myrtle river rises in Myrtle lake just a mile west of the Blue River divide. Myrtle lake is surrounded by fairly level country, and is at an elevation of about 3,000 feet. Its superficial area is about 15 square miles. No information has been obtained regarding the storage facilities of the lake; however, it is interesting to note that with the area given above, a 5-foot dam

Myrtle River, Dawson Falls

Photograph by F. R. Archibald

One of the many natural power sites on the Myrtle river. This photograph, taken at a low water stage shows Dawson falls, which are about four miles upstream from Helmcken Falls.

would give an increased storage capacity of 48,000 acre-feet (at least), which would mean an increase in minimum flow for continuous power of about 80 second-feet (assuming a shortage of water for 300 days). The wonderful latent power possibilities of the river warrant a much more thorough investigation.

The following are the more important power sites:—

Name of Falls.	Natural Head.	Distance from mouth of Myrtle River and Location.
Helmcken falls	450 feet (triangulated)	1 mile; in lot 3210.
Dawson falls	Three lower falls 20 feet each (approx.) Upper fall 50 feet (approx.)	3 miles; in lot 3208.
Un-named falls	25 feet (approx.)	10 miles; in lot 3494.
Horseshoe falls	35 feet (approx.)	12 miles; in lot 3499.
Meadow falls	20 feet (approx.)	13 miles; in lot 3998.
Un-named falls	Said to be about 40 feet	20 miles; a mile or two below lake outlet.

Helmcken Falls and Myrtle river canyon.
Photograph by F. R. Archibald.

This photograph of Helmcken falls on the Myrtle river is one of the first ever taken of what is probably one of the finest natural power sites of British Columbia's vast hinterland. A sheer fall of 450 feet (triangulated) over which a stream plunges whose estimated minimum flow is 400 sec.-ft., and whose maximum is probably 10,000 sec.-ft., is an unusual sight and one which for majestic grandeur is probably unsurpassed in the Dominion. Studies of the flow of the Myrtle river have been commenced and a year's cycle will be complete on Sept. 1, 1915.

For a matter of historic record it should be stated that Helmcken falls (a photograph of which is printed elsewhere) were discovered by two members of a land survey party in charge of Mr. R. H. Lee, of Kamloops, in the summer of 1913 (Messrs. Luce and Hossack). Although they were said to be known to the Indians, who spoke of them as "the falls which are two big cedars high," these two men are the first white men which are known to have seen the falls. For scenic beauty this wonderful natural power-site is probably without a peer, and will sooner or later become a mecca for tourists from various parts of the world.

The total length of Myrtle river is about 22 miles between the lake and the river's confluence with the Clearwater.

A gauge was established on the Myrtle river on September 1, 1914, by Messrs. E. H. Tredcroft and C. B. Corbould, and a meter measurement made showing a flow of 800 second-feet. After further measurements are made, a year's cycle of records will be available on September 1, 1915. Gauge readings are taken by Mr. P. McDougall weekly. Owing to the inaccessibility of the station, it has been impossible to procure more readings, but, since the stream's behaviour is fairly regular, it is thought that fairly reliable results will be obtained. A very rough estimate, made by comparison of the Myrtle drainage area with that of the Clearwater, places the minimum flow at 400 and the maximum at 10,000 second-feet.

Paul Creek (2032).

Location.—Section 31, township 20, range 16, west 6th meridian.

Records available.—July 1 to October 6, 1911; May 12 to September 25, 1912; May 18 to September 30, 1913; April 20 to September 27, 1914.

Drainage area.—Sixty-five square miles.

Gauge.—Vertical staff gauge read weekly by E. L. Ridout.

Channel.—Channel is rocky, and current is very swift at high stages.

Discharge measurements.—The gauge-height curve is fairly well defined. The flow is artificially controlled by a dam on Paul lake.

Winter flow.—Stream usually dries up during winter, or else ice conditions obtain.

Accuracy.—Accuracy, with the exception of flood times, is considered high.

Discharge Measurements of Paul Creek below Paul Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 27	E. M. Dann	1505	5·5	4·60	9·02	2·25	41·4
May. 19	C. B. Corbould	1673	5·7	6·05	11·50	2·75	69·9
July 14	C. B. Corbould	1915	7·0	2·70	5·50	1·95	14·8
" 25	E. M. Dann and C. E. Webb	1915	5·8	1·98	6·44	1·73	12·7
Aug. 8	C. B. Corbould	1915	6·0	3·26	7·90	2·12	25·7

For further hydrographic data see Water Resources, Paper Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Paul Creek below Paul Lake, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				42·9		14·9		30·8		12·0		13·2
2				45·4		17·4		30·0	1·72	11·7		12·7
3				48·0		20·0		29·2		13·0		12·2
4			2·50	50·5		22·5		28·4		14·2		11·7
5				55·0		25·0	2·15	27·6		15·5		11·2
6				59·5		27·5		26·8		16·6		10·7
7				64·0	2·20	30·2		25·9		17·9	1·65	10·2
8				68·5		31·8		25·0		19·2		9·5
9				73·0		33·4		24·1	2·00	20·5		8·8
10			2·85	77·6		35·0		23·2		20·5		8·1
11				79·4		36·6		22·3		20·5		7·4
12				81·2		38·2		21·4		20·5		6·7
13				83·0		39·8	2·00	20·5		20·5	1·49	6·0
14				84·7		41·4		19·8		20·5		5·6
15				86·5	2·4	43·0		19·2		20·5		5·2
16				88·3		45·1		18·6	2·00	20·5		4·8
17			3·00	90·0		47·3		18·0		20·0		4·4
18				87·1		49·4		17·4		19·5		3·9
19				84·2		51·6	1·90	16·8		19·0		3·5
20	1·10	2·6		81·3		53·7		16·3		18·4	1·15	3·1
21		7·2		78·4		55·8		15·9		17·9		2·7
22		11·8		75·5	2·60	58·0		15·4		17·3		2·4
23		16·4		72·6		53·9		15·0	1·90	16·8		2·0
24		21·0	2·75	69·7		49·8		14·5		16·5		1·7
25		25·6		61·6		45·7		14·1		16·1		1·4
26	2·20	30·2		53·4		41·5	1·80	13·7		15·7		1·0
27		32·7		45·2		37·4		13·5		15·3	0·90	0·7
28		35·2		37·0	2·25	33·3		13·2		14·9		
29		37·8		28·8		32·4		12·9		14·5		
30		40·3		20·6		31·6		12·6		14·1		
31			1·75	12·4				12·3	1·80	13·7		

Monthly Discharge of Paul Creek below Paul Lake, for 1914.

(Drainage area, 65 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet
May	90·0	12·4	64·0	0·98	1·1	3,935
June	58·0	14·9	38·1	0·6	·7	2,267
July	30·8	12·3	19·8	0·3	·3	1,217
August	20·5	11·7	17·2	0·26	·3	1,057
September	13·2	0·7	6·3	0·97	1·1	375
October						
November						
December						
The period	90·0	0·7	29·1	0·02	3·5	8,851

Note.—Precipitation 10 to 50 inches annually.
Flow artificially controlled by a dam on Paul lake.
The estimated flow for April is 600 acre-feet, while during the winter months the run-off is practically nil

Raft River (2055).

Location.—Raft river, Water District No. 2.

Records Available.—June 1, 1914, to December 14, 1914.

Drainage Area.—One hundred and twenty-five square miles.

Gauge.—Standard chain gauge on highway bridge, graduated in feet and tenths, having a range from 3.0 to 9.0, and read by J. McLennan, Raft River P.O.

Channel.—Average width of channel 150 feet. Bed of stream composed of rock, sand, and gravel, and permanent as far as can be ascertained.

Discharge Measurements.—Only three discharge measurements were taken on this river during 1914 owing to its being situated in country only just being opened up by this survey, but all results of these measurements point to a high degree of accuracy eventually being obtained.

Winter Flow.—Ice conditions obtain on this river during the latter half of December, throughout January, and during the first half of February.

Accuracy.—The accuracy of returns is doubtful, since stream is not completely rated.

Raft River.

Raft river, which joins the North Thompson 76 miles above Kamloops and 5 miles above the mouth of the Clearwater river, rises in the hills about 40 miles north of its mouth.

The lowest half-mile of the river has a sluggish flow, its banks are low and liable to overflow in freshet. Above this point is a canyon about 500 feet wide at its widest section; in the canyon are a series of falls, the two highest being about three-quarters of a mile from the stream's mouth, the lower having a natural drop of 15 feet, and the upper one, 25 feet. No information relating to the upper section of the river is at present available.

A station was established at MacLennan's ranch, half a mile from the mouth, by Mr. E. H. Tredcroft on June 2, 1914. Although it was impracticable to thoroughly rate the stream during the year, further meterings will be taken in 1915, and more complete returns made public at the close of that year.

Discharge Measurements of Raft River near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 2	E. H. Tredcroft	1923	105	493·8	5·47	8·00	2703·0
July 26	do	1923	80	135·4	2·05	4·35	277·5
Aug. 28	E. H. Tredcroft and C. B. Corbould	1923	67	71·7	1·18	3·55	84·7

An effort will be made to completely rate this station during 1915.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Raft River, 1 mile above mouth, for 1914.

Day.	June.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	8·30	2,940
2	7·90	2,620
3	8·20	2,860
4	7·80	2,540
5	7·30	2,145
6	6·80	1,760
7	6·40	1,450
8	6·50	1,525
9	6·70	1,680
10	7·00	1,920
11	7·20	2,070
12	7·30	2,145
13	7·10	2,000
14	7·20	2,070
15	7·20	2,070
16	7·40	2,220
17	7·50	2,300
18	7·00	1,920
19	6·90	1,840
20	6·40	1,450
21	6·40	1,450
22	6·10	1,240
23	6·10	1,240
24	6·30	1,380
25	6·40	1,450
26	6·30	1,380
27	6·20	1,310
28	6·30	1,380
29	6·30	1,380
30	6·10	1,240

Daily Gauge Height and Discharge of Raft River 1 mile above mouth, for 1914—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·90	1,100	3·90	155	3·30	50	4·50	330	4·60	370	3·90	155
2	5·70	960	3·80	135	3·20	35	4·40	295	4·50	330	3·90	155
3	5·70	960	3·70	115	3·20	35	4·40	295	4·60	370	3·90	155
4	5·60	895	3·80	135	3·20	35	4·20	235	4·50	330	3·80	135
5	5·50	830	3·70	115	3·10	20	4·10	205	4·40	295	3·80	135
6	5·30	710	3·60	95	3·10	20	4·00	180	4·20	235	3·70	115
7	5·20	655	3·70	115	3·10	20	4·00	180	4·20	235	3·80	135
8	5·10	605	3·80	135	3·20	35	3·90	155	4·20	235	3·80	135
9	5·00	555	3·70	115	3·30	50	3·90	155	4·20	235	3·90	155
10	4·90	505	3·70	115	3·50	80	3·90	155	4·20	235	3·90	155
11	4·70	410	3·70	115	3·70	115	4·00	180	4·10	205	3·90	155
12	4·70	410	3·60	95	3·90	155	4·10	205	4·10	205	4·10	205
13	5·00	555	3·60	95	3·90	155	4·30	265	3·90	155	4·70	410
14	5·40	770	3·50	80	3·80	135	4·40	295	3·90	155	5·20	655
15	6·20	1,310	3·40	65	3·70	115	4·20	235	3·90	155	.....	.....
16	5·35	740	3·40	65	3·70	115	4·00	180	4·00	180	.....	.....
17	5·05	580	3·40	65	3·80	135	4·30	265	4·10	205	.....	.....
18	4·75	432	3·40	65	4·20	235	4·90	505	4·10	205	.....	.....
19	4·65	390	3·40	65	4·50	330	4·90	505	4·00	180	.....	.....
20	4·45	312	3·40	65	4·60	370	4·70	410	4·00	180	.....	.....
21	4·40	295	3·30	50	4·40	295	4·60	370	3·90	155	.....	.....
22	4·35	280	3·30	50	4·30	265	4·40	295	3·80	135	.....	.....
23	4·30	265	3·20	35	4·20	235	4·20	235	3·80	135	.....	.....
24	4·30	265	3·20	35	4·20	235	4·20	235	3·70	115	.....	.....
25	4·20	235	3·20	35	4·10	205	4·20	235	3·70	115	.....	.....
26	4·10	205	3·20	35	4·00	180	4·20	235	3·80	135	.....	.....
27	4·20	235	3·20	35	4·20	235	4·20	235	3·90	155	.....	.....
28	4·90	505	3·40	65	4·30	265	4·40	295	3·90	155	.....	.....
29	4·30	265	3·40	65	4·50	330	4·40	295	3·90	155	.....	.....
30	4·20	235	3·40	65	4·50	330	4·60	370	3·90	155	.....	.....
31	4·10	205	3·30	50	.....	.....	4·60	370	.....	.....	.....	.....

Monthly Discharge of Raft River at 1 mile above mouth, for 1914.

(Drainage area, 125 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	2,940	1,240	1,499	12·0	13·39	89,196
July	1,310	205	538	4·3	4·9	33,080
August	155	35	81	0·65	0·75	4,984
September	370	20	160	1·3	1·45	9,520
October	505	155	271	2·2	2·54	16,663
November	370	115	203	1·6	1·78	12,079

Note.—Precipitation varies from 20 inches at mouth to 50 inches at source (estimated).
Drainage area possibly in error.
Station established, June, 1914.

Siwash Creek (2058).

Location.—Section 12, township 22, range 16, west 6th meridian.

Records Available.—June 7 to July 28, 1914.

Drainage Area.—Seven square miles.

Gauge.—Standard vertical staff gauge installed by Cippoletti weir and read daily by J. S. Wardell.

Channe'.—Straight above weir. Velocity, medium.

Discharge Measurements.—Three discharge measurements have been taken during 1914 at varying stages.

Winter Flow.—Stream usually runs dry during August.

Accuracy.—Accuracy of results compiled from weir discharge table considered very high, probably within 5 per cent.

Discharge Measurements of Siwash Creek, above Heffley Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 2	C. B. Corbould	1915	6	4·0	0·71	. .	2·9
" 8	do	1915	6	4·7	0·89	2·9	4·2
" 29	do	1915	6	3·8	0·45	2·8	1·7

Meterings taken to check weir measurements.

Daily Guage Height and Discharge of Siwash Creek, near Heffley Creek, for 1914.

Day.	June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	0·19	1·1
2	.....	2·9	0·14	0·7
3	.....	.....	0·14	0·7
4	.....	.....	0·14	0·7
5	.....	.....	0·12	0·6
6	.....	.....	0·12	0·6
7	0·34	2·7	0·14	0·7
8	0·34	2·7	0·04	0·1
9	0·36	2·9	0·04	0·1
10	0·39	3·2	0·04	0·1
11	0·44	3·8	0·04	0·1
12	0·34	2·7	0·04	0·1
13	0·34	2·7	0·04	0·1
14	0·34	2·7	0·04	0·1
15	0·29	2·1	0·14	0·7
16	0·29	2·1	0·09	0·4
17	0·24	1·6	0·09	0·4
18	0·24	1·6	0·04	0·1
19	0·24	1·6	0·04	0·1
20	0·24	1·6	0·04	0·1
21	0·24	1·6	0·04	0·1
22	0·19	1·1	0·04	0·1
23	0·24	1·6	0·04	0·1
24	0·24	1·6	0·04	0·1
25	0·24	1·6	0·04	0·1
26	0·24	1·6	0·04	0·1
27	0·24	1·6	0·04	0·1
28	0·24	1·6	0·04	0·1
29	0·24	1·6	.....	.....
30	0·19	1·1	.....	.....
31	.....	.....	.....	.....

Monthly Discharge of Siwash Creek above Heffley Lake, for 1914.

(Drainage area, 7 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	3·8	1·1	2·1	0·30	0·33	125·0
July	1·1	0·1	0·3	0·04	0·05	18·4

Note.—Station was established on June 7. Water stopped coming down the creek on July 30. Cippoletti weir station.

Thompson River at Kamloops (2040).

Location.—Section 7, township 20, range 17, west 6th meridian.

Records Available.—April 1 to September 30, 1911; March 24 to December 31, 1912; April 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—14,400 square miles.

Gauge.—Standard staff gauge on traffic bridge, read daily by Geo. Clapperton.

Channel.—Width of channel varies from 750 to 850 feet at the station, while at high-water depth is from 12 to 17 feet higher than at low stages.

Discharge Measurements.—The curve for this river is well defined, measurements having been taken at various stages.

Winter Flow.—River generally freezes over about 1st January, and remains so until early in March.

On March 5, 1912, a metering was made under ice cover and showed a discharge of 3,980 second-feet.

Accuracy.—The accuracy on the whole is high.

DAILY GAUGE HEIGHT AND DISCHARGE of Thompson River at Kamloops, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·10	5,300	0·10	5,300	0·20	5,600	0·10	5,300	3·70	18,950	8·10	45,000
2	0·20	5,600	0·10	5·300	0·20	5,600	0·20	5,600	4·10	20,800	8·4	47,300
3	0·20	5·600	0·10	5·300	0·30	5,900	0·20	5,600	4·70	23,800	8·6	48,800
4	0·30	5,900	0·10	5·300	0·20	5,600	0·10	5,300	5·50	28,000	10·0	60,200
5	0·30	5,900	0·0	5,000	0·20	5,600	0·20	5,600	5·90	30,400	10·6	65,200
6	0·20	5,600	0·0	5,000	0·20	5,600	0·20	5,600	5·60	28,600	10·6	65,200
7	0·30	5,900	0·0	5,000	0·20	5,600	0·20	5,600	5·30	26,800	10·2	61,800
8	0·50	6,600	0·0	5,000	0·30	5,900	0·30	5,900	5·50	28,000	10·0	60,200
9	0·50	6,600	0·0	5,000	0·20	5,600	0·50	6,600	5·60	28,600	9·8	58,500
10	0·30	5,900	0·0	5,000	0·20	5,600	0·60	6,950	5·50	28,000	9·5	56,000
11	0·40	6,250	0·0	5,000	0·20	5,600	0·80	7,550	5·80	29,800	9·5	56,000
12	0·30	5,900	0·0	5,000	0·20	5,600	0·90	7,900	6·20	32,100	9·8	58,500
13	0·30	5,900	0·0	5,000	0·30	5,900	1·10	8,500	6·60	34,600	9·8	58,500
14	0·20	5,600	0·0	5,000	0·40	6,250	1·20	8,900	6·80	35,800	10·0	60,200
15	0·20	5,600	0·2	4,500	0·30	5,900	1·60	10,350	7·60	41,400	10·4	63,500
16	0·30	5,900	0·2	4,500	0·20	5,600	1·90	11,500	8·60	48,800	10·9	67,700
17	0·40	6,250	0·2	4,500	0·20	5,600	2·40	13,400	9·20	53,600	11·4	72,000
18	0·30	5,900	0·2	4,500	0·30	5,900	2·50	13,800	9·20	53,600	11·8	75,500
19	0·30	5,900	0·2	4,500	0·20	5,600	2·50	13,800	9·00	52,000	12·0	77,300
20	0·20	5,600	0·2	4,500	0·20	5,600	2·80	15,000	8·70	49,700	12·0	77,300
21	0·20	5,600	0·2	4,500	0·20	5,600	2·80	15,000	8·50	48,050	11·6	73,700
22	0·20	5,600	0·2	4,500	0·20	5,600	2·80	15,000	8·60	48,800	11·2	70,300
23	0·20	5,600	0·2	4,500	0·20	5,600	3·00	15,800	8·90	51,200	11·4	72,000
24	0·20	5,600	0·2	4,500	0·30	5,900	2·90	15,400	9·20	53,600	10·6	65,200
25	0·20	5,600	0·2	4,500	0·20	5,600	2·90	15,400	9·60	56,800	10·1	61,700
26	0·20	5,600	0·1	4,750	0·20	5,600	3·10	16,250	9·80	58,500	9·8	58,500
27	0·10	5,300	0·1	4,750	0·10	5,300	3·30	17,150	9·60	56,800	9·8	58,500
28	0·10	5,300	0·2	5,600	0·10	5,300	3·40	17,600	9·30	54,400	10·0	60,200
29	0·10	5,300	.....	.....	0·20	5,600	3·30	17,150	8·90	51,200	10·0	60,200
30	0·20	5,600	.....	.....	0·0	5,000	3·50	18,050	8·50	48,050	10·1	61,000
31	0·20	5,600	.....	.....	0·0	5,000	.....	.....	8·30	46,500	.....	.....

Daily Gauge Height and Discharge of Thompson River at Kamloops, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	10·1	61,000	6·50	34,000	3·50	18,050	4·00	20,300	2·50	13,800	2·20	12,600
2	10·2	61,800	6·30	32,700	3·30	17,150	4·20	21,300	3·00	15,800	2·00	11,800
3	10·5	64,300	6·40	32,400	3·20	16,700	4·10	20,800	3·00	15,800	2·10	12,200
4	10·7	66,000	6·50	34,000	3·00	15,800	4·20	21,300	3·10	16,250	1·80	11,100
5	10·9	67,700	6·50	34,000	3·50	18,050	3·50	18,050	3·20	16,700	1·70	10,700
6	10·9	67,700	6·50	34,000	3·30	17,150	3·20	16,700	3·00	15,800	1·80	11,100
7	10·7	66,000	6·20	32,100	3·40	17,600	3·00	15,800	3·10	16,250	1·60	10,350
8	10·3	62,600	6·00	30,900	3·20	16,700	2·80	15,000	2·80	15,000	1·40	9,650
9	10·1	61,000	6·00	30,900	3·00	15,800	2·70	14,600	2·70	14,600	1·40	9,650
10	9·8	58,500	5·60	28,600	3·00	15,800	2·50	13,800	2·80	15,000	1·30	9,250
11	9·6	56,800	5·30	26,800	3·50	18,050	2·30	13,000	2·60	14,200	1·20	8,900
12	9·60	56,800	5·60	25,300	3·10	16,250	2·20	12,600	2·70	14,600	0·70	7,300
13	9·6	56,800	4·90	24,800	3·20	16,700	2·50	13,800	2·80	15,600	0·40	6,250
14	9·8	58,500	4·80	21,300	3·00	15,800	2·40	13,400	2·60	14,200	0·0	5,000
15	10·0	60,200	4·70	23,800	2·80	15,000	2·30	13,000	2·60	14,200	0·0	5,000
16	10·4	63,500	4·60	23,300	2·50	13,800	2·20	12,600	2·50	13,800	0·0	5,000
17	10·2	61,800	5·00	25,300	2·30	13,000	2·50	13,800	2·50	13,800	0·0	5,000
18	9·6	56,800	4·90	24,800	2·20	12,600	2·30	13,000	2·40	13,400	0·0	5,000
19	9·0	52,000	4·80	24,360	2·10	12,200	2·20	12,600	2·50	13,800	0·0	5,000
20	8·7	49,700	4·50	22,800	2·20	12,600	3·10	16,250	2·30	13,000	0·0	5,000
21	8·6	48,800	4·40	22,300	3·00	15,800	3·10	16,250	2·20	12,600	0·0	5,000
22	8·8	50,500	4·50	22,800	2·80	15,000	3·00	15,800	2·10	12,200	0·0	5,000
23	8·1	45,000	4·50	22,800	3·00	15,800	3·10	16,250	2·00	11,800	0·0	5,000
24	7·7	42,100	4·40	22,300	2·80	15,000	2·80	15,000	2·30	13,000	0·0	5,000
25	7·6	41,400	4·10	20,800	2·70	14,600	2·70	14,600	2·20	12,600	0·0	5,000
26	7·5	40,700	4·00	20,300	2·90	15,400	2·60	14,200	2·00	11,800	0·0	5,000
27	7·4	40,000	4·00	20,300	3·00	15,800	2·50	13,800	2·10	12,200	0·0	5,000
28	7·4	40,000	4·00	20,300	3·50	18,050	2·30	13,000	1·80	11,100	0·0	5,000
29	7·5	40,700	3·80	19,400	4·00	20,300	2·30	13,000	1·80	11,100	0·0	5,000
30	7·1	37,900	3·80	19,400	4·00	20,300	2·50	13,800	1·70	10,700	0·0	5,000
31	6·6	34,600	4·00	20,300	.....	.....	2·40	13,400	.....	.....	0·0	5,000

Monthly Discharge of Thompson River at Kamloops, for 1914.

(Drainage area, 14,400 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	6,600	5,300	5,755	0·40	0·46	353,860
February	5,300	4,500	4,850	0·33	0·34	269,360
March	6,250	5,000	5,621	0·39	0·45	345,622
April	18,050	5,300	11,051	0·76	0·85	657,580
May	58,500	18,950	40,879	2·84	3·27	2,513,519
June	77,300	45,000	62,510	4·34	4·84	3,719,600
July	67,700	34,600	53,909	3·74	4·31	3,314,752
August	34,000	19,400	25,842	1·79	2·06	1,588,962
September	20,300	12,200	16,028	1·11	1·24	953,727
October	21,300	12,600	15,187	1·05	1·21	933,807
November	16,700	10,700	13,803	0·95	1·06	821,377
December	12,600	5,000	7,124	0·49	0·56	438,038
The year	77,600	4,500	21,879	1·51	20·65	15,910,204

Note.—The annual precipitation of the North Thompson river above Kamloops varies from 7 to 12 inches at Kamloop to about 40 inches at the Albreda summit, while on the South Thompson, Shuswap lakes, and tributary streams it varies to a maximum of 40 inches annually.

It is to be noted that the flow recorded at the station "Thompson river at Kamloops" comprises that of both the North and South Thompson, the station being established below their confluence.

Tranquille River (2043).

Location.—Section 36, township 20, range 19, west 6th meridian.

Records Available.—July 4 to October 21, 1911; March 29 to September 7, 1912; May 1 to October 31, 1913; May 3 to November 14, 1914.

Drainage Area.—Two hundred and thirty square miles.

Gauge.—Standard vertical gauge read daily by Eug. Cooney.

Channel—Straight at the gauge section, about 20 feet wide. Bed of stream composed of stone and boulders and control is good.

Discharge Measurements.—Gauge-height discharge curve is well defined.

Winter Flow.—Ice conditions prevail during December, January, and February.

Accuracy.—High, results compiled from a well-rated curve.

Discharge Measurements of Tranquille River near mouth, for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 30	C. B. Corbould	1915	18·5	31·0	4·24	1·35	132·0
Aug. 4	C. B. Corbould	1915	15	14·5	0·59	0·65	8·6

For further meterings and hydrographic data see Water Resources Paper Nos. 1 and 8.

Daily Gauge Height and Discharge of Tranquille River at Cooney's, Ranch, for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·35	90
2	.....	.....	1·35	90
3	2·70	577	1·30	80
4	2·70	577	1·25	71
5	2·20	340	1·20	62
6	2·10	302	1·20	62
7	2·10	302	1·27	74
8	2·10	302	1·30	80
9	2·10	302	1·30	80
10	2·20	340	1·32	84
11	2·30	382	1·37	95
12	2·60	524	1·32	84
13	2·60	524	1·30	80
14	2·60	524	1·30	80
15	2·70	577	1·30	80
16	2·50	473	1·25	71
17	2·40	427	1·25	71
18	2·20	340	1·20	62
19	2·10	302	1·15	53
20	2·00	267	1·12	48
21	1·95	250	1·10	45
22	1·90	234	1·10	45
23	1·85	219	1·12	48
24	1·80	204	1·15	53
25	1·75	189	1·20	62
26	1·60	150	1·17	56
27	1·50	125	1·12	48
28	1·40	101	1·10	45
29	1·35	90	1·07	41
30	1·32	84	1·05	38
31	1·32	84	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Tranquille River at Cooney's Ranch, for 1915.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·02	34	0·70	10	0·44	4	0·59	7	0·69	10
2	1·00	31	0·67	9	0·44	4	0·61	7	0·69	10
3	0·97	28	0·67	9	0·44	4	0·61	7	0·69	10
4	0·92	23	0·65	8	0·44	4	0·59	7	0·71	10
5	0·90	21	0·64	8	0·44	4	0·59	7	0·74	12
6	0·90	21	0·61	7	0·44	4	0·59	7	0·74	12
7	0·87	19	0·64	8	0·44	4	0·59	7	0·71	10
8	0·87	19	0·66	9	0·54	6	0·59	7	0·71	10
9	0·85	18	0·64	8	0·56	6	0·59	7	0·71	10
10	0·82	16	0·64	8	0·56	6	0·59	7	0·71	10
11	0·80	15	0·61	7	0·56	6	0·59	7	0·71	10
12	0·80	15	0·61	7	0·56	6	0·64	8	0·71	10
13	0·77	13	0·59	7	0·56	6	0·61	7	0·71	10
14	0·80	15	0·56	6	0·59	7	0·61	7	0·79	14
15	0·82	16	0·56	6	0·59	7	0·61	7	.....	.....
16	0·82	16	0·54	6	0·59	7	0·61	7	.....	.....
17	0·80	15	0·54	6	0·59	7	0·61	7	.....	.....
18	0·77	13	0·51	5	0·59	7	0·61	7	.....	.....
19	0·75	12	0·51	5	0·61	7	0·64	8	.....	.....
20	0·72	11	0·49	5	0·59	7	0·64	8	.....	.....
21	0·77	13	0·49	5	0·59	7	0·64	8	.....	.....
22	0·75	12	0·54	6	0·59	7	0·64	8	.....	.....
23	0·72	11	0·51	5	0·59	7	0·64	8	.....	.....
24	0·80	15	0·49	5	0·59	7	0·64	8	.....	.....
25	0·75	12	0·49	5	0·61	7	0·64	8	.....	.....
26	0·70	10	0·49	5	0·61	7	0·64	8	.....	.....
27	0·70	10	0·46	4	0·59	7	0·64	8	.....	.....
28	0·70	10	0·46	4	0·59	7	0·64	8	.....	.....
29	0·70	10	0·46	4	0·59	7	0·64	8	.....	.....
30	0·70	10	0·44	4	0·59	7	0·64	8	.....	.....
31	0·70	10	0·44	4	.....	.....	0·64	8	.....	.....

Monthly Discharge of Tranquille River, near Cooney's Ranch, for 1914.

(Drainage area, 230 square miles.)

Month.	Discharge in Second-Feet.				Run-Off	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	577·0	84·0	314·0	1·36	1·57	19,307
June	95·0	38·0	66·0	0·29	0·32	3,927
July	34·0	10·0	16·0	0·07	0·08	984
August	10·0	4·0	6·3	0·03	0·03	387
September	7·0	4·0	6·1	0·03	0·03	363
October	8·0	7·0	7·4	0·03	0·03	455
The period	577·0	4·0	69·3	0·30	2·06	25,423

Note.—Precipitation over the drainage area probably varies from 8 to 10 inches annually, but it is probable that there are large evaporation losses in Dubois, Pass, and Tranquille lakes.

KAMLOOPS DIVISION.

Adams River (2005).

Location.—Section 6, township 23, range 12, west 6th meridian.

Records Available—July 1 to August 31, 1911; January 1 to December 31, 1912; January 1st to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—One thousand six hundred square miles.

Gauge.—Standard vertical staff gauge read by Mrs. Sturgill, Chase, B.C., up to October 17, 1914.

On October 17, a Gurley automatic water stage recorder No. 630 was put into operation, at a point 50 feet below the old staff gauge. A series of readings on both gauges at the same instant gives a definite relationship between old and new gauge readings.

Channel.—The channel varies in width from 300 to 500 feet above the dam where meterings are made. The velocities are uniform, the mean never exceeding 3.0 feet per second at the measuring section. The run-off is artificially controlled by a dam near the outlet of Adams lake.

Discharge Measurements.—The gauge-height discharge curve is fairly well rated by well distributed meterings.

Winter Flow.—Partial ice conditions exist during winter months, but the river is seldom frozen over at the gauge sufficiently to have material effect on the accuracy of returns.

Accuracy.—The accuracy of returns on the whole is fairly high, the only possibility of error being in the gauge heights, sudden changes in which, owing to the opening and closing of the Adams River Lumber Company's dam may have escaped the observer's notice. This error will be entirely overcome in 1915.

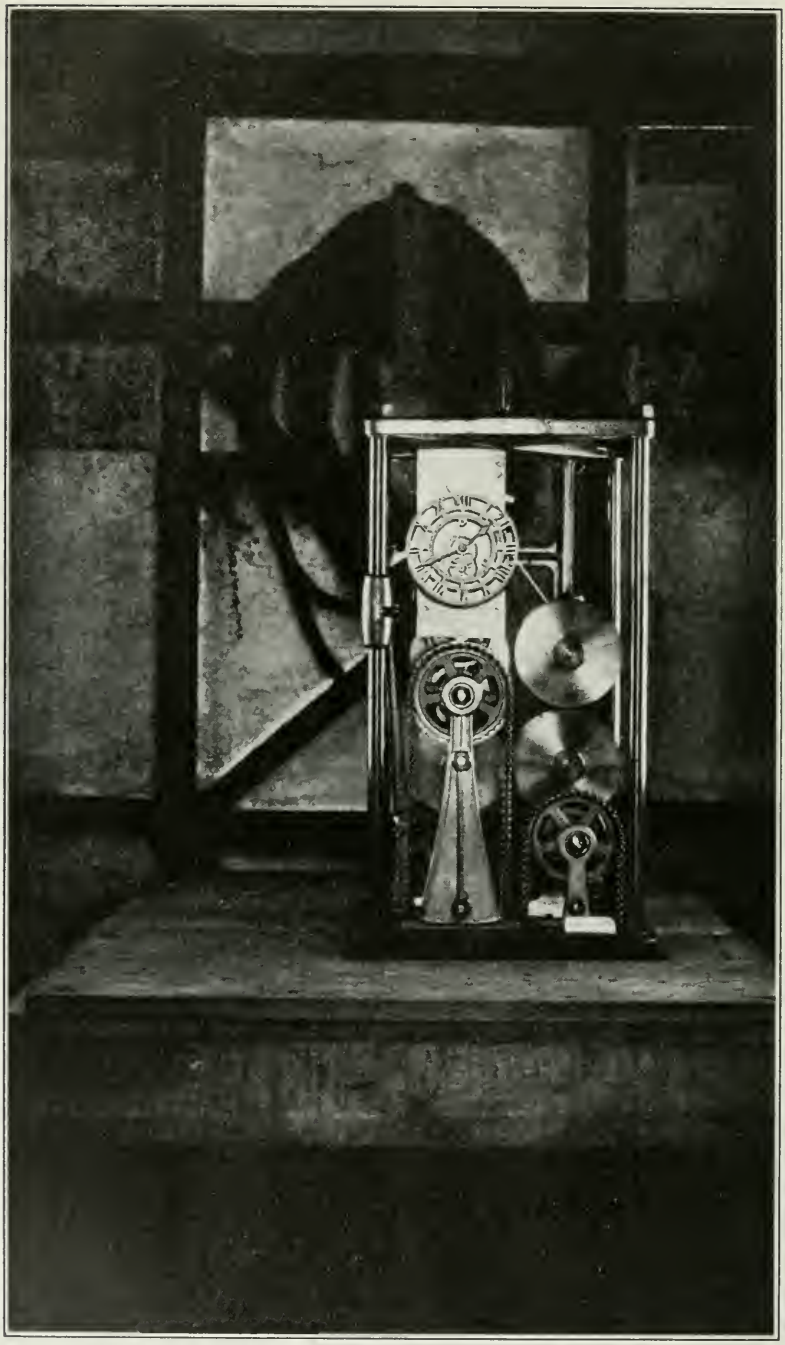
Adams Lake. Photograph by Eyre M. Dann.

Looking north from the south end of Adams lake, which forms a splendid natural reservoir site for a possible power development on Adams river. Adams lake empties into Adams river, falling 190 feet in its six-mile course to Shuswap lake.

Adams River—Automatic Gauge House.

Photograph by Eyre M. Dann.

The gauge house is of timber construction and is covered by galvanized iron sheeting for fire protection. The well lining is an Ingot iron culvert (24 inch diameter) in which the float and weights operate. The culvert stands in the middle of a timber and rock-fill cribbing upon which the house is built. A 2½ inch cast iron feed pipe to the bottom of the river, keeps the water in the well constantly at the same elevation as the river. Although zero weather occurred during the winter, the temperature in the well was never low enough to cause the water to freeze.



Adams River—Automatic Water Stage Register.

Photograph by Eyre M. Dann.

The Gurley Automatic Gauge shown in this photograph is so well known to engineers as to require little explanation. A float suspended from a copper ribbon passes over a drum which indicates the height of water surface. The clock and paper winding apparatus are actuated by weights, and the time and gauge height (to hundreths of feet) are printed every fifteen minutes. The gauge and clock will run without attention for thirty days.

SESSIONAL PAPER No. 25e

Discharge Measurements of Adams River near Adams Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 3	E. H. Tredcroft	1,923	443·0	2,354·0	2·41	4·7	5,650·0

Station rated 1911 and 1912. Gauge height in terms of newly installed automatic gauge, 5·41.

Daily Gauge Height and Discharge of Adams River near Adams River Lumber Co's. Dam, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·25	1,060	2·55	1,282	2·66	1,368	4·30	3,370	4·20	3,175	5·01	5,139
2	2·25	1,060	2·55	1,282	2·66	1,368	4·30	3,370	4·20	3,175	5·11	5,430
3	2·25	1,060	2·55	1,282	2·55	1,282	4·30	3,370	4·30	3,370	5·11	5,430
4	2·25	1,060	2·55	1,282	2·55	1,282	4·40	3,575	4·30	3,370	5·11	5,430
5	2·25	1,060	2·45	1,207	2·55	1,282	4·40	3,575	4·30	3,370	5·11	5,430
6	2·25	1,060	2·45	1,207	2·55	1,282	4·40	3,575	4·40	3,575	5·11	5,430
7	2·15	990	2·45	1,207	2·55	1,282	4·40	3,575	4·40	3,575	5·21	5,730
8	2·15	990	2·45	1,207	2·55	1,282	4·50	3,810	4·40	3,575	5·21	5,730
9	2·15	990	2·45	1,207	2·55	1,282	4·50	3,810	4·40	3,575	5·21	5,730
10	2·15	990	2·45	1,207	2·55	1,282	4·50	3,810	4·50	3,810	5·21	5,730
11	2·15	990	2·45	1,207	2·55	1,282	4·50	3,810	4·50	3,810	5·21	5,730
12	2·15	990	2·45	1,207	2·55	1,282	4·50	3,810	4·50	3,810	5·21	5,730
13	2·15	990	2·45	1,207	2·55	1,282	1·84	786	4·60	4,050	5·21	5,730
14	2·15	990	2·45	1,207	2·55	1,282	1·84	786	4·60	4,050	5·21	5,730
15	3·07	1,704	2·45	1,207	2·55	1,282	1·84	786	4·60	4,050	5·31	6,030
16	3·07	1,704	2·45	1,207	0·15	105	1·84	786	4·60	4,050	5·31	6,030
17	3·07	1,704	2·66	1,368	0·15	105	1·95	857	4·70	4,300	5·31	6,030
18	3·07	1,704	2·66	1,368	0·15	105	1·95	857	4·81	4,587	5·31	6,030
19	2·96	1,611	2·66	1,368	0·15	105	1·95	857	4·81	4,587	5·31	6,030
20	2·96	1,611	2·66	1,368	0·25	125	2·05	922	4·91	4,858	5·31	6,030
21	2·96	1,611	2·66	1,368	0·25	125	4·30	3,370	4·91	4,858	5·31	6,030
22	2·86	1,528	2·66	1,368	0·25	125	4·30	3,370	5·01	5,139	5·31	6,030
23	2·86	1,528	2·66	1,368	0·25	125	4·30	3,370	5·01	5,139	5·41	6,330
24	2·86	1,528	2·66	1,368	0·25	125	4·20	3,175	5·11	5,430	5·41	6,330
25	2·86	1,528	2·66	1,368	0·25	125	4·20	3,175	5·11	5,430	5·41	6,330
26	2·86	1,528	2·66	1,368	0·25	125	4·20	3,175	5·11	5,430	5·41	6,330
27	2·86	1,528	2·66	1,368	0·25	125	4·20	3,175	5·31	6,030	5·41	6,330
28	2·65	1,360	2·66	1,368	0·35	145	4·10	3,000	5·31	6,030	5·41	6,330
29	2·65	1,360			0·35	145	4·10	3,000	5·21	5,730	5·41	6,330
30	2·65	1,360			0·35	145	4·20	3,175	5·11	5,430	5·41	6,330
31	2·65	1,360			0·35	145			5·01	5,139		

Daily Gauge Height and Discharge of Adams River near Adams River Lumber Co's. Dam, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·41	6,330	3·59	2,248	.....	4,830	.....	962	4·19	3,157	2·71	1,408
2	5·41	6,330	3·59	2,248	.....	4,830	.....	962	4·16	3,105	2·70	1,400
3	5·31	6,030	3·59	2,248	.....	4,830	.....	1,025	3·53	2,176	2·69	1,392
4	5·31	6,030	3·59	2,248	.....	4,830	.....	1,025	3·69	2,373	2·69	1,392
5	5·31	6,030	3·59	2,249	.....	4,830	2·30	1,095	3·81	2,539	2·67	1,376
6	4·91	4,858	3·59	2,248	.....	5,110	2·35	1,132	4·23	3,233	2·66	1,368
7	4·91	4,858	3·59	2,248	.....	5,110	3·07	1,704	4·51	3,834	2·64	1,352
8	4·91	4,858	3·59	2,248	.....	5,110	3·76	2,469	3·89	2,656	2·62	1,336
9	4·91	4,858	3·59	2,248	.....	5,110	2·35	1,132	4·20	3,175	2·60	1,320
10	5·01	5,139	.....	.....	.....	5,110	2·3	1,095	3·92	2,702	2·57	1,297
11	5·01	5,139	.....	.....	.....	5,110	1·44	570	3·91	2,686	2·55	1,282
12	5·01	5,139	.....	.....	.....	5,110	4·50	3,810	3·86	2,612	2·52	1,260
13	5·01	5,139	.....	.....	5·01	5,139	4·30	3,370	3·83	2,568	2·51	1,252
14	5·01	5,139	.....	.....	.....	2,176	4·30	3,370	3·83	1,940	2·49	1,237
15	5·01	5,139	.....	.....	2·12	969	3·90	2,670	2·93	1,585	2·47	1,222
16	5·01	5,139	.....	.....	.....	.....	3·80	2,525	2·92	1,577	2·45	1,207
17	5·01	5,139	.....	.....	.....	.....	3·84	2,583	2·90	1,560	2·43	1,192
18	5·01	5,139	.....	.....	.....	.....	3·84	2,583	2·46	1,215	2·41	1,177
19	5·01	5,139	.....	.....	.....	.....	3·83	2,568	2·85	1,520	2·39	1,162
20	5·01	5,139	.....	.....	.....	.....	3·81	2,539	2·84	1,512	2·37	1,147
21	3·48	2,116	.....	.....	.....	.....	3·81	2,539	2·84	1,512	2·35	1,132
22	3·48	2,116	.....	.....	.....	.....	3·78	2,497	2·82	1,496	2·33	1,117
23	3·48	2,116	.....	.....	.....	.....	3·77	2,483	2·80	1,480	2·31	1,102
24	3·48	2,116	.....	.....	.....	.....	3·59	2,248	2·78	1,464	2·29	1,088
25	3·48	2,116	4·70	4,300	.....	.....	.....	2,260	2·76	1,448	2·27	1,074
26	3·48	2,116	.....	4,560	.....	.....	.....	2,260	2·77	1,456	2·25	1,060
27	3·48	2,116	.....	4,560	.....	.....	3·65	2,322	2·76	1,448	2·23	1,046
28	3·48	2,116	.....	4,560	.....	.....	4·11	3,017	2·74	1,432	2·20	1,025
29	3·48	2,116	.....	4,560	.....	.....	3·54	2,188	2·73	1,424	2·15	990
30	3·48	2,116	.....	4,560	.....	.....	4·32	3,410	2·72	1,416	2·13	976
31	3·59	2,248	.....	4,560	.....	.....	4·23	3,232	.....	.....	.....	.....

Monthly Discharge of Adams River near Adams Lake, for 1914.

(Drainage area, 1,600 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	1,704·0	990·0	1,307·0	0·81	0·94	80,402·0
February	1,368·0	1,207·0	1,287·0	0·80	0·83	71,458·0
March	1,368·0	105·0	690·0	0·43	0·50	42,451·0
April	3,810·0	786·0	2,736·0	1·71	1·90	162,804·0
May	6,030·0	3,175·0	4,403·0	2·75	3·17	270,700·0
June	6,330·0	5,139·0	5,900·0	3·68	4·11	351,074·0
July	6,330·0	2,116·0	4,197·0	2·62	3·02	258,062·0
October	3,810·0	570·0	2,182·0	1·36	1·57	134,164·0
November	3,834·0	1,215·0	2,077·0	1·29	1·44	123,590·0
December	1,408·0	976·0	1,213·0	0·75	0·87	74,580·0
The period	6,330·0	105·0	2,599·2	1·62	18·35	1,569,285·0

Note.—Summary is for a ten-month period, omitting August and September, for which time it was impossible to procure a gauge reader.

Precipitation over the Adams river drainage area probably varies from 20 to 40 inches per annum, while large evaporation losses occur on Adams lake.

Ashnola River, near Keremeos (2065).

Location.—Near Ashnola, Water District No. 4.

Records Available.—June 27 to December 19, 1914.

Drainage Area.—Four hundred and eighty square miles.

Gauge.—Standard chain gauge read daily by H. Atherton.

Channel.—The channel is straight for about 100 yards above and below measuring section. Velocity is fairly high. The bed of the stream is composed of rocks and gravel. Only one channel at all stages. Average depth at high water, 5 feet.

Discharge Measurements.—Are made by wading at low water and by cable carrier at high water.

Winter Flow.—No records have been kept during winter months, but ice conditions are known to exist during January and February.

Accuracy.—The accuracy of returns is low, only three measurements having been obtained and these at low water.

Ashnola River.

Ashnola river is the largest tributary of the Similkameen below Princeton. It rises in the high mountains of the Cascade range south of the boundary, and joins the Similkameen at Ashnola half-way between Hedley and Keremeos, and has a total length of about 40 miles. It has a number of small tributaries from the surrounding mountains, the largest of which is the East Fork from the south, which joins it 5 miles from the mouth. The other tributaries, six in number, are small unnamed creeks.

The drainage area from the 1912 map of the Department of Lands of British Columbia is 480 square miles.

The river and its tributaries flow through deep narrow valleys with steep slopes on both sides, like all streams in this district. Little is known of the headwaters of this river, as the upper part of its course is difficult of access.

The precipitation at the mouth is about 10 inches per annum. Water is taken from Ashnola river by the South Keremeos Land Company for use on the ranches in the neighbourhood of Keremeos, 10 miles away on the north side of the Similkameen river. The water runs in an earth ditch most of the way. It crosses the Similkameen at Ashnola in a 40-inch wood stave pipe supported on the highway bridge at this point. Ashnola river at low stages carries more than this system can carry. Discharge records of the river taken by this survey in 1914 show a minimum flow of 65 c.f.s. on August 25. The maximum flow is over 1000 c.f.s. With storage there is sufficient water in the river to irrigate large areas of land in the Similkameen valley below Keremeos.

Discharge Measurements of Ashnola river near Ashnola, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 28	K. G. Chisholm	1,013	57·0	111·0	1·73	0·10	192·0
Aug. 1	"	1,013	41·0	46·0	1·54	0·61	71·0
Dec. 1	"	1,073	40·0	50·0	1·36	0·53	68·0

An effort will be made to completely rate this station during 1915

Daily Gauge Height and Discharge of Ashnola River near Keremeos, for 1914.

Day.	June.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27	1·50	876
28		
29		
30	1·60	925
31		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Ashnola River near Keremeos, for 1914.

Day.	July.		August.		September.		October.		November		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			−0·35	119	−0·7	49	−0·2	160			−0·6	65
2	1·50	876										
3					−0·7	49	−0·27	140	−0·32	127	−0·55	74
4	1·40	828	−0·35	119								
5					−0·7	49			−0·30	132	−0·40	107
6			−0·35	119			−0·25	146				
7	1·25	757							−0·30	132		
8			−0·35	119	−0·5	84	−0·25	146			−0·30	132
9	09·5	620										
10					−0·4	107	−0·30	132	−0·35	119	−0·25	146
11	0·85	576	−0·40	107								
12					−0·45	95			−0·40	107	−0·15	176
13			−0·45	95			−0·20	160				
14	1·05	665							−0·45	95		
15			−0·40	107	−0·45	95	−0·12	186			−0·10	263
16	0·90	598										
17					−0·45	95	−0·15	176	−0·45	95	−0·20	301
18	0·55	446	−0·35	119								
19					−0·05	84			−0·45	95	−0·30	340
20			−0·45	95			−0·25	146				
21	0·35	361							−0·30	132		
22			−0·50	84	−0·12	186	−0·30	132				
23	0·22	308										
24					−0·20	169	−0·30	132	−0·40	107		
25	0·15	282	−0·66	65								
26					−0·30	132			−0·40	107		
27			−0·65	57			−0·25	146				
28	0·05	244							−0·45	95		
29			−0·60	65	−0·15	176	−0·25	146				
30	0	226										
31							−0·30	132				

Monthly Discharge of Ashnola River near Keremeos, for 1914.

(Drainage area, 480 square miles.)

Month.	Discharge in Second-Feet.				Run-Off	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	925	876	for period	June 27 to	June 30	
July	876	226	522	1·1	1·3	32,097
August	119	57	97·7	0·2	0·2	6,007
September	186	49	104·3	0·2	0·2	6,206
October	186	132	148·6	0·3	0·3	9,137
November	132	95	111·9	0·2	0·2	6,658
December	340	55	for period	Dec. 1 to	Dec. 19	
The period	876	49	196·9	0·4	2·2	66,105

Note.—Station established in latter end of June, 1914.

Boundary Creek (2048).

Location.—At Greenwood, Water District No. 4.

Records Available.—January 1 to December 7, 1914.

Drainage Area.—One hundred and twenty-five square miles.

Gauge.—Vertical staff gauge graduated in feet and tenths, situated on upstream side of traffic bridge, read daily by P. H. McCarrach.

Channel.—Channel is straight for about 300 feet above and below measuring section. Bed of stream is rocky and permanent.

Discharge Measurements.—Four discharge measurements have been obtained during 1914 at varying stages.

Winter Flow.—No records have been kept on this stream during winter months, but ice conditions are known to exist during January and February.

Accuracy.—The accuracy of results is considered good, and should fall within 10 per cent.

Discharge Measurements of Boundary Creek at Greenwood, B.C., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20.....	C. E. Richardson and C. Varcoe.....	1527	41·5	99·8	3·8	2·9	379
June 8.....	E. M. Dann and K. Chisholm	1913	39·0	84·0	3·2	2·5	269
July 20.....	" " "	1913	39·0	41·0	1·28	1·21	52·6
Aug. 26.....	" " "	1913	17·0	15·6	0·77	0·77	12·0

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Boundary Creek near Greenwood, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·90	20	0·90	20	0·90	20	1·20	45	2·90	380	2·80	352
2	0·90	20	.....	.....	0·90	20	1·20	45	3·35	504	2·90	380
3	0·90	20	.....	.....	0·90	20	1·30	55	3·50	546	3·30	491
4	0·90	20	.....	.....	0·90	20	1·40	66	3·30	491	3·00	407
5	0·90	20	.....	.....	0·90	20	1·50	78	3·20	463	3·00	407
6	0·90	20	.....	.....	0·90	20	1·60	90	3·00	407	2·80	352
7	1·00	28	.....	.....	0·90	20	1·80	117	2·90	380	2·70	325
8	1·00	28	.....	.....	0·90	20	2·00	150	2·90	380	2·60	297
9	1·00	28	.....	.....	0·90	20	2·10	170	3·00	407	2·60	297
10	1·00	28	.....	.....	0·90	20	2·25	204	3·00	407	2·50	270
11	0·95	24	.....	.....	0·90	20	2·60	297	3·00	407	2·50	270
12	0·90	20	0·90	20	0·90	20	2·80	352	3·10	435	2·40	243
13	0·90	20	0·90	20	0·90	20	2·90	380	3·15	449	2·40	243
14	0·90	20	0·90	20	0·95	24	3·00	407	3·20	463	2·50	270
15	0·90	20	0·90	20	0·95	24	3·40	518	3·40	518	2·60	297
16	0·90	20	0·90	20	1·00	28	3·45	532	3·55	559	2·70	325
17	0·90	20	0·90	20	1·00	28	3·55	560	3·20	463	2·80	352
18	0·90	20	0·90	20	1·00	28	3·40	518	3·00	407	2·80	352
19	0·90	20	0·90	20	1·00	28	3·40	518	3·00	407	2·70	325
20	0·90	20	0·90	20	1·10	36	3·50	546	3·00	407	2·50	270
21	0·90	20	0·90	20	1·10	36	3·30	491	3·00	407	2·40	243
22	0·90	20	0·90	20	1·10	36	3·20	463	3·00	407	2·30	217
23	0·90	20	0·90	20	1·10	36	3·20	463	3·30	491	2·10	170
24	1·00	28	0·90	20	1·20	45	3·30	491	3·30	491	2·10	170
25	0·90	20	0·90	20	1·20	45	3·20	463	3·30	491	2·10	170
26	0·90	20	0·90	20	1·15	40	3·10	435	2·95	394	2·00	150
27	0·90	20	0·90	20	1·20	45	3·10	435	2·90	380	2·00	150
28	0·90	20	0·90	20	1·20	45	3·00	407	2·80	352	1·90	133
29	0·90	20	.....	.....	1·20	45	2·90	380	2·70	325	1·90	133
30	0·90	20	.....	.....	1·20	45	2·90	380	2·70	325	1·90	133
31	0·90	20	.....	.....	1·20	45	.....	.....	2·70	325	.....	.....

Daily Gauge Height and Discharge of Boundary Creek near Greenwood, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	[1] Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·90	133	1·00	28	0·40	2	0·90	20	1·15	40	1·10	36
2	1·80	117	1·00	28	0·40	2	0·85	17	1·15	40	1·10	36
3	1·90	133	1·00	28	0·40	2	0·85	17	1·20	45	1·01	36
4	1·80	117	0·90	20	0·40	2	0·85	17	1·20	45	1·10	36
5	1·70	103	0·90	20	0·40	2	0·85	17	1·20	45	1·05	32
6	1·70	103	0·90	20	0·40	2	0·80	14	1·20	45	1·05	32
7	1·60	90	0·90	20	0·40	2	0·80	14	1·20	45	1·05	32
8	1·60	90	0·90	20	0·60	5	0·80	14	1·20	45	.....	.....
9	1·50	78	0·90	20	0·60	5	0·80	14	1·20	45	.....	.....
10	1·50	78	0·90	20	0·60	5	0·80	14	1·15	40	.....	.....
11	1·40	66	0·80	14	0·60	5	0·90	20	1·10	36	.....	.....
12	1·40	66	0·80	14	0·50	3	0·90	20	1·10	36	.....	.....
13	1·40	66	0·80	14	0·50	3	0·90	20	1·20	45	.....	.....
14	1·40	66	0·80	14	0·55	4	0·90	20	1·20	45	.....	.....
15	1·40	66	0·80	14	0·70	9	0·90	20	1·20	45	.....	.....
16	1·30	55	0·80	14	0·70	9	0·90	20	1·15	40	.....	.....
17	1·30	55	0·80	14	0·70	9	0·95	24	1·15	40	.....	.....
18	1·25	50	0·70	9	0·70	9	1·00	28	1·15	40	.....	.....
19	1·20	45	0·70	9	0·75	11	1·00	28	1·20	45	.....	.....
20	1·20	45	0·70	9	0·80	14	1·00	28	1·20	45	.....	.....
21	1·20	45	0·70	9	0·80	14	1·00	28	1·20	45	.....	.....
22	1·20	45	0·70	9	0·80	14	1·00	28	1·20	45	.....	.....
23	1·20	45	0·60	5	0·80	14	1·00	28	1·20	45	.....	.....
24	1·20	45	0·60	5	0·80	14	1·00	28	1·15	40	.....	.....
25	1·20	45	0·60	5	0·70	9	1·00	28	1·15	40	.....	.....
26	1·10	36	0·60	5	0·70	9	1·00	28	1·15	40	.....	.....
27	1·10	36	0·50	3	0·90	20	1·00	28	1·15	40	.....	.....
28	1·10	36	0·50	3	1·00	28	1·05	32	1·15	40	.....	.....
29	1·00	28	0·50	3	0·95	24	1·05	32	1·15	40	.....	.....
30	1·00	28	0·50	3	0·90	20	1·10	36	1·15	40	.....	.....
31	1·00	28	0·50	3	.....	.....	1·15	40	.....	.....	.....	.....

Monthly Discharge of Boundary Creek near Greenwood, for 1914.

(Drainage area, 125 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	28	20	21·4	0·17	0·19	1,316
February	20	20	20·0	0·16	0·17	1,111
March	45	20	29·7	6·24	6·28	1,826
April	560	45	335·2	2·68	2·99	19,946
May	559	325	428	3·4	3·9	26,317
June	491	133	273	2·18	2·43	16,245
July	133	28	66	0·53	0·61	4,058
August	28	3	13	0·10	0·11	799
September	28	2	9	0·07	0·08	535
October	40	14	23	0·18	0·21	1,414
November	45	36	42	0·33	0·37	2,499
December	36	32	(For period Dec. 1 to Dec. 7.)			
The year	560	2	107	0·84 (estimated)	11·6	78,000 (estimated)

Note.—Winter conditions obtained after December 7.

From October 1, 1912, to September 30, 1913, precipitation at Greenwood was 14·7 inches. This is probably somewhat lower than the mean annual precipitation over the whole drainage area.

Celeste Creek (2050).

Location.—Near Albas, Water District No. 2.

Drainage Area.—Eighty square miles.

Records Available.—March 1 to December 31, 1914.

Gauge.—Standard vertical staff gauge, graduated in feet and tenths. Read by H. C. Harris three times per week.

Channel.—Average width 25 feet. Bed of stream very rocky.

Discharge Measurements.—Two meterings only have been obtained.

Winter Flow.—Creek generally freezes over during winter months.

Accuracy—The results as shown are very approximate, since it has been impossible to rate the station completely during 1914.

Discharge Measurements of Celeste Creek near Albas, B.C., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 13.....	E. H. Tredcroft & K. Chisholm.....	1923	32	37·0	1·47	0·58	54·7
Aug. 29.....	E. M. Dann	1913	19	15·4	1·5	0·35	23·4

Measurements made at stream's mouth, regular section not suitable for low water.
An effort will be made to completely rate this station during 1915.

Daily Gauge Height and Discharge of Celeste Creek, near Shuswap Lake, for 1914.

Day.	February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·65	66					1·95	335
2					0·70	75	1·75	289		
3			0·65	66					2·15	382
4					0·75	83	1·85	312		
5			0·65	66					2·15	382
6					0·75	83	1·95	335		
7			0·65	66					2·05	359
8					0·80	92	1·95	335		
9										
10			0·65	66					2·10	370
11					0·85	101	2·00	347		
12			0·65	66					2·05	359
13							2·25	405		
14			0·65	66	0·95	120				
15							2·35	429	2·05	359
16			0·65	66	1·00	130				
17										
18					1·15	160	2·35	429	2·10	370
19			0·65	66						
20					1·25	181	2·35	429	2·00	347
21			0·65	66						
22	0·65	66			1·30	191				
23			0·65	66			2·25	405	1·90	324
24					1·80	300				
25	0·65	66					2·25	405		
26			0·65	66					1·80	300
27					1·65	267				
28	0·65	66	0·65	66			2·15	382		
29										
30					1·65	267	2·15	382	1·80	300
31			0·70	75						

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Celeste Creek, near Shuswap Lake, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1												
2					0·30	18	0·50	43	1·00	130	0·85	101
3	1·70	278	0·70	75								
4					0·27	15			1·10	150	0·85	101
5			0·70	75			0·50	43				
6	1·55	245			0·25	13			1·05	140		
7			0·65	66			0·50	43			0·85	101
8					0·30	18			1·05	140		
9	1·35	202	0·65	66			0·50	43			0·85	101
10									1·00	130		
11	1·25	181			0·22	10	0·60	58			0·80	92
12			0·65	66					1·00	130		
13	1·15	160					0·70	75			0·75	83
14			0·65	66	0·20	9			1·00	130		
15	1·30	191					0·90	110			0·70	75
16			0·55	50					0·95	120		
17					0·20	9	1·00	130			0·70	75
18	1·20	170	0·50	43					0·90	110		
19					0·25	12	1·10	150			0·65	66
20									0·85	101		
21	1·10	150	0·50	43	0·30	18	1·05	140				
22									0·80	92	0·65	66
23	1·00	130			0·35	23	1·00	130				
24			0·45	36					0·75	83	0·60	58
25	0·95	120										
26					0·40	29	1·00	130	0·75	83	0·60	58
27	0·90	110	0·35	23								
28					0·45	36	0·95	120	0·70	75	0·60	58
29			0·35	23								
30	0·80	92			0·45	36	0·90	110	0·80	92	0·60	58
31			0·30	18								

Monthly Discharge of Celeste Creek near Shuswap Lake, for 1914.

(Drainage area, 80 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area	Total in acre-feet
March	75	60	66·6	0·8	0·9	4,095
April	300	75	157·7	1·9	2·1	2,384
May	429	289	375·7	4·7	5·4	23,100
June	382	360	349·0	4·3	4·8	20,767
July	278	92	169·0	2·1	2·4	10,391
August	75	18	50·0	0·6	0·7	3,074
September	36	9	19·0	0·2	0·2	1,130
October	150	43	94·6	1·2	1·4	5,817
November	150	75	113·7	1·4	1·6	6,761
December	101	58	78·0	1·0	1·1	4,795
The period	429	9	147·3	1·8	20·6	80,317

Note.—Mean annual precipitation probably varies from 30 to 50 inches. Probably there are large evaporation losses from Hum-a-mult lake.

Crazy Creek (2051).

Location.—Section 28, township 23, range 5, west of the 6th meridian.

Drainage Area.—Forty-five square miles.

Records Available.—March 8, to December 13, 1914.

Gauge.—Standard vertical staff gauge situated on C.P.R. siding bridge.

Channel.—The channel averages about 75 feet in width. Bed of stream is rocky, and velocities are high.

Winter Flow.—Ice conditions exist on this stream during November, December, January and February.

Accuracy.—The accuracy of returns is considered on the whole to be fairly high. Four discharge measurements have been obtained at varying stages, and the curve is well defined.

Miscellaneous.—The British Columbia Forest Mills Co., Ltd., hold records on this stream for 9 cubic feet per second. The water is used to run a smal hydro-electric plant comprising : One Pelton bucket wheel and one Can. Gen. Electric dynamo (2,000 volts, 50 amps), replaced during winter months by steam plant for purpose of operating saw-mill.

Discharge Measurements of Crazy Creek at Taft, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
Oct. 25.....	E. M. Dann and K. G. Chisholm.....	1055	46	57·8	2·05	1·60	118·3 D
1914.							
Mar. 3.....	K. G. Chisholm.....	1505	33	21·8	1·11	0·72	24·3
May 18.....	E. H. Tredcroft.....	1055	77	124·7	3·0	2·30	370·7
July 15.....	E. H. Tredcroft.....	1923	78·5	151·2	4·09	2·80	619·5

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Crazy Creek near Taft, B.C., for 1914.

Day.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·00	35	2·00	242	2·30	371
2	.....	.....	0·90	29	2·40	417	2·60	517
3	.....	.....	1·00	35	2·50	467	3·00	722
4	.....	.....	1·10	43	2·25	348	2·60	517
5	.....	.....	1·40	82	2·00	242	2·35	394
6	.....	.....	1·60	118	1·90	205	2·30	371
7	.....	.....	1·75	158	1·90	205	2·00	242
8	0·60	24	1·80	173	1·90	205	2·00	242
9	0·75	25	1·80	173	2·10	282	2·10	282
10	0·60	24	1·80	173	2·25	348	2·20	325
11	0·70	25	1·85	189	2·20	325	2·40	417
12	0·80	26	1·90	205	2·30	371	2·35	394
13	0·85	28	2·00	242	2·40	417	2·50	467
14	0·80	26	2·05	262	2·65	542	2·60	517
15	0·85	28	2·15	303	2·60	517	2·65	542
16	0·85	28	2·20	325	2·65	542	2·70	567
17	0·80	26	2·00	242	2·60	517	2·75	593
18	0·95	32	1·90	205	2·30	371	2·70	567
19	0·90	29	2·00	242	2·25	348	2·50	467
20	0·95	32	2·10	282	2·20	325	2·35	394
21	1·00	35	2·00	242	2·30	371	2·15	303
22	1·10	43	1·90	205	2·40	417	2·10	282
23	1·10	43	1·80	173	2·55	492	2·10	282
24	1·20	53	1·90	205	2·65	542	2·15	303
25	1·10	43	1·80	173	2·50	467	2·20	325
26	0·60	24	1·80	173	2·35	394	2·50	467
27	0·65	24	1·80	173	2·10	282	2·35	394
28	0·70	25	1·80	173	2·00	242	2·25	348
29	0·90	29	1·75	158	1·90	205	2·30	371
30	1·00	35	1·80	173	1·80	173	2·30	371
31	1·10	43	.....	.....	1·95	223	.....	.....

Daily Gauge Height and Discharge of Crazy Creek near Taft, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·35	394	1·40	82	0·80	26	1·60	118	1·45	90	1·30	67
2	2·45	442	1·30	67	0·80	26	1·55	108	1·85	189	1·25	60
3	2·40	417	1·30	67	0·80	26	1·40	82	1·65	131	1·20	53
4	2·45	442	1·30	67	0·80	26	1·40	82	1·55	108	1·20	53
5	2·30	371	1·25	60	0·80	26	1·30	67	1·50	98	1·15	48
6	2·20	325	1·20	53	0·75	25	1·25	60	1·50	98	1·15	48
7	2·10	282	1·20	53	0·75	25	1·20	53	1·45	90	1·10	43
8	2·00	242	1·30	67	0·90	29	1·10	43	1·40	82	1·10	43
9	2·00	242	1·20	53	1·30	67	1·10	43	1·40	82	1·10	43
10	2·00	242	1·15	48	1·00	35	1·10	43	1·40	82	1·10	43
11	2·05	262	1·10	43	0·95	32	1·10	43	1·50	98	1·00	35
12	2·10	282	1·10	43	1·00	35	1·10	43	1·50	98	1·00	35
13	2·10	282	1·10	43	1·05	39	1·10	43	1·45	90	1·00	35
14	2·57	502	1·05	39	1·10	43	1·10	43	1·40	82	.....	.....
15	2·80	619	1·05	39	1·00	35	1·05	39	1·30	67	.....	.....
16	2·20	325	1·05	39	0·90	29	1·00	35	1·25	60	.....	.....
17	1·95	223	1·10	43	0·90	29	1·40	82	1·20	53	.....	.....
18	1·90	205	1·05	39	0·90	29	1·45	90	1·20	53	.....	.....
19	1·80	173	1·00	35	1·40	82	1·45	90	1·20	53	.....	.....
20	1·80	173	1·00	35	1·30	67	1·40	82	1·15	48	.....	.....
21	1·75	158	1·00	35	1·20	53	1·40	82	1·10	43	.....	.....
22	1·60	118	1·00	35	1·10	43	1·40	82	1·10	43	.....	.....
23	1·50	98	1·00	35	0·95	32	1·35	74	1·10	43	.....	.....
24	1·50	98	1·00	35	0·95	32	1·35	74	1·20	53	.....	.....
25	1·50	98	0·90	29	0·90	29	1·30	67	1·20	53	.....	.....
26	1·50	98	0·90	29	0·90	29	1·25	60	1·20	53	.....	.....
27	1·50	98	0·90	29	1·85	189	1·25	60	1·20	53	.....	.....
28	1·45	90	0·85	28	1·60	118	1·20	53	1·40	82	.....	.....
29	1·40	82	0·80	26	1·50	98	1·10	43	1·40	82	.....	.....
30	1·40	82	0·80	26	1·50	98	1·10	43	1·35	74	.....	.....
31	1·40	82	0·80	26	.....	.....	1·40	82	.....	.....	.....	.....

Monthly Discharge of Crazy Creek at Taft, B.C., for 1914.

(Drainage area, 45 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	53	24	31·7	0·7	0·8	1,949
April	325	29	178·8	3·97	4·43·	10,640
May	542	173	356·2	7·90	9·10	21,902
June	722	242	411·8	9·10	10·10	25,504
July	619	82	243·4	5·40	6·20	14,966
August	82	26	43·0	0·95	1·09	2,644
September	189	25	48·4	1·07	1·19	2,880
October	118	43	65·0	1·40	1·60	3,997
November	189	43	78·0	1·70	1·90	4,641
December	67	35	(for period	December	1 to Decem	ber 13.)
The period	722	24	161·8	3·57	36·41	89,123

Note.—Winter conditions obtained after December 13.

The mean annual precipitation at Revelstoke is given as 42·99 inches (Meteorological Service, Department of Marine and Fisheries) which is probably slightly less than the precipitation over the Crazy creek drainage area.

The gauge reader, Mr. J. Lidstone, states that from his observation of the amount of snow on hills during the winter of 1913–14 that the total run-off of the stream during 1914 is about 33 per cent less than in average years.

Eagle River, at Malakwa, (2010).

Location.—Section 9, township 23, range 6, west 6th meridian.

Records Available.—May 14 to December 31, 1913; January 8, to December 12, 1914.

Drainage Area.—Four hundred and twenty square miles.

Gauge.—Standard chain gauge situated on highway bridge and read daily by P. C. Col·l.

Channel.—The channel is uniform and straight for 100 yards above and below the gauge.

Discharge Measurements.—Are made from upstream side of highway bridge. Velocities are uniform and not too high.

Winter Flow.—Partial ice conditions exist on the river during January and February.

Accuracy.—The accuracy of results is considered to be very high, nine measurements have been obtained at varying stages, but during March, April, and May, 1914, gauge readings were not considered to be very reliable.

Discharge Measurements of Eagle River at Malakwa, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
Nov. 7.....	E. M. Dann & K. G. Chisholm	1,505	111·0	454·0	1·36	2·61	620·0
1914.							
Mar. 3.....	K. G. Chisholm.....	1,505	125·0	206·5	1·24	1·80	257·0
May 18.....	E. H. Tredcroft.....	1,055	111·0	717·7	3·98	4·90	2,860·0
July 16.....	"	1,923	119·5	718·7	4·14	5·05	2,972·0

See measurements of Eagle river in Water Resources Paper Nos. 1 and 8.

Daily Gauge Height and Discharge of Eagle River near Malakwa, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	320	2·00	320	1·80	256	2·25	422	4·50	2,285	6·60	6,500
2	.....	320	1·95	302	1·80	256	2·20	400	5·20	3,280	6·30	5,655
3	.....	320	1·95	302	1·80	256	2·25	422	5·20	3,280	6·20	5,400
4	.....	355	1·95	302	1·80	256	2·35	470	5·10	3,125	5·30	3,460
5	.....	355	1·85	270	1·80	256	2·80	725	4·70	2,550	5·05	3,047
6	.....	355	.....	270	1·80	256	3·05	904	4·45	2,225	5·00	2,970
7	.....	400	.....	270	1·80	256	3·35	1,127	4·30	2,050	4·90	2,825
8	2·20	400	.....	270	1·70	225	3·55	1,292	4·45	2,225	4·55	2,350
9	2·25	422	.....	256	1·75	240	3·65	1,380	4·65	2,482	4·65	2,482
10	2·20	400	.....	256	1·75	240	3·70	1,425	5·00	2,970	5·30	3,460
11	2·20	400	.....	256	1·80	256	3·75	1,472	.....	.....	5·40	3,645
12	2·20	400	.....	256	1·80	256	3·85	1,570	.....	.....	5·45	3,737
13	2·15	377	.....	256	1·90	285	4·20	1,935	.....	.....	5·90	4,655
14	2·10	355	.....	256	1·90	285	4·20	1,935	.....	.....	6·10	5,145
15	2·10	355	.....	256	1·95	302	4·50	2,285	.....	.....	6·65	6,650
16	2·10	355	.....	256	1·95	302	4·50	2,285	.....	.....	6·25	5,527
17	2·10	355	.....	256	1·95	302	4·30	2,050	5·60	4,025	6·40	5,925
18	2·10	355	.....	256	2·05	337	4·15	1,880	.....	4,025	6·70	6,800
19	2·15	377	.....	270	2·05	337	4·35	2,107	5·00	2,970	6·00	4,900
20	2·20	400	.....	270	2·10	355	4·45	2,225	4·95	2,897	5·60	4,025
21	2·10	355	.....	270	2·20	400	4·30	2,050	5·15	3,202	5·15	3,202
22	2·10	355	1·85	270	2·25	422	4·20	1,935	5·30	3,460	5·00	2,970
23	2·10	355	1·80	256	2·30	445	3·95	1,670	5·35	3,552	4·90	2,825
24	2·10	355	1·80	256	2·30	445	4·00	1,720	5·40	3,645	4·85	2,755
25	2·10	355	1·85	270	2·20	400	4·00	1,720	5·55	3,927	5·10	3,125
26	.....	337	1·80	256	2·25	422	3·95	1,670	.....	.....	5·55	3,927
27	2·05	337	1·80	256	2·30	445	3·90	1,620	.....	.....	5·35	3,552
28	2·00	320	1·80	256	2·20	400	4·20	1,935	4·40	2,165	5·30	3,460
29	2·10	355	.....	.....	2·20	400	4·30	2,050	.....	.....	5·20	3,280
30	2·10	355	.....	.....	2·20	400	4·35	2,107	.....	.....	5·40	3,645
31	2·15	377	.....	.....	2·25	422	.....	.....	.....	.....	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Eagle River near Malakwa, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·55	3,927	3·50	1,250	2·60	605	3·30	1,090	3·20	1,015	2·60	605
2	5·85	4,542	3·50	1,250	2·60	605	3·25	1,052	3·90	1,620	2·55	577
3	5·80	4,430	3·55	1,292	2·65	632	3·10	940	3·60	1,335	2·60	605
4	5·70	4,225	3·50	1,250	2·65	632	2·90	795	3·45	1,207	2·45	522
5	5·40	3,645	3·30	1,090	2·60	605	2·95	830	3·40	1,165	2·30	445
6	5·20	3,280	3·40	1,165	2·40	495	2·80	725	3·35	1,127	2·40	495
7	5·05	3,047	3·30	1,090	2·60	605	2·80	725	3·20	1,015	2·30	445
8	4·95	2,897	3·30	1,090	2·90	795	2·70	660	3·30	1,090	2·20	400
9	4·85	2,755	3·20	1,015	2·90	795	2·70	660	3·15	977	2·30	445
10	4·90	2,825	3·00	865	2·60	605	2·60	605	3·05	902	2·10	355
11	5·00	2,970	2·90	795	2·75	692	2·60	605	3·10	940	2·20	400
12	5·10	3,125	3·10	940	2·65	632	2·60	605	3·00	865	2·10	355
13	5·00	2,970	2·90	795	2·55	577	2·60	605	2·80	725	.....	.....
14	5·50	3,830	3·00	865	2·60	605	2·55	577	2·70	660	.....	.....
15	6·65	6,650	3·05	902	2·40	495	2·50	550	2·60	605	.....	.....
16	5·10	3,125	3·00	865	2·30	445	2·65	632	2·50	550	.....	.....
17	4·50	2,285	2·90	795	2·35	470	3·90	1,620	2·50	550	.....	.....
18	4·40	2,165	2·95	830	2·70	660	3·70	1,425	2·55	577	.....	.....
19	4·40	2,165	2·95	830	3·40	1,165	3·65	1,380	2·40	495	.....	.....
20	4·60	2,415	3·00	865	3·00	865	3·50	1,250	2·40	495	.....	.....
21	4·00	1,720	3·00	865	2·85	760	3·25	1,052	2·35	470	.....	.....
22	3·75	1,472	2·90	795	2·80	725	3·10	940	2·30	445	.....	.....
23	3·60	1,335	2·90	795	2·80	725	3·00	865	2·25	422	.....	.....
24	3·60	1,335	2·70	660	2·90	795	2·90	795	2·30	445	.....	.....
25	3·60	1,335	2·80	725	2·90	795	2·80	725	2·50	550	.....	.....
26	3·50	1,250	2·70	660	2·95	830	2·80	725	2·60	605	.....	.....
27	3·40	1,165	2·80	725	4·30	2,050	2·75	692	2·60	605	.....	.....
28	3·30	1,090	2·80	725	3·45	1,207	2·70	660	2·80	725	.....	.....
29	3·30	1,090	2·75	692	3·35	1,127	2·70	660	2·80	725	.....	.....
30	3·40	1,165	2·70	660	3·30	1,090	2·90	795	2·70	660	.....	.....
31	3·65	1,380	2·65	632	.....	.....	3·30	1,090	.....	.....	.....	.....

Monthly Discharge of Eagle River near Malakwa, for 1914.

(Drainage area, 420 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	422	320	362	0·9	1·0	22,277
February	320	256	268	0·6	0·7	14,844
March	445	225	326	0·8	0·9	20,063
April	2,285	400	1,559	3·7	4·1	92,806
May	4,025	2,050	(For period of 20 days).			
June	6,800	2,350	4,063	9·7	10·8	250,000
July	6,650	1,090	2,632	6·3	7·3	161,871
August	1,292	632	896	2·1	2·4	55,093
September	2,050	445	769	1·8	2·0	45,783
October	1,620	550	849	2·0	2·3	52,200
November	1,620	422	785	1·9	2·1	46,700
December	605	355	(for period	Dec. 1st to	Dec 12th)	
The year	6,800	225	1,332 (Estimated).	3·15	42·7	975,300 (Estimated)

Note.—During part of January and part of February the river was affected to a slight extent by ice. Consequently the records for these two months are less reliable than for the remainder of the year.

Owing to the unreliability of gauge readings for a portion of May, it was thought best to leave that part of the month blank, gauge readings and discharges being filled in only in those cases where reasonable reliance can be placed thereon.

Granite Creek (2064).

Location.—Near Coalmont, Water District No. 4.

Records Available.—June 19 to December 31, 1914.

Drainage Area.—Forty square miles.

Gauge.—Standard vertical staff gauge graduated in feet and tenths, situated on footbridge. Read daily by Miss Emily Cook.

Channel.—Channel is straight for 100 feet above and 500 feet below measuring section. Velocity high. Bed of stream is composed of gravel and rock, considered permanent.

Discharge Measurements.—Four discharge measurements were obtained during 1914. Highest recorded flow 300 cubic feet per second.

Winter Flow.—No records have been obtained during winter months on this stream, but ice conditions are expected to prevail throughout January and February.

Accuracy.—The accuracy of returns will eventually be high, but several more measurements are required to define curve satisfactorily.

Discharge Measurements of Granite Creek near Coalmont, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 18.....	K. G. Chisholm.....	1,913	68·0	92·0	3·26	2·22	300·0
July 25.....	"	1,913	27·0	44·0	0·70	1·32	31·0
Sept. 3.....	"	1,913	26·0	20·1	0·61	1·05	12·2
Nov. 26.....	"	1,913	37·0	36·0	0·86	1·4	31·0

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Granite Creek near mouth, for 1914.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·90	129	1·20	21	1·05	12	1·15	18	1·35	34
2	.....	.....	1·90	129	1·20	21	1·05	12	1·20	21	1·50	50
3	.....	.....	1·85	115	1·20	21	1·05	12	1·20	21	1·40	39
4	.....	.....	1·75	90	1·15	18	1·05	12	1·20	21	1·40	39
5	.....	.....	1·70	79	1·15	18	1·05	12	1·20	21	1·45	45
6	.....	.....	1·70	79	1·15	18	1·05	12	1·20	21	1·35	34
7	.....	.....	1·70	79	1·20	21	1·05	12	1·20	21	1·30	29
8	.....	.....	1·65	71	1·25	25	1·10	15	1·20	21	1·30	29
9	.....	.....	1·60	63	1·25	25	1·20	21	1·25	25	1·35	34
10	.....	.....	1·60	63	1·20	21	1·15	18	1·25	25	1·30	29
11	.....	.....	1·55	56	1·15	18	1·15	18	1·20	21	1·50	50
12	.....	.....	1·55	56	1·15	18	1·15	18	1·20	21	1·35	34
13	.....	.....	1·50	50	1·15	18	1·10	15	1·20	21	1·30	29
14	.....	.....	1·50	50	1·10	15	1·10	15	1·20	21	1·30	29
15	.....	.....	1·50	50	1·10	15	1·20	21	1·15	18	.....	.....
16	.....	.....	1·45	45	1·10	15	1·20	21	1·15	18	.....	.....
17	.....	.....	1·45	45	1·10	15	1·20	21	1·15	18	.....	.....
18	.....	.....	1·40	39	1·10	15	1·25	25	1·20	21	.....	.....
19	2·20	280	1·40	39	1·10	15	1·30	29	1·30	29	.....	.....
20	2·10	215	1·40	39	1·10	15	1·20	21	1·25	25	.....	.....
21	2·05	191	1·40	39	1·15	18	1·20	21	1·25	25	.....	.....
22	2·00	168	1·40	39	1·10	15	1·15	18	1·20	21	.....	.....
23	2·00	168	1·35	34	1·10	15	1·15	18	1·20	21	.....	.....
24	2·00	168	1·35	34	1·10	15	1·15	18	1·20	21	1·20	21
25	2·05	191	1·30	29	1·10	15	1·10	15	1·20	21	.....	.....
26	2·00	168	1·30	29	1·10	15	1·10	15	1·20	21	1·40	39
27	2·00	168	1·30	29	1·10	15	1·15	18	1·20	21	1·40	39
28	1·95	148	1·30	29	1·05	12	1·25	25	1·20	21	1·40	39
29	1·90	129	1·30	29	1·00	10	1·20	21	1·20	21	1·30	29
30	1·95	148	1·25	25	1·00	10	1·15	18	1·20	21	1·30	29
31	.....	.....	1·25	25	1·00	10	.....	.....	1·30	29	.....	.....

Monthly Discharge of Granite Creek at mouth, for 1914.

(Drainage area, 40 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	280	129	178	4·4	4·9	10,592
July	129	25	55	1·4	1·6	3,381
August	25	10	16·7	0·4	0·5	1,027
September	29	12	17·6	0·4	0·4	1,047
October	29	18	21·6	0·5	0·6	1,328
November	50	21	(From 1st to 11th, 24th, 26th to the 30th)			

Note.—The average annual precipitation over this drainage area is probably 20 inches at the stream's mouth, to 40 inches at its source.

The station was not established until the freshet flow for 1914 was almost over

Ice conditions existed during December and part of November

Kettle River, North Fork (2052).

Location.—At Grand Forks, Water District No. 5.

Records Available.—June 1 to December 31, 1914.

Drainage Area.—Six hundred and forty square miles.

Gauge.—Standard vertical staff gauge situated on foot bridge, graduated in feet and tenths, and read daily by Geo. O'Keefe.

Channel.—Channel is straight for 100 yards above and below measuring section. Velocity high.

Discharge Measurements.—Five discharge measurements have been obtained in 1914. Meterings are made by cable suspension from foot bridge.

Winter Flow.—No records have been obtained on this river during winter months.

Accuracy.—The accuracy will eventually be high. The present results should fall well within 15 per cent. Results for June may be inaccurate since slag from the Granby Smelter is sometimes carried downstream to the gauging section prior to the freshet, not being carried out until the spring floods are at their height.

Discharge Measurements of Kettle River, North Fork, at Grand Forks, 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 19	C. E. Richardson	1527	130	1,100	4·59	5·08	5,050
June 9	K. G. Chisholm	1913	132	847	2·77	4·00	2,348
July 22	"	1913	123	474	0·90	1·48	426
Aug. 22	"	1913	.....	255	0·35	0·52	88
" 24	"	1913	.....	244	0·35	0·50	86

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kettle River, North Fork, near Grand Forks, for 1914.

Day.	June.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	5·10	5,100
2	5·65	7,360
3	7·00	13,400
4	7·05	13,625
5	6·00	8,900
6	5·10	5,100
7	4·70	3,890
8	4·30	2,850
9	4·05	2,420
10	3·90	2,205
11	4·00	2,350
12	4·00	2,350
13	4·35	2,950
14	5·10	5,100
15	5·20	5,480
16	5·35	6,090
17	5·60	7,150
18	5·75	7,785
19	5·30	5,880
20	4·70	3,890
21	4·40	3,050
22	4·00	2,350
23	3·75	2,030
24	3·60	1,875
25	3·70	1,975
26	3·70	1,975
27	3·70	1,975
28	3·60	1,875
29	3·50	1,780
30	3·65	1,925

Daily Gauge Height and Discharge of Kettle River, North Fork, near Grand Forks, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·60	1,875	1·00	220	0·45	78	1·30	340	2·00	695	1·50	435
2	3·50	1,780	1·00	220	0·45	77	1·25	320	2·15	780	1·50	435
3	3·50	1,780	1·00	220	0·45	78	1·25	320	2·35	900	1·50	435
4	3·35	1,640	0·90	180	0·40	70	1·20	300	2·50	995	1·50	435
5	3·30	1,595	0·90	180	0·40	70	1·20	300	2·50	995	1·50	435
6	3·10	1,430	0·80	150	0·40	70	1·20	300	2·50	995	1·40	385
7	2·85	1,235	0·70	120	0·40	70	1·15	280	2·50	995	1·40	385
8	2·70	1,130	0·40	70	0·45	77	1·15	280	2·40	930	1·30	340
9	2·55	1,025	0·40	70	0·45	78	1·10	260	2·30	870	1·20	300
10	2·40	930	0·50	85	0·50	85	1·10	260	2·30	870	1·10	260
11	2·30	870	0·50	85	0·50	85	1·10	260	2·20	810	1·00	220
12	2·20	810	0·60	100	0·55	93	1·10	260	2·20	810	0·90	180
13	2·10	750	0·60	100	0·55	92	1·10	260	2·10	750	0·90	180
14	2·10	750	0·60	100	0·55	93	1·15	280	2·10	750	0·90	180
15	2·00	695	0·60	100	0·60	100	1·15	280	2·20	810	0·90	180
16	2·00	695	0·60	100	0·60	100	1·20	300	2·20	810	0·90	180
17	1·90	640	0·60	100	0·70	120	1·35	362	1·90	640	0·90	180
18	1·80	585	0·60	100	0·70	120	1·55	460	1·80	585	0·90	180
19	1·70	535	0·60	100	0·70	120	1·90	640	1·80	585	0·90	180
20	1·60	485	0·60	100	0·85	165	2·10	750	1·80	585	0·90	180
21	1·50	435	0·60	100	1·05	240	2·10	750	1·80	585	0·90	180
22	1·40	385	0·60	100	1·15	280	2·00	695	1·80	585	0·90	180
23	1·40	385	0·55	92	1·10	260	1·85	613	1·80	585	0·90	180
24	1·30	340	0·55	92	1·10	260	1·80	585	1·80	585	0·90	180
25	1·30	340	0·55	93	1·10	260	1·80	585	1·70	535	0·90	180
26	1·30	340	0·50	85	1·10	260	1·80	585	1·70	535	0·90	180
27	1·20	300	0·50	85	1·20	300	1·70	535	1·60	485	1·00	220
28	1·20	300	0·50	85	1·20	300	1·70	535	1·60	485	1·00	220
29	1·10	260	0·50	85	1·30	340	1·70	535	1·60	485	1·00	220
30	1·10	260	0·50	85	1·30	340	1·70	535	1·60	485	1·00	220
31	1·00	220	0·50	85	.....	.....	1·85	613	.....	.....	1·00	220

Monthly Discharge of Kettle River, North Fork, near Grand Forks, for 1914.

(Drainage area, 640 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	13,625	1,780	4,483	7·0	7·8	266,757
July	1,875	220	800	1·2	1·4	49,190
August	220	70	112·5	0·2	0·2	6,917
September	340	70	156·0	0·24	0·27	9,283
October	750	260	431·5	0·7	0·8	26,532
November	995	485	717·0	1·1	1·2	42,664
December	435	180	254	0·4	0·5	15,620
The period	13,625	70	993·4	1·55	12·17	416,963

Note.—No precipitation records available.

Mr. George O'Keefe, gauge reader, states that only in very severe winters does the north fork of the Kettle river freeze at this point. He states that it has not been frozen over once during the period of his residence at Grand Forks—fourteen years.

Kettle River, West Fork (2045).

Location.—Near Westbridge, Water District No. 5.

Records Available.—February 23 to September 30, 1914.

Drainage Area.—Six hundred and ninety square miles.

Gauge.—Standard vertical staff gauge, graduated in feet and tenths, read daily by R. Demazes.

Channel.—Channel is straight for 500 feet above and below measuring section. Bed composed of gravel and boulders. Velocity varies with stage of water. Highest recorded mean velocity 4 feet per second. Highest recorded discharge 1,235 cubic feet per second.

Discharge Measurements.—Are obtained from bridge. Three measurements were procured during 1914 at varying stages.

Winter Flow.—No records have been taken on this river during winter months. Partial ice conditions prevail during January and February.

Accuracy—Accuracy of returns is considered to be fairly high, and results should fall within 10 per cent.

Discharge Measurements of Kettle River, West Fork, at Westbridge, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Guage Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 7.....	E. M. Dann and K. G. Chisholm.....	1,913	97·5	304·0	4·05	1·78	1,235·0
July 20.....	K. G. Chisholm.....	1,913	97·0	122·0	1·43	−0·09	174·0
Aug. 27.....	"	1,913	41·0	35·0	1·20	−0·71	42·0[1]

[1]Low-water section.

Daily Gauge Height and Discharge of Kettle River, West Fork, near mouth, for 1914.

Day.	February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				150	0·50	360	3·00	2,560	3·20	2,770
2				160	0·50	360	3·70	3,305	3·05	2,610
3				170	0·55	380	4·05	3,670	4·00	3,615
4				180	0·60	400	3·80	3,415	3·35	2,932
5				190	0·70	445	3·40	2,985	2·90	2,445
6			0·0	200	0·75	470	3·35	2,932	2·45	1,965
7			0·0	200	1·00	610	3·35	2,932	2·40	1,910
8			0·0	200	1·50	975	3·25	2,825	2·20	1,695
9			0·0	200	1·60	1,065	2·90	2,445	2·10	1,590
10			0·0	200	1·85	1,317	2·95	2,502	2·10	1,590
11			0·0	200	1·95	1,425	2·75	2,287	2·05	1,535
12			0·05	215	2·15	1,642	2·75	2,287	2·05	1,535
13			0·05	215	2·55	2,072	2·90	2,445	2·20	1,695
14			0·05	215	2·75	2,287	3·40	2,985	2·20	1,695
15			0·10	230	3·05	2,610	4·45	4,115	2·25	1,747
16			0·10	230	2·95	2,502	4·15	3,782	2·40	1,910
17			0·15	245	2·50	2,020	3·85	3,467	2·30	1,800
18			0·20	260	2·55	2,072	3·45	3,040	2·15	1,642
19			0·45	346	2·70	2,235	3·15	2,715	1·85	1,317
20			0·60	400	2·80	2,340	2·40	1,910	1·90	1,370
21			0·70	445	2·80	2,340	2·40	1,910	1·75	1,212
22			0·65	422	2·95	2,502	2·55	2,072	1·65	1,112
23	2·30	1,800	0·60	400	2·85	2,392	2·80	2,340	1·60	1,065
24	2·20	1,695	0·50	360	2·80	2,340	2·80	2,340	1·55	1,020
25	2·25	1,747	0·50	360	2·70	2,235	2·95	2,502	1·55	1,020
26	2·22	1,715	0·50	360	2·60	2,125	3·25	2,825	1·50	975
27	2·15	1,642	0·60	400	2·50	2,020	3·25	2,825	1·55	1,020
28	2·10	1,590	0·65	422	2·40	1,910	3·45	3,040	1·50	975
29			0·60	400	2·60	2,125	3·15	2,715	1·45	932
30			0·50	360	2·70	2,235	3·05	2,160	1·25	775
31			0·50	360			2·80	2,340		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kettle River, West Fork, near mouth, for 1914.

Day.	July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·15	705	−0·30	120	−0·80	30
2	0·95	580	−0·35	110	−0·80	30
3	0·90	550	−0·40	100	−0·80	30
4	0·85	522	−0·50	80	−0·70	43
5	0·90	550	−0·50	80	−0·70	43
6	0·80	495	−0·55	70	−0·70	43
7	0·70	445	−0·70	43	−0·60	60
8	0·70	445	−0·70	43	−0·60	60
9	0·70	445	−0·80	30	−0·60	60
10	0·60	400	−0·80	30	−0·60	60
11	0·55	380	−0·80	30	−0·50	80
12	0·50	360	−0·90	15	−0·50	80
13	0·40	325	−0·90	15	−0·40	100
14	0·30	290	−0·90	15	−0·40	100
15	0·40	325	−0·90	15	−0·50	80
16	0·35	307	−0·85	23	−0·50	80
17	0·35	307	−0·80	30	−0·40	100
18	0·40	325	−0·80	30	−0·30	120
19	0·30	290	−0·75	37	−0·30	120
20	0·30	290	−0·70	43	−0·30	120
21	0·30	290	−0·65	52	−0·35	110
22	0·35	307	−0·65	52	−0·30	120
23	0·30	290	−0·70	43	−0·20	145
24	0·20	260	−0·65	52	−0·20	145
25	0·10	230	−0·70	43	−0·25	133
26	0·05	215	−0·70	43	−0·30	120
27	0·00	200	−0·70	43	−0·30	120
28	0·00	200	−0·70	43	−0·25	133
29	−0·10	170	−0·75	37	−0·20	145
30	−0·15	158	−0·80	30	−0·25	133
31	−0·15	158	−0·80	30	..	..

Monthly Discharge of Kettle River, West Fork, near mouth, for 1914.

(Drainage area, 690·0 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet
January						
February	1,800	1,590	For the period Feb. 23		Feb. 28	
March	445	150	280·5	0·4	0·5	17,247
April	2,610	360	1,660·3	2·4	2·7	98,797
May	4,115	1,910	2,778	4·0	4·6	170,816
June	3,015	775	1,649	2·4	2·7	98,121
July	705	158	349	0·5	0·6	21,459
August	120	15	46	0·07	0·08	2,828
September	145	30	91·4	0·13	0·14	5,439
The period	4,115	15	979·0	1·41	11·32	414,707

Note.—Precipitation is probably from 20 to 30 inches annually

Returns for October, November and December are withheld from publication owing to unreliability of gauge readings.

Kettle River near Nicholson's Bridge (2046).

Location.—Near Kettle Valley, Water District No. 5.

Records Available.—March 1 to December 11, 1914.

Drainage Area.—Two thousand, one hundred and eighty square miles.

Gauge.—Standard vertical staff gauge, graduated in feet and tenths, situated on pier of highway bridge, and read daily by F. Whiting (rancher).

Channel.—The channel is straight for about 500 feet above and below measuring section. Average width, 150 feet. Bed of river is composed of gravel and sand, and considered permanent. Velocity high and control is good.

Discharge Measurements.—Four discharge measurements were obtained during 1914. Highest recorded discharge 6,215 feet per second.

Winter Flow.—Ice conditions exist during January and February.

Accuracy.—Considered to be very high, and results should be within 5 per cent, except at extreme high water.

Discharge Measurements of Kettle River at Nicholson's Bridge, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20.....	C. E. Richardson & C. Varcoe.	1,527	178·0	1,063·0	5·75	5·00	6,104·0
June 7.....	E. M. Dann & K. G. Chisholm	1,913	162·0	869·0	4·86	3·79	4,225·0
July 19.....	" " ..	1,913	154·0	329·0	2·93	0·36	668·0
Aug. 27.....	" " ..	1,913	137·0	184·0	0·78	−0·80	144·0

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kettle R ver near Nicholson's Bridge, Rock Creek, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	−0·6	200	0·5	735	4·1	4,675	4·40	5,140
2	.....	.....	.....	.....	−0·6	200	0·5	735	4·7	5,610	4·90	5,930
3	.....	.....	.....	.....	−0·6	200	0·5	735	5·5	6,910	6·40	8,410
4	.....	.....	.....	.....	−0·6	200	0·5	735	5·1	6,250	6·55	8,655
5	.....	.....	.....	.....	−0·5	230	0·55	765	4·55	5,370	5·35	6,660
6	.....	.....	.....	.....	−0·4	265	0·8	930	4·35	5,060	4·35	5,060
7	.....	.....	.....	.....	−0·4	265	1·35	1,320	4·00	4,520	3·90	4,520
8	.....	.....	.....	.....	−0·4	265	1·75	1,645	3·95	4,445	3·60	3,920
9	.....	.....	.....	.....	−0·4	265	2·05	1,920	4·05	4,595	3·55	3,845
10	.....	.....	.....	.....	−0·4	265	2·25	2,125	4·20	4,830	3·45	3,700
11	−0·3	300	.....	.....	−0·4	265	2·55	2,460	4·60	5,450	3·50	3,775
12	−0·3	300	.....	.....	−0·4	265	2·80	2,780	4·85	5,850	3·55	3,845
13	−0·3	300	.....	.....	−0·4	265	3·10	3,195	5·05	6,175	3·85	4,295
14	−0·25	320	.....	.....	−0·3	300	3·45	3,700	5·60	7,075	4·35	5,060
15	−0·25	320	.....	.....	−0·2	340	3·70	4,070	6·45	8,490	4·45	5,215
16	−0·25	320	.....	.....	−0·1	390	4·00	4,520	6·85	9,150	4·35	5,060
17	−0·25	320	.....	.....	0·0	440	4·00	4,520	6·10	7,915	4·40	5,140
18	−0·3	300	.....	.....	0·0	440	3·90	4,370	5·60	7,075	4·05	4,595
19	−0·3	300	.....	.....	0·0	440	3·50	3,775	5·30	6,580	3·60	3,920
20	−0·3	300	.....	.....	0·0	440	4·15	4,750	5·00	6,095	3·35	3,555
21	−0·3	300	.....	.....	0·1	495	4·10	4,675	5·00	6,095	3·10	3,195
22	−0·3	300	.....	.....	0·15	525	3·80	4,220	4·95	6,010	2·90	2,410
23	.....	.....	.....	.....	0·3	610	3·60	3,920	5·20	6,415	2·45	2,345
24	.....	.....	.....	.....	0·4	670	3·90	4,370	5·25	6,495	2·40	2,290
25	.....	.....	.....	.....	0·45	700	3·80	4,220	5·05	6,175	2·40	2,290
26	.....	.....	.....	.....	0·5	735	3·60	3,920	4·75	5,690	2·40	2,290
27	.....	.....	.....	.....	0·5	735	3·50	3,775	4·10	4,675	2·35	2,235
28	.....	.....	.....	.....	0·5	735	3·50	3,775	3·95	4,445	2·30	2,180
29	.....	.....	.....	.....	0·5	735	3·40	3,630	3·55	3,845	2·27	2,145
30	.....	.....	.....	.....	0·5	735	3·60	3,920	3·40	3,630	2·20	2,092
31	.....	.....	.....	.....	0·5	735	.....	.....	3·80	4,220	.....	.....

Daily Gauge Height and Discharge of Kettle River near Nicholson's Bridge, Rock Creek, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·00	1,870	−0·4	265	−0·85	130	0·15	520	0·5	735	−0·1	390
2	1·80	1,690	−0·4	265	−0·90	120	0·02	451	0·55	765	−0·1	390
3	1·80	1,690	−0·4	265	−0·90	120	0·0	440	0·7	865	−0·2	340
4	1·70	1,600	−0·45	250	−0·90	120	0·0	440	0·6	800	−0·2	340
5	1·60	1,520	−0·50	230	−0·90	120	0·0	440	0·68	852	−0·2	340
6	1·45	1,400	−0·50	230	−0·90	120	−0·02	430	0·77	910	−0·2	340
7	1·30	1,280	−0·50	230	−0·90	120	−0·10	390	0·69	845	−0·2	340
8	1·15	1,175	−0·55	215	−0·85	130	−0·15	365	0·55	765	−0·2	340
9	1·05	1,105	−0·55	215	−0·80	140	−0·20	340	0·50	735	−0·2	340
10	0·85	965	−0·55	215	−0·80	140	−0·22	330	0·42	683	−0·2	340
11	0·70	865	−0·55	215	−0·75	155	−0·25	320	−0·37	652	−0·22	332
12	0·65	830	−0·55	215	−0·75	155	−0·25	320	0·30	610	.....	.....
13	0·50	735	−0·60	200	−0·70	170	−0·20	340	0·25	580	.....	.....
14	0·60	800	−0·60	200	−0·65	185	−0·15	365	0·20	550	.....	.....
15	0·70	865	−0·60	200	−0·60	200	−0·05	415	0·20	550	.....	.....
16	0·45	700	−0·60	200	−0·60	200	−0·05	415	0·20	550	.....	.....
17	0·40	670	−0·60	200	−0·50	230	0·02	451	0·20	550	.....	.....
18	0·40	670	−0·65	185	−0·40	265	0·38	658	0·15	520	.....	.....
19	0·40	670	−0·65	185	−0·20	340	0·65	832	0·10	495	.....	.....
20	0·40	670	−0·65	185	−0·10	390	0·60	800	0·10	495	.....	.....
21	0·40	670	−0·65	185	0·0	440	0·50	734	0·0	440	.....	.....
22	0·30	610	−0·70	170	0·0	440	0·40	670	0·0	440	.....	.....
23	0·30	610	−0·70	170	−0·5	415	0·32	622	0·0	440	.....	.....
24	0·25	580	−0·80	140	−0·15	365	0·27	592	−0·05	415	.....	.....
25	0·20	550	−0·80	140	−0·25	320	0·25	580	−0·05	415	.....	.....
26	0·15	520	−0·80	140	−0·15	365	0·20	550	−0·10	390	.....	.....
27	0·05	465	−0·80	140	−0·15	365	0·20	550	−0·10	390	.....	.....
28	−0·10	390	−0·80	140	0·0	440	0·17	533	−0·10	390	.....	.....
29	−0·20	340	−0·85	130	0·15	520	0·15	522	−0·10	390	.....	.....
30	−0·30	300	−0·85	130	0·20	550	0·20	550	−0·10	390	.....	.....
31	−0·40	265	−0·85	130	.....	.....	0·27	592	.....	.....	.....	.....

Monthly Discharge of Kettle River at Nicholson's Bridge, Rock Creek, for 1914.

(Drainage area, 2,180 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	735	200	430	0·2	0·2	26,476
April	4,750	735	3,007	1·4	1·6	178,930
May	9,150	3,630	5,800	2·7	3·1	356,660
June	8,655	2,092	4,142	1·9	2·1	246,492
July	1,870	265	873	0·4	0·5	53,679
August	265	130	193	0·1	0·1	11,876
September	550	120	259	0·1	0·1	15,412
October	832	320	502	0·2	0·2	30,867
November	910	390	587	0·3	0·3	34,929
December	390	332	(for the period Dec. 1 to Dec. 11)			
The year	9,150	120	1,395 (estimated)	0·8	8·7 (estimated)	1,008,000 (estimated)

Note.—Precipitation records are not available, but it probably varies from 20 to 30 inches per annum in average years. This station gives the flow of the Kettle river above Midway before it joins Boundary creek.
Winter conditions existed subsequent to December 11.

Kettle River at Carson (2049).

Location.—At Carson, Water District No. 5.

Records Available.—September 5 to December 31, 1913; January 1 to 22, February 25 to December 9, 1914.

Drainage Area.—Three thousand and ten square miles.

Gauge.—Gauge is a movable staff gauge situated on downstream side of highway bridge, 4 miles from Grand Forks.

Channel.—Straight at measuring section; bed of stream, gravel and sand; control good.

Discharge Measurements.—Measurements are made from highway bridge. Four meterings were obtained during 1914. Highest recorded discharge 7,840 second-feet.

Winter Flow.—Partial ice conditions prevail during December, January, and February.

Accuracy.—Accuracy is considered good, and results should fall within 10 per cent.

Kettle River.

The Kettle river has its source in the southern portion of the Gold range, and drains the district between the Okanagan and Arrow lakes. It discharges into the Columbia at Marcus, in the state of Washington. From its source it follows a southerly course to Westbridge, a distance of 75 miles, where it is joined by the West Fork entering from the northeast. From Midway to Rock creek the course is southerly. The river here takes a turn to the southeast and crosses into United States territory at Midway, 10 miles below. After a wide semi-circular loop it crosses the boundary into Canadian territory at Danville, below Grand Forks. At Grand Forks the North Fork joins it. From Grand Forks it flows due east in a line about a mile north of boundary to Cascade. It turns south here across the boundary towards its confluence with the Columbia.

The North Fork and the West Fork are the chief tributaries. Boundary creek and Rock creek are next in size. Boundary creek joins at Midway from the north, Rock creek comes in at the village of Rock Creek from the west. Christina creek discharges into the Kettle near Cascade, draining Christina lake.

The total drainage area in British Columbia is about 3,160 square miles. The drainage area of the North Fork is 640 square miles; of Boundary creek, 125 square miles; of the West Fork, 690 square miles; and of the main river above the West Fork, 1,175 square miles.

The water is used for irrigation in the vicinity of Grand Forks, Cascade, and Rock creek. These are the principal agricultural areas in the district, the most important being that around Grand Forks, where some 2,000 acres are planted in fruit trees. With exception of the localities mentioned there is little agricultural land in the district. The tributary valleys and the major portion of the main valley being narrow and the slopes steep. The plateaus are above the altitude limit for agriculture.

From Grand Forks to Cascade, a distance of 12 miles, the valley of the Kettle river is wide and flat and suitable for irrigation by pumping. Several pumping plants are in operation. The transmission lines from the Cascade Power and Light Company's plant and from the Bonnington Falls plant runs through the valley. Power may be had at 3 cents per killowatt hour.

There are three hydro-electric developments in the district. The Cascade Power and Light Company's plant at Cascade developes 5,000 horse-power under a head of 155 feet. This is auxiliary to the Bonnington Falls plant on the

Kootenay below Nelson. Power from these plants is used at Grand Forks, Phoenix, and Greenwood for town lighting and for use at the smelters and mines. The Granby Company develop about 700 horse-power under a 30-foot head from the North Forks near Grand Forks for use in its smelter. The city of Greenwood is lighted from a plant of 250 horse-power capacity under 130-foot head at Boundary falls.

Very little data as to climatic conditions are available, precipitation and temperatures vary greatly over the district owing to the irregular formation. The mean annual precipitation in the vicinity of Grand Forks is probably about 15 inches. In the higher altitudes it is greater.

The northern portion of the district is well timbered with cedar, hemlock, and pine. Considerable logging is carried on, the total drive of the Kettle river and its tributaries being over twenty million feet in 1913.

Regular gauging stations have been established at the following places:— At Carson, above the North Fork, on the North Fork near its mouth; on Boundary creek at Greenwood; on the Kettle below Rock creek; and on the West Fork at Westbridge.

Discharge Measurements of Kettle River at Carson, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 19	C. E. Richardson and C. Varcoe	1527	169	1,460	5·37	7·15	7,840
June 9	K. G. Chisholm	1913	158	1,161	3·62	8·95	4,200
July 23	"	1913	153	693	0·99	12·09	684
Aug. 24	"	1913	120	560	0·39	12·09	221

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kettle River at Carson, for 1913.

Day.	September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	12·3	555	12·1	685	12·3	555
2	.....	.....	12·3	555	12·2	620	12·3	555
3	.....	.....	12·4	490	12·2	620	12·3	555
4	.....	.....	12·4	490	12·2	620	12·3	555
5	11·6	1,070	12·4	490	12·1	685	12·4	490
6	11·6	1,070	12·4	490	12·0	760	12·5	430
7	11·8	910	12·4	490	12·1	685	12·5	430
8	12·0	760	12·4	490	12·1	685	12·4	490
9	12·1	685	12·4	490	12·2	620	12·1	685
10	12·1	685	12·5	430	12·1	685	12·2	620
11	12·2	620	12·4	490	12·1	685	12·2	620
12	12·3	555	12·4	490	12·2	620	12·3	555
13	12·3	555	12·4	490	12·2	620	12·4	490
14	12·3	555	12·3	555	12·25	587	12·4	490
15	12·3	555	12·0	760	12·4	490	12·4	490
16	12·3	555	12·0	760	12·2	620	12·4	490
17	12·4	490	12·3	555	12·2	620	12·5	430
18	12·4	490	12·0	760	12·1	685	12·4	490
19	12·4	490	12·3	620	12·2	620	12·4	490
20	12·4	490	12·3	555	12·2	620	12·4	490
21	12·4	490	12·3	555	12·25	588	12·3	555
22	12·4	490	12·2	620	12·5	430	12·3	555
23	12·45	460	12·2	620	12·4	490	12·1	685
24	12·4	490	12·2	620	12·4	490	12·0	760
25	12·4	490	11·8	910	12·4	490	12·0	760
26	12·4	490	11·6	1,070	12·45	460	12·0	760
27	12·5	430	11·8	910	12·25	587	12·1	685
28	12·5	430	11·8	910	12·25	588	12·2	620
29	12·5	430	12·0	760	12·2	620	12·3	555
30	12·4	490	12·0	760	12·3	555	12·3	555
31	.....	.....	12·1	685	.....	.....	12·4	490

Monthly Discharge of Kettle River, at Carson, for 1913.

(Drainage area, 3,010 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet
September	1,070	430	585·5	0·2	0·22	34,839
October	1,070	430	626·6	0·2	0·23	38,528
November	760	430	604·3	0·2	0·22	35,958
December	760	430	560·6	0·18	0·21	34,470

Note.—These data were compiled from gauge readings taken under the direction of Mr. Clifford Vareoe, Provincial Water Rights Engineer, at Grand Forks, to whom due acknowledgment is made.

For remarks relating to precipitation, etc., see Kettle River for 1914

Daily Gauge Height and Discharge of Kettle River, at Carson, for 191 .

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Guage Height.	Di-s charge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	12·4	490	.....	.....	12·5	430	12·0	760	8·90	4,275	8·30	5,380
2	12·5	430	.....	.....	12·5	430	12·0	760	8·50	5,000	8·00	5,985
3	12·5	430	.....	.....	12·5	430	12·05	722	7·50	7,065	7·50	7,065
4	12·5	430	.....	.....	12·6	375	11·9	835	6·90	8,400	7·70	6,625
5	12·5	430	.....	.....	12·6	375	11·9	835	7·65	6,735	7·90	6,195
6	12·5	430	.....	.....	12·6	375	11·6	1,070	7·90	6,195	8·20	5,575
7	12·4	490	.....	.....	12·6	375	11·2	1,435	8·20	5,575	8·60	4,810
8	12·3	555	.....	.....	12·7	320	10·7	1,930	8·50	5,000	8·70	4,630
9	12·3	555	.....	.....	12·7	320	10·4	2,235	8·20	5,575	8·90	4,275
10	12·4	490	.....	.....	12·7	320	10·2	2,450	7·90	6,195	9·00	4,105
11	12·5	430	.....	.....	12·7	320	9·9	2,800	7·65	6,735	9·00	4,105
12	12·55	402	.....	.....	12·6	375	9·75	2,995	7·70	6,625	9·00	4,105
13	12·6	375	.....	.....	12·6	375	9·35	3,555	7·40	7,285	8·90	4,275
14	12·4	490	.....	.....	12·6	375	9·10	3,945	7·20	7,730	8·50	5,000
15	12·45	460	.....	.....	12·5	430	9·00	4,105	6·25	9,920	8·30	5,380
16	12·4	490	.....	.....	12·5	430	8·90	4,275	5·20	13,470	8·35	5,285
17	12·4	490	.....	.....	12·5	430	8·30	5,380	5·90	10,760	8·40	5,190
18	12·4	490	.....	.....	12·5	430	8·50	5,000	7·00	8,175	8·60	4,810
19	12·5	430	.....	.....	12·5	430	8·70	4,630	7·15	7,840	8·90	4,275
20	12·5	430	.....	.....	12·4	490	8·20	5,575	7·30	7,510	9·11	3,945
21	12·6	375	.....	.....	12·4	490	8·20	5,575	7·50	7,065	9·30	3,630
22	12·6	375	.....	.....	12·3	555	8·50	5,000	7·40	7,285	9·50	3,340
23	.....	.....	.....	.....	12·25	587	8·60	4,810	7·50	7,065	9·60	3,200
24	.....	.....	.....	.....	12·0	760	8·60	4,810	7·40	7,285	9·70	3,060
25	.....	.....	12·5	430	11·9	835	8·40	5,190	7·30	7,510	9·70	3,060
26	.....	.....	12·55	402	11·9	835	8·70	4,630	7·20	7,730	9·70	3,060
27	.....	.....	12·5	430	12·0	760	8·60	4,810	7·70	6,625	9·90	2,800
28	.....	.....	12·5	430	12·0	760	8·70	4,630	8·20	5,575	10·0	2,680
29	.....	.....	.....	.....	12·0	760	8·80	4,450	8·50	5,000	10·1	2,560
30	.....	.....	.....	.....	12·0	760	8·90	4,275	8·70	4,630	10·1	2,560
31	.....	.....	.....	.....	12·0	760	.....	.....	8·40	5,190	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kettle River, at Carson, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	10·2	2,450	12·4	490	12·9	221	12·0	760	11·8	910	12·1	685
2	10·3	2,340	12·4	490	13·0	180	12·0	760	11·7	990	12·1	685
3	10·5	2,130	12·4	490	13·0	180	12·1	685	11·7	990	12·2	620
4	10·5	2,130	12·5	430	13·0	180	12·2	620	11·8	910	12·2	620
5	10·7	1,930	12·5	430	13·0	180	12·2	620	11·6	1,070	12·3	555
6	10·8	1,830	12·5	430	13·0	180	12·3	555	11·55	1,112	12·3	555
7	10·9	1,730	12·6	375	12·9	221	12·3	555	11·55	1,113	12·3	555
8	11·0	1,630	12·6	375	12·9	221	12·3	555	11·6	1,070	12·3	555
9	11·1	1,530	12·6	375	12·9	221	12·3	555	11·7	990	12·3	555
10	11·3	1,340	12·6	375	12·9	221	12·3	555	11·75	950	....	....
11	11·4	1,245	12·6	375	12·9	221	12·4	490	11·8	910	....	....
12	11·5	1,155	12·4	490	12·9	221	12·4	490	11·8	910	....	....
13	11·6	1,070	12·5	430	12·9	221	12·3	555	11·8	910	....	....
14	11·4	1,245	12·5	430	12·9	221	12·3	555	11·9	835	....	....
15	11·4	1,245	12·5	430	12·8	270	12·3	555	11·9	835	....	....
16	11·4	1,245	12·5	430	12·7	320	12·3	555	12·1	685	....	....
17	11·4	1,245	12·6	375	12·7	320	12·3	555	12·1	685	....	....
18	11·5	1,155	12·6	375	12·6	375	12·0	760	12·1	685	....	....
19	11·7	990	12·6	375	12·6	375	11·5	1,155	12·0	760	....	....
20	11·7	990	12·6	375	12·6	375	11·6	1,070	12·1	685	....	....
21	11·8	910	12·6	375	12·5	430	11·6	1,070	12·1	685	....	....
22	11·9	835	12·6	375	12·4	490	11·7	990	12·0	760	....	....
23	11·9	835	12·6	375	12·3	555	11·8	910	12·1	685	....	....
24	12·0	760	12·7	320	12·3	555	11·9	835	12·1	685	....	....
25	12·0	760	12·7	320	12·4	490	11·9	835	12·1	685	....	....
26	12·1	685	12·7	320	12·4	490	11·9	835	12·1	685	....	....
27	12·2	620	12·8	270	12·4	490	12·0	760	12·1	685	....	....
28	12·3	555	12·8	270	12·3	555	12·0	760	12·1	685	....	....
29	12·3	555	12·8	270	12·3	555	12·0	760	12·1	685	....	....
30	12·4	490	12·8	270	12·0	760	12·0	760	12·1	685	....	....
31	12·4	490	12·9	221	....	....	12·0	760	....	....	....	....

Monthly Discharge of Kettle River, at Carson, for 1914.

(Drainage area, 3,010 square miles.)

Month.	Discharge in Second-Feet.				Run-Off	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area	Total in acre-feet.
January	555	375	453	0·15	0·17	27,854
February						
March	835	320	506	0·17	0·20	31,113
April	5,575	722	3,449	1·10	1·20	205,230
May	13,470	4,275	7,001	2·30	2·60	430,475
June	7,065	2,560	4,365	1·40	1·60	259,764
July	2,450	490	1,230	0·40	0·50	76,511
August	490	221	378	0·12	0·14	23,267
September	760	180	343	0·11	0·12	20,410
October	1,155	490	717	0·24	0·28	44,099
November	1,113	685	831	0·27	0·30	49,448
December	685	555	For period	Dec. 1st—Dec. 9th		
The year	13,470	180	1,700 (estimated)	0·54	8·41 (estimated)	1,215,000 (estimated)

Note.—Precipitation varies from 20 to 30 inches per annum in normal years.

Ice conditions obtained at this station, subsequent to December 9, and also practically throughout the whole month of February.

This station gives the discharge of the Kettle river as it flows north, across the international boundary before joining the North Fork of the Kettle river at Grand Forks.

Niskonlith Creek (2031).

Location.—Section 5, township 21, range 13, west 6th meridian.

Records Available.—September 1 to December 31, 1911; April 1 to September, 13, 1912; May 1 to September 30, 1913; April 1 to December 11, 1914.

Drainage Area.—Fifty square miles.

Gauge.—Vertical staff gauge read semi-weekly by H. Hoffman.

Channel.—The stream bed is composed of large rocks and boulders. Velocities are high and the control is good.

Winter Flow.—Ice conditions prevail during last half of December, January, February, and March.

Accuracy.—The accuracy is only medium, more measurements being required.

Discharge Measurements of Niskonlith Creek at mouth, 1914:—

For Meter measurements and further hydrographic data see Water Resources Paper Nos. 1 and 8.

Daily Gauge Height and Discharge of Niskonlith Creek at mouth, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							0·60	3·0			1·77	57·5
2												
3	0·75	6·7							1·40	35·0		
4							0·65	4·1				
5	0·75	6·7									1·72	54·5
6							0·70	5·3				
7									1·45	38·0		
8												
9	0·75	6·7					0·70	5·3			1·57	45·5
10												
11									1·50	41·0		
12	0·75	6·7										
13							0·72	6·0			1·50	41·0
14												
15									1·60	47·0		
16	0·75	6·7					0·72	6·0			1·47	39·5
17												
18												
19									1·80	59·0	1·42	36·5
20												
21							0·75	6·7				
22									1·90	66·0	1·30	29·0
23												
24							0·77	7·4				
25											1·22	25·2
26												
27							1·20	24·0	1·90	66·0		
28												
29											1·05	17·5
30							1·25	26·5	1·80	59·0		
31												

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Niskonlith Creek at mouth, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							0·42	0·6			0·32	0·1
2	1·05	17·5										
3			0·57	2·6	0·50	1·4			0·40	0·4		
4											0·40	0·40
5							0·42	0·6				
6	1·0	15·0	0·57	2·6					0·40	0·4		
7												
8					0·47	1·0					0·60	3·0
9	0·45	0·9					0·42	0·6	0·40	0·4		
10			0·85	9·8								
11					0·45	0·9					0·40	0·4
12							0·45	0·9				
13	0·45	0·9	0·85	9·8					0·40	0·4		
14												
15					0·42	0·6						
16							0·42	0·6			0·40	
17	0·45	0·9	0·55	2·2					0·37	0·3		
18					0·40	0·4					0·40	
19							0·40	0·4				
20												Under 100.
21	0·45	0·9	0·55	2·2	0·37	0·3			0·30	0·1		
22												
23							0·40	0·4			0·37	
24	0·40	0·4	0·52	1·8					0·35	0·2		
25					0·32	0·2						
26											0·35	
27							0·40	0·4	0·35	0·2		
28	0·40	0·4	0·52	1·8	0·40	0·4						
29												
30							0·40	0·4				
31	0·57	2·6	0·52	1·8								

Monthly Discharge of Niskonlith Creek at mouth, for 1914.

(Drainage area, 50 square miles.)

Month.	Discharge in Second Feet				Run Off.	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area	Total in acre-feet.
April	26·5	3·0	9·4	0·19	0·21	559
May	66·0	35·6	51·4	1·03	1·19	3,160
June	57·0	17·5	38·5	0·77	0·86	2,291
July	17·5	0·4	4·4	0·09	0·10	270
August	9·8	1·8	3·8	0·08	0·09	234
September	1·4	0·2	0·65	0·01	0·01	39
October	0·9	0·4	0·54	0·01	0·01	33
November	0·4	0·1	0·30	0·01	0·01	18
December						
The period	66·0	0·1	14·62	0·27	2·48	6,604

Note.—Precipitation varies from 10 to 20 inches.
Dam on Niskonlith lake controls the streams regimen.

Okanagan River (2052).

Location.—Near Fairview, Water District No. 4.

Records Available.—April 8 to December 31, 1914.

Drainage Area.—Three thousand square miles.

Gauge.—Standard 6-foot vertical staff gauge, read four times a week by A. S. Hatfield.

Channel.—Average width of channel at measuring section is seventy-five feet. Channel above the station curves gently from the southwest. Below the station the channel is straight for 50 feet, then curves to the southeast.

Bed of stream is composed of gravel and sand, and constant shifting of channel at the station has resulted.

Discharge Measurements.—Meterings have been obtained at all stages of flow, and were well distributed throughout at the season, thus making it possible to make adjustments for the change in area due to scouring.

Winter Flow.—No winter records have been made on this stream, but partial ice conditions are believed to exist during January and February.

Accuracy.—In spite of the adverse conditions, results are thought to be fairly high. It will be necessary to establish a new station in 1915.

Okanagan River.

The Okanagan river rises in Okanagan lake, a large body of water, 65 miles long and from 2 to 4 miles wide and, flowing southerly for 100 miles, joins the Columbia in the state of Washington. From Penticton, where the river leaves Okanagan lake, to the international boundary is 35 miles. Through the greater part of this distance it is a sluggish stream, expanding into three lakes. Dog lake, Masseaux lake, and Osoyoos lake. The international boundary cuts across the lower part of the last. From the falls at the foot of Dog lake to Vaseaux lake, a distance of 5 miles, the stream is swift.

The drainage basin in Canada has an area of 3,000 square miles. It is a long narrow valley, lying north-and-south in the eastern portion of the dry belt, and includes one of the best fruit-growing districts in British Columbia. Irrigation is of course necessary, the precipitation varying from 15 inches in the northern parts to 8 inches in the south. The mountains on both sides of the valley are steep in most places, timbered on the upper slopes. The lower slopes are partly covered with light timber, but for the most part are open and covered with bunch grass. In places they give way to rolling hills and benches. The soil is fine and very fertile when it can be watered. On the whole the land is difficult of irrigation, chiefly because of its topography, and also because there are no large tributaries north of the border. The inflowing streams are small, flowing in deep gulleys from the mountains. In the spring they are rushing torrents. In the summer they become nearly dry, and in most cases there are no storage possibilities. From Penticton south to the boundary there are large tracts of land which only need a water supply to become exceedingly productive.

The one large tributary of the Okanagan is the Similkameen. It flows in from the west, and though it joins the Okanagan at Oroville, in Washington, by far the major part of its course is through Canadian territory. It is a larger stream than the Okanagan above the junction, but lacks the steadying influence of any lakes and is therefore subject to much greater fluctuations. In 1914 the minimum flow of the Okanagan was 485 second-feet, and of the Similkameen 160 second-feet. The maximum flow, however, was 1,500 second-feet for the Okanagan and 15,500 for the Similkameen.

There is one good power site on the Okanagan. This is at Okanagan falls, at the foot of Dog lake. The river here is narrowly confined between two rock bluffs, and drops some 15 feet almost vertically. Dog lake and Okanagan lake act as natural reservoirs. A cheap development is possible at this point, and it is probable that here is a solution of the irrigation problem for large areas at present barren.

A gauge was installed on the Okanagan near Fairview by the Hydrographic Survey in April, 1914. Daily flow records are available from that date.

DISCHARGE MEASUREMENTS of Okanagan River near Fairview, for 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 7	E. M. Dann	1505	75	276	1·90	0·71	524
May 11	K. Chisholm	1505	75	456	2·63	2·43	1,199
June 5	"	1913	76	520	2·76	3·28	1,436
July 17	"	1913	76	454	2·51	2·27	1,138
Aug. 14	E. M. Dann	1913	75	354	2·20	1·31	796
" 28	K. G. Chisholm	1913	76	320	2·20	1·08	704
Nov. 21	"	1673	74	309	1·85	0·84	575

Shifting condition of channel existed during freshet season.

DAILY GAUGE HEIGHT AND DISCHARGE of Okanagan River near Fairview, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1			1·80	945		
2					3·10	1,385
3					3·20	1,415
4					3·25	1,425
5			2·10	1,065	3·30	1,440
6			2·10	1,065	3·30	1,440
7			2·05	1,045		
8	0·80	560	2·10	1,065		
9	0·85	575			3·30	1,440
10	0·90	595			3·20	1,415
11					3·20	1,415
12			2·50	1,210	3·20	1,415
13			2·60	1,240		
14	1·20	710	2·90	1,325		
15	1·30	750	3·30	1,440		
16	1·35	765			3·50	1,500
17	1·35	765			3·50	1,500
18					3·40	1,470
19			3·20	1,415	3·30	1,440
20			3·10	1,385		
21	1·45	805	3·20	1,415		
22	1·45	805	3·20	1,145		
23	1·50	825			3·20	1,415
24	1·60	865			3·20	1,415
25					3·10	1,385
26			3·00	1,355	3·00	1,355
27			3·00	1,355		
28	1·65	885	2·90	1,325		
29	1·60	865	2·90	1,325		
30	1·65	885			2·85	1,310

Daily Gauge Height and Discharge of Okanagan River near Fairview, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·80	1,295	.....	.....	1·07	685	0·90	610	.....	.....	0·82	575
2	2·75	1,280	.....	.....	1·05	675	.....	.....	0·90	610	0·85	585
3	2·70	1,270	1·62	900	1·02	665	.....	.....	0·90	610	0·87	595
4	.....	.....	1·60	890	.....	.....	.....	.....	0·90	610	.....	.....
5	.....	.....	1·57	890	.....	.....	0·85	585	0·90	610	.....	.....
6	2·50	1,210	1·55	880	.....	.....	0·84	585	.....	.....	.....	.....
7	2·45	1,195	.....	.....	0·92	620	0·82	575	.....	.....	0·85	585
8	2·40	1,180	.....	.....	0·90	610	0·82	575	.....	.....	0·85	585
9	2·35	1,165	.....	.....	0·87	595	.....	.....	0·90	610	0·82	575
10	.....	.....	1·45	840	0·85	585	.....	.....	0·90	610	0·82	575
11	.....	.....	1·42	830	.....	.....	.....	.....	0·90	610	.....	.....
12	.....	.....	1·40	820	0·79	565	0·85	585	0·90	610	.....	.....
13	2·30	1,155	1·37	810	0·80	565	0·85	585	.....	.....	.....	.....
14	2·30	1,155	.....	.....	0·82	575	0·85	585	.....	.....	0·80	565
15	2·27	1,145	.....	.....	0·82	575	0·85	585	.....	.....	0·80	565
16	2·25	1,140	.....	.....	.....	.....	.....	.....	0·90	610	0·77	550
17	.....	.....	1·30	785	.....	.....	.....	.....	0·87	595	0·77	550
18	.....	.....	1·27	775	.....	.....	.....	.....	0·87	595	.....	.....
19	.....	.....	1·25	765	.....	.....	0·95	630	0·87	595	.....	.....
20	2·12	1,085	1·22	755	.....	.....	0·94	630	.....	.....	.....	.....
21	2·10	1,075	.....	.....	0·80	565	0·92	620	.....	.....	0·72	530
22	2·07	1,065	.....	.....	0·80	565	0·92	620	.....	.....	0·67	505
23	2·05	1,055	.....	.....	0·80	565	.....	.....	0·85	585	0·65	495
24	2·00	1,040	1·12	720	0·80	565	.....	.....	0·82	575	0·65	495
25	.....	.....	1·10	715	.....	.....	.....	.....	0·80	565	.....	.....
26	.....	.....	1·07	705	.....	.....	0·88	600	0·80	565	.....	.....
27	1·90	1,000	1·05	695	.....	.....	0·88	600	.....	.....	.....	.....
28	1·85	980	.....	.....	0·92	620	0·88	600	.....	.....	0·62	485
29	1·80	965	.....	.....	0·92	620	0·88	600	.....	.....	0·62	485
30	1·77	955	.....	.....	0·90	610	.....	.....	0·82	575	0·62	485
31	.....	.....	1·10	700	.....	.....	.....	.....	.....	.....	0·62	485

Monthly Discharge of Okanagan River near Fairview, for 1914.

(Drainage area, 3,000 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	885	560	761	0·25	0·28	45,282
May	1,440	945	1,258	0·42	0·48	77,350
June	1,500	1,310	1,421	0·47	0·52	84,559
July	1,295	955	1,120	0·37	0·43	68,870
August	900	695	792	0·26	0·30	48,698
September	685	565	601	0·20	0·22	35,762
October	630	575	598·2	0·20	0·23	36,782
November	610	565	596·5	0·20	0·22	35,494
December	595	485	540·5	0·15	0·17	33,234
The period	1,500	485	854·2	0·28	2·85	466,031

Note.—This station was established in April, 1914, having for the period a maximum flow of 1,500 sec.-feet in June and a minimum of 485 sec-feet in December.

The flow is regulated by Okanagan and Dog lakes, from which there is a large evaporation loss.
The precipitation is low, varying from 10 to 30 inches annually.

Similkameen River (2054).

Location.—Near Ashnola, Water District No. 4.
Records Available.—April 8 to December 31, 1914.
Drainage Area.—Two thousand three hundred and twenty square miles.
Gauge.—Standard vertical staff gauge, read by Harry Atherton of Keremeos.
Channel.—Average width of channel at measuring section is about 210 feet. Channel is straight at the station. Bed of stream is very rocky and water turbulent even at low stages.
Discharge Measurements.—The gauge-height discharge curve is very well rated by well-distributed meterings.
Winter Flow.—No winter records have been made on this stream. Partial ice conditions are believed to exist during January and February.
Accuracy.—Very high. Results compiled from a well-rated curve.

Similkameen River.

Two main streams unite at Princeton to form the Similkameen, the South Similkameen and the Tulameen rivers. The South Similkameen has its source in the Hogameen mountains of the Cascade range, some 15 miles south of the International boundary, and flows north for a distance of 50 miles to its confluence. The Tulameen heads in the Hope mountains of the Cascade range, and starting in a northerly direction, follows a curved line, finally joining in a southeast direction. Very few elevations are established in this district. The peaks of the Cascades at the international boundary obtain an altitude of 8,000 feet above sea-level. The highest points in the Hope range are not over 7,600 feet. At the confluence of the two main tributaries at Princeton the elevation of the river is about 2,100 feet. From this point the Similkameen flows in a southeasterly direction for 75 miles, joining the Okanagan at Oroville. The last 20 miles are in the state of Washington.

From the right going upstream, the main tributaries are: Keremeos creek at Keremeos, Twenty-mile creek at Hedley, and Five-mile and One-mile creeks at 5 and 1 miles, respectively, downstream from Princeton. From the left, Ashnola river at Ashnola, half-way between Keremeos and Hedley, is the chief tributary.

The Similkameen river is fairly swift. In the 25 miles between Princeton and Hedley the drop is 440 feet, giving an average grade of 19 feet to the mile. Approximately the same grade obtains for the 20 miles from Hedley to Keremeos. Below this point to the boundary the current is sluggish.

At Hedley the Daly Reduction Company, owners of the Nickle Plate mine, have taken advantage of the steep grade of the river for power purposes. By means of a dam and 3 miles of flume, a maximum head of 67 feet is obtained and a plant installed with a capacity of 1,800 horse-power. This new plant takes the place of a combination plant using water from twenty-mile creek and auxiliary steam engine. The plant was completed in 1914, and can deliver 2,000 horse-power. The drainage basin above the international boundary has an area of about 2,500 square miles. The river cuts right across the southern part of the Okanagan range in a V-shaped glacial valley, the mountains on each side rising steeply to an altitude of 5,000 or 6,000 feet. The southern slopes of the hills are open and grassy in many places, and afford excellent pasturage and, where timbered, the trees do not grow close together. The northern slopes are more thickly wooded. Precipitation varies with the altitudes. The average of four years at Hedley gives 10·8 inches for the annual precipitation. At the Nickel Plate mine, 3 miles away and 4,000 feet higher up, figures for the same four years show 21·8 inches.

The only agricultural land in the district is the bottom of the valley. Above Keremeos this is very narrow, but below that point it widens out and there are a number of fine fruit ranches.

A regular gauging station was established at Ashnola, below Ashnola creek, on April 8, 1914.

DISCHARGE MEASUREMENTS of Similkameen River at Ashnola, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Feet.	Ft. per sec.	Sec.-ft.
April 8	E. M. Dann	1505	162	552	3·41	1·35	1,881
May 10	K. G. Chisholm	1505	202	1,097	6·69	3·92	7,326
June 10	"	1913	195	913	5·14	3·10	4,697
" 24	"	1913	194	856	4·51	2·75	3,870
July 29	"	1913	171	382·5	2·24	0·30	858
Aug. 30	"	1913	125	261	1·38	−0·47	360
Nov 23	"	1673	152	375	2·04	0·20	764

DAILY GAUGE HEIGHT AND DISCHARGE of Similkameen River at Ashnola, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	2·75	3,870	4·50	9,450
2	.....	.....	3·50	5,880	5·20	12,020
3	.....	.....	4·35	8,895	5·45	12,945
4	.....	.....	3·95	7,440	4·60	9,815
5	.....	.....	3·55	6,045	4·00	7,620
6	.....	.....	3·30	5,270	3·65	6,380
7	.....	.....	3·25	5,125	3·45	5,725
8	1·35	1,880	3·15	4,840	3·25	5,125
9	1·65	2,240	3·35	5,420	3·20	4,980
10	1·85	2,480	3·80	6,900	3·15	4,840
11	2·15	2,870	4·05	7,800	3·30	5,270
12	2·15	2,870	4·30	8,710	3·60	6,210
13	2·35	3,165	4·60	9,815	4·15	8,160
14	2·65	3,675	5·50	13,130	4·40	9,080
15	2·90	4,185	6·15	15,525	4·60	9,815
16	2·85	4,075	5·90	14,600	4·80	10,550
17	2·65	3,675	5·35	12,575	4·80	10,550
18	2·40	3,240	5·25	12,205	4·50	9,450
19	2·40	3,240	4·85	10,735	4·60	7,620
20	2·95	4,305	4·75	10,365	3·70	6,550
21	2·55	3,490	4·90	10,920	3·40	5,570
22	2·35	3,165	4·90	10,920	3·10	4,700
23	2·35	3,165	5·25	12,205	3·10	4,700
24	2·20	2,940	5·35	12,575	3·00	4,420
25	2·10	2,800	5·10	11,655	2·80	3,970
26	2·10	2,800	4·50	9,450	2·75	3,870
27	2·15	2,870	4·05	7,800	2·85	4,080
28	2·10	2,800	3·80	6,900	2·75	3,870
29	1·95	2,605	3·60	6,210	2·70	3,770
30	2·10	2,800	3·65	6,380	2·85	4,080
31	.....	.....	4·00	7,620	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Similkameen River at Ashnola, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·90	4,185	0·20	795	−0·53	338	−0·15	543	0·1	720	0·00	645
2	2·80	3,970	0·15	755	−0·58	318	−0·18	523	0·12	735	0·05	680
3	2·65	3,675	0·15	755	−0·55	330	−0·20	510	0·0	645	0·17	755
4	2·70	3,770	0·10	710	−0·55	330	−0·18	523	0·02	660	0·02	645
5	2·45	3,320	0·05	680	−0·55	330	−0·19	516	0·1	720	−0·07	610
6	2·15	2,870	0·05	680	−0·55	330	−0·22	498	0·15	757	0·00	645
7	2·00	2,670	0·05	680	−0·50	350	−0·20	510	0·12	735	−0·05	610
8	1·90	2,545	0·00	645	−0·45	375	−0·24	486	0·20	795	0·15	547
9	2·00	2,670	0·00	645	−0·40	400	−0·28	462	0·25	832	−0·37	425
10	1·75	2,360	0·00	645	0·30	450	−0·22	498	0·27	847	−0·55	330
11	1·60	2,180	0·00	645	−0·30	450	−0·12	562	0·27	847	−0·77	250
12	1·40	1,940	−0·10	575	−0·30	450	−0·04	617	0·47	1,009	−0·90	190
13	1·50	2,060	−0·10	575	−0·30	450	−0·04	617	0·37	926	−0·95	175
14	1·70	2,300	−0·10	575	−0·30	450	−0·06	603	0·17	772	−1·00	160
15	1·50	2,060	−0·20	510	−0·33	435	−0·12	562	0·15	757	−0·85	210
16	1·30	1,820	−0·20	510	−0·33	435	−0·20	510	0·02	660	−0·67	290
17	1·15	1,655	−0·20	510	−0·28	462	−0·19	516	−0·03	624	−0·60	310
18	1·10	1,605	−0·15	545	−0·28	462	−0·07	596	−0·00	645	−0·52	350
19	1·00	1,500	−0·15	545	−0·13	556	−0·04	617	−0·00	645	−0·40	400
20	0·90	1,400	−0·20	510	0·05	680	−0·00	645	0·01	652	−0·32	450
21	0·85	1,350	−0·20	510	−0·03	624	−0·00	645	0·25	832	−0·32	450
22	0·75	1,255	−0·20	510	−0·13	556	−0·03	624	0·27	847	−0·32	450
23	0·60	1,120	−0·30	450	−0·19	516	−0·10	575	0·20	795	−0·30	450
24	0·55	1,075	−0·40	400	−0·20	510	−0·08	589	0·15	757	−0·30	450
25	0·50	1,035	−0·45	375	−0·28	462	−0·00	645	0·15	757	−0·27	480
26	0·50	1,035	−0·50	350	−0·23	492	−0·00	645	0·37	926	−0·25	480
27	0·40	950	−0·50	350	−0·04	617	−0·08	589	0·47	1,009	−0·27	480
28	0·35	910	−0·55	330	0·10	720	−0·00	645	0·42	967	−0·27	480
29	0·30	870	−0·55	330	−0·03	624	−0·03	624	0·37	926	−0·27	480
30	0·25	830	−0·45	375	−0·13	556	0·01	720	0·20	795	−0·25	489
31	0·20	795	−0·53	338	.....	.....	0·01	720	.....	.....	−0·22	510

Monthly Discharge of Similkameen River at Ashnola, for 1914.

(Drainage area, 2,320 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet
April	4,305	1,880	3,101·5	1·33	1·5	184,550
May	15,525	3,870	8,960·6	3·86	4·45	550,966
June	12,945	3,770	6,839·5	2·95	3·29	406,980
July	4,185	795	1,993·0	0·86	0·99	122,543
August	795	330	542·5	0·23	0·26	33,357
September	720	318	468·6	0·02	0·2	27,883
October	720	402	578·5	0·25	0·29	35,570
November	1,009	624	780·5	0·33	0·37	46,800
December	755	160	447·3	0·19	0·22	27,503
The period	15,525	160	2,635·3	1·13	11·57	1,436,152

Note.—Precipitation over this drainage area varies from a minimum of 10 inches to a maximum of 50 inches at higher altitudes.

During 1914 the greatest flow recorded was 15,525 cubic feet per second, in May, and the lowest 160 cubic feet per second in December.

Shuswap River at Enderby (2034).

Location.—Section 26, township 18, range 9, west of the 6th meridian.

Records Available.—August 25 to November 10, 1911; March 1 to December 31, 1912; April 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—One thousand six hundred and fifty square miles.

Gauge.—A standard vertical staff gauge situated on highway bridge, and read daily by D. Mowat.

Channel.—The channel is straight for 100 yards at section. The rise and fall of the river each year is about 10 feet. Control is good.

Winter Conditions.—Ice conditions prevail some years during January and February. During 1914 river remained open throughout.

Discharge Measurements.—Eleven well-distributed measurements have been obtained during 1911, 1912, and 1913. Measurements were made from boat except during high water, when they were made from bridge.

Accuracy.—The returns are considered to be accurate, and are within 10 per cent.

Daily Gauge Height and Discharge of Shuswap River near Enderby, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·60	965	2·60	965	2·25	775	2·70	1,020	.....	4,540	9·05	8,695
2	2·60	965	2·55	937	2·25	775	2·70	1,020	.....	4,820	9·10	8,770
3	2·60	965	2·60	965	2·25	775	2·75	1,050	6·60	5,100	9·70	9,720
4	2·60	965	3·05	1,242	2·25	775	2·85	1,110	6·80	5,380	10·0	10,200
5	2·60	965	3·20	1,340	2·25	775	3·00	1,210	6·85	5,450	10·2	10,500
6	2·70	1,020	3·30	1,410	2·20	749	3·30	1,410	6·90	5,520	10·35	10,800
7	2·85	1,110	3·30	1,410	2·20	749	3·55	1,600	7·00	5,660	10·35	10,800
8	2·85	1,110	3·35	1,445	2·20	749	3·70	1,720	7·10	5,800	10·2	10,500
9	2,85	1,110	3·35	1,445	2·20	749	3·85	1,845	7·30	6,080	10·0	10,200
10	2·85	1,110	3·35	1,445	2·20	749	3·90	1,890	7·60	6,520	9·9	10,000
11	2·80	1,080	3·35	1,445	2·20	749	3·95	1,935	7·70	6,660	9·8	9,880
12	2·80	1,080	3·35	1,445	2·20	749	4·10	2,080	7·80	6,800	9·8	9,880
13	2·80	1,080	3·35	1,445	2·15	724	4·25	2,230	8·00	7,100	9·8	9·880
14	2·80	1,080	3·35	1,445	2·15	724	4·50	2,480	8·30	7,540	9·9	10,000
15	2·80	1,080	3·00	1,210	2·25	775	4·60	2,590	8·70	8,140	10·1	10,300
16	2·75	1,050	3·00	1,210	2·30	801	5·05	3,100	9·10	8,770	10·3	10,700
17	2·75	1,050	2·90	1,140	2·30	801	5·10	3,160	9·40	9,240	10·6	11,300
18	2·70	1,020	2·75	1,050	2·35	828	5·20	3,280	9·60	9,560	10·75	11,500
19	2·70	1,020	2·75	1,050	2·45	882	5·45	3,589	9·70	9,720	10·9	11,700
20	2·70	1,020	2·70	1,020	2·45	882	5·65	3,825	9·80	9,880	11·1	12,000
21	2·70	1,020	2·50	910	2·50	910	5·80	4,020	9·80	9,880	11·0	11,900
22	2·70	1,020	2·25	775	2·50	910	5·80	4,020	9·75	9,800	10·9	11,700
23	2·70	1,020	2·25	775	2·55	937	5·90	4,150	9·80	9,880	10·7	11,400
24	2·65	992	2·30	801	2·65	992	6·00	4,280	9·80	9,880	10·5	11,110
25	2·65	992	2·30	801	2·70	1,020	6·05	4,345	9·90	10,000	10·3	10,700
26	2·65	992	2·25	775	2·65	992	6·05	4,345	9·90	10,000	10·2	10,500
27	2·60	965	2·25	775	2·60	965	6·05	4,345	9·80	9,880	10·0	10,200
28	2·55	937	2·25	775	2·60	965	6·05	4,345	9·70	9,720	9·9	10,000
29	3·10	1,270	.....	.....	2·60	965	6·05	4,345	9·50	9,400	9·8	9,880
30	3·25	1,375	.....	.....	2·60	965	6·05	4,345	9·30	9,080	9·8	9,880
31	3·10	1,270	.....	.....	2·65	992	.....	.....	9·05	8,695	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Shuswap River near Enderby, for 1914—(*Concluded*).

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	9·80	9,880	5·20	3,280	3·30	1,410	3·45	1,520	4·05	2,030	3·80	1,800
2	9·80	9,880	5·10	3,160	3·20	1,340	3·50	1,560	4·30	2,280	3·75	1,760
3	9·80	9,880	5·00	3,040	3·20	1,340	3·55	1,600	4·30	2,280	3·75	1,760
4	9·80	9,880	4·90	2,920	3·15	1,303	3·55	1,600	4·30	2,280	3·70	1,720
5	9·70	9,720	4·80	2,810	3·10	1,270	3·55	1,600	4·30	2,280	3·65	1,680
6	9·70	9,720	4·70	2,700	3·05	1,242	3·55	1,600	4·40	2,380	3·60	1,640
7	9·65	9,640	4·70	2,700	3·05	1,242	3·55	1,600	4·40	2,380	3·60	1,640
8	9·50	9,400	4·60	2,590	3·05	1,242	3·55	1,600	4·40	2,380	3·55	1,600
9	9·30	9,080	4·50	2,480	3·05	1,242	3·55	1,600	4·45	2,430	3·50	1,560
10	9·05	8,695	4·40	2,380	3·05	1,242	3·55	1,600	4·45	2,430	3·40	1,480
11	8·90	8,460	4·40	2,380	3·05	1,242	3·60	1,640	4·50	2,480	3·35	1,445
12	8·70	8,140	4·25	2,230	3·05	1,242	3·65	1,680	4·50	2,480	3·30	1,410
13	8·45	7,765	4·20	2,180	3·05	1,242	3·70	1,720	4·45	2,430	3·30	1,410
14	8·30	7,540	4·15	2,130	3·05	1,242	3·70	1,720	4·40	2,380	3·20	1,340
15	8·30	7,540	4·05	2,030	3·00	1,210	3·70	1,720	4·40	2,380	3·10	1,270
16	8·30	7,540	4·00	1,980	3·00	1,210	3·70	1,720	4·30	2,280	3·05	1,242
17	8·10	7,250	4·00	1,980	3·00	1,210	4·15	2,130	4·30	2,280	3·00	1,210
18	7·95	7,025	3·95	1,935	3·00	1,210	4·10	2,080	4·20	2,180	2·90	1,140
19	7·75	6,730	3·90	1,890	3·10	1,270	4·10	2,080	4·20	2,180	2·90	1,140
20	7·70	6,660	3·80	1,800	3·10	1,270	4·10	2,080	4·20	2,180	2·90	1,140
21	7·30	6,080	3·80	1,800	3·10	1,270	4·10	2,080	4·10	2,080	2·90	1,140
22	7·20	5,940	3·70	1,720	3·05	1,242	4·10	2,080	4·00	1,980	2·80	1,080
23	7·00	5,660	3·65	1,680	3·05	1,242	4·10	2,080	4·00	1,980	2·80	1,080
24	6·80	5,380	3·60	1,640	3·05	1,242	4·10	2,080	3·95	1,935	2·75	1,050
25	6·60	5,100	3·60	1,640	3·05	1,242	4·10	2,080	3·95	1,935	2·75	1,050
26	6·30	4,680	3·60	1,640	3·05	1,242	4·10	2,080	3·90	1,890	2·75	1,050
27	6·10	4,410	3·50	1,560	3·20	1,340	4·05	2,030	3·90	1,890	2·80	1,080
28	5·90	4,150	3·40	1,480	3·50	1,560	4·05	2,030	3·85	1,845	2·75	1,050
29	5·70	3,890	3·40	1,480	3·40	1,480	4·00	1,980	3·85	1,845	2·75	1,050
30	5·50	3,640	3·40	1,480	3·40	1,480	4·00	1,980	3·85	1,845	2·70	1,020
31	5·40	3,520	3·30	1,410			4·05	2,030			2·70	1,020

For meterings and further hydrographic data see Water Resources Papers Nos. 1 and 8.

Monthly Discharge of Shuswap River at Enderby, for 1914.

(Drainage area, 1,650 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January	1,375	937	1,055	0·6	0·7	64,870	2·52
February	1,445	775	1,123	0·7	0·7	62,368	1·60
March	1,020	724	843	0·5	0·6	51,834	0·82
April	4,345	1,020	2,822	1·7	1·9	167,920	1·02
May	10,000	4,540	7,887	4·8	5·5	484,954	1·12
June	12,000	8,695	10,486	6·3	7·0	623,960	1·68
July	9,880	3,520	7,189	4·3	5·0	442,038	0·88
August	3,280	1,410	2,133	1·3	1·5	131,153	0·27
September	1,560	1,210	1,285	0·8	0·9	76,365	2·49
October	2,130	1,520	1,838	1·1	1·3	113,016	1·23
November	2,480	1,845	2,187	1·3	1·4	130,133	1·89
December	1,800	1,020	1,324	0·8	0·9	81,408	.....
The year	12,000	724	3,348	22·0	27·4	2,430,019	.....

Note.—Rainfall data are from Monthly Weather Review of the Meteorological Service of the Department of Marine and Fisheries, and show the monthly precipitation at Enderby. The mean precipitation over the whole drainage area is probably considerably higher than the precipitation at Enderby.

The total mean annual precipitation at Enderby for a period of eight years is given as 20·71 inches.

South Similkameen River (2063).

Location.—At Princeton, Water District No. 4.

Records Available.—May 14 to December 19, 1914.

Drainage Area.—Four hundred and forty square miles.

Gauge.—Standard chain gauge situated on the highway bridge, read by J. J. Priest of Princeton.

Channel.—Average width of channel at measuring section is about 170 feet. Above section channel is curved for about 200 feet and straight for about 100 feet below station. Bed of stream is of gravel, with a few boulders, and not liable to shift.

Discharge Measurements.—Made with cable and 30-pound weight. The gauge-height discharge curve is very well rated by well-distributed meterings.

Winter Flow.—No winter records have been made on this stream, but partial ice conditions are believed to exist during January and February.

Accuracy.—High results compiled from a well-rated curve.

South Similkameen.

Two branches, Pasayten river and Roche river, unite to form the South Similkameen river. The Pasayten is about 25 miles long. It heads among the high mountains of the Cascade range, south of the border, and flows due north to the junction. It is a rapid stream flowing through a narrow deep valley. The Roche river heads in six branches in the Hogameen range, which joins the divide between the Skagit and the South Similkameen rivers. It pursues a northeasterly course to the junction through a wide flat valley, whose sides slope easily back to a height of 2,000 feet above the river. From the junction the South Similkameen flows due north for 25 miles to its confluence with the Tulameen at Princeton to form the Similkameen river. In this distance it is joined by Copper creek and Whipsaw creek from the west, and several small unnamed creeks.

From the junction of the Roche and the Pasayten to the confluence of Whipsaw creek, a distance of 18 miles, the South Similkameen flows through a deep narrow canyon on a grade of over 40 feet to the mile. Good power sites are numerous. Below Whipsaw creek to the mouth the grade is flatter and the valley wider.

The area of the drainage basin above the mouth is 440 miles, covering a rough mountainous country of rugged scenic beauty. The new motor road connecting Princeton with the coast follows the valley of the South Similkameen and Roche river across the headwaters of the Skagit and down Silver creek to the Fraser near Hope. It is at present under construction.

Large deposits of copper occur on Copper mountain, 10 miles south of Princeton. The British Columbia Copper Company has large holdings here and is doing some development work.

A gauging station was established on the South Similkameen near the mouth on May 14, 1914. Six discharge measurements and daily gauging were taken during the season.

Discharge Measurements of South Similkameen River at Princeton, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 13	K. G. Chisholm	1505	192	476	7·33	3·88	3,490
June 15	"	1913	191	511	6·25	4·00	3,194
" 22	"	1913	191	380	4·74	3·31	1,799
July 27	"	1913	106	117	3·58	1·88	419
Sept. 2	"	1913	112	145	1·02	1·23	149
Nov. 28	"	1673	125	121	3·19	1·85	386

Daily Gauge Height and Discharge of South Similkameen River at Princeton, for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	4·05	3,665
2	.....	.....	4·67	6,037
3	.....	.....	4·62	5,832
4	.....	.....	3·97	3,407
5	.....	.....	3·71	2,661
6	.....	.....	3·51	2,187
7	.....	.....	3·31	1,803
8	.....	.....	3·25	1,705
9	.....	.....	3·22	1,657
10	.....	.....	3·20	1,625
11	.....	.....	3·14	1,541
12	.....	.....	3·31	1,803
13	.....	.....	3·69	2,610
14	4·46	5,178	3·80	2,900
15	4·75	6,365	4·00	3,500
16	4·60	5,750	4·23	4,291
17	4·40	4,935	4·19	4,145
18	4·25	4,365	4·00	3,500
19	3·98	3,438	3·95	3,345
20	4·07	3,731	3·70	2,635
21	3·97	3,407	3·42	2,005
22	3·98	3,438	3·27	1,737
23	4·08	3,764	3·03	1,397
24	4·37	4,820	2·98	1,337
25	4·10	3,830	3·03	1·397
26	3·82	2,958	3·07	1,447
27	3·69	2,610	3·17	1,583
28	3·46	2,085	3·12	1,513
29	3·24	1,689	3·11	1,499
30	3·38	1,929	3·16	1,569
31	3·38	1,929	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of South Similkameen River at Princeton, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·33	1,839	1·73	335	1·23	144	1·40	200	1·64	293	1·47	224
2	3·30	1,785	1·70	320	1·23	144	1·38	193	1·75	345	1·42	207
3	3·25	1,705	1·68	311	1·23	144	1·38	193	1·82	381	1·50	235
4	3·12	1,513	1·61	280	1·22	141	1·35	182	1·84	392	1·55	255
5	3·00	1,360	1·61	280	1·20	135	1·32	172	1·95	455	1·50	235
6	2·91	1,256	1·62	284	1·20	135	1·30	165	1·82	381	1·45	217
7	2·86	1,201	1·61	280	1·30	165	1·32	172	1·67	306	1·45	217
8	2·73	1,065	1·61	280	1·45	217	1·30	165	1·60	275	1·40	200
9	2·68	1,017	1·61	280	1·48	228	1·35	182	1·60	275	1·22	141
10	2·68	1,017	1·60	275	1·40	200	1·42	207	1·62	284	1·20	135
11	2·65	990	1·59	271	1·40	200	1·50	235	1·65	298	1·20	135
12	2·65	990	1·57	263	1·38	193	1·50	235	1·72	330	1·20	135
13	2·67	1,008	1·54	251	1·35	182	1·45	217	1·72	330	1·20	135
14	2·66	999	1·54	251	1·35	182	1·42	207	1·68	311	2·15	580
15	2·51	864	1·52	243	1·38	193	1·35	182	1·50	235	2·15	580
16	2·42	787	1·48	228	1·35	182	1·32	172	1·54	251	2·20	615
17	2·35	730	1·48	228	1·35	182	1·32	172	1·60	275	2·20	615
18	2·32	706	1·47	224	1·40	200	1·34	179	1·52	243	2·20	615
19	2·30	690	1·47	224	1·50	235	1·51	263	1·45	217	2·20	615
20	2·20	615	1·46	221	1·58	267	1·52	243	1·45	217	.....	.....
21	2·14	573	1·52	243	1·50	235	1·47	224	1·50	235	.....	.....
22	2·10	545	1·45	217	1·45	217	1·45	217	1·56	259	.....	.....
23	2·05	515	1·41	203	1·40	200	1·42	207	1·65	298	.....	.....
24	2·00	485	1·39	197	1·38	193	1·42	207	1·70	320	.....	.....
25	1·82	381	1·35	182	1·40	200	1·40	200	1·78	360	.....	.....
26	1·95	455	1·32	172	1·42	207	1·40	200	1·90	425	.....	.....
27	1·90	425	1·30	165	1·50	235	1·36	186	1·90	425	.....	.....
28	1·87	408	1·27	156	1·58	267	1·35	182	1·85	397	.....	.....
29	1·75	345	1·25	150	1·52	243	1·35	182	1·70	320	.....	.....
30	1·78	360	1·24	147	1·40	200	1·45	217	1·50	235	.....	.....
31	1·78	360	1·23	144	.....	.....	1·60	275	.....	.....	.....	.....

Monthly Discharge of South Similkameen River at Princeton, for 1914.

(Drainage area, 440 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	6,037	1,337	2,544·4	5·5	6·1	151,404
July	1,839	345	870·6	1·9	2·2	53,531
August	335	144	235·0	0·5	0·6	14,450
September	267	135	195·5	0·44	0·49	11,633
October	275	165	201·0	0·46	0·5	12,359
November	455	217	312·2	0·71	0·79	18,577
The period	6,037	135	726·4	1·58	10·68	261,954

Note.—Mean annual precipitation probably varies from 15 inches near the stream's confluence with the Tulameen river, to 50 inches at its source on the Skagit River divide.

Ice conditions existed subsequent to December 19.

Tulameen River (2062).

Locaiion.—At Coalmont, Water District No. 4.
Records Available.—May 15 to October 3, 1914.
Drainage Area.—Four hundred square miles.
Gauge.—Chain gauge. Brass jack chain and 3-pound sash weight on downstream side of bridge at measuring station, read by J. J. Currie.
Channel.—Straight for about 700 feet at measuring section. Bed of stream of clean gravel and permanent. Average width about 100 feet.
Discharge Measurements.—The gauge-height discharge curve is fairly well rated by well-distributed meterings.
Winter Flow.—No winter records have been made. Ice conditions prevail on this river during the latter part of December, January and February.
Accuracy.—Fairly high, results compiled from a well-rated curve.

Tulameen River.

The Tulameen river is one of the largest tributaries of the Similkameen. It rises in many small branches in the eastern slopes of the Hope Range, whose summits are over 7,000 feet in altitude, and joins the Similkameen at Princeton at an elevation of 2,100 feet, after a course of 45 miles.

The tributaries entering from the right going upstream are China creek, Cook creek, Otter creek, Bear creek, Eagle creek, and Siwash creek. Otter creek is the largest tributary. It flows in from the north through a broad deep valley, joining at the village of Tulameen, 16 miles from Princeton. From the left going upstream are Granite creek, Cedar creek, Slate creek, and Champion creek. The largest and most important of these, because of the gold and platinum deposits found in its bed, is Granite creek, which flows in at the village of Granite Creek, 10 miles up the Tulameen valley from Princeton. In 1885, on the discovery of gold in Granite creek, the Granite Creek rush took place. In 1886 the village of Granite Creek had a population of over 2,000, and in that year $193,000 worth of gold and platinum were washed out of the gravel of the creek. Since 1888 placer mining has been on the decline, and at present the population of Granite Creek consists of five or six families.

There are valuable deposits of coal, copper, and gold in the district. Two coal mines are at present working on a small scale, at Princeton and at Coalmont. The Kettle Valley and Great Northern railroads connecting this country with Vancouver, which are now near completion, should give rise to an era of development and progress. The amount of arable land is practically negligible. The valleys of the river and its tributaries, with the exception of the Tulameen for 3 miles between Slate creek and Otter creek, are very narrow. They are, in fact, little better than deep narrow canyons. The valley of the Otter and the portion of the Tulameen mentioned above, which are much wider, contain some good land. It is nearly all homesteaded. The altitude is over 2,700 feet, and although this is below the limit of cultivation in other parts of the Interior Plateau region, yet wheat cannot be successfully grown.

The climate over the drainage basin of the Tulameen and its tributaries is variable, depending on the locality. At Princeton the mean annual precipitation is 13 inches. At Coalmont and Tulameen and in the Otter valley it is probably not much greater than this. In the higher altitudes and on the eastern slopes of the Hope mountains at the sources of the Tulameen it varies from 20 to 40 inches per annum. Temperatures are not extreme, and are as a rule lower than the Okanagan country. The yearly average is about 45° F. In Bulletin 27 of the Bureau of Provincial Information, the maximum is shown as being 101° in 1897 and 1904, and the minimum as 45° in 1907.

The current of the Tulameen is swift except in the three miles between Slate and Otter creek, where it meanders through a valley about one-half mile wide, at grade of 29 feet to the mile. Otter creek has a peculiarly sluggish current for a mountain stream. For a distance of 8 miles north from the mouth it has an average grade of 12 feet to the mile. About 4 miles of this distance is occupied by lakes. Above Slate creek the Tulameen has a grade of about 100 feet to the mile, and rushes through a narrow steep-sided canyon. Its tributaries, excepting the Otter, are very swift and occupy deep V-shaped valleys. The country is heavily wooded on the upper slopes. On the lower slopes the trees grow in more open order. Fir, yellow pine, lodgepole pine, and poplar predominate.

A regular gauging station was established at Coalmont on May 14, 1914. Records are available from that date.

Discharge Measurements of Tulameen River at Coalmont, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
Nov. 16.....	E. M. Dann & K. G. Chisholm	1,505	136	228	3·76	—	846[1]
1914.							
May 14.....	K. G. Chisholm.....	1,505	143	601·0	8·82	4·03	5,300
June 14.....	"	1,913	118	387·0	4·60	2·50	1,778
" 19.....	"	1,913	118	333·0	3·84	2·10	1,277
July 26.....	"	1,913	80	130·0	1·05	0·13	137
Sept. 4.....	"	1,913	80	95·5	0·41	−0·30	39[2]
Nov. 25.....	"	1,673	102	181·0	1·73	0·63	314

[1]Measurement made at Princeton before regular station was established.
[2]Not at regular section.

Daily Gauge Height and Discharge of Tulameen River near Coalmont, for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3·00	2,660
2			3·10	2,870
3			3·00	2,660
4			2·75	2,185
5			2·35	1,575
6			2·20	1,390
7			2·05	1,230
8			2·00	1,180
9			1·95	1,135
10			2·00	1,180
11			2·10	1,280
12			2·50	1,780
13			2·55	1,855
14			2·65	2,015
15	3·80	4,640	2·75	2,185
16	3·80	4,640	2·95	2,560
17	3·35	3,450	2·65	2,015
18	3·35	3,450	2·35	1,575
19	3·35	3,450	2·05	1,230
20	3·30	3,325	1·80	1,005
21	3·30	3,325	1·60	850
22	3·25	3,205	1·60	850
23	3·55	3,960	1·50	780
24	3·70	4,365	1·60	850
25	3·30	3,325	1·75	965
26	2·70	2,100	1·55	815
27	2·60	1,935	1·65	885
28	2·55	1,850	1·40	715
29	2·10	1,280	1·50	780
30	2·30	1,510	1·60	850
31	2·70	2,100		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Tulameen River near Coalmont, for 1914.

Day.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·45	745	−0·05	90	.....	.....	0·10	125
2	1·35	685	−0·15	70	.....	.....	−0·10	80
3	1·54	745	−0·15	70	.....	.....	0	100
4	1·30	655	−0·15	70	−0·30	40	0	100
5	1·15	565	−0·15	70	−0·30	40	0	100
6	0·95	455	−0·15	70	−0·30	40	0	100
7	0·95	455	−0·15	70	−0·30	40	0	100
8	0·95	455	−0·05	90	−0·30	40	0	100
9	0·85	405	−0·05	90	−0·20	60	0	100
10	0·90	430	−0·15	70	0·10	125	0	100
11	0·90	430	−0·15	70	0·10	125	0	100
12	.....	.....	−0·15	70	−0·10	80	0·10	125
13	0·50	250	−0·15	70	0·10	125	0·10	125
14	0·50	250	−0·15	70	0·20	150	0	100
15	0·60	290	−0·15	70	0	100	0	100
16	0·50	250	−0·15	70	−0·10	80	0	100
17	0·40	215	.....	.....	−0·10	80	0	100
18	0·40	215	.....	.....	0·10	125	0·10	125
19	0·40	215	.....	.....	0·10	125	0·20	150
20	0·40	215	.....	.....	0·10	125	0·20	150
21	0·25	165	.....	.....	0·10	125	0·10	125
22	0·25	165	.....	.....	0·10	125	0·20	150
23	0·15	135	.....	.....	−0·20	60	0	100
24	0·15	135	.....	.....	−0·20	60	−0·20	60
25	0·15	135	.....	.....	−0·10	80	−0·10	80
26	0·10	125	.....	.....	0·10	125	0	100
27	0·10	125	.....	.....	0	100	0	100
28	0·10	125	.....	.....	0·10	125	0·10	125
29	0·00	100	.....	.....	−0·10	80	0·20	150
30	−0·10	80	.....	.....	0	100	0·10	125
31	−0·10	80	.....	.....	.....	.....	0·30	180

Monthly Discharge of Tulameen River near Coalmont, for 1914.

(Drainage area, 400 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet.
May	4,640	1,280	3,053·5	7·63	8·80	187,753
June	2,870	780	1,463·5	3·66	4·08	87,086
July	745	80	309·8	0·77	0·89	19,050
August	90	70	73·7	0·18	0·21	4,531
September	125	40	91·8	0·23	0·26	5,462
October	180	60	112·1	0·28	0·32	6,893
The period	4,640	40	850·7	2·12	14·56	310,775

Note.—Mean annual precipitation at the stream's confluence with the South Similkameen river is probably 15 inches, at the head waters of Granite creek and Tulameen river proper it is probably 50 inches, while at the head of Otter creek it is probably 20 to 30 inches per annum.

Ice conditions existed during part of November and December.

Thompson River at Chase, B.C. (2042).

Location.—Section 35, township 21, range 13, west 6th meridian.

Records Available.—April 22 to July 31, 1911; April 10 to December 31, 1912; April 12 to December 31, 1913; January 1 to 27, March 24 to December 31, 1914.

Drainage Area.—Seven thousand square miles.

Gauge.—A vertical staff gauge is used and read daily by Mr. F. J. Gook of the Adams River Lumber Company, Chase, B.C.

Channel.—Above the measuring section river broadens out into Little Shuswap lake. Below section river is straight for 200 yards.

Discharge Measurements.—Eleven well-distributed measurements have been made during 1911, 1912, and 1913. Measurements are made from cable and boat.

Winter Conditions.—The Thompson, at Chase, remains partially open throughout the year except during severe winters.

Accuracy.—The accuracy of returns is considered to be high, and should fall within 10 per cent.

Discharge Measurements of Thompson River, at Chase, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 31.....	E. M. Dann & K. G. Chisholm.....	1505	358	3,610	0·77	2·58	2,794

For further hydrographic data see Water Resources Paper Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Thompson River, near Chase, B.C., for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·95	3,390	.....	.....	.....	2,940	2·50	2,720	5·20	9,160	8·85	24,225
2	2·95	3,390	.....	.....	.....	2,940	2·50	2,720	5·35	9,670	8·85	24,225
3	2·95	3,390	.....	.....	.....	2,940	2·60	2,840	5·60	10,540	8·95	24,675
4	2·95	3,390	.....	.....	.....	2,940	2·60	2,840	5·58	11,445	9·15	25,575
5	2·95	3,390	.....	.....	.....	2,830	2·60	2,840	6·00	12,000	9·25	26,035
6	2·95	3,390	.....	.....	.....	2,830	2·60	2,840	6·15	12,600	9·30	26,250
7	2·95	2,390	.....	.....	.....	2,830	2·60	2,840	6·25	13,000	9·30	26,250
8	2·95	3,390	.....	.....	.....	2,830	2·60	2,840	6·35	13,400	9·35	26,475
9	2·95	3,390	.....	.....	.....	2,830	2·65	2,910	6·40	13,600	9·40	26,700
10	2·95	3,390	.....	.....	.....	2,830	2·75	3,050	6·50	14,000	9·40	26,700
11	2·95	3,390	.....	.....	.....	2·830	2·85	3,210	6·60	14,400	9·40	26,700
12	3·05	3,570	.....	.....	.....	2,830	3·05	3,570	6·75	15,000	9·50	27,150
13	3·05	3,570	.....	.....	.....	2,830	3·20	3,840	6·85	15,400	9·55	27,375
14	3·05	2,570	.....	.....	.....	2,730	3·35	4,120	7·05	16,200	9·60	27,600
15	3·05	3,570	.....	.....	.....	2,730	3·40	4,220	7·25	17,025	9·75	28,275
16	3·05	3,570	.....	.....	.....	2,730	3·55	4,565	7·55	18,375	9·85	28,725
17	3·05	3,570	.....	.....	.....	2,730	3·65	4,795	7·65	18,825	10·00	29,450
18	3·05	3,570	.....	.....	.....	2,730	3·85	5,275	7·75	19,275	10·05	29,700
19	3·05	3,570	.....	.....	.....	2,730	4·00	5,650	7·90	19,950	10·10	29,950
20	3·05	3,570	.....	.....	.....	2,730	4·05	5,775	8·05	20,625	10·20	30,450
21	3·05	3,570	.....	.....	.....	2,730	4·15	6,025	8·15	21,075	10·20	30,450
22	3·05	3,570	.....	.....	.....	2,730	4·30	6,430	8·25	21,525	10·20	30,450
23	3·05	3,570	.....	.....	.....	2,730	4·40	6,710	8·35	21,975	10·15	30,200
24	3·05	3,570	.....	.....	2·50	2,720	4·40	6,710	8·55	22,875	10·10	29,950
25	3·05	3,570	.....	.....	2·50	2,720	4·50	7,000	.....	23,550	10·10	29,950
26	3·05	3,570	.....	.....	2·50	2,720	4·65	7,450	8·80	24,000	10·10	29,950
27	2·95	3,390	2·75	3,050	2·50	2,720	4·80	7,910	8·80	24,000	10·10	29,950
28	.....	.....	.....	.....	2·50	2,720	4·90	8,220	8·90	24,450	10·10	29,950
29	.....	.....	.....	.....	2·50	2,720	5·05	8,685	8·90	24,450	10·10	29,950
30	.....	.....	.....	.....	2·50	2,720	5·15	9,000	8·90	24,450	10·10	29,950
31	.....	.....	.....	.....	2·50	2,720	.....	.....	8·90	24,450	.....	.....

Daily Gauge Height and Discharge of Thompson River, near Chase, B.C., for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
1	10·10	29,950	7·65	16,200	4·60	7,300	4·00	5,650	4·50	7,000	4·45	6,855
2	10·10	29,950	7·00	16,000	4·60	7,300	4·00	5,650	4·60	7,300	4·40	6,710
3	10·10	29,950	6·85	15,400	4·60	7,300	4·00	5,650	4·60	7,300	4·40	6,710
4	10·10	29,950	6·75	15,000	4·50	7,000	4·00	5,650	4·65	7,450	4·35	6,570
5	10·10	29,950	6·55	14,200	4·50	7,000	4·00	5,650	4·70	7,600	4·30	6,430
6	10·10	29,950	6·45	13,800	4·50	7,000	3·90	5,400	4·75	7,755	4·30	6,430
7	10·10	29,450	6·30	13,200	4·50	7,000	3·90	5,400	4·80	7,910	4·30	6,430
8	9·90	28,950	6·25	13,000	4·40	6,710	3·90	5,400	4·80	7,910	4·30	6,430
9	9·80	28,500	6·20	12,800	4·40	6,710	3·90	5,400	4·80	7,910	4·20	6,150
10	9·65	27,825	6·10	12,400	4·40	6,710	3·90	5,400	4·90	8,220	4·20	6,150
11	9·50	27,150	5·95	11,815	4·40	6,710	3·90	5,400	4·90	8,220	4·10	5,900
12	9·45	26,925	5·85	11,445	4·40	6,710	3·90	5,400	4·90	8,220	4·10	5,900
13	9·40	26,700	5·75	11,075	4·30	6,430	3·90	5,400	4·90	8,220	4·00	5,650
14	9·30	26,250	5·70	10,890	4·25	6,290	4·00	5,650	4·90	8,220	4·00	6,650
15	9·30	26,250	5·65	10,715	4·20	6,150	4·00	5,650	4·90	8,220	4·00	5,650
16	9·30	26,250	5·60	10,540	4·20	6,150	4·00	5,650	4·90	8,220	4·00	5,650
17	9·25	26,025	5·50	10,196	4·10	5,900	4·00	5,650	4·80	7,910	3·90	5,400
18	9·15	25,575	5·40	9,840	4·10	5,900	4·10	5,900	4·80	7,910	3·90	5,400
19	9·05	25,125	5·30	9,500	4·00	5,650	4·15	6,025	4·80	7,910	3·80	5,150
20	8·90	24,450	5·20	9,160	4·00	5,650	4·20	6,150	4·80	7,910	3·75	5,030
21	8·75	23,775	5·20	9,160	4·00	5,650	4·30	6,430	4·75	7,755	3·70	4,910
22	8·70	23,550	5·15	9,000	4·00	5,650	4·30	6,430	4·70	7,600	3·70	4,910
23	8·60	23,100	5·10	8,840	3·95	5,525	4·30	6,430	4·70	7,600	3·70	4,910
24	8·45	22,425	5·00	8,530	3·90	5,400	4·35	6,570	4·65	7,450	3·60	4,680
25	8·25	21,525	4·90	8,220	3·90	5,400	4·40	6,710	4·60	7,300	3·60	4,680
26	8·05	20,625	4·85	8,065	3·90	5,400	4·40	6,710	4·60	7,300	3·55	4,565
27	7·85	19,725	4·80	7,910	3·90	5,400	4·40	6,710	4·50	7,000	3·50	4,450
28	7·65	18,825	4·70	7,600	3·90	5,400	4·40	6,710	4·50	7,000	3·50	4,450
29	7·45	17,925	4·65	7,450	4·00	5,650	4·40	6,710	4·50	7,000	3·50	4,450
30	7·25	17,025	4·60	7,300	4·00	5,650	4·40	6,710	4·50	7,000	3·50	4,450
31	7·20	16,890	4·60	7,300	.....	.....	4·45	6,855	.....	.....	3·50	4,450

Monthly Discharge of Thompson River, at Chase, B.C., for 1914.

(Drainage area, 7,000 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	3,570	3,390	3,490	0·5	0·6	214,590
February	.....	.....	3,000	0·4	0·4	166,600
March	2,940	2,720	2,783	0·4	0·4	171,123
April	9,000	2,720	4,920	0·7	0·8	292,760
May	24,450	9,160	17,783	2·5	2·9	1,093,363
June	30,450	24,225	28,107	4·0	4·5	1,672,540
July	29,950	16,800	25,175	3·6	4·1	1,547,950
August	16,200	7,300	10,856	1·5	1·7	667,516
September	7,300	5,400	6,223	0·9	1·0	370,300
October	6,855	5,400	5,971	0·8	0·9	367,142
November	8,220	7,000	7,677	1·1	1·2	456,813
December	6,855	4,450	5,521	0·8	0·9	339,472
The year	30,450	2,720	10,125	1·4	19·4	7,360,169

Note.—Flow for February estimated. River under entire or partial ice conditions.

Precipitation probably varies from 20 inches per annum at Chase to 50 inches at the headwaters of streams tributary to Shuswap lake.

Barnes Creek (2001).

Location.—Section 23, township 20, range 24, west 6th meridian.

Records Available.—April 26 to September 14, 1912; May 1 to December 14, 1913; April 1 to December 8, 1914.

Drainage Area.—Thirty-eight square miles.

Gauge.—Standard vertical staff gauge, graduated in feet and tenths, and read daily by C. Crossley.

Channel.—Channel straight at measuring section. Velocity medium. Bed of stream permanent.

Discharge Measurements.—Discharge measurements made by wading at all stages, except very high water.

Winter Flow.—Ice conditions prevail on this stream during January, February, and March.

Accuracy.—The accuracy of results is considered to be very high, the curve being well defined, and returns should fall within 5 per cent.

Discharge Measurements of Barnes Creek above Barnes Lake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 6.....	C. B. Corbould.....	1915	8	·4	0·75	0·35	3·0

Station rated during 1911 and 1912. Hydrographer notes that on July 6 no water was running into Barnes lake, it was all going down the gulch to the Tiffin ranch, and other lands just east of Ashcroft. He estimates that about ·5 sec.-feet is flowing out of Barnes lake and joining Barnes creek one-quarter mile below.

For further hydrographic data see Water Resources Papers Nos. 1 and 3.

Daily Gauge Height and Discharge of Barnes Creek, Barnes Lake, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·30	2·0	0·70	19·0	0·80	27·0
2	0·32	2·4	0·85	31·0	0·80	27·0
3	0·37	3·4	0·90	35·0	0·80	27·0
4	0·42	4·6	0·80	27·0	0·80	27·0
5	0·47	6·1	0·80	27·0	0·80	27·0
6	0·50	7·0	0·80	27·0	0·70	19·0
7	0·50	7·0	0·80	27·0	0·80	27·0
8	0·50	7·0	0·82	28·6	0·80	27·0
9	0·50	7·0	0·95	39·5	0·80	27·0
10	0·50	7·0	1·20	63·0	0·80	27·0
11	0·50	7·0	1·40	83·0	0·80	27·0
12	0·50	7·0	1·40	83·0	0·80	27·0
13	0·52	8·0	1·40	83·0	0·80	27·0
14	0·62	13·4	1·45	88·0	0·80	27·0
15	0·62	13·4	1·50	93·0	0·70	19·0
16	0·60	12·0	1·40	83·0	0·70	19·0
17	0·60	12·0	1·32	75·0	0·60	12·0
18	0·60	12·0	1·30	73·0	0·50	7·0
19	0·60	12·0	1·15	58·5	0·50	7·0
20	0·60	12·0	1·10	54·0	0·50	7·0
21	0·50	7·0	1·00	44·0	0·50	7·0
22	0·50	7·0	1·00	44·0	0·60	12·0
23	0·50	7·0	1·00	44·0	0·60	12·0
24	0·50	7·0	1·10	54·0	0·60	12·0
25	0·50	7·0	1·00	44·0	0·55	9·5
26	0·50	7·0	1·00	44·0	0·50	7·0
27	0·50	7·0	1·00	44·0	0·50	7·0
28	0·55	9·5	0·90	35·0	0·50	7·0
29	0·60	12·0	0·80	27·0	0·50	7·0
30	0·65	15·5	0·80	27·0	0·50	7·0
31	.....	.....	0·80	27·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Barnes Creek, near Barnes Lake, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·50	7·0	0·30	2·0	0·20	0·7	0·40	4·0	0·40	4·0	0·45	5·5
2	0·50	7·0	0·30	2·0	0·20	0·7	0·40	4·0	0·40	4·0	0·45	5·5
3	0·40	4·0	0·30	2·0	0·20	0·7	0·40	4·0	0·40	4·0	0·45	5·5
4	0·40	4·0	0·30	2·0	0·20	0·7	0·40	4·0	0·40	4·0	0·45	5·5
5	0·40	4·0	0·30	2·0	0·20	0·7	0·40	4·0	0·40	4·0	0·45	5·5
6	0·40	4·0	0·30	2·0	0·20	0·7	0·40	4·0	0·40	4·0	0·45	5·5
7	0·40	4·0	0·30	2·0	0·22	1·0	0·40	4·0	0·40	4·0	0·50	7·0
8	0·45	5·5	0·30	2·0	0·30	2·0	0·40	4·0	0·40	4·0	0·50	7·0
9	0·50	7·0	0·30	2·0	0·35	3·0	0·40	4·0	0·40	4·0	.....	.....
10	0·50	7·0	0·30	2·0	0·35	3·0	0·40	4·0	0·40	4·0	.....	.....
11	0·50	7·0	0·30	2·0	0·35	3·0	0·40	4·0	0·40	4·0	.....	.....
12	0·50	7·0	0·30	2·0	0·35	3·0	0·40	4·0	0·40	4·0	.....	.....
13	0·50	7·0	0·30	2·0	0·32	2·4	0·40	4·0	0·40	4·0	.....	.....
14	0·50	7·0	0·30	2·0	0·30	2·0	0·40	4·0	0·42	4·6	.....	.....
15	0·50	7·0	0·30	2·0	0·30	2·0	0·45	5·5	0·45	5·5	.....	.....
16	0·50	7·0	0·30	2·0	0·30	2·0	0·45	5·5	0·47	6·1	.....	.....
17	0·50	7·0	0·30	2·0	0·32	2·4	0·45	5·5	0·50	7·0	.....	....
18	0·40	4·0	0·30	2·0	0·37	3·4	0·50	7·0	0·50	7·0	.....	.....
19	0·40	4·0	0·30	2·0	0·40	4·0	0·50	7·0	0·50	7·0	.....	.....
20	0·40	4·0	0·30	2·0	0·40	4·0	0·50	7·0	0·50	7·0	.....	.....
21	0·40	4·0	0·25	1·4	0·40	4·0	0·50	7·0	0·50	7·0	.....	.....
22	0·40	4·0	0·25	1·4	0·40	4·0	0·50	7·0	0·50	7·0	.....	.....
23	0·40	4·0	0·25	1·4	0·40	4·0	0·50	7·0	0·50	7·0	.....	.....
24	0·40	4·0	0·22	1·0	0·40	4·0	0·50	7·0	0·50	7·0	.....	.....
25	0·40	4·0	0·20	0·7	0·40	4·0	0·45	5·5	0·50	7·0	.....	.....
26	0·40	4·0	0·20	0·7	0·40	4·0	0·45	5·5	0·50	7·0	.....	.....
27	0·40	4·0	0·20	0·7	0·35	3·0	0·40	4·0	0·50	7·0	.....	.....
28	0·40	4·0	0·20	0·7	0·35	3·0	0·40	4·0	0·50	7·0	.....	.....
29	0·40	4·0	0·20	0·7	0·40	4·0	0·40	4·0	0·50	7·0	.....	.....
30	0·35	3·0	0·20	0·7	0·40	4·0	0·40	4·0	0·50	7·0	.....	.....
31	0·35	3·0	0·20	0·7	.....	.....	0·40	4·0	.....	.....	.....	.....

Monthly Discharge of Barnes Creek, near Barnes Lake, for 1914.

(Drainage area, 38 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet.
April	15·5	2·0	8·3	0·2	0·2	492
May	93·0	19·0	49·4	1·3	1·5	3,038
June	27·0	7·0	17·6	0·5	0·5	1,048
July	7·0	3·0	5·0	0·1	0·2	310
August	2·0	0·7	1·6	0·04	0·05	98
September	4·0	0·7	2·6	0·1	0·1	154
October	7·0	4·0	4·9	0·1	0·2	301
November	7·0	4·0	5·5	0·1	0·2	327
December	7·0	5·5	(for period Dec. 1 to Dec. 8.)			
The period	93·0	0·7	11·8	0·30	2·95	5,768

Note.—Winter conditions prevail after December 8.

Bonaparte River (2003).

Location.—Section 18, township 21, range 24, west 6th meridian.

Records Available.—June 10 to November 6, 1911; March 25 to December 22, 1912; March 30 to December 31, 1913; January 1 to December 9, 1914.

Drainage Area.—Two thousand square miles.

Gauge.—Standard vertical staff gauge read daily by J. G. Collins.

Channel.—Channel straight at measuring section, average width 50 feet. Velocity high.

Discharge Measurements.—Discharge measurements are made by wading, except at high water, when cable carrier is used.

Winter Flow.—Ice conditions prevail on this stream during January and February.

Accuracy.—The accuracy of returns is considered very high, the curve being well defined, and results should fall within 5 per cent.

Discharge Measurements of Bonaparte River, near mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 22.....	C. B. Corbould.....	1673	54	160	6·28	3·23	1,005[1]
July 9.....	"	1915	48	107	3·3	1·98	359[2]

[1] Actual gauge height 3·30, gauge sunk 0·07 foot during the winter, thus making actual readings 0·07 too high.
[2] Actual gauge height 2·05.
For further hydrographic data see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Heights and Discharge of Bonaparte River, near Collins Ranch, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·03	70	1·03	70	1·03	70	1·38	164·5	3·08	841	2·83	651
2	0·98	56	0·98	56	1·03	70	1·33	150·5	3·13	889	2·83	651
3	0·98	56	0·98	56	1·03	70	1·33	150·5	2·93	717·5	2·78	622
4	1·03	70	0·98	56	1·08	83	1·38	164·5	3·03	795	2·78	622
5	1·08	83	0·98	56	1·08	83	1·38	164·5	3·13	889	2·78	622
6	1·08	83	0·98	56	1·08	83	1·63	232·5	3·23	993·5	2·78	622
7	1·13	96	0·98	56	1·08	83	1·68	246·5	3·33	1,109	2·78	622
8	1·13	96	0·98	56	1·08	83	1·73	260·0	3·33	1,109	2·78	622
9	1·08	83	0·98	56	1·13	96	1·78	273·5	3·43	1,232·5	2·73	597
10	1·03	70	0·98	56	1·13	96	1·88	302	3·53	1,354	2·78	622
11	1·13	96	0·98	56	1·18	110	1·93	317	3·63	1,482·5	2·83	651
12	1·13	96	0·98	56	1·18	110	2·03	347	3·68	1,553·5	2·88	683
13	1·13	96	0·98	56	1·18	110	2·13	377	3·73	1,625	2·93	717·5
14	1·13	96	0·93	42·5	1·23	123	2·23	408	3·73	1,625	2·93	717·5
15	1·08	83	0·93	42·5	1·28	137	2·43	475·5	3·83	1,768·5	2·98	753·5
16	1·08	83	0·93	42·5	1·28	137	2·58	532	3·83	1,768·5	2·98	753·5
17	1·18	110	0·93	42·5	1·33	150·5	2·68	573·5	3·73	1,625	2·83	651·0
18	1·23	123	0·93	42·5	1·38	164·5	2·83	651	3·63	1,482·5	2·73	597
19	1·13	96	0·93	42·5	1·38	164·5	2·83	651	3·53	1,354	2·63	552·5
20	1·08	83	0·93	42·5	1·48	191·5	3·03	795	3·43	1,232·5	2·58	532
21	1·08	83	0·93	42·5	1·53	205	2·83	651	3·23	993·5	2·53	512
22	1·08	83	0·93	42·5	1·53	205	2·78	622	3·28	1,049·5	2·43	475·5
23	1·08	83	0·93	42·5	1·48	191·5	2·78	622	3·28	1,049·5	2·43	475·5
24	1·08	83	0·93	42·5	1·43	178·0	2·73	597	3·33	1,109	2·43	475·5
25	1·08	83	0·98	56·0	1·33	150·5	2·73	597	3·28	1,049·5	2·48	493
26	1·03	70	0·98	56·0	1·23	123	2·73	597	3·23	993·5	2·48	493
27	1·03	70	0·98	56·0	1·33	150·5	2·73	597	3·18	940	2·48	493
28	1·03	70	1·03	70	1·33	150·5	2·78	622	3·13	889	2·43	475·5
29	1·03	70	.....	.....	1·38	164·5	2·83	651	3·03	795	2·43	475·5
30	1·03	70	.....	.....	1·43	178	2·93	717·5	2·88	683	2·43	475·5
31	1·03	70	.....	.....	1·43	178	.....	.....	2·83	651	.....	.....

DAILY GAUGE HEIGHT AND DISCHARGE of Bonaparte River, at Collins Ranch, for 1914.—*Con.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·38	458	1·53	205	0·98	56	1·13	96	1·03	70	1·13	96
2	2·33	440·5	1·48	191·5	0·98	56	1·08	83	1·03	70	1·13	96
3	2·28	423·5	1·43	178	0·93	42·5	1·08	83	1·03	70	1·13	96
4	2·23	408	1·38	164·5	0·93	42·5	1·08	83	1·03	70	1·13	96
5	2·18	392	1·33	150·5	0·93	42·5	1·08	83	1·08	83	1·13	96
6	2·13	377	1·33	150·5	0·93	42·5	1·08	83	1·08	83	1·13	96
7	2·08	362	1·28	137	0·93	42·5	1·08	83	1·08	83	1·13	96
8	2·03	347	1·28	137	0·98	56·0	1·08	83	1·08	83	1·23	103
9	1·98	332	1·23	123	0·98	56·0	1·08	83	1·08	83	1·28	137
10	1·93	317	1·23	123	0·93	42·5	1·13	96	1·03	70	.....	.....
11	1·88	302	1·23	123	1·13	96	1·13	96	1·03	70	.....	.....
12	1·83	288	1·23	123	1·08	83	1·13	96	1·03	70	.....	.....
13	1·83	288	1·23	123	1·13	96	1·08	83	1·08	83	.....	.....
14	1·78	273·5	1·18	110	1·13	96	1·08	83	1·08	83	.....	.....
15	1·83	288	1·18	110	1·13	96	1·08	83	1·08	83	.....	.....
16	1·78	273·5	1·18	110	1·18	110	1·03	70	1·08	83	.....	.....
17	1·78	273·5	1·18	110	1·18	110	1·03	70	1·13	96	.....	.....
18	1·73	260	1·18	110	1·23	123	1·03	70	1·13	96	.....	.....
19	1·68	246·5	1·18	110	1·23	123	1·03	70	1·13	96	.....	.....
20	1·73	260	1·13	96	1·28	137	1·03	70	1·13	96	.....	.....
21	1·68	246·5	1·13	96	1·28	137	1·03	70	1·18	110	.....	.....
22	1·68	246·5	1·13	96	1·23	123	1·03	70	1·18	110	.....	.....
23	1·63	232·5	1·13	96	1·23	123	1·03	70	1·23	123	.....	.....
24	1·63	232·5	1·08	83	1·18	110	1·03	70	1·23	123	.....	.....
25	1·63	232·5	1·08	83	1·18	110	1·03	70	1·18	110	.....	.....
26	1·68	246·5	1·08	83	1·13	96	1·03	70	1·18	110	.....	.....
27	1·63	232·5	1·03	70	1·13	96	1·03	70	1·18	110	.....	.....
28	1·63	232·5	1·03	70	1·13	96	1·03	70	1·18	110	.....	.....
29	1·58	218·5	1·03	70	1·13	96	1·03	70	1·13	96	.....	.....
30	1·58	218·5	0·98	56	1·13	96	1·03	70	1·13	96	.....	.....
31	1,53	205·0	0·98	56	.....	.....	1·03	70			.....	.....

SESSIONAL PAPER No. 25e

Monthly Discharge of Bonaparte River at Collins Ranch, near Ashcroft, for 1914.

(Drainage area, 2,000 square miles.)

Month.	Discharges in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	123	56·0	82·6	0·04	0·05	5,079
February	70	42·5	51·7	0·03	0·03	2,871
March	205	70	131·9	0·06	0·07	8,110
April	795	150·5	450·3	0·22	0·25	26,795
May	1,768·5	651	1,149·9	0·57	0·66	70,710
June	753·5	475·5	590·1	0·29	0·32	35,113
July	458	205	295·3	0·15	0·17	18,157
August	205	56	114·3	0·06	0·07	7,028
September	137	42·5	87·7	0·04	0·05	5,218
October	96	70	77·9	0·04	0·05	4,790
November	123	70	90·6	0·04	0·05	5,391
December	137	96	(for period	Dec. 1 to D	ec. 9.)	
The year	1,768·5	42·5	270 (estimated)	0·13 (estimated)	1·82 (estimated)	195,000 (estimated)

Note.—Winter conditions obtained after December 9.

Precipitation varies from a minimum of 5 to a maximum of 25 inches per annum. The low run-off "depth in inches on drainage area" seems to indicate high evaporation losses, and probably an over-estimate of the drainage area, which however, was taken from the best available map.

Criss Creek (2007).

Location.—Sec. 32, township 22, range 22, west 6th meridian.

Records Available.—June 14 to September 14, 1912; April 22 to November 21, 1913; April 1 to December 9, 1914.

Drainage Area.—One hundred and fifty square miles.

Gauge.—Standard vertical staff gauge, read daily by W. J. Hoey.

Channel.—The channel at measuring section is straight. Velocity is high Bed of stream composed of gravel and boulders.

Winter Flow.—Ice conditions exist on this stream during January, February, and part of March.

Accuracy.—The accuracy of returns is considered to be very high. The curve is well rated, and results should be within 5 per cent.

Discharge Measurements of Criss Creek above Deadman River, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity	Gauge Height	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft
May 21	C. B. Corbould	1673	32	77	5·34	2·05	412
July 10	C. B. Corbould	1915	23	29·5	0·83	0·35	24·5

Actual gauge height 2·10 gauge sunk ·05 feet during winter, thus making actual reading ·05 too high.

Actual gauge height 0·4.

See measurements 1913, Water Resources Paper No. 8.

Daily Gauge Height and Discharge of Criss Creek near Hoey's Ranch, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·25	18·3	1·45	165·8	1·25	117·0
2	0·25	18·3	1·75	265·0	1·25	117·0
3	0·25	18·3	1·95	360·8	1·30	127·5
4	0·55	29·0	2·15	471·5	1·30	127·5
5	0·65	34·8	2·25	532·5	1·25	117·0
6	0·95	64·2	2·15	471·5	1·25	117·0
7	1·00	71·0	2·10	443·0	1·35	140·0
8	1·05	79·2	1·95	360·8	1·45	165·8
9	1·10	87·5	1·95	360·8	1·55	194·0
10	1·10	87·5	1·95	360·8	1·75	265·0
11	1·15	97·0	1·85	309·5	1·85	309·5
12	1·25	117·0	1·75	265·0	1·85	309·5
13	1·25	117·0	1·75	265·0	1·75	265·0
14	1·25	117·0	1·85	309·5	1·65	227·0
15	1·25	117·0	1·95	360·8	1·55	194·0
16	1·35	140·0	2·25	532·5	1·50	179·0
17	1·35	140·0	2·15	471·5	1·45	165·8
18	1·35	140·0	2·05	415·2	1·35	140·0
19	1·45	165·8	1·95	360·8	1·25	117·0
20	1·45	165·8	1·95	360·8	1·25	117·0
21	1·45	165·8	1·85	309·5	1·25	117·0
22	1·35	140·0	1·85	309·5	1·25	117·0
23	1·25	117·0	1·95	360·8	1·15	97·0
24	1·25	117·0	1·85	309·5	1·15	97·0
25	1·25	117·0	1·75	265·0	1·05	79·2
26	1·25	117·0	1·65	227·0	1·05	79·2
27	1·25	117·0	1·65	227·0	0·95	64·2
28	1·25	117·0	1·60	209·0	0·95	64·2
29	1·25	117·0	1·55	194·0	0·95	64·2
30	1·25	117·0	1·45	165·8	0·95	64·2
31			1·35	140·0		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Criss Creek near Hoey's Ranch, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·90	57·5	0·05	13·0	−0·25	6·5	0·16	14·0	0·15	15·5	0·15	15·5
2	0·85	52·2	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
3	0·75	42·5	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
4	0·75	42·5	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
5	0·65	34·8	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
6	0·65	34·8	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
7	0·60	31·5	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
8	0·60	31·5	0·00	12·0	−0·25	6·5	0·15	15·5	0·15	15·5	0·15	15·5
9	0·45	24·5	0·00	12·0	−0·35	4·5	0·15	15·5	0·15	15·5	0·25	18·3
10	0·35	21·0	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
11	0·35	21·0	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
12	0·25	18·3	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
13	0·25	18·3	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
14	0·45	24·5	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
15	0·55	29·0	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
16	0·65	34·8	−0·05	10·8	−0·25	6·5	0·15	15·5	0·15	15·5	.....	.....
17	0·75	42·5	−0·10	9·5	−0·15	8·5	0·20	17·0	0·15	15·5	.....	.....
18	0·75	42·5	−0·10	9·5	−0·05	10·8	0·20	17·0	0·15	15·5	.....	.....
19	0·55	29·0	−0·10	9·5	−0·05	10·8	0·15	15·5	0·15	15·5	.....	.....
20	0·45	24·5	−0·10	9·5	0·00	12·0	0·15	15·5	0·15	15·5	.....	.....
21	0·35	21·0	−0·15	8·5	0·05	13·0	0·15	15·5	0·15	15·5	.....	.....
22	0·25	18·3	−0·05	10·8	0·05	13·0	0·15	15·5	0·15	15·5	.....	.....
23	0·15	15·5	−0·05	10·8	0·15	15·5	0·15	15·5	0·15	15·5	.....	.....
24	0·15	15·5	−0·15	8·5	0·25	18·3	0·15	15·5	0·15	15·5	.....	.....
25	0·15	15·5	−0·20	7·5	0·25	18·3	0·15	15·5	0·15	15·5	.....	.....
26	0·10	14·0	−0·25	6·5	0·25	18·3	0·15	15·5	0·15	15·5	.....	.....
27	0·10	14·0	−0·25	6·5	0·25	18·3	0·15	15·5	0·15	15·5	.....	.....
28	0·10	14·0	−0·25	6·5	0·35	21·0	0·15	15·5	0·15	15·5	.....	.....
29	0·10	14·0	−0·25	6·5	0·35	21·0	0·15	15·5	0·15	15·5	.....	.....
30	0·05	13·0	−0·25	6·5	0·35	21·0	0·15	15·5	0·15	15·5	.....	.....
31	0·05	13·0	−0·25	6·5	.....	.....	0·15	15·5	.....	.....	.....	.....

Monthly Discharge of Criss Creek near Hoey's Ranch, for 1914.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	165·8	18·3	102·2	0·7	0·8	6,081
May	532·5	140	327·7	2·2	2·5	20,149
June	309·5	64·2	145	0·96	1·07	8,628
July	57·5	13·0	26·6	0·18	0·20	1,636
August	13·0	6·5	9·9	0·07	0·08	609
September	21·0	4·5	10·7	0·07	0·08	638
October	17·0	14·0	15·5	0·1	0·1	953
November	15·5	15·5	15·5	0·1	0·1	922
December	18·3	15·5	(for period Dec. 1 to Dec. 9.)			
The period	532·5	4·5	81·6	0·55	4·93	39,616

Note.—Winter conditions prevailed after December 9. No precipitation records are available for the Criss Creek valley. From the general situation and contour of the drainage basin it is thought that climatic conditions are similar to those of Kamloops, where the mean annual precipitation is 10·3 inches.

Officials of the Dominion Forestry Branch state that Criss creek actually rises from Silvahoukun mountain, at a point where government maps show Tranquille river flowing. If this is verified by later surveys the drainage area of Criss creek shown above (150 square miles) will be much smaller than the actual drainage area of the stream.

Coldwater River (2006).

Location.—At Merritt, Water District No. 3.

Records Available.—April 17 to August 31, 1913; April 1 to December 6, 1914.

Drainage Area.—Three hundred and sixty square miles.

Gauge.—It is a vertical staff gauge, and is read daily by J. Skimming.

Channel.—The stream is from 50 to 75 feet wide; velocities are medium. Bed of stream is rocky and permanent.

Discharge Measurements.—Are made by wading during low water, and from traffic bridge at high water.

Winter Flow.—Ice conditions exist on this river during January and February.

Accuracy.—Measurements on July 29 appears to indicate that channel shifted during summer of 1914. Results are therefore subject to inaccuracy.

Discharge Measurements of Coldwater River at Merritt, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 12.....	E. M. Dann & K. G. Chisholm.....	1505	47	73·4	1·11	1·02	81·3
May 2.....	do do ..	1505	68	244·0	5·86	3·27	1,459·0
July 8.....	do do ..	1505	62	151·0	2·78	1·69	420·0
July 29.....	C. B. Corbould.....	1915	56	90·6	0·96	0·85	87·5

For further metering, see Water Resources Paper No. 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Coldwater near Merritt, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1.	0·25	2	2·60	985	3·10	1,340
2.	0·27	3	3·15	1,375	3·70	1,775
3.	0·30	4	3·80	1,845	3·70	1,775
4.	0·42	9	3·45	1,592	3·00	1,265
5.	1·57	345	3·05	1,302	2·35	952
6.	1·87	510	2·82	1,125	2·30	790
7.	2·00	600	2·70	1,055	2·15	692
8.	2·13	692	2·72	1,055	2·07	630
9.	2·27	757	3·07	1,302	2·10	660
10.	2·40	855	3·57	1,665	2·10	660
11.	2·47	887	3·30	1,630	2·25	757
12.	2·60	985	3·55	1,665	2·40	855
13.	2·67	1,020	3·70	1,775	2·70	1,055
14.	2·90	1,195	4·10	2,065	2·90	1,195
15.	3·00	1,265	4·40	2,285	3·05	1,302
16.	3·05	1,302	4·10	2,065	3·30	1,480
17.	2·75	1,090	3·60	1,700	3·30	1,480
18.	2·55	952	3·50	1,630	3·00	1,265
19.	2·55	952	3·25	1,445	2·70	1,055
20.	2·67	1,020	3·25	1,445	2·45	887
21.	2·57	952	3·35	1,517	2·15	692
22.	2·47	887	3·45	1,592	2·00	600
23.	2·40	855	3·70	1,775	1·80	480
24.	2·32	790	3·85	1,880	1·92	540
25.	2·27	757	3·50	1,630	2·20	725
26.	2·25	757	3·05	1,302	2·10	660
27.	2·25	757	2·75	1,090	2·12	660
28.	2·20	725	2·55	952	2·02	600
29.	2·15	692	2·35	822	2·15	692
30.	2·27	757	2·35	822	2·30	790
31.			2·60	985		

Daily Gauge Height and Discharge of Coldwater River near Merritt, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·20	725	0·75	46	0·45	12	0·67	31	3·00	1,265	1·35	247
2	2·30	790	0·75	46	0·45	12	0·65	31	1·80	480	1·25	202
3	2·27	757	0·70	38	0·45	12	0·65	31	1·50	320	1·25	202
4	2·20	725	0·70	38	0·40	9	0·65	31	1·50	320	1·15	159
5	1·90	540	0·70	38	0·40	9	0·65	31	1·60	370	1·15	159
6	1·80	480	0·70	38	0·40	9	0·65	31	1·45	295	1·10	138
7	1·65	397	0·70	38	0·40	9	0·65	31	1·25	202	.....	.....
8	1·62	370	0·70	38	0·40	9	0·60	25	1·20	180	.....	.....
9	1·60	370	0·70	38	0·40	9	0·60	25	1·45	295	.....	.....
10	1·62	370	0·65	31	0·42	9	0·60	25	1·45	295	.....	.....
11	1·60	370	0·65	31	0·45	12	0·60	25	1·35	247	.....	.....
12	1·50	320	0·65	31	0·50	15	0·70	38	1·40	270	.....	.....
13	1·45	295	0·60	25	0·50	15	0·70	38	1·30	225	.....	.....
14	1·45	295	0·60	25	0·55	20	0·70	38	1·30	225	.....	.....
15	1·40	270	0·60	25	0·60	25	0·70	38	1·30	225	.....	.....
16	1·32	225	0·60	25	0·60	25	0·65	31	1·10	138	.....	.....
17	1·30	225	0·55	20	0·65	31	0·65	31	.....	.....	.....	.....
18	1·30	225	0·55	20	0·70	38	0·10	0	.....	.....	.....	.....
19	1·20	180	0·55	20	0·70	38	0·15	0	.....	.....	.....	.....
20	1·20	180	0·55	20	1·10	138	1·10	138	.....	.....	.....	.....
21	1·10	138	0·50	15	1·60	102	0·15	0	.....	.....	.....	.....
22	1·00	102	0·50	15	0·90	77	0·90	89	.....	.....	.....	.....
23	1·00	102	0·50	15	0·85	66	0·85	66	.....	.....	.....	.....
24	1·00	102	0·50	15	0·80	55	0·85	66	.....	.....	.....	.....
25	1·00	102	0·50	15	0·80	55	0·85	66	1·40	270	.....	.....
26	1·00	102	0·50	15	0·75	46	0·90	77	1·70	425	.....	.....
27	0·90	77	0·47	12	0·70	38	0·85	66	1·60	370	.....	.....
28	0·90	77	0·45	12	0·67	31	0·85	66	1·60	370	.....	.....
29	0·80	55	0·45	12	0·70	38	0·80	55	1·40	270	.....	.....
30	0·80	55	0·45	12	0·70	38	0·80	55	1·35	247	.....	.....
31	0·80	55	0·45	12	.....	.....	1·60	102	.....	.....	.....	.....

Monthly Discharge of Coldwater River at Merritt, for 1914.

(Drainage area, 360 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	1,302	2	745·8	2·1	2·3	44,378
May	2,285	822	1,463·6	4·1	4·7	89,993
June	1,775	480	943·6	2·6	2·9	56,148
July	790	55	292·8	0·8	0·9	18·003
August	46	12	25·2	0·07	0·08	1,549
September	138	9	33·4	0·1	0·1	1,987
October	138	0	44·4	0·1	0·1	2,730
November	1,265	138	332·0	0·9	1·0	19,755
December	247	138	For period of 6 days.			
The period	2,285	0	485·1	1·34	12·68	234,543

Note.—Winter conditions prevailed after December 6.

No records of precipitation are available for the drainage basin of the Coldwater river. The precipitation at Nicola lake (similar climate to Merritt) is 10·66 inches (mean annual). It must be noted, however, that the Coldwater river rises in the same hills from which the Coquihalla is fed, and the precipitation in the hills is many times that in the lower reaches of the Coldwater.

Deadman River (2008).

Location.—Section 15, township 22, Range 22, west 6th meridian.

Records Available.—April 22 to November 21, 1913; April 1 to December 9, 1914.

Drainage Area.—300 square miles.

Gauge.—Standard staff gauge read daily by J. Hoey.

Channel.—Channel is straight and control is good. Velocity is high only at high water.

Discharge Measurements.—Curve is well defined with ten measurements at varying stages.

Winter Flow.—Ice conditions exist on this river during January, February, and March.

Accuracy.—Accuracy is considered very high, and results should fall within five per cent.

Discharge Measurements of Deadman River near Savona, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 24	C. B. Corbould	1,673	32·0	83·0	3·36	3·4	278·0[1]
July 10	"	1,915	24·0	29·8	1·45	1·6	43·5

[1]Measurements from bridge, high-water section.
See measurements, 1913, Water Resources Paper No. 8.

Daily Gauge Height and Discharge of Deadman River above Criss Creek, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·20	23·0	3·40	245·0	2·60	122·5
2	1·30	27·5	3·50	267·5	2·60	122·5
3	1·30	27·5	3·70	321·5	2·50	110·5
4	1·30	27·5	3·90	389·0	2·40	100·0
5	1·30	27·5	4·10	472·5	2·40	100·0
6	1·30	27·5	4·30	562·5	2·40	100·0
7	1·40	32·5	4·30	562·5	2·50	110·5
8	1·40	32·5	4·30	562·5	2·40	100·0
9	1·60	42·5	4·20	517·5	2·40	100·0
10	1·80	53·5	4·10	472·5	2·40	100·0
11	1·90	59·5	4·10	472·5	2·40	100·0
12	2·20	81·0	4·10	472·5	2·40	100·0
13	2·50	110·5	4·10	472·5	2·40	100·0
14	2·70	135·0	4·20	517·5	2·40	100·0
15	3·10	191·0	4·30	562·5	2·45	105·2
16	3·30	225·0	4·20	517·5	2·50	110·5
17	3·40	245·0	4·15	495·0	2·50	110·5
18	3·50	267·5	4·10	472·5	2·50	110·5
19	3·50	267·5	3·90	389·0	2·40	100·0
20	3·50	267·5	3·80	353·0	2·40	100·0
21	3·40	245·0	3·70	321·5	2·30	89·5
22	3·40	245·0	3·50	267·5	2·30	89·5
23	3·40	245·0	3·40	245·0	2·20	81·0
24	3·40	245·0	3·30	225·0	2·10	73·0
25	3·40	245·0	3·20	207·5	2·10	73·0
26	3·40	245·0	3·00	176·0	2·10	73·0
27	3·40	245·0	3·00	176·0	2·10	73·0
28	3·40	245·0	2·90	161·5	2·20	81·0
29	3·40	245·0	2·80	147·5	2·20	81·0
30	3·40	245·0	2·70	135·0	2·20	81·0
31			2·70	135·0		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Deadman River above Criss Creek, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gage Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·20	81·0	2·00	66·0	1·50	37·5	0·95	11·0	0·90	9·0	0·90	9·0
2	2·10	73·0	1·90	59·5	1·50	37·5	0·90	9·0	0·90	9·0	0·90	9·0
3	2·00	66·0	1·80	53·5	1·50	37·5	0·90	9·0	0·90	9·0	0·90	9·0
4	2·00	66·0	1·60	42·5	1·45	35·0	0·90	9·0	1·00	13·0	0·90	9·0
5	1·90	59·5	1·60	42·5	1·45	35·0	0·90	9·0	1·00	13·0	0·90	9·0
6	1·90	59·5	1·80	53·5	1·40	32·5	0·90	9·0	1·00	13·0	0·90	9·0
7	1·80	53·5	1·80	53·5	1·40	32·5	0·90	9·0	1·00	13·0	0·90	9·0
8	1·70	48·0	1·90	59·5	1·40	32·5	0·90	9·0	1·00	13·0	0·90	9·0
9	1·70	48·0	2·00	66·0	1·30	27·5	0·90	9·0	1·00	13·0	0·90	9·0
10	1·60	42·5	2·00	66·0	1·30	27·5	0·90	9·0	1·00	13·0	.....	.....
11	1·60	42·5	2·00	66·0	1·30	27·5	0·90	9·0	1·00	13·0	.....	.....
12	1·50	37·5	2·00	66·0	1·30	27·5	0·90	9·0	1·00	13·0	.....	.....
13	1·50	37·5	2·00	66·0	1·30	27·5	0·90	9·0	1·00	13·0	.....	.....
14	1·50	37·5	1·90	59·5	1·30	27·5	0·90	9·0	1·00	13·0	.....	.....
15	1·70	48·0	1·90	59·5	1·30	27·5	0·90	9·0	1·00	13·0	.....	.....
16	1·70	48·0	1·90	59·5	1·25	25·2	0·90	9·0	1·00	13·0	.....	.....
17	1·70	48·0	1·80	53·5	1·25	25·2	0·90	9·0	1·00	13·0	.....	.....
18	1·80	53·5	1·80	53·5	1·20	23·0	0·90	9·0	0·95	11·0	.....	.....
19	1·80	53·5	1·80	53·5	1·20	23·0	0·90	9·0	0·95	11·0	.....	.....
20	1·90	59·5	1·80	53·5	1·20	23·0	0·90	9·0	0·95	11·0	.....	.....
21	2·00	66·0	1·80	53·5	1·20	23·0	0·90	9·0	0·95	11·0	.....	.....
22	2·00	66·0	1·80	53·5	1·20	23·0	0·90	9·0	0·90	9·0	.....	.....
23	1·90	59·5	1·70	48·0	1·20	23·0	0·90	9·0	0·90	9·0	.....	.....
24	1·80	53·5	1·70	48·0	1·10	18·0	0·90	9·0	0·90	9·0	.....	.....
25	1·80	53·5	1·70	48·0	1·10	18·0	0·90	9·0	0·90	9·0	.....	.....
26	1·80	53·5	1·70	48·0	1·00	13·0	0·90	9·0	0·90	9·0	.....	.....
27	1·80	53·5	1·70	48·0	1·00	13·0	0·90	9·0	0·90	9·0	.....	.....
28	1·80	53·5	1·65	45·2	0·95	11·0	0·90	9·0	0·90	9·0	.....	.....
29	1·80	53·5	1·60	42·5	0·95	11·0	0·90	9·0	0·90	9·0	.....	.....
30	1·80	53·5	1·60	42·5	0·95	11·0	0·90	9·0	0·90	9·0	.....	.....
31	1·80	53·5	1·60	42·5	.....	.....	0·90	9·0	.....	.....	.....	.....

Monthly Discharge of Deadman River above Criss Creek, for 1914.

(Drainage area, 306 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	267·5	23·0	154·0	0·51	0·57	9,164
May	562·5	135·0	364·0	1·20	1·40	22,381
June	122·5	73·0	96·6	0·32	0·36	5,748
July	81·0	37·5	54·3	0·18	0·21	3,339
August	66·0	42·5	51·0	0·18	0·21	3,320
September	37·5	11·0	25·0	0·08	0·09	1,488
October	11·0	9·0	9·1	0·03	0·03	559
November	13·0	9·0	11·1	0·04	0·05	660
December	9·0	9·0	(For period Dec. 1 to Dec. 9.)			
The period	562·5	9·0	96·0	0·32	2·92	46,659

Note.—Winter conditions prevailed after December 9.

Fraser River at Lytton (2012).

Location.—Section 1, township 15, range 27, west 6th meridian.

Records Available. — February 20 to December 31, 1912; January 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—Sixty-three thousand square miles.

Gauge.—Gauge painted on rock, and read daily by J. Clark.

Channel.—The channel varies in width from 200 feet at low water to 800 feet at high water. The flow is uniform, but velocities are very high during high water.

Discharge Measurements.—The curve is well defined, from 11,562 second feet to 162,000 second feet; above this the curve has been projected.

Winter Flow.—Open flow throughout the year.

Accuracy.—Conditions for gauge readings are good. Meterings are taken from ferry boat, but should be very accurate except at extreme high water. The results are considered to fall within 10 per cent of true accuracy.

Daily Gauge Height and Discharge of Fraser River at Lytton, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	10·0	13,000	11·0	16,500	11·0	16,500	10·0	13,000	.....	.....	28·3	119,800
2	10·5	14,750	10·5	14,750	11·0	16,500	10·0	13,000	.....	.....	27·9	117,375
3	11·5	18,500	10·0	13,000	11·0	16,500	10·0	13,000	.....	.....	27·7	116,125
4	12·0	20,500	9·5	11,250	11·0	16,500	10·5	14,750	.....	.....	28·65	121,900
5	12·5	23,000	9·0	9,500	10·5	14,750	.....	.....	10·5	14,750	29·9	129,400
6	12·0	20,500	9·0	9,500	10·5	14,750	.....	.....	11·0	16,500	31·0	136,250
7	12·0	20,500	9·5	11,250	10·5	14,750	.....	.....	11·0	16,500	32·0	142,500
8	12·0	20,500	11·0	16,500	10·0	13,000	.....	.....	10·5	14,750	32·1	143,100
9	12·0	20,500	11·5	18,500	11·0	16,500	.....	.....	10·0	13,000	31·4	138,750
10	11·0	16,500	11·5	18,500	10·0	13,000	.....	.....	11·0	16,500	31·5	139,375
11	10·5	14,750	12·0	20,500	10·0	13,000	.....	.....	12·0	20,500	31·7	140,625
12	11·5	18,500	12·0	20,500	10·0	13,000	.....	.....	12·5	23,000	31·5	139,375
13	11·5	18,500	13·0	25,500	10·0	13,000	.....	.....	13·0	25,500	31·6	140,000
14	11·0	16,500	13·0	25,500	10·5	14,750	.....	.....	13·5	28,500	31·8	141,250
15	10·0	13,000	14·0	31,500	11·5	18,500	.....	.....	15·0	37,500	32·6	146,100
16	10·0	13,000	14·0	31,500	11·0	16,500	.....	.....	16·5	47,000	34·5	157,625
17	9·5	11,250	13·5	28,500	11·0	16,500	.....	.....	19·0	62,500	36·1	167,600
18	10·0	13,000	13·0	25,500	12·0	20,500	.....	.....	.....	.....	37·7	177,200
19	10·0	13,000	12·0	20,500	12·0	20,500	.....	.....	.....	.....	39·2	186,200
20	10·0	13,000	12·0	20,500	12·5	23,000	.....	.....	.....	.....	39·8	189,800
21	9·5	11,250	12·0	20,500	13·0	25,500	.....	.....	28·2	119,200	39·9	190,400
22	9·5	11,250	11·5	18,500	13·5	28,500	.....	.....	28·5	121,000	37·6	176,600
23	10·0	13,000	11·0	16,500	13·0	25,500	.....	.....	28·6	121,600	35·3	162,625
24	9·0	9,500	11·0	16,500	13·0	25,500	.....	.....	29·0	124,000	34·2	155,750
25	9·0	9,500	11·0	16,500	13·0	25,500	.....	.....	29·2	125,200	33·8	153,300
26	9·0	9,500	11·5	18,500	12·0	20,500	.....	.....	31·0	136,250	32·8	147,300
27	9·0	9,500	12·0	20,500	12·0	20,500	.....	.....	31·3	138,125	32·3	144,300
28	9·5	11,250	11·0	16,500	11·0	16,500	.....	.....	32·5	145,500	31·3	138,125
29	10·0	13,000	.....	.....	11·0	16,500	.....	.....	31·5	139,375	31·2	137,500
30	10·0	13,000	.....	.....	11·0	16,500	.....	.....	30·3	131,875	32·3	144,300
31	11·0	16,500	.....	.....	11·0	16,500	.....	.....	29·6	127,600	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Fraser River at Lytton, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	33·6	152,100	27·2	113,000	19·8	67,300	17·5	153,000	14·5	34,500	14·6	35,100
2	33·9	153,900	26·4	108,000	19·4	64,900	17·4	152,400	14·1	32,100	14·6	35,100
3	34·5	157,625	25·8	104,250	19·2	63,700	17·5	53,000	13·6	29,100	14·1	32,100
4	35·0	160,750	25·5	102,375	19·1	63,100	17·0	50,000	14·2	32,700	13·6	29,100
5	35·5	163,875	25·3	101,125	18·5	59,250	16·5	47,000	14·3	33,300	13·0	25,500
6	35·8	165,750	25·3	101,125	18·4	58,600	16·2	45,200	14·2	32,700	13·0	25,500
7	35·0	160,750	25·4	101,750	18·3	57,950	15·2	38,800	14·5	34,500	12·9	25,000
8	34·8	159,500	25·2	100,500	18·3	57,950	14·7	35,700	14·8	36,300	12·5	23,000
9	33·5	151,500	25·1	99,875	18·1	56,650	14·5	34,500	14·3	33,300	12·0	20,500
10	32·8	147,300	24·6	96,750	18·1	56,650	14·5	34,500	13·5	28,500	12·0	20,500
11	32·4	144,900	24·2	94,250	18·6	59,900	14·5	34,500	13·0	25,500	11·7	19,300
12	32·3	144,300	24·2	94,250	18·5	59,250	14·2	32,700	13·1	26,100	11·1	16,900
13	32·5	145,500	24·1	93,625	18·4	58,600	14·5	34,500	13·4	27,900	11·2	17,300
14	32·6	146,100	23·6	90,500	18·2	57,300	14·9	36,900	13·4	27,900	11·0	16,500
15	32·8	147,300	23·1	87,375	18·3	57,950	15·6	41,400	13·0	25,500	10·9	16,150
16	32·6	146,100	23·0	86,750	18·1	56,650	16·6	47,600	13·0	25,500	10·8	15,800
17	32·6	146,100	22·6	84,250	18·0	56,000	17·2	51,200	12·7	24,000	10·9	16,150
18	32·5	145,500	22·2	81,750	17·8	54,800	17·5	53,000	12·5	23,000	10·7	15,450
19	32·2	143,700	21·7	78,700	17·5	53,000	17·8	54,800	12·6	23,500	10·7	15,450
20	31·7	140,625	21·6	78,100	17·3	51,800	17·8	54,800	13·3	27,300	10·6	15,100
21	31·1	136,875	21·6	78,100	16·9	49,400	17·9	55,400	13·8	30,300	10·9	16,150
22	30·5	133,125	21·6	78,100	16·8	48,800	17·5	53,000	14·4	33,900	11·1	16,900
23	30·1	130,625	21·6	78,100	16·5	47,000	17·2	51,200	14·5	34,500	11·4	18,100
24	31·2	137,500	21·5	77,500	16·5	47,000	17·0	50,000	14·2	32,700	12·1	21,000
25	33·2	149,700	21·4	76,900	16·9	49,400	16·5	47,000	14·0	31,500	12·3	22,000
26	34·1	155,125	21·3	76,300	17·2	51,200	15·8	42,700	13·8	30,300	12·8	24,500
27	31·4	138,750	21·2	75,700	17·8	54,800	15·2	38,800	13·6	29,100	12·8	24,500
28	29·8	128,800	20·5	71,500	18·1	56,650	14·7	35,700	13·8	30,300	13·1	26,100
29	29·4	126,400	20·3	70,300	18·0	56,000	14·5	34,500	14·4	33,900	13·2	26,700
30	29·0	124,000	20·0	68,500	17·7	54,200	14·1	32,100	14·3	33,300	13·0	25,500
31	28·3	119,800	19·6	66,100	.....	.....	14·3	33,300	.....	.....	12·9	25,000

For further meter measurements see Water Resources Papers Nos. 1 and 8.

Monthly Discharge of Fraser River at Lytton-above confluence with the Thompson river, for 1914.

(Drainage area, 63,000 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	23,000	9,500	14,839	0·2	0·2	912,418
February	31,500	9,500	19,044	0·3	0·3	1,057,664
March	28,500	13,000	18,048	0·3	0·3	1,109,676
April	14,750	13,000	(for period	April 1 to April 4.)		
May	145,500	14,750	73,592	1·2	1·4	4,525,004
June	190,400	116,125	148,018	2·3	2·6	8,808,062
July	165,750	119,800	145,286	2·3	2·6	8,933,446
August	113,000	66,100	87,593	1·4	1·6	5,385,873
September	67,300	47,000	56,191	0·9	1·0	3,343,569
October	55,400	32,100	43,845	0·7	0·8	2,695,945
November	36,300	23,000	30,100	0·5	0·6	1,791,100
December	35,100	15,100	21,998	0·3	0·3	1,352,578
The year	190,400	9,500	56,000	0·88 (estimated)	11·9	40,800,000 (estimated)

Note.—The gauge reader at this station, Chas. Lual, was drowned early in April, and it was nearly a month before a suitable gauge reader could be procured to take his place. Consequently, flow records for the greater part of April must remain blank.

The mean annual precipitation at Quesnel is given as 13·23 inches (Meteorological Service, Department of Marine and Fisheries). This is probably somewhat less than the mean annual precipitation over the whole drainage area of the Fraser.

Hat Creek, Above Hammond's Diversion (2016).

Location.—Section 18, township 19, range 26, west 6th meridian: At Colley's ranch, just above the Hammond diversion.

Records Available.—April 22, 1911, to December 31, 1911; January 1, 1912, to November 18, 1912; April 30, 1913, to December 31, 1913; April 1, 1914, to November 30, 1914.

Drainage Area.—Four hundred and twenty square miles.

Gauge.—Standard vertical staff gauge, read daily by Thos. King,

Channel.—The channel is 12 to 14 feet in width and is straight above and below the gauge; the control is good.

Discharge Measurements.—Well-distributed meterings have been obtained covering the stream's range. Meterings were mostly made in the box flume above the Hammond diversion weir.

Winter Flow.—Stream is sometimes open during winter months. Snowfall is about 4 feet per annum, and rainfall probably 10 to 12 inches, bringing the total precipitation up to 14 to 16 inches, annually.

Accuracy.—Conditions for metering are good and gauge readings are carefully taken. Accuracy is probably within 10 per cent.

Discharge Measurements of Hat Creek above Hammond's Diversion, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 8	C. B. Corbould	1,915	14·5	11·4	1·6	0·4	18·2

For further hydrographic data, see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Hat Creek near Hammond's Div., for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·08	2·0	0·73	28·6	1·08	51·0
2	0·07	1·7	0·95	41·7	1·08	51·0
3	0·08	2·0	0·83	34·3	0·93	40·5
4	0·10	2·5	0·68	26·0	0·93	40·5
5	0·09	2·2	0·61	22·5	0·93	40·5
6	0·16	4·0	0·73	28·6	0·83	34·3
7	0·12	3·0	0·73	28·6	0·83	34·3
8	0·28	7·8	0·78	31·4	0·83	34·3
9	0·33	9·7	0·83	34·3	0·83	34·3
10	0·28	7·8	0·98	43·7	0·83	34·3
11	0·33	9·7	1·13	55·2	0·83	34·3
12	0·26	7·1	1·13	55·2	0·88	37·3
13	0·33	9·7	1·20	61·5	0·93	40·5
14	0·26	7·1	1·38	83·3	0·93	40·5
15	0·33	9·7	1·30	72·5	0·95	41·7
16	0·28	7·8	1·23	64·8	0·93	40·5
17	0·35	10·5	1·13	55·2	0·93	40·5
18	0·33	9·7	1·00	45·0	0·83	34·3
19	0·43	13·8	0·93	40·5	0·80	32·5
20	0·38	11·7	0·93	40·5	0·73	28·6
21	0·45	14·8	1·13	55·2	0·73	28·6
22	0·41	13·0	1·13	55·2	0·71	27·5
23	0·43	13·8	1·28	70·3	0·68	26·0
24	0·41	13·0	1·23	64·8	0·68	26·0
25	0·43	13·8	1·08	51·0	0·68	26·0
26	0·41	13·0	1·03	47·2	0·63	23·5
27	0·43	13·8	1·03	47·2	0·63	23·5
28	0·48	16·1	1·03	47·2	0·63	23·5
29	0·46	15·2	0·93	40·5	0·63	23·5
30	0·55	19·5	0·83	34·3	0·60	22·0
31			0·98	43·7		

Daily Gauge Height and Discharge of Hat Creek near Hammond's Div., for 1914.—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·58	21·0	0·21	5·3	0·10	2·5	0·13	3·3	0·13	3·3	.....	.....
2	0·55	19·5	0·18	4·5	0·10	2·5	0·13	3·3	0·13	3·3	.....	.....
3	0·53	18·5	0·18	4·5	0·09	2·2	0·13	3·3	0·13	3·3	.....	.....
4	0·53	18·5	0·18	4·5	0·09	2·2	0·13	3·3	0·13	3·3	.....	.....
5	0·52	18·0	0·18	4·5	0·08	2·0	0·13	3·3	0·13	3·3	.....	.....
6	0·48	16·1	0·13	3·3	0·08	2·0	0·13	3·3	0·11	2·8	.....	.....
7	0·48	16·1	0·13	3·3	0·08	2·0	0·13	3·3	0·11	2·8	.....	.....
8	0·43	13·8	0·15	3·7	0·11	2·8	0·13	3·3	0·13	3·3	.....	.....
9	0·43	13·8	0·13	3·3	0·12	3·0	0·13	3·3	0·11	2·8	.....	.....
10	0·38	11·7	0·13	3·3	0·13	3·3	0·13	3·3	0·11	2·8	.....	.....
11	0·38	11·7	0·13	3·3	0·13	3·3	0·15	3·7	0·11	2·8	.....	.....
12	0·38	11·7	0·13	3·3	0·11	2·8	0·15	3·7	0·11	2·8	.....	.....
13	0·38	11·7	0·13	3·3	0·13	3·3	0·15	3·7	0·11	2·8	.....	.....
14	0·33	9·7	0·13	3·3	0·13	3·3	0·13	3·3	0·11	2·8	.....	.....
15	0·33	9·7	0·13	3·3	0·13	3·3	0·13	3·3	0·11	2·8	.....	.....
16	0·33	9·7	0·13	3·3	0·14	3·5	0·13	3·3	0·11	2·8	.....	.....
17	0·33	9·7	0·13	3·3	0·13	3·3	0·14	3·5	0·11	2·8	.....	.....
18	0·33	9·7	0·13	3·3	0·23	6·0	0·13	3·3	0·11	2·8	.....	.....
19	0·33	9·7	0·13	3·3	0·23	6·0	0·14	3·5	0·11	2·8	.....	.....
20	0·33	9·7	0·12	3·0	0·21	5·3	0·13	3·3	0·11	2·8	.....	.....
21	0·33	9·7	0·12	3·0	0·13	3·3	0·13	3·3	0·11	2·8	.....	.....
22	0·28	7·8	0·12	3·0	0·13	3·3	0·13	3·3	0·11	2·8	.....	.....
23	0·25	6·8	0·12	3·0	0·13	3·3	0·13	3·3	0·13	3·3	.....	.....
24	0·25	6·8	0·12	3·0	0·13	3·3	0·13	3·3	0·15	3·7	.....	.....
25	0·25	6·8	0·12	3·0	0·13	3·3	0·13	3·3	0·15	3·7	.....	.....
26	0·23	6·0	0·12	3·0	0·13	3·3	0·13	3·3	0·13	3·3	.....	.....
27	0·23	6·0	0·12	3·0	0·13	3·3	0·13	3·3	0·13	3·3	.....	.....
28	0·23	6·0	0·12	3·0	0·13	3·3	0·13	3·3	0·13	3·3	.....	.....
29	0·23	6·0	0·10	2·5	0·11	2·8	0·13	3·3	0·13	3·3	.....	.....
30	0·23	6·0	0·10	2·5	0·13	3·3	0·13	3·3	0·13	3·3	.....	.....
31	0·21	5·3	0·10	2·5	.....	.....	0·13	3·3	.....	.....	.....	.....

Monthly Discharge of Hat Creek above Hammond's Diversion, for 1914.

(Drainage area, 47 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	19·5	1·7	9·5	0·2	0·2	565
May	83·3	22·5	46·8	1·0	1·1	2,878
June	51·0	22·0	33·9	0·7	0·8	2,017
July	21·0	5·3	11·1	0·2	0·3	680
August	5·3	2·5	3·4	0·07	0·08	209
September	6·0	2·0	3·2	0·07	0·08	190
October	3·7	3·3	3·4	0·07	0·08	209
November	3·7	2·8	3·1	0·06	0·07	184
The period	83·3	1·7	14·3	0·30	2·71	6,932

Note.—Ice conditions prevailed early in December, when Hat creek was discharging practically no water.

No precipitation records are available for the Hat Creek drainage basin. The mean annual precipitation at Ashcroft is very low—about 5 inches per annum. The precipitation over the Upper Hat Creek valley is, however, considerably in excess of this amount.

Nahatlatch River, Upper (2028).

Location.—Section 14, township 12, range 27, west 6th meridian.

Records Available.—February 26 to December 31, 1912; January 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—Three hundred square miles.

Gauge.—Standard chain gauge, read weekly by Chas. Nicholson.

Channel.—The channel is straight at measuring section. Velocities are fairly high.

Discharge Measurements.—Discharge measurements are made from cable car, and curve has been well defined at varying stages.

Winter Flow.—Open water conditions prevailed throughout the winter.

Accuracy.—The accuracy of results will eventually be high. The present results should fall well within 15 per cent.

Discharge Measurements of Nahatlatch (Upper) River near Keefers, B.C., for 1914.

Date	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20	K. G. Chisholm	1,055	111	793	4·35	8·55	3,452
" 30	E. M. Dann and K. G. C.	1,055	116	627	3·60	6·70	2,255

For further hydrographic data see Water Resources Papers Nos. 1 and 8.

Daily Gauge Height and Discharge of Nahatlatch River at Keefers, B.C., for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3·84	549	3·67	489						
2												
3									8·46	4,066		
4	4·76	940										
5							4·79	955				
6											7·30	2,810
7												
8			3·74	514	3·52	437						
9												
10									7·41	2,920		
11	4·86	990										
12							6·59	2,131				
13											8·50	4,110
14												
15			3·54	444	4·42	784						
16												
17									8·56	4,176		
18	4·26	714										
19							6·19	1,797				
20											8·20	3,780
21									8·50	4,110		
22			3·44	409	5·27	1,208						
23												
24									9·90	5,760		
25	3·86	556										
26							5·59	1,394				
27											8·40	4,000
28												
29									6·80	2,320		
30					4·57	851			6·70	2,230		
31												

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Nahatlatch River at Keefers, B.C., for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									8·15	3,725		
2			6·00	1,660								
3												
4	10·0	5,900					4·95	1,035				
5												
6					4·50	820					4·90	1,010
7												
8									6·10	1,730		
9			5·50	1,340								
10												
11	8·90	4,550					4·60	865				
12												
13					4·20	690					4·10	650
14												
15									5·30	1,225		
16			6·10	1,730								
17												
18							8·50	4,110				
19	8·30	3,890										
20					6·00	1,660					4·10	650
21												
22									5·00	1,160		
23			5·60	1,400								
24												
25							5·50	1,340				
26	6·50	2,050									3·90	570
27					5·60	1,400						
28									6·00	1,660		
29												
30			5·50	1,340								
31												

Monthly Discharge of Nahatlatch River at Keefers, B.C., for 1914.

(Drainage area, 300 square miles.)

Month.	Discharge in Second-Feet.				Run-Off	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area	Total in acre-feet.
January	990	556	80·0	2·7	3·1	49,190
February	549	409	479	1·6	1·7	26,602
March	1,208	437	753·8	2·5	2·9	46,349
April	2,131	955	1,569·2	5·2	5·8	93,373
May	5,760	2,230	3,654·6	12·2	14·1	224,711
June	4,110	2,810	3,675	12·2	13·6	218,680
July	5,900	2,050	4,097	13·7	15·8	251,987
August	1,730	1,340	1,494	5·0	5·8	91,864
September	1,660	690	1,142	3·8	4·2	67,950
October	4,110	865	1,837	6·1	7·0	112,954
November	3,725	1,160	1,900	6·3	7·0	113,058
December	1,010	570	720	2·4	2·8	44,271
The year	5,900	409	1,843	6·14	83·8	1,340,969

Note.—Precipitation above the upper station is probably about 70 to 80 inches in normal years. The fact that the "depth in inches on drainage area" for 1914 is 83·8 seems to indicate either an unusually large rainfall or that the drainage area given (300 square miles) is somewhat too small.

Nahatlach River, Lower (2027).

Location.—Section 7, township 12, range 26, west 6th meridian.

Records Available.—March 1 to December 7, 1912; January 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—Four hundred square miles.

Gauge.—Standard vertical staff gauge, read weekly by Chas. Nicholson.

Channel.—Channel at section is straight, with an average depth at low water of 8 feet. Velocity low. Bed of river rocky and permanent.

Discharge Measurements.—Discharge measurements are made from cable car.

Winter Flow.—Open conditions generally prevail throughout the winter.

Accuracy.—Accuracy of results will eventually be high, and the present returns are within 15 per cent.

Daily Gauge Height and Discharge of Nahatlatch River at Keefers, B.C., for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·40	520	1·20	450						
2												
3									6·30	4,520		
4	2·60	1,140										
5							2·60	1,140				
6											5·20	3,365
7												
8			1·10	410	1·10	410						
9												
10									5·50	3,680		
11	2·32	962										
12							4·30	2,500				
13											6·80	5,045
14												
15			0·90	340	1·95	755						
16												
17									6·60	4,205		
18	1·70	645										
19							4·10	2,320				
20											7·00	5,255
21												
22			0·80	310	2·95	1,385			7·50	5,800		
23												
24									8·20	6,570		
25	1·60	600										
26							3·35	1,680				
27											6·40	4,625
28												
29					2·25	920						
30									4·70	2,880		
31												

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Nahatlatch River at Keefers, B.C., for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									6·00	4,205		
2			3·95	2,185								
3												
4	8·20	6,570					2·45	1,042				
5												
6					2·10	835					2·40	1,010
7												
8									3·90	2,140		
9			3·20	1,560								
10												
11	7·00	5,255					2·20	890				
12												
13					1·80	685					1·60	600
14												
15									3·00	1,420		
16			3·80	2,050								
17												
18							6·40	4,625				
19	6·10	4,310										
20					3·20	1,560					1·60	600
21												
22									2·60	1,140		
23			3·20	1,560								
24												
25							3·20	1,560				
26	4·30	2,500									1·50	555
27					3·00	1,420						
28									3·80	2,050		
29												
30			3·00	1,420								
31												

For meterings and further hydrographic data, see Water Resources Papers Nos. 1 and 8.

Monthly Discharge of Nahatlatch (Lower) River at Keefers, B.C. for 1914.

(Drainage area, 400 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	1,140	600	836	2·1	2·4	51,446
February	520	310	395	1·0	1·0	21,937
March	1,385	410	784	2·0	2·3	48,206
April	2,500	1,140	1,910	4·8	5·3	113,650
May	6,570	2,880	4,609	11·5	13·3	283,404
June	5 255	3,365	4,572	11·4	12·7	272,080
July	6,570	2,500	4,659	11 6	13·4	286,469
August	2,185	1,420	1,755	4·4	5·1	107,910
September	1,560	685	1,125	2·8	3·1	66,940
October	4,625	890	2,029	5·0	5·8	124,758
November	4,205	1,140	2,191	5 5	6 1	130,369
December	1,010	555	691	1·7	2·0	42,488
The year	6,570	310	2,130	5·3	72·5	1,549,657

Note.—No precipitation records available—it is probable, however, that the rainfall is about the same as at the headwaters of the Lillooet river—from 80 to 90 inches annually.

The high run-off in depth in inches on drainage area seems to indicate that the drainage area is slightly too small

Nicola River at Merritt (2029).

Location.—At Merritt, Water District No. 3.

Records Available.—June 16 to December 31, 1911; January 31 to December 31, 1912; January 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage Area.—One thousand five hundred square miles.

Gauge.—Standard vertical staff gauge, read tri-weekly by Miss C. A. Seaton.

Channel.—The bed of the stream is gravelly, and the flow is in two channels during high water.

Discharge Measurements.—Four well-distributed measurements have been obtained in 1914.

Winter Flow.—Open conditions usually prevail throughout the year.

Accuracy.—The accuracy is considered to be within 15 per cent of true conditions.

Discharge Measurements of Nicola River at Merritt, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
May 3	K. G. Chisholm	1505	135	537	4·65	7·53	2,500
May 25	do	1055	135	649	4·51	7·80	2,926
July 8	do	1913	60	306	3·45	6·07	750
July 29	C. B. Corbould	1915	55	245	0·90	5·10	218

For further hydrographic data, see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Nicola River at Merritt, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	4·80	130	5·00	185	.....	.....	.....	.....	7·40	2,330
2	.....	.....	.....	.....	.....	.....	5·15	235	6·40	1,055	.....	.....
3	.....	.....	4·80	130	5·00	185	.....	.....	.....	.....	7·90	3,060
4	.....	.....	.....	.....	.....	.....	5·30	292	6·50	1,170	.....	.....
5	4·80	130	4·70	104	4·90	156	5·40	335	.....	.....	7·20	2,050
6	.....	.....	.....	.....	.....	.....	.....	.....	6·90	1,640	.....	.....
7	5·70	490	4·60	82	4·90	156	5·50	380	.....	.....	6·80	1,520
8	.....	.....	.....	.....	.....	.....	.....	.....	7·00	1,780	.....	.....
9	5·50	380	4·60	82	4·90	156	5·80	550	.....	.....	6·80	1,520
10	.....	.....	.....	.....	.....	.....	.....	.....	7·50	2,470	.....	.....
11	5·20	253	4·60	82	4·80	130	6·10	775	.....	.....	6·90	1,640
12	.....	.....	.....	.....	.....	.....	6·10	775	7·60	2,610	.....	.....
13	5·20	253	4·65	93	4·80	130	.....	.....	.....	.....	6·90	1,640
14	.....	.....	.....	.....	.....	.....	6·30	955	8·40	3,790	.....	.....
15	5·00	185	4·65	93	5·00	185	.....	.....	.....	.....	7·10	1,915
16	.....	.....	.....	.....	.....	.....	6·60	1,280	8·20	3,500	.....	.....
17	5·00	185	4·65	93	5·00	185	.....	.....	.....	.....	7·10	1,915
18	.....	.....	.....	.....	.....	.....	6·50	1,170	7·60	2,610	.....	.....
19	5·00	185	4·65	93	5·10	218	.....	.....	.....	.....	7·00	1,780
20	.....	.....	.....	.....	.....	.....	6·60	1,280	7·60	2,610	.....	.....
21	4·80	130	4·70	104	5·10	218	.....	.....	.....	.....	6·70	1,395
22	.....	.....	.....	.....	5·10	218	6·70	1,395	7·77	2,760	.....	.....
23	4·60	82	4·70	104	.....	.....	.....	.....	.....	.....	6·60	1,280
24	.....	.....	.....	.....	5·00	185	6·80	1,520	8·10	3,350	.....	.....
25	4·70	104	4·70	104	.....	.....	.....	.....	.....	.....	6·60	1,280
26	.....	.....	.....	.....	5·00	185	6·60	1,280	7·60	2,610	.....	.....
27	4·80	130	4·80	130	.....	.....	.....	.....	.....	.....	6·60	1,280
28	.....	.....	.....	.....	5·00	185	6·40	1,055	7·10	1,915	.....	.....
29	4·80	130	.....	.....	5·10	218	.....	.....	.....	.....	6·50	1,170
30	.....	.....	.....	.....	.....	.....	6·30	955	7·10	1,915	.....	.....
31	4·80	130	.....	.....	5·10	218	.....	.....	.....	.....	.....	.....

Daily Gauge Height and Discharge of Nicola River at Merritt, for 1914.

Day.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6·40	1,055			4·30	34	4·40	50
2			5·00	185				
3	6·30	955			4·30	34	4·40	50
4			4·90	156				
5	6·20	860			4·30	34	4·40	50
6			4·80	130				
7	6·20	860			4·40	50	4·40	50
8			4·80	130				
9	5·90	620			4·50	64	4·30	34
10			4·80	130				
11	5·80	550			4·50	64	4·30	34
12			4·70	104				
13	5·70	490			4·60	82	4·40	50
14			4·70	104				
15	5·70	490			4·60	82	4·40	50
16			4·60	82				
17	5·50	380			4·60	82	4·50	64
18			4·60	82				
19	5·50	380			4·60	82	4·60	82
20			4·50	64				
21	5·50	380			4·70	104	4·75	117
22			4·50	64				
23	5·30	292			4·60	82	4·70	104
24			4·50	64				
25	5·30	292			4·60	82	4·70	104
26			4·50	64				
27	5·20	253			4·50	64	4·60	82
28			4·40	50				
29	5·10	218			4·50	64	4·60	82
30			4·40	50				
31	5·00	185					4·70	104

Monthly Discharge of Nicola River at Merritt, for 1914.

(Drainage area, 1,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	490	82	198	0·13	0·15	12,175
February	130	82	102	0·07	0·07	5,665
March	218	130	183	0·12	0·14	11,252
April	1,520	235	889	0·59	0·66	52,899
May	3,790	1,055	2,386	1·59	1·83	146,712
June	3,060	1,170	1,718	1·14	1·27	102,230
July	1,055	185	516	0·34	0·39	31,728
August	185	50	97	0·06	0·07	5,964
September	104	34	67	0·04	0·04	3,987
October	117	34	69	0·05	0·06	4,243
The period	3,790	34	622·5	0·41	4·68	376,855

Note.—Precipitation on the Coldwater varies from 10 to 50 inches, while on the Nicola river proper it averages only about 10 inches, and this is subject to large evaporation losses.

The flow at this station includes the flow of Coldwater river.

Nicola River, at Mouth (2030).

Location.—Section 12, township 17, range 25, west 6th meridian.

Records Available.—August 1 to November 31, 1911; April 5 to December 21, 1912; May 9 to December 11, 1913; April 1 to September 30, 1914.

Drainage Area.—Two thousand six hundred and fifty square miles.

Gauge.—Inclined staff gauge, read three times a week by Miss Violet Curnow.

Channel.—Is straight at measuring section. Velocity high. Bed of stream is composed of rocks and gravel. During high water on the Thompson river the control is affected at the measuring section but not at the gauge.

Discharge Measurements.—Are made from bridge at all stages.

Winter Flow.—Ice conditions exist usually during January, February and March.

Accuracy.—The accuracy will eventually be high, but at present more measurements are required.

Discharge Measurements of Nicola River at mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 23	K. G. Chisholm	1055	141	891	8·06	7·6	6,456
July 31	C. B. Corbould	1915	115	197	2·40	2·42	468

For further hydrographic data, see Water Resources Papeers Nos. 1 and 8.

Daily Gauge Height and Discharge of Nicola River at mouth, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec. ft.	Feet.	Sec.-ft.
1	2·90	575	.....	.....	.....	.....
2	.....	.....	.....	.....	7·20	5,345
3	.....	.....	7·60	6,640	.....	.....
4	3·30	775	.....	.....	.....	.....
5	.....	.....	7·60	6,640	6·50	3,860
6	.....	.....	6·40	3,710	.....	.....
7	.....	.....	.....	.....	5·80	2,955
8	4·80	1,870	.....	.....	.....	.....
9	.....	.....	6·60	4,025	.....	.....
10	.....	.....	.....	.....	5·60	2,725
11	5·10	2,165	.....	.....	.....	.....
12	.....	.....	7·80	7,370	.....	.....
13	.....	.....	.....	.....	6·40	3,710
14	.....	.....	7·90	7,740	.....	.....
15	6·30	3,570	7·15	5,205	6·80	4,385
16	.....	.....	.....	.....	.....	.....
17	.....	.....	.....	.....	.....	.....
18	6·10	3,315	.....	.....	.....	.....
19	.....	.....	7·80	7,370	.....	.....
20	.....	.....	.....	.....	.....	.....
21	5·80	2,955	.....	.....	.....	.....
22	.....	.....	.....	.....	.....	.....
23	5·60	2,725	7·60	6,640	.....	.....
24	.....	.....	.....	.....	5·60	2,725
25	5·40	2,495	.....	.....	.....	.....
26	.....	.....	7·20	5,345	.....	.....
27	.....	.....	.....	.....	5·40	2,495
28	5·40	2,495	6·40	3,710	.....	.....
29	.....	.....	.....	.....	.....	.....
30	5·60	2,725	.....	.....	5·20	2,270
31	.....	.....	6·30	3,570	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Nicola River at mouth, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1										
2	5·20	2,270								
3			2·30	335	1·50	115				
4										
5	4·80	1,870								
6					1·40	100				
7										
8	4·30	1,445								
9			2·10	270						
10										
11										
12					1·50	115				
13			2·00	240						
14										
15	4·00	1,220			1·80	180				
16										
17			1·80	180						
18										
19										
20			1·70	155	1·80	180				
21	3·40	830								
22									4·00	1,220
23										
24			1·60	135	1·70	155				
25	2·60	450							3·70	1,020
26										
27			1·50	115	1·90	210				
28	2·55	430					1·90	210	3·40	830
29										
30					2·00	240				
31			1·90	210			2·00	240		

Monthly Discharge of Nicola River at Mouth, for 1914.

(Drainage area, 2,650 square miles.)

Month	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet
April	3,570	575	2,333	0·9	1·0	138,820
May	7,740	3,570	5,604	2·1	2·4	348,264
June	5,345	2,270	3,385	1·3	1·4	201,420
July	2,270	430	1,216	0·46	0·5	74,766
August	335	115	205	0·08	0·09	12,605
September	240	100	162	0·06	0·07	9,640
October	240	240				
November	1,220	830				

Note. Gauge readings during October and November were not numerous enough to give accurate run-off data.
Precipitation varies from a minimum of 5 to 10 inches at Spences Bridge to 50 inches in the upper reaches of several tributaries of the Nicola river.
The maximum recorded flow was 7,740 second-feet in May, and the minimum 100 second-feet in September.
The autumn rains on the Coldwater-Coquihalla summit probably account for the increased November flow.

Spius Creek (2037).

Location.—Section 23, township 13, range 23, west 6th meridian.

Records Available.—August 18 to November 22, 1911; May 8 to September 12, 1912; May 25 to November 30, 1913; March 22 to December 24, 1914.

Drainage Area.—Three hundred and forty-four (344) square miles.

Gauge.—Standard chain gauge, read daily by G. A. Longbotham.

Channel.—The channel is composed of rocks and boulders; velocity of water is high at all stages.

Discharge Measurements.—Six discharge measurements were obtained during 1914 at varying stages, and curve is fairly well defined.

Winter Flow.—Ice conditions exist from November to February under normal conditions.

Accuracy.—Accuracy of results is considered high, except at freshet, when they should fall within 15 per cent.

Discharge Measurements of Spius Creek near Canford, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 18.....	K. G. Chisholm.....	1505	70	111	1·73	1·48	191
May 5.....	do	1505	91	234	5·51	3·04	1,309
May 6.....	do	1505	90	224	5·16	2·92	1,171
May 27.....	do	1055	108	240	5·11	3·00	1,236
July 19.....	do	1913	76	138	3·60	2·08	499
July 10.....	C. B. Corbould.....	1915	68	67·1	1·85	1·25	120

For further hydrographic data on Spius creek, see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Spius Creek, near Canford, for 1914.

Day.	March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	...	.....	1·45	180	2·75	1,031	4·10	2,415
2	...	.....	1·50	198	3·35	1,627	4·35	2,677
3	...	.....	1·50	198	3·95	2,257	4·05	2,362
4	...	.....	1·55	218	2·80	1,077	2·80	1,077
5	...	.....	1·80	335	2·95	1,221	2·75	1,031
6	...	.....	2·15	545	2·90	1,173	2·50	810
7	...	.....	2·30	650	2·90	1,173	2·65	939
8	...	.....	2·40	728	3·15	1,420	2·60	894
9	...	.....	2·50	810	3·20	1,470	2·60	894
10	...	.....	2·65	939	3·25	1,522	2·65	939
11	...	.....	2·90	1,173	3·30	1,575	2·70	984
12	...	.....	2·75	1,031	3·90	2,205	2·95	1,221
13	...	.....	3·00	1,270	3·80	2,100	3·10	1,370
14	...	.....	3·05	1,320	4·60	2,940	2·95	1,221
15	...	.....	3·05	1,330	4·55	2,887	3·80	2,100
16	...	.....	3·10	1,370	4·35	2,677	4·10	2,415
17	...	.....	3·00	1,270	4·00	2,310	3·70	1,995
18	...	.....	2·90	1,173	3·75	2,047	3·30	1,575
19	...	.....	2·80	1,077	3·70	1,995	2·70	984
20	...	.....	2·65	939	3·90	2,205	2·50	810
21	...	.....	2·60	894	4·00	2,310	2·30	650
22	1·70	285	2·55	852	4·20	2,520	2·35	689
23	1·65	261	2·55	852	4·25	2,572	2·25	614
24	1·60	238	2·60	894	4·00	2,310	2·25	614
25	1·50	198	2·65	939	3·25	1,522	2·30	650
26	1·45	180	2·60	894	3·10	1,370	2·40	728
27	1·40	162	2·50	810	3·05	1,320	2·50	810
28	1·45	180	2·35	769	3·10	1,370	2·55	852
29	1·45	180	2·45	769	2·70	984	2·85	1,125
30	1·45	180	2·45	769	2·95	1,221	2·80	1,077
31	1·40	162	...	...	3·80	2,100	...	.....

Daily Gauge Height and Discharge of Spius Creek near Canford, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·85	1,125	.....	112	0·90	52	1·15	96	2·40	728	2·00	450
2	2·80	1,077	1·20	107	0·90	52	1·15	96	2·40	728	2·00	450
3	2·80	1,077	1·20	107	0·90	52	1·15	96	2·40	728	2·00	450
4	2·50	810	1·15	96	0·90	52	1·10	86	2·45	769	1·95	420
5	2·40	728	1·15	96	0·90	52	1·10	86	2·40	728	1·85	362
6	2·35	689	1·10	86	0·90	52	1·05	76	2·30	650	1·75	310
7	2·25	614	1·10	86	0·90	52	1·05	76	2·15	545	1·65	261
8	2·20	578	1·05	76	1·00	67	1·05	76	1·90	390	1·60	238
9	2·20	578	1·05	76	1·05	76	1·10	86	1·90	390	1·50	198
10	2·25	614	1·05	76	1·10	86	1·10	86	1·85	362	1·45	180
11	2·20	578	1·05	76	1·15	96	1·10	86	1·85	362	1·40	162
12	1·95	420	1·05	76	1·25	120	1·10	86	1·90	390	1·40	162
13	1·90	390	1·05	76	1·40	162	1·15	96	1·85	362	1·40	162
14	1·85	362	1·05	76	1·55	218	1·20	107	1·85	362	1·40	162
15	1·85	362	1·05	76	1·60	238	1·25	120	1·80	335	1·35	147
16	1·80	335	1·05	76	1·65	261	1·30	133	1·80	335	1·40	162
17	1·80	335	1·05	76	1·75	310	1·35	147	1·75	310	1·45	180
18	1·70	285	1·00	67	1·55	218	1·40	162	1·70	285	1·50	198
19	1·65	261	1·00	67	1·50	198	1·40	162	1·70	285	1·50	198
20	1·50	198	1·00	67	1·35	147	1·50	198	1·65	261	1·65	261
21	1·45	189	1·00	67	1·20	107	1·55	218	1·60	238	1·95	420
22	1·40	162	1·00	67	1·20	107	1·65	261	1·60	238	2·25	614
23	1·40	162	1·00	67	1·15	96	1·65	261	1·70	285	2·00	450
24	1·40	162	1·00	67	1·15	96	1·65	261	1·70	285	2·00	450
25	1·40	162	1·00	67	1·15	96	1·60	238	2·30	650	.....	.....
26	1·35	147	1·00	67	1·15	96	1·60	238	2·40	728	.....	.....
27	1·35	147	0·95	59	1·10	86	1·60	238	2·15	545	.....	.....
28	.....	138	0·95	59	1·15	96	1·60	238	2·10	512	.....	.....
29	.....	129	0·95	59	1·15	96	1·60	238	2·10	512	.....	.....
30	1·25	120	0·90	52	1·15	96	1·85	362	2·05	481	.....	.....
31	.....	116	0·90	52	.....	.....	2·00	450	.....	.....	.....	.....

Monthly Discharge of Spius Creek near Canford, B.C., for 1914.

(Drainage area, 344 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	1,370	180	839·5	2·4	2·7	49,953
May	2,940	984	1,823·0	5·3	6·1	112,093
June	2,677	614	1,217·4	3·5	3·9	72,444
July	1,125	116	420·7	1·2	1·4	25,867
August	112	52	75·3	0·2	0·2	4,630
September	310	52	117·8	0·3	0·3	7,009
October	450	76	166·0	0·5	0·6	10,207
November	769	238	459·3	1·3	1·4	27,330
December	614	147	293·6	0·8	0·9	18,052
The period	2,940	52	601·4	1·7	17·5	327,585

Note.—Mean annual precipitation at the mouth of Spius creek is about 10 inches, while in the higher altitudes it is probably about 30 inches.

Winter conditions existed subsequent to December 24.

Thompson River at Spence's Bridge (2039).

Location.—Section 10, township 17, range 25, west of 6th meridian.

Records available.—October 25 to December 31, 1911; January 1 to December 31, 1912; January 1 to December 31, 1913; January 1 to December 31, 1914.

Drainage area.—Twenty-one thousand square miles.

Gauge.—Gauge is standard chain gauge, situated on traffic bridge, read daily by Miss Violet Curnow.

Channel.—The channel varies in width from 400 feet to 500 feet. Depth of section at high water greater by 16 feet than at low.

Velocities range from 2.0 second-feet to 11 feet per second.

Discharge measurements.—Measurements are made from traffic bridge. Owing to great velocity at high water, meterings are difficult to obtain. However, curve is well defined.

Winter flow.—River usually remains open throughout the year.

Accuracy.—Results are considered to be very accurate, and all returns should fall within 5 per cent of the truth.

Daily Gauge Height and Discharge of Thompson River at Spence's Bridge for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft
1	1·90	5,870	1·70	5,640	1·90	5,870	1·75	5,695	7·8	26,880	13·5	61,170
2	2·00	6,000	1·70	5,640	1·86	5,750	1·70	5,640	8·1	28,300	13·5	61,170
3	2·10	6,140	1·70	5,640	1·85	5,810	1·75	5,695	9·2	33,840	13·5	61,170
4	2·20	6,290	1·60	5,530	1·80	5,750	1·80	5,750	9·6	35,920	13·5	61,170
5	2·20	6,290	1·50	5,425	1·80	5,750	1·90	5,870	10·0	38,000	14·1	66,080
6	2·30	6,450	1·50	5,425	1·75	5,695	2·00	6,000	10·0	38,000	14·6	70,240
7	2·40	6,620	1·50	5,425	1·70	5,640	2·30	6,450	10·3	39,660	15·3	76,240
8	2·50	6,800	1·45	5,375	1·65	5,585	2·50	6,800	10·6	41,340	15·0	73,690
9	2·60	7,000	1·50	5,425	1·60	5,530	2·70	7,240	10·7	41,970	14·8	71,910
10	2·60	7,000	1·60	5,530	1·65	5,585	3·00	8,000	10·8	42,460	14·5	69,405
11	2·50	6,800	1·70	5,640	1·70	5,640	3·30	8,830	11·0	43,630	14·5	69,405
12	2·40	6,620	1·70	5,640	1·70	5,640	3·60	9,675	11·4	46,190	14·6	70,240
13	2·40	6,620	1·75	5,695	1·75	5,695	4·00	10,850	11·9	49,330	14·7	71,075
14	2·30	6,450	1·80	5,750	1·80	5,750	4·40	12,200	12·4	52,705	14·9	72,750
15	2·30	6,450	1·80	5,750	1·80	5,750	4·90	14,020	12·8	55,750	15·0	71,600
16	2·30	6,450	1·80	5,750	1·75	5,695	5·30	15,630	13·0	57,250	15·0	75,600
17	2·30	6,450	1·75	5,695	1·75	5,695	5·70	17,340	13·2	58,770	15·9	81,520
18	2·20	6,290	1·70	5,640	1·80	5,750	5·80	17,760	13·4	60,470	16·3	85,040
19	2·20	6,290	1·70	5,640	1·80	5,750	5·90	18,180	14·8	71,910	16·7	88,560
20	2·10	6,140	1·75	5,695	1·80	5,750	6·40	20,410	14·3	67,740	16·7	89,600
21	2·10	6,140	1·70	5,640	1·85	5,810	6·50	20,900	14·3	67,740	16·55	87,240
22	2·10	6,140	1·70	5,640	1·85	5,810	6·60	21,360	14·1	66,080	16·3	85,040
23	2·00	6,000	1·75	5,695	1·90	5,870	6·70	21,820	14·2	66,910	15·9	81,520
24	2·00	6,000	1·70	5,640	1·90	5,870	6·80	22,280	14·3	67,740	15·7	79,760
25	1·90	5,870	1·70	5,640	1·85	5,810	6·90	22,740	14·5	69,405	15·5	78,000
26	1·80	5,750	1·75	5,695	1·80	5,750	6·90	22,740	14·8	71,910	15·0	73,800
27	1·80	5,750	1·80	5,750	1·80	5,750	7·15	23,880	14·8	71,910	14·6	70,240
28	1·60	5,530	1·90	5,870	1·90	5,870	7·15	23,880	14·7	71,075	14·75	71,490
29	1·45	5,375			1·85	5,810	7·30	24,480	14·6	70,240	14·75	71,490
30	1·40	5,330			1·85	5,810	7·50	25,500	14·2	66,910	14·8	71,910
31	1·60	5,530			1·80	5,750			13·8	61,585		

Daily Gauge Height and Discharge of Thompson River at Spence's Bridge, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	14·8	71,910	11·0	43,600	7·30	24,580	6·60	21,360	5·70	17,340	4·80	13,650
2	15·0	73,600	10·7	41,900	7·00	23,200	6·80	22,280	5·80	17,760	4·80	13,650
3	15·1	74,480	10·65	41,620	6·80	22,280	7·00	23,200	5·80	17,760	4·80	13,650
4	15·2	75,360	10·7	41,900	6·60	21,360	7·30	24,580	6·00	18,600	4·70	13,280
5	15·4	77,120	10·5	40,780	6·50	20,900	7·30	24,580	6·20	19,520	4·65	13,095
6	15·6	78,880	10·6	41,340	6·50	20,900	6·80	22,280	6·40	20,440	4·50	12,550
7	15·4	77,120	10·4	40,220	6·20	19,520	6·50	20,900	6·70	21,820	4·40	12,200
8	15·2	75,360	10·3	39,660	6·20	19,520	6·30	19,980	6·50	20,900	4·30	11,860
9	15·0	73,600	10·2	39,100	6·20	19,520	5·90	18,180	6·30	19,980	4·30	11,860
10	14·35	68,155	10·1	38,540	6·20	19,520	5·80	17,760	6·10	19,060	4·20	11,520
11	14·3	67,740	9·7	36,440	6·20	19,520	5·80	17,760	6·00	18,600	3·70	9,950
12	14·3	67,740	9·4	34,880	6·20	19,520	5·90	18,180	6·00	18,600	3·40	9,110
13	14·3	67,740	9·3	34,360	6·20	19,520	5·70	17,340	6·10	19,060	3·40	9,110
14	14·35	68,155	8·90	32,300	6·20	19,520	5·60	16,920	6·00	18,600	3·20	8,550
15	14·4	68,570	8·60	30,800	6·10	19,060	5·50	16,500	6·00	18,600	3·10	8,270
16	14·6	70,240	8·60	30,800	6·00	18,600	5·40	16,080	5·80	17,760	3·00	8,000
17	14·5	69,405	8·60	30,800	5·80	17,760	5·30	15,660	5·60	16,920	2·90	7,740
18	14·4	68,570	8·40	29,890	5·50	16,500	5·30	15,660	5·50	16,500	2·80	7,490
19	14·0	65,250	8·40	29,800	5·40	16,080	5·40	16,080	5·40	16,080	2·80	7,490
20	13·7	62,770	8·30	29,300	5·20	15,240	5·80	17,760	5·30	15,660	2·80	7,490
21	13·3	59,570	8·20	28,800	5·40	16,080	6·00	18,600	5·20	15,240	2·80	7,490
22	13·3	59,570	8·20	28,800	5·80	17,760	6·20	19,520	5·10	14,820	2·90	7,740
23	12·9	55,500	8·10	28,300	5·80	17,760	6·50	20,900	5·10	14,820	2·90	7,740
24	12·6	54,250	8·10	28,300	6·00	18,600	6·30	19,980	5·10	14,820	3·00	8,000
25	12·1	59,680	8·10	28,300	5·90	18,180	6·00	18,600	5·10	14,820	3·00	8,000
26	11·9	49,330	7·80	26,800	6·00	18,600	5·80	17,760	5·00	14,490	3·10	8,270
27	11·9	49,330	7·80	26,800	6·00	18,600	5·65	17,130	5·00	14,490	3·10	8,270
28	11·8	48,670	7·70	26,420	6·00	18,600	5·70	17,340	4·90	14,020	3·10	8,270
29	11·7	48,020	7·60	25,950	6·20	19,520	5·60	16,920	4·90	14,020	3·20	8,550
30	11·6	47,380	7·50	25,500	6·30	19,980	5·55	16,710	4·8	13,650	3·20	8,550
31	11·3	45,460	7·40	25,040	.....	.....	5·60	16,920	.....	.....	3·20	8,550

Monthly Discharge of Thompson River at Spence's Bridge for 1914.

(Drainage area, 21,000 square miles.)

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	7,000	5,300	6,208	0·3	0·3	381,720
February	5,870	5,375	5,625	0·3	0·3	312,395
March	5,870	5,530	5,742	0·3	0·3	353,062
April	25,500	5,610	14,593	0·7	0·8	868,380
May	71,910	26,880	54,304	2·6	3·0	3,339,044
June	89,000	61,170	73,958	3·5	3·9	4,397,875
July	78,880	45,460	64,210	3·0	3·4	3,948,120
August	43,600	25,040	33,133	1·6	1·8	2,037,246
September	24,580	15,240	19,210	0·9	1·0	1,143,090
October	24,580	15,660	18,820	0·9	1·0	1,157,210
November	21,820	13,650	17,152	0·8	0·9	1,020,620
December	13,650	7,490	9,675	0·4	0·5	594,895
The year	89,000	5,330	26,881	1·28	17·2	19,553,657

Note.—Precipitation varies from 5 inches at the confluence of the Thompson and Fraser rivers to 40 inches at the Albreda summit and 40 inches at the source of several streams tributary to Shuswap lake.

For meterings and further hydrographic data, see Water Resources Papers Nos. 1 and 8.

SESSIONAL PAPER No. 25e

MISCELLANEOUS METERING STATIONS.

Date.	Stream.	Tributary to—	Locality.	Gauge Height.	Discharge
				Feet.	Sec.-ft.
May 8	Alkali creek	Cherry creek	Above Cornwall's div.	—	2·5
June 11	"	"	Cornwall's ranch	—	1·2
" 12	"	"	Below beaver dam div.	—	2·2
Sept. 4	Bear creek	Clearwater river	Crossing Myrtle trail	—	7·4
June 11	"	"	" "	—	162·0
" 10	Beaver creek	"	" "	—	190·4
Sept. 6	Boulder creek	N. Thompson river	1 mile from mouth	1·0	19·2
Aug. 12	Cahilty creek	Louis creek	1 mile from mouth	0·95	6·8
June 11	Candle creek	Clearwater river	Larkey's ranch	—	49·7
Aug. 29	"	"	"	—	0·3
June 15	Chartrand creek	Guicgon creek	At bridge	1·25	4·6
" 16	Chartrand spring	Chartrand creek	Chartrand ranch	—	0·5
April 27	Cherry creek	Kamloops lake	Cornwall's ranch	—	9·6
May 8	"	"	"	—	23·8
" 11	"	"	"	—	86·1
June 11	"	"	"	—	8·3
" 17	Dupuis creek	Mamit lake	Above Mamit lake	—	2·2
" 3	Edwards creek	Heffley creek	1 mile above Heffley creek		6·7
Aug. 25	Fishtrap creek	N. Thompson river	1 mile from mouth	0·5	11·4
May 27	Gordon creek	North Thompson river	At highway bridge		1·8
June 17	Greenstone creek	Meadow creek	Above Homfray dam		10·5
" 15	Guichon creek	(Chartrand div. of)	At road		2·9
" 13	"	Mamit lake	F. Allen's ranch		25·8
" 15	"	"	Chartrand ranch		50·6
" 3	Heffley creek	(Anderson diversion of)	At intake		3·4
" 10	Hemp creek	Clearwater	Crossing Clearwater trail		284·0
" 16	Meadow creek	Guichon creek	Above Indian Reserve ditch		66·7
Sept. 1	Myrtle river	Clearwater river	At lower crossing	1·1	852·0
May 27	Noble creek	N. Thompson river	Above B. C. F. div.		6·8
Aug. 7	Paul creek	"	At outlet of lake	4·45	23·0
May 8	Pendleton creek	Cherry creek	Above Cornwall's intake		1·3
June 12	"	"	"		0·6
Aug. 17	Queest creek	Shuswap lake	¼ mile from mouth		9·2
June 16	Quenville creek	Guichon creek	Above Quenville div.		2·9
Aug. 12	Scotch creek	Shuswap lake	3 miles from mouth		93·5
" 15	Seymour river	"	1 mile from mouth	2·37	1,051·0
June 13	Three-mile creek	Kamloops lake	Harris ranch		6·7
Aug. 21	N. Thompson river	Thompson river	C.N.R. bridge near Kamloops		17,775·0
" 25	Whitewood creek	N. Thompson river	At highway bridge		1·7
June 15	Witch creek	Guichon creek	¼ mile from mouth		28·1

MISCELLANEOUS METERING STATIONS.

Date.	Stream.	Tributary to—	Locality.	Gauge Height	Discharge
				Feet.	Sec.-ft.
Aug. 13	Hat creek (Hammond's diversion)				7·6
June 16	Six-mile creek	Tulameen river	Above diversions	3·77	1·0
Nov. 15, 1913	Twenty-mile creek	Similkameen river	Above intake Nickel Plate mine	0·70	13·2
June 12	"	"	" "	2·60	236·0
1914					
June 23	"	"	" "	2·00	140·0
July 2	" "	" "	" "	0·89	30·2
Aug. 31	"	"	" "	0·59	12·0

REPORT

OF THE

BRITISH COLUMBIA HYDROGRAPHIC SURVEY FOR 1914

CHAPTER 7

Nelson Division—Hydrographic Data

CHAPTER VII.

Nelson Division.—Hydrographic Data.

REGULAR METERING STATION.

Cariboo Creek, near Burton City (3057).

Location.—Upstream side of highway bridge, one-quarter mile from mouth, and one-quarter mile from Burton City wharf, between Upper and Lower Arrow lakes, Nelson district.

Records Available.—August to December, 1914.

Climatic Conditions.—Summers, hot with considerable rain in May and June, and very little rain in July and August. Winters mild, seldom below 0°F. with light snowfall. High water occurs generally in April or May. Extreme floods occur after heavy snowfall, during preceding winter, and continuous hot days and nights or warm rains in the latter part of April or the beginning of May. Low water may occur in August or September or during the winter. The stream does not stay frozen for long periods in the winter. Frazil ice is seldom present.

Gauge.—Located at highway bridge, near Burton. It is affected by backwater from Columbia river during May, June, July, and part of August. Mr. Ralph Islip reads the gauge daily

Channel.—The channel above and below the gauge is wide and filled with small log jams. It is very liable to shift during high water.

Discharge Measurements.—The curve is based on two discharge measurements made in September and October. A measurement was made early in August, but the gauge height was affected by backwater.

Accuracy.—The results published herein are probably within 20 per cent of the true discharge.

General.—Cariboo creek and its many tributaries rise in the divide between the Arrow lakes and Slocan lake watersheds, between Barton City and New Denver. The drainage area, in all, is about 225 square miles. The freshet is caused by the melting of snow, and not from glaciers.

Cariboo creek deposits large quantities of silt in Columbia river narrows, and is a detriment to navigation. The maximum flow has been estimated at 8,000 c.f.s., but this discharge will only occur once in a long time.

Discharge Measurements of Cariboo Creek near Burton City, for 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
July 24	C. E. K.	1,672	46	177	2·05	4·40	364[1]
Sept. 3	C. E. K. & J. A. E.	1,927	47	144	0·94	1·28	136
Oct. 30	J. A. E.	1,900	63	172	1·75	1·75	303

[1]Affected by backwater

Daily Gauge Heights and Discharges of Cariboo Creek near Barton City, B.C., for 1914.

Day.	August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	300	1·0	77	1·28	129	1·73	293	1·85	348
2	.....	293	1·0	77	1·28	129	1·75	302	1·82	334
3	.....	286	1·28	129	1·26	124	1·75	302	1·85	348
4	.....	279	1·28	129	1·25	122	1·76	306	1·85	348
5	.....	272	1·25	122	1·25	122	1·76	306	1·85	348
6	.....	265	1·24	120	1·2	110	1·75	302	1·9	372
7	1·65	258	1·25	122	1·2	110	1·75	302	1·9	372
8	.....	251	1·25	122	1·2	110	1·78	315	1·92	382
9	.....	244	1·25	122	1·2	110	1·78	315	1·92	382
10	.....	230	1·28	129	1·2	110	1·78	315	1·92	382
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	.....	223	1·25	122	1·22	115	1·78	315	1·92	382
13	1·55	216	1·25	122	1·22	115	1·8	324	1·95	396
14	1·5	196	1·2	110	1·2	110	1·8	324	1·95	396
15	1·5	196	1·25	122	1·2	110	1·8	324	1·96	401
16	1·4	164	1·3	134	1·15	103	1·8	324	1·96	401
17	1·4	164	1·28	129	1·15	103	1·8	324	1·96	401
18	1·45	180	1·28	129	1·15	103	1·8	324	1·95	396
19	1·4	164	1·25	122	1·2	110	1·8	324	1·95	396
20	1·4	164	1·25	122	1·25	122	1·8	324	1·95	396
21	1·45	180	1·2	110	1·4	164	1·82	334	1·97	406
22	1·45	180	1·2	110	1·45	180	1·82	334	1·97	406
23	1·45	180	1·25	122	1·50	196	1·85	348	1·97	406
24	1·4	164	1·25	122	1·6	236	1·85	348	1·97	406
25	1·4	164	1·2	110	1·69	276	1·85	348	1·96	401
26	1·4	164	1·2	110	1·69	276	1·85	348	1·96	401
27	1·4	164	1·25	122	1·68	271	1·8	324	1·95	396
28	1·4	164	1·28	129	1·68	271	1·8	324	1·95	396
29	1·3	134	1·27	127	1·7	280	1·82	334	1·95	396
30	1·2	110	1·25	122	1·75	302	1·82	334	1·96	401
31	1·2	110	.....	.....	1·73	293	.....	.....	1·96	401

Monthly Discharge of Cariboo Creek near Burton City, B.C., for 1914.

(Drainage area, 225 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
August	.....	110	203	0·90	1·04	12,500	.....
September	134	77	116	0·51	0·57	6,900	D
October	302	103	162	0·72	0·83	9,961	D
November	348	293	322	1·43	1·59	19,200	D
December	406	334	386	1·71	1·97	23,700	D

Carpenter Creek near New Denver (3024).

Location.—About 3 miles from the mouth, opposite the Denver Light and Power Company's power-house, Nelson district.

Records Available.—May to December, 1914.

Climatic Conditions.—Summers, hot. May and June are generally wet, but there is very little rain in July and August. Winters not severe, seldom below zero. Snowfall is not heavy in the lower altitudes.

Gauge.—Vertical staff enamel gauge was originally established immediately above the dam, but in December it was moved below the dam and opposite the power-house. Mr. C. J. Campbell reads the gauge three times a week.

Channel.—The channel generally below the dam and canyon is rocky and filled with huge boulders, but at the new gauge should be fairly permanent, though the water will be very broken during freshet.

Discharge Measurements.—No desirable metering station has as yet been established. Five measurements were made in 1914 from the highway bridge near New Denver. At this section and for a mile above the creek is flowing through a shifting gravel bed, and it is doubtful if the total discharge at the gauge is recorded when measurements are made from the bridge.

Accuracy.—The results published are not guaranteed.

General.—Carpenter creek is a flashy mountain stream, flowing from the east into Slocan lake, near New Denver. The drainage area is about 65 square miles of very mountainous country, abundant in mineral wealth. Glaciers feed the various forks. Heavy freshets are liable to occur in May, June, or July.

The water is used for mining and power purposes. The only plant operating at present on Carpenter creek is the Denver Light and Power Company, Ltd., Mr. C. J. Campbell, manager. The plant is located at the canyon about 3 miles above New Denver. The head is about 100 feet and a 93.75-k.v.a. C.G.E. generator is installed. At present, in the neighbourhood of 100 h.p. is developed.

DISCHARGE MEASUREMENTS of Carpenter Creek at New Denver, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 16	C. E. W., D. O. B. G.	1,048	199	96·6	5·60	1·9	541·0
May 13	J. A. E., G. K. B	1,672	200	130	7·28	2·35	919·0
July 9	D. O. R. G., J. A. E.	1,929	199	132	5·19	2·10	684·0
Aug. 18	D. O. B. Gill	1,929	33	47	3·83	1·10	180·0
Nov. 4	J. A. E., G. K. B	1,969	32	47	4·28	0·90	180·0

Daily Gauge Height and Discharge of Carpenter Creek near New Denver, B.C., for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	2·0	610	2·6	1,140
2	.....	.....	2·1	690	3·0	1,550
3	.....	.....	2·4	950	3·4	1,990
4	.....	.....	2·1	690	3·2	1,770
5	.....	.....	2·0	610	2·6	1,140
6	.....	.....	1·9	540	2·2	775
7	.....	.....	1·8	472	2·0	610
8	.....	.....	1·95	575	1·9	540
9	.....	.....	2·3	860	1·9	540
10	.....	.....	2·25	817	1·9	540
11	.....	.....	2·1	690	2·0	610
12	.....	.....	.....	800	2·1	690
13	.....	.....	2·35	905	2·3	860
14	.....	.....	2·6	1,140	2·4	950
15	.....	.....	2·75	1,290	2·7	1,240
16	.....	.....	2·85	1,390	2·85	1,390
17	.....	.....	2·7	1,240	3·0	1,550
18	.....	.....	2·5	1,040	2·9	1,440
19	.....	.....	2·5	1,040	2·7	1,240
20	1·7	414	2·5	1,040	2·5	1,040
21	.....	396	2·6	1,140	2·2	775
22	.....	378	2·6	1,140	2·1	690
23	1·6	360	2·6	1,140	2·0	610
24	1·6	360	2·7	1,240	2·0	610
25	.....	337	2·6	1,140	2·0	610
26	1·5	315	.....	1,060	2·1	690
27	1·6	360	2·3	860	2·2	775
28	.....	360	2·2	775	2·2	775
29	1·6	360	2·1	690	2·3	860
30	1·7	414	2·1	690	2·3	860
31	.....	.....	2·3	860	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Carpenter Creek near New Denver, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·4	950	.....	340	0·90	159	0·90	159	0·8	144	0·4	99
2	2·4	950	1·5	315	0·80	144	0·95	166	1·0	174	0·4	99
3	2·6	1,140	1·5	315	0·80	144	0·85	151	1·0	174	0·4	99
4	2·5	1,040	1·5	315	0·80	144	0·80	144	0·9	159	0·4	99
5	2·4	950	1·4	278	0·80	144	.....	144	1·1	194	0·3	91
6	.....	817	1·4	278	0·80	144	0·80	144	0·9	159	0·3	91
7	2·2	775	.....	261	0·80	144	0·80	144	0·8	144	0·3	91
8	.....	732	1·3	245	0·80	144	0·80	144	0·8	144	0·3	91
9	2·1	690	.....	245	0·80	144	0·80	144	0·8	144	0·3	91
10	.....	650	1·3	245	0·80	144	0·80	144	0·8	144	0·3	91
11	2·0	610	.....	245	0·80	144	0·80	144	0·8	144	0·3	91
12	2·1	690	1·3	245	0·80	144	0·80	144	0·8	144	.....	91
13	2·4	950	.....	231	0·80	144	0·80	144	0·7	130	.....	91
14	.....	841	1·2	217	0·8	144	0·80	144	0·6	118	.....	91
15	2·15	732	1·2	217	0·8	144	0·80	144	0·6	118	.....	91
16	1·85	506	1·2	217	0·8	144	0·8	144	0·6	118		91
17	1·8	472	1·3	245	0·8	144	1·0	174	0·6	118		91
18	1·75	443	1·25	231	0·85	151	1·0	174	0·3	91		91
19	1·85	506	1·0	224	1·15	205	1·0	174	0·5	108		91
20	.....	513	1·2	217	1·1	194	1·0	174	0·5	108	0·4	99
21	.....	520	.....	217	1·0	174	0·85	151	0·5	108	0·4	99
22	.....	527	1·2	217	0·9	159	0·80	144	0·5	108	0·25	88
23	.....	534	1·1	194	0·8	144	0·80	144	0·5	108	0·2	85
24	1·90	540	.....	194	0·8	144	0·80	144	0·4	99	0·2	85
25	1·90	540	1·1	194	0·8	144	0·80	144	0·4	99	0·2	85
26	1·80	472	.....	194	1·05	184	.....	144	0·4	99	0·1	79
27	.....	443	1·1	194	1·2	217	.....	144	0·4	99	0·1	79
28	1·70	414	.....	189	1·05	184	.....	144	0·4	99	0·1	79
29	1·60	360	1·05	184	1·00	174	.....	144	0·4	99	0·1	79
30	.....	360	1·00	174	0·90	159	0·80	144	0·4	99	0·1	79
31	1·60	360	0·90	159	.....	.....	0·80	144	.....	.....	0·1	79

Monthly Discharge of Carpenter Creek near New Denver, for 1914.

(Drainage area, 65 square miles.)

Month.	Discharge in Second Feet.				Run-Off	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	.....	.....	.....	.....	.....	.....
May	1,390	472	905	13·9	16·0	55,700
June	1,990	540	962	14·8	16·5	57,200
July	1,140	360	646	9·94	11·5	39,700
August	340	159	233	3·58	4·13	14,300
September	217	144	157	2·42	2·70	9,340
October	174	144	148	2·28	2·63	9,100
November	194	91	126	1·94	2·16	7,500
December	99	79	92·5	1·42	1·64	5,690
The period	.....	.....	.....	.....	.....	.....

Carpenter Creek, South Fork, near Sandon (3025).

Location.—In the flume back of the C.P.R. station at Sandon, behind a deserted bakery, Nelson district.

Records Available.—May to December, 1914.

Climatic Conditions.—Similar to Carpenter creek, New Denver, only the winters are longer, with more snow. Frazil ice is a possibility.

Gauge.—Enamel gauge, 0 feet to 3 feet, placed at the side of the box flume. Mrs. E. A. Cameron reads the gauge daily.

Flume.—The creek is flumed for several hundred feet through the townsite of Sandon. The flume is a box flume, 11.67 feet wide by 6 feet deep. For 50 feet above and below the section the slope is 0.056 feet. Kutter's formula was applied to determine the daily discharges.

Accuracy.—During high water the results are probably within 10 per cent, but at low stages, due to the gauge being only read to tenths, no accuracy can be given. A measurement made by Messrs. Webb and Gill, in April, agrees closely with the slope method.

General.—Sandon is about 6 miles from the source of the south fork of Carpenter creek, and is at an altitude of 3,488 feet. The drainage area, from the topographical map of the Geological Survey appears to be only about 12 miles. This shows a tremendous run-off per square mile during the months of May, June, and July.

The south fork has been used a great deal for mining, particularly during 1896-1902, but at present no water is used.

Daily Gauge Height and Discharge of south fork of Carpenter Creek near Sandon, B.C., for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·4	114	0·85	310
2			0·6	192	1·10	444
3			0·8	284	1·65	778
4			0·6	192	1·30	560
5			0·4	114	1·00	388
6			0·4	114	0·80	284
7			0·4	114	0·80	284
8			0·4	114	0·65	214
9			0·6	192	0·60	192
10			0·65	214	0·55	171
11			0·7	235	0·55	171
12			0·8	284	0·55	171
13			0·9	335	0·85	310
14			0·95	362	1·1	444
15			1·00	388	1·35	590
16			0·95	362	1·55	714
17			0·9	335	1·65	778
18			0·8	284	1·65	778
19			0·8	284	1·3	560
20			0·85	310	1·0	388
21			0·85	310	0·8	284
22			0·85	310	0·7	235
23			0·85	310	0·6	192
24			0·85	310	0·6	192
25			0·9	335	0·65	214
26	0·2	52	0·8	284	0·75	260
27	0·3	82	0·8	284	0·75	260
28	0·2	52	0·75	260	0·75	260
29	0·2	52	0·55	171	0·80	284
30	0·3	82	0·55	171	0·85	310
31			0·55	171		

SESSIONAL PAPER No. 25e

DAILY GAUGE HEIGHT AND DISCHARGE of south fork of Carpenter Creek near Sandon, B.C., for 1914.—(*Con.*)

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·95	362	0·30	82	0·10	27	0·20	52	0·2	52	0·1	27
2	1·1	444	0·30	82	0·'0	27	0·20	52	0·2	52	0·1	27
3	1·35	590	0·30	82	0·10	27	0·20	52	0·2	52	0·1	27
4	1·05	416	0·20	52	0·10	27	0·20	52	0·2	52	0·1	27
5	0·9	335	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
6	0·85	310	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
7	0·85	310	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
8	0·8	284	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
9	0·75	260	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
10	0·7	235	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
11	0·65	214	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
12	0·75	260	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
13	0·75	260	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
14	0·7	235	0·2	52	0·10	27	0·20	52	0·2	52	0·1	27
15	0·7	235	0·2	52	0·10	27	0·20	52	0·1	27	0·1	27
16	0·6	192	0·2	52	0·10	27	0·20	52	0·1	27	0·1	27
17	0·55	171	0·20	52	0·10	27	0·20	52	0·1	27	0·1	27
18	0·55	171	0·20	52	0·10	27	0·20	52	0·1	27	0·1	27
19	0·50	150	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
20	0·40	114	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
21	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
22	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
23	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
24	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
25	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
26	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
27	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
28	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
29	0·30	82	0·20	52	0·20	52	0·20	52	0·1	27	0·1	27
30	0·30	82	0·10	27	0·20	52	0·20	52	0·1	27	0·1	27
31	0·30	82	0·10	27	.....	.....	0·20	52	.....	.....	0·1	27

MONTHLY DISCHARGE of south fork of Carpenter Creek near Sandon, B.C., for 1914.

(Drainage area, 12 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet	
May	388	114	249	20·8	24·0	15,300	B
June	778	171	367	30·6	34·1	21,800	B
July	590	82	208	17·3	19·9	12,800	C
August	82	27	53·3	4·44	5·12	3,280	
September	52	27	37·0	3·08	3·44	2,200	
October	52	52	52·0	4·33	4·99	3,200	
November	52	27	38·7	3·22	3·59	2,300	
December	27	27	27·0	2·25	2·59	1,660	

COLUMBIA RIVER NEAR CASTLEGAR (3004).

Location.—Castlegar precinct, Nelson Water district, below Arrow lakes and above mouth of Kootenay river, at the C.P.R. bridge near Castlegar, B.C., Nelson district.

Records Available.—1913 and 1914.

Climatic Conditions.—Summers hot, with plenty of rain in May and June, but very little rain in July and August. Winters, the snowfall is not very heavy, the temperature seldom goes below O°F.; the river rarely freezes over.

Gauge.—Vertical staff gauge was used till August, when a chain gauge was established. Messrs. P. G. Farmer, J. McE. Agnew, and J. A. Turnbull read the gauges at different times during the year.

Channel.—Straight for 200 yards above and below the measuring section and gauge. A pronounced riffle in low water is lost during high water. The rise and fall of the river is about 25 feet.

Discharge Measurements.—Measurements are made from the upstream side of the railway bridge. Five measurements were made in 1914.

Accuracy.—This station is maintained chiefly to check the results obtained from Kootenay river near Glade, and Columbia river near Trail. Due to a probability of backwater, these results are not guaranteed.

Discharge Measurements of Columbia River near Castlegar, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 14	C. E. W. and A. J. V.	1048	380	6,800	1·66	1·7	11,300
Mar. 5	C. E. R. and A. J. V.	1672	398	6,170	1·24	0·72	7,680
May 31	J. A. Elliott	1909	515	14,100	5·82	15·12	82,100
July 28	G. K. Beeston	1672	530	13,500	7·67	17·52	104,000
Aug. 6	G. K. B. and D. O. R. G.	1929	515	12,900	6·60	15·8	85,100

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Columbia River near Castlegar, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·3	9,600	0·8	8,000	0·8	8,000	1·0	8,600	6·6	33,000	17·3	91,100
2	1·2	9,200	0·8	8,000	0·8	8,000	1·0	8,600	7·0	35,000	17·9	94,600
3	1·2	9,200	0·8	8,000	0·8	8,000	1·0	8,600	7·4	37,000	18·3	96,900
4	1·2	9,200	0·7	7,700	0·8	8,000	1·0	8,600	7·6	38,000	18·8	99,800
5	1·2	9,200	0·7	7,700	0·8	8,000	1·1	8,900	7·8	39,000	19·2	102,000
6	1·1	8,900	0·7	7,700	0·8	8,000	1·2	9,200	8·1	40,500	19·3	103,000
7	1·1	8,900	0·7	7,700	0·8	8,000	1·2	9,200	8·5	42,700	19·1	102,000
8	1·1	8,900	0·6	7,400	0·8	8,000	1·3	9,600	8·9	44,800	19·0	101,000
9	1·2	9,200	0·6	7,400	0·8	8,000	1·5	10,200	9·4	47,500	18·9	100,000
10	1·3	9,600	0·5	7,100	0·8	8,000	1·8	11,300	9·9	50,200	18·4	97,500
11	1·3	9,600	0·5	7,100	0·8	8,000	2·0	12,000	10·2	51,800	18·4	97,500
12	1·3	9,600	0·5	7,100	0·8	8,000	2·3	13,200	10·8	55,100	18·5	98,000
13	1·4	9,900	0·5	7,100	0·8	8,000	2·5	14,000	11·4	58,400	18·7	99,200
14	1·5	10,200	0·5	7,100	0·8	8,000	2·7	14,800	12·0	61,700	18·8	99,800
15	1·6	10,600	0·5	7,100	0·8	8,000	2·9	15,600	12·6	65,000	19·0	101,000
16	1·6	10,600	0·4	6,800	0·8	8,000	3·0	16,000	13·6	70,500	19·6	105,000
17	1·5	10,200	0·4	6,800	0·8	8,000	3·3	17,200	14·0	72,700	20·6	111,000
18	1·5	10,200	0·4	6,800	0·8	8,000	3·6	18,500	14·2	73,800	21·4	115,000
19	1·4	9,900	0·5	7,100	0·8	8,000	3·9	19,800	14·6	76,000	22·2	120,000
20	1·3	9,600	0·5	7,100	0·8	8,000	4·2	21,200	14·8	77,100	22·6	123,000
21	1·3	9,600	0·6	7,400	0·9	8,300	4·5	22,600	15·2	79,300	23·0	125,000
22	1·3	9,600	0·6	7,400	0·9	8,300	4·8	24,000	15·2	79,300	22·6	123,000
23	1·3	9,600	0·6	7,400	0·9	8,300	5·1	25,500	15·4	80,500	22·4	122,000
24	1·3	9,600	0·7	7,700	0·9	8,300	5·4	27,000	15·7	82,100	22·2	120,000
25	1·2	9,200	0·7	7,700	0·9	8,300	5·6	28,000	16·0	83,800	21·8	118,000
26	1·2	9,200	0·8	8,000	1·0	8,600	5·8	29,000	16·2	84,900	21·2	114,000
27	1·1	8,900	0·8	8,000	1·0	8,600	6·0	30,000	16·4	86,100	21·0	113,000
28	1·0	8,600	0·8	8,000	1·0	8,600	6·2	31,000	16·6	87,200	20·8	112,000
29	1·0	8,600	.....	.....	1·0	8,600	6·2	31,000	16·6	87,200	20·6	111,000
30	0·9	8,300	.....	.....	1·1	8,900	6·4	32,000	16·8	88,300	20·4	110,000
31	0·9	8,300	.....	.....	1·1	8,900	.....	.....	17·0	89,400	.....	.....

Daily Gauge Height and Discharge of Columbia River near Castlegar, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	20·6	111,000	.....	89,400	11·3	57,800	6·3	31,500	5·0	25,000	3·8	19,400
2	20·8	112,000	.....	86,600	11·1	56,700	6·2	31,000	5·0	25,000	4·0	20,200
3	21·0	113,000	.....	83,800	11·0	56,200	6·4	32,000	4·9	24,500	4·1	20,700
4	21·6	116,000	.....	83,000	10·8	55,100	6·6	33,000	4·8	24,000	4·0	20,200
5	22·1	120,000	.....	82,300	10·7	54,500	6·9	34,500	4·9	24,500	4·0	20,200
6	22·8	124,000	15·6	81,600	10·5	53,500	7·0	35,000	5·0	25,000	3·8	19,400
7	23·2	126,000	15·6	81,600	10·4	52,900	7·2	36,000	5·2	26,000	3·4	17,700
8	23·6	128,000	15·4	80,500	10·2	51,800	7·3	36,500	5·1	25,500	3·5	18,100
9	23·6	128,000	15·0	78,200	10·0	50,800	6·8	34,000	5·0	25,000	3·4	17,700
10	23·4	127,000	14·8	77,100	9·9	50,200	6·6	33,000	5·1	25,500	3·3	17,200
11	23·3	127,000	14·6	76,000	9·7	49,100	6·6	33,000	5·0	25,000	3·2	16,800
12	23·2	126,000	14·2	73,800	9·5	48,100	6·5	32,500	5·1	25,500	3·1	16,400
13	23·1	126,000	13·9	72,100	9·4	47,500	6·5	32,500	5·1	25,500	3·0	16,000
14	23·6	128,000	13·6	70,500	9·2	46,400	6·4	32,000	5·0	25,000	2·8	15,200
15	23·8	129,000	13·3	68,800	9·0	45,400	6·2	31,000	5·0	25,000	2·8	15,200
16	24·0	131,000	13·2	68,300	8·7	43,800	5·9	29,500	5·0	25,000	2·8	15,200
17	24·3	133,000	13·0	67,200	8·4	42,200	5·8	29,000	4·9	24,500	2·7	14,800
18	24·0	131,000	12·9	66,600	8·1	40,500	5·6	28,000	4·8	24,000	2·6	14,400
19	23·6	128,000	12·9	66,600	7·9	39,500	5·8	29,000	4·8	24,000	2·4	13,600
20	23·4	127,000	12·8	66,100	7·7	38,500	5·9	29,500	4·8	24,000	2·3	13,200
21	23·2	126,000	12·8	66,100	7·6	38,000	5·9	29,500	4·7	23,500	2·2	12,800
22	22·8	124,000	12·7	65,500	7·4	37,000	5·8	29,000	4·4	22,100	2·1	12,400
23	22·2	120,000	12·6	65,000	7·1	35,500	5·8	29,000	4·5	22,600	2·0	12,000
24	21·6	116,000	12·6	65,000	6·9	34,500	5·7	28,500	4·4	22,100	1·9	11,600
25	21·3	115,000	12·5	64,400	6·7	33,500	5·7	28,500	4·2	21,200	1·8	11,300
26	20·0	107,000	12·4	63,900	6·6	33,000	5·6	28,000	4·0	20,200	1·8	11,300
27	.....	104,000	12·4	63,900	6·6	33,000	5·5	27,500	3·9	19,800	1·7	10,900
28	.....	101,000	12·2	62,800	6·5	32,500	5·4	27,000	3·8	19,400	1·6	10,600
29	.....	98,000	12·0	61,700	6·3	31,500	5·3	26,500	3·9	19,800	1·5	10,200
30	.....	95,100	11·7	60,000	6·3	31,500	5·2	26,000	4·0	20,200	1·4	9,900
31	.....	92,300	11·5	58,900	.....	.....	5·1	25,500	.....	.....	1·4	9,900

Monthly Discharge of Columbia River near Castlegar, for 1914.

(Drainage area, 15,000 square miles.)

Month.	Discharge in Second-Feet.		Run-Off.	
	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	9,000	0·6	0·69	553,000
February	7,370	0·49	0·51	409,000
March	7,400	0·49	0·56	455,000
April	17,400	1·16	1·29	1,040,000
May	54,400	3·62	4·17	3,340,000
June	93,900	6·25	6·97	5,590,000
July	118,000	7·87	9·07	7,260,000
August	72,400	4·83	5·57	4,450,000
September	44,300	2·96	3·30	2,640,000
October	27,000	1·80	2·08	1,660,000
November	23,400	1·56	1·74	1,390,000
December	16,100	1·07	1·23	990,000

Note.—In this case the mean discharge represents the difference between the mean discharges of the Columbia near Trail and the Kootenay near Glade.

SESSIONAL PAPER No. 25e

MONTHLY DISCHARGE of Columbia River near Castlegar, for 1914—*Concluded.*

(Drainage area, 15,000 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	10,600	8,300	9,410	0·63	0·73	579,000
February	8,000	6,800	7,440	0·50	0·52	413,000
March	8,900	8,600	8,180	0·54	0·62	503,000
April	32,000	8,600	17,800	1·18	1·32	1,060,000
May	89,400	33,000	64,400	4·29	4·95	3,960,000
June	125,000	91,100	108,000	7·2	8·03	6,430,000
July	133,000	92,300	119,000	7·93	9·14	7,320,000
August	89,400	58,900	71,500	4·76	5·49	4,400,000
September	57,800	31,500	44,000	2·03	3·27	2,620,000
October	36,500	25,500	30,600	2·04	2·35	1,880,000
November	26,000	19,400	23,600	1·57	1·75	1,400,000
December	20,700	9,900	15,000	1·00	1·15	922,000

COLUMBIA RIVER NEAR REVELSTOKE (3007).

Location.—S.E. ¼ section 33, township 23, range 2, west 6th, meridian, above the mouth of Illecillewaet river on downstream side of highway bridge near Revelstoke.

Records Available.—1912-13-14, during open season.

Climatic Conditions.—In 1914 the precipitation was 40.5 inches, of which about 10 feet was snowfall. The summers are hot, with considerable rainfall. The winters are fairly cold, as low as −20°F. some seasons, with very heavy snowfall. Frazil ice forms in large quantities.

Gauge.—Chain gauge used and read daily during open season by Mr. J. H Jones.

Channel.—About 1,000 feet wide, controlled by a fairly permanent sandbar. 500 yards below. Shift in 1913 apparently caused by the building of a breakwater at the control.

Discharge Measurements.—Sixteen well distributed measurements taken during 1911-12-13-14. Miscellaneous ice-cover metering taken on February 27, 1912. Discharge, 4,460 c.f.s.

Accuracy.—Accurate gauge reading, fair conditions for metering. These results are considered to be within 3 per cent.

DISCHARGE MEASUREMENTS of Columbia River near Revelstoke, B.C., for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section	Mean Velocity	Gauge Height	Discharge
			Feet	Sq. ft	Ft. per sec	Feet	Sec. ft
June 25	J. A. Elliott	1909	846	11,500	6·38	13·2	73,400
May 29	"	1672	835	8,190	5·93	11·6	48,500
Sept 7	J. A. E., C. E. R	1927	825	7,940	4·78	9·5	37,700
Oct 8	J. A. E	1909	740	5,750	3·18	7·0	18,280
Nov 18	"	1909	705	4,210	2·66	5·1	11,200

Daily Gauge Height and Discharge of Columbia River near Revelstoke, B.C., for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	Average	11·6	52,700
2	.....	35,000	13·18	67,300
3	.....	.....	15·25	88,700
4	.....	.....	16·35	100,000
5	.....	.....	16·05	97,500
6	.....	.....	15·3	89,300
7	.....	.....	14·1	76,500
8	.....	.....	13·3	68,000
9	.....	.....	12·8	63,200
10	.....	.....	12·9	64,700
11	.....	.....	13·3	68,000
12	.....	.....	13·9	74,000
13	.....	.....	15·2	88,200
14	.....	.....	16·2	98,600
15	.....	.....	16·9	106,000
16	.....	.....	17·8	116,000
17	.....	.....	18·8	129,000
18	.....	.....	19·0	132,000
19	.....	.....	19·0	132,000
20	11·8	54,000	17·4	113,000
21	12·2	56,500	16·1	98,200
22	12·4	59,400	15·6	90,900
23	12·9	64,600	14·6	81,300
24	13·6	71,500	14·1	76,800
25	13·8	73,500	14·1	77,000
26	13·5	70,500	14·9	85,200
27	12·8	63,700	15·4	90,500
28	12·2	58,100	15·4	90,800
29	11·4	51,000	15·7	93,200
30	10·8	46,400	16·1	97,900
31	10·96	47,400	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Columbia River near Revelstoke, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	16·1	97,900	14·7	82,700	10·5	43,600	8·9	31,300	6·8	18,200	5·5	12,400
2	17·1	109,000	15·0	86,000	10·8	46,000	8·6	29,200	6·9	18,700	5·4	12,000
3	18·1	121,000	15·0	86,000	10·7	45,200	8·3	27,100	7·0	19,200	5·3	11,600
4	19·1	133,000	15·0	86,000	10·5	43,600	7·9	24,400	6·9	18,700	5·1	10,800
5	19·2	134,000	15·0	86,000	10·4	42,800	7·6	22,600	6·8	18,200	5·0	10,500
6	19·0	132,000	14·4	79,500	9·8	38,000	7·4	21,400	6·6	17,200	4·9	10,200
7	18·2	122,000	14·2	77,500	9·7	37,200	7·2	20,200	6·4	16,200	4·8	9,900
8	18·0	120,000	14·4	79,500	10·6	44,400	7·2	20,200	6·3	15,700	4·8	9,900
9	17·2	110,000	13·4	69,500	10·0	39,600	7·3	20,800	6·3	15,700		
10	17·4	112,000	12·3	59,000	9·7	37,200	7·2	20,200	6·2	15,200		
11	18·6	127,000	11·9	55,400	9·3	34,100	7·1	19,700	6·3	15,700		
12	18·4	124,000	11·5	51,800	8·6	29,200	6·9	18,700	6·1	14,800		Average
13	18·2	122,000	11·7	53,600	8·2	26,400	6·8	18,200	6·0	14,400		8,000
14	20·7	146,000	12·4	59,900	8·1	25,700	6·7	17,700	5·9	14,000		
15	19·3	136,000	12·9	64,700	7·6	22,600	6·6	17,200	5·8	13,600		
16	18·8	129,000	12·8	63,700	6·8	18,200	7·7	23,200	5·7	13,200		
17	16·3	100,000	12·6	61,700	7·0	19,200	7·9	24,400	5·4	12,000		
18	16·2	99,000	12·5	60,800	7·2	20,200	7·8	23,800	5·3	11,600		
19	16·8	105,000	12·5	60,800	8·0	25,000	7·7	23,200	5·3	11,600		
20	16·1	98,000	12·8	63,700	7·7	23,200	7·0	19,200	5·2	11,200		
21	15·3	89,300	13·0	65,700	7·6	22,600	6·6	17,200	5·2	11,200		
22	14·6	81,600	12·9	64,700	7·5	22,000	6·4	16,200	5·2	11,200		
23	14·2	77,500	12·6	61,700	7·4	21,400	6·4	16,200	5·3	11,600		
24	14·1	76,500	12·0	56,300	7·5	22,000	6·3	15,700	5·4	12,000		
25	14·2	77,500	11·5	51,800	7·7	23,200	6·2	15,200	5·5	12,400		
26	13·7	72,500	11·3	50,200	8·0	25,000	6·1	14,800	5·7	13,200		
27	13·4	69,500	11·4	51,000	9·7	37,200	6·0	14,400	5·6	12,800		
28	13·1	66,600	11·6	52,700	9·6	36,400	5·9	14,000	5·7	13,200		
29	12·9	64,700	11·8	54,500	9·6	36,400	5·7	13,200	5·7	13,200		
30	13·2	67,500	10·5	43,600	9·1	32,700	6·2	15,200	5·6	12,800		
31	13·9	74,500	10·4	42,800			6·8	18,200				

Monthly Discharge of Columbia River near Revelstoke, for 1914.

(Drainage area, 9,000 square miles.)

Month.	Discharge in Second-Feet				Run-Off		Accuracy
	Maximum	Minimum.	Mean	Per Square Mile.	Depth in inches on Drainage Area	Total in Acre-feet	
May	73,500		44,500	4·94	5·70	2,740,000	
June	132,000	52,700	90,200	10·0	11·2	5,370,000	B
July	146,000	64,700	103,000	11·4	13·1	6,330,000	B
August	86,000	42,800	66,700	7·41	2·54	3,100,000	A
September	46,000	18,200	31,700	3·52	3·93	1,890,000	A
October	31,300	13,200	19,900	2·21	2·55	1,220,000	A
November	19,200	11,200	14,300	1·59	1·77	851,000	A
December	12,400		8,750	0·97	1·12	538,000	

Four-Mile Creek below Hewitt Mill (3027).

Location.—At bridge about 3 miles from mouth, near Silverton, and about a mile below Hewitt Mill. Nelson district.

Records Available.—May to December, 1914.

Climatic Conditions.—Summers, hot with light rainfall after June. Winters, not very severe, with moderate snowfall. The creek does not stay frozen for more than a few days at a time. Frazil and anchor ice may form at times.

Gauge.—Vertical staff, enamel, read daily by Mr. Geo. Stilwell, superintendent at Hewitt mill.

Channel.—Swift water, with rocky bed. Apparently permanent.

Discharge Measurements.—Seven measurements were made in 1914.

Accuracy.—The measurements may not be very accurate. Daily gauge readings are obtained. Accuracy not guaranteed below gauge height, 0.5. Accuracy above 0.5 and below 1.5, 10 per cent. Accuracy above 1.5, 20 per cent.

General.—Four-mile creek is a small creek flowing from the east into Slocan lake, near Silverton. It drains a mountainous country, abundant in mineral wealth, and the creek is used for mining purposes by Standard, Hewitt, and Van Roi mines.

Discharge Measurements of Four Mile Creek, Silverton, below Hewitt Mill, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 19	C. E. W., D. O'B. G.	1,048	26·5	43·0	3·97	0·85	171
May 12	J. A. E., G. K. B	1,672	33·5	63·5	4·69	1·20	298
June 11	G. K. B., C. E. R.	1,927	30·0	57·2	4·81	1·15	275
June 18	G. K. B	1,927	37·0	95·6	5·01	2·10	479[1]
July 9	D. O. B. G., J. A. E.	1,929	28·0	66·0	4·30	1·25	283
Aug. 18	D. O'B. G.	1,929	24·0	33·1	2·64	0·5	87·6
Nov. 3	J. A. E., G. K. B.	1,909	22·0	32·5	3·12	0·5	101

[1]Meter out of order.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Four-Mile River, below Hewitt Mill, for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·9	190	1·65	436
2	1·1	150	2·10	612
3	1·25	296	2·45	758
4	1·2	280	2·40	737
5	1·1	250	1·85	514
6	1·05	235	1·70	455
7	1·05	235	1·50	381
8	1·05	235	1·40	346
9	1·17	271	1·35	329
10	1·2	280	1·35	329
11	1·2	280	1·35	329
12	1·2	280	1·45	364
13	1·28	306	1·60	417
14	1·37	336	1·95	553
15	1·7	455	2·05	592
16	1·8	494	2·25	674
17	1·65	436	2·4	737
18	1·55	399	2·4	737
19	1·5	381	2·47	767
20	1·45	364	2·0	572
21	1·45	364	1·60	417
22	1·45	364	1·40	346
23	1·52	388	1·30	312
24	1·62	425	1·30	312
25	1·65	436	1·30	312
26	1·52	388	1·40	346
27	1·45	364	1·50	381
28	1·32	319	1·5	381
29	1·25	296	1·55	399
30	1·32	319	1·6	417
31	1·48	374	.....	.....

Daily Gauge Height and Discharge of Four-Mile River, below Hewitt Mill, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·65	436	0·70	140	0·30	65	0·55	108	0·62	122	0·10	41
2	1·7	455	0·70	140	0·30	65	0·50	98	0·67	133	0·15	46
3	1·7	455	0·70	140	0·30	65	0·50	98	0·65	129	0·15	46
4	1·7	455	0·70	140	0·30	65	0·45	89	0·55	108	0·10	41
5	1·6	417	0·70	140	0·25	59	0·45	89	0·50	98	0·10	41
6	1·5	381	0·70	140	0·32	68	0·45	89	0·45	89	0·10	41
7	1·4	346	0·80	165	0·40	80	0·45	89	0·45	89	0·10	41
8	1·4	346	0·70	140	0·40	80	0·40	80	0·45	89	0·10	41
9	1·3	312	0·60	118	0·40	80	0·40	80	0·45	89	0·10	41
10	1·25	296	0·60	118	0·37	76	0·40	80	0·45	89	0·05	36
11	1·2	280	0·60	118	0·35	73	0·40	80	0·40	80	0·05	36
12	1·2	280	0·55	108	0·35	73	0·40	80	0·40	80	0·05	36
13	1·25	296	0·50	98	0·35	73	0·35	73	0·40	80	0·05	36
14	1·3	312	0·50	98	0·38	77	0·35	73	0·45	89	0·02	34
15	1·25	296	0·50	98	0·40	80	0·30	65	0·30	65	0·05	36
16	1·22	286	0·50	98	0·50	98	0·30	65	0·30	65	0·05	36
17	1·07	241	0·55	108	0·55	108	0·55	108	0·25	59	0·05	36
18	1·00	220	0·50	98	0·65	129	0·55	108	0·25	59	0·00	32
19	1·00	220	0·45	89	0·65	129	0·55	108	0·25	59	0·00	32
20	1·00	220	0·45	89	0·60	118	0·55	108	0·25	59	0·00	32
21	0·87	183	0·42	84	0·55	108	0·52	102	0·25	59	−0·05	28
22	0·85	177	0·40	80	0·50	98	0·40	80	0·25	59	−0·10	25
23	0·80	165	0·40	80	0·50	98	0·40	80	0·25	59	−0·18	21
24	0·80	165	0·40	80	0·50	98	0·40	80	0·25	59	−0·20	20
25	0·80	165	0·35	73	0·50	98	0·40	89	0·20	52	−0·10	25
26	0·80	165	0·35	73	0·50	98	0·40	80	0·25	59	−0·00	32
27	0·80	165	0·30	65	0·68	136	0·35	73	0·25	59	−0·05	36
28	0·75	152	6·30	65	0·60	118	0·35	73	0·25	59	−0·05	36
29	0·75	152	0·35	73	0·60	118	0·35	73	0·25	59	−0·00	32
30	0·70	140	0·35	73	0·55	108	0·46	91	0·20	52	0·00	32
31	0·70	140	0·30	65	.....	.....	0·50	98	.....	.....	0·00	32

Monthly Discharge of Four-Mile Creek near Silverton, for 1914.

(Drainage area, 41 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	494	190	328	8·00	9·22	20,200	D
June	758	312	475	11·6	12·9	28,300	D
July	455	140	268	6·54	7·54	16,500	D
August	165	65	103	2·51	2·89	6,300	B
September	136	59	91·3	2·23	2·50	5,430	B
October	108	65	86·3	2·10	2·42	5,300	B
November	133	52	76·9	1·88	2·10	4,580	B
December	46	20	34·8	0·85	0·98	2,140	B

Four Mile Creek Above Hewitt Intake (3028).

Location.—Immediately above Hewitt intake, about 5 miles from Silverton. Nelson district.

Records Available.—May to December, 1914.

Climatic Conditions.—Similar to Four-mile creek below Hewitt mill.

Gauge.—Vertical staff, enamel, read daily by Mr. P. Harding, of Van Roi mill.

Channel.—Water smooth and swift, controlled by Hewitt diversion dam.

Discharge Measurements.—Five measurements were made in 1914, by wading.

Accuracy.—No high-water measurements were made. The gauge readings have been somewhat intermittent. The results may not be closer than 20 per cent.

General.—Granite creek flows in below this station and above the station located below Hewitt mill.

Discharge Measurements of Four Mile Creek near Silverton, above Hewitt Intake, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 19	G. E. W., D. O'B. G.	1048	38·5	62·7	1·27	1·05	80·1
June 11	G. K. B., C. E. R.	1927	28·2	55·0	3·55	1·52	195·0[1]
July 9	J. A. E., D. O'B. G.	1929	30·5	57·8	3·56	1·58	206·0
Aug. 18	D. O'B. G.	1929	26	26·9	1·86	0·8	50·1
Nov. 3	J. A. E., G. K. B.	1909	25	22·6	2·09	0·8	47·4

[1]Different section.

Daily Gauge Height and Discharge of Four Mile Creek above Hewitt Intake near Silverton, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	0·9	60·0	2·05	348·0
2	.....	.....	1·2	110·0	2·3	430·0
3	.....	.....	1·55	198·0	2·0	332·0
4	.....	.....	1·7	241·0	1·9	301·0
5	.....	.....	1·65	226·0	1·8	271·0
6	.....	.....	1·6	212·0	1·6	212·0
7	.....	.....	1·55	198·0	1·6	212·0
8	.....	.....	1·5	183·0	1·6	212·0
9	.....	.....	1·65	226·0	1·5	183·0
10	.....	.....	1·7	241·0	1·7	241·0
11	.....	.....	1·6	212·0	1·7	241·0
12	.....	.....	1·5	183·0	1·8	271·0
13	.....	.....	1·5	183·0	1·9	301·0
14	.....	.....	1·8	271·0	1·9	301·0
15	.....	.....	2·0	332·0	2·1	365·0
16	.....	.....	2·15	381·0	2·2	397·0
17	.....	.....	2·1	365·0	2·3	430·0
18	.....	.....	1·9	301·0	2·2	397·0
19	.....	.....	1·7	241·0	2·0	332·0
20	.....	.....	1·7	241·0	2·2	397·0
21	.....	.....	1·8	271·0	2·0	332·0
22	.....	.....	1·9	301·0	1·9	301·0
23	.....	.....	1·9	301·0	1·7	241·0
24	0·7	39·5	1·8	271·0	1·6	212·0
25	0·7	39·5	1·6	212·0	1·6	212·0
26	0·6	31·7	1·45	170·0	1·5	183·0
27	0·7	39·5	1·4	157·0	1·5	183·0
28	0·6	31·7	1·5	183·0	1·4	157·0
29	0·8	48·0	1·6	212·0	1·5	183·0
30	0·8	48·0	1·8	271·0	1·6	212·0
31	.....	.....	1·9	301·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Four Mile Creek above Hewitt Intake near Silverton, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·5	183·0	1·0	71·5	0·80	48·0	0·82	50·4	0·8	48·0	0·5	26·2
2	.....	183·0	1·0	71·5	0·75	43·8	0·82	50·4	0·9	60·0	0·48	25·2
3	.....	183·0	1·0	71·5	0·75	43·8	0·80	48·0	0·82	50·4	0·45	23·7
4	.....	183·0	1·0	71·5	0·75	43·8	0·78	46·3	0·8	48·0	0·4	21·2
5	.....	183·0	0·9	60·0	0·75	43·8	0·78	46·3	0·85	54·0	0·4	21·2
6	.....	183·0	0·9	60·0	0·55	29·0	0·72	41·2	0·82	50·4	0·4	21·2
7	.....	183·0	1·0	71·5	0·50	26·2	0·69	37·9	0·78	46·3	0·5	26·2
8	.....	183·0	1·0	71·5	0·60	31·7	0·70	39·5	0·7	39·5	0·5	26·2
9	1·5	183·0	1·0	71·5	0·62	33·3	0·68	37·9	0·72	41·2	0·5	26·2
10	1·45	170·0	1·0	71·5	0·62	33·3	0·68	37·9	0·7	39·5	0·5	26·2
11	1·45	170·0	.....	70·0	0·68	37·9	0·7	39·5	0·7	39·5	0·45	23·7
12	1·6	212·0	.....	65·0	0·68	37·9	0·68	37·9	0·7	39·5	0·45	23·7
13	1·65	226·0	.....	60·0	0·68	37·9	0·65	35·6	0·68	37·9	Ice.	20·0
14	1·65	226·0	.....	60·0	0·68	37·9	0·62	33·3	0·65	35·6		18·0
15	1·65	226·0	.....	60·0	0·68	37·9	0·6	31·7	0·62	33·3		17·0
16	1·45	170·0	.....	55·0	0·60	31·7	0·6	31·7	0·57	30·0		16·0
17	1·25	121·0	.....	50·0	0·68	37·9	0·82	50·4	0·60	31·7		15·0
18	1·25	121·0	0·8	48·0	0·78	46·3	0·88	57·6	0·60	31·7		15·0
19	1·35	144·0	0·9	60·0	0·97	68·0	0·85	54·0	0·60	31·7		15·0
20	1·30	132·0	0·95	65·8	0·98	69·2	0·78	46·3	0·58	30·6		16·0
21	1·15	100·0	0·9	60·0	0·85	54·0	0·7	39·5	0·60	31·7		16·0
22	1·15	100·0	0·95	65·8	0·88	57·6	0·7	39·5	0·58	30·6	0·3	16·8
23	1·20	110·0	0·9	60·0	0·78	46·3	0·68	37·9	0·55	29·0	0·3	16·8
24	1·10	90·0	1·0	71·5	0·80	48·0	0·65	35·6	0·52	27·3	0·3	16·8
25	1·10	90·0	1·0	71·5	0·80	48·0	0·65	35·6	0·5	26·2	0·25	13·6
26	1·1	90·0	0·85	54·0	0·85	51·0	0·65	35·6	0·55	29·0	0·25	13·6
27	1·1	90·0	0·85	54·0	0·95	65·8	0·62	33·3	0·52	27·3	0·25	13·6
28	1·1	90·0	0·85	54·0	0·95	65·8	0·6	31·7	0·5	26·2	0·25	13·6
29	1·1	90·0	0·85	54·0	0·95	65·8	0·6	31·7	0·5	26·2	0·25	13·6
30	1·1	90·6	0·85	54·0	0·88	57·6	0·65	35·6	0·5	26·2	0·25	13·6
31	1·0	71·5	0·80	48·0	.....	.....	0·70	39·5	.....	.....	0·20	12·5

Monthly Discharge of Four Mile Creek near Silverton, for 1914.

(Drainage area, 30 square miles.)

Month.	Discharge in Second-Feet.				Run-Off		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	381	60	234	7·80	8·99	14,400	D
June	430	157	290	9·66	10·8	17,300	D
July	226	71·5	148	4·93	5·68	9,100	
August	71·5	48	62·4	2·08	2·40	3,840	
September	69·2	26·2	46·1	1·54	1·72	2,740	C
October	57·6	31·7	40·3	1·34	1·54	2,480	C
November	60·0	26·2	36·6	1·22	1·36	2,180	C
December	26·2	12·5	18·8	0·63	0·73	1,160	

Goat River Near Erickson (3031).

Location.—Immediately above bridge near Erickson, and 5 miles from Creston. Nelson district.

Records Available.—May to November, 1914.

Climatic Conditions.—Similar to Nelson (see Kootenay river near Nelson), being affected by Kootenay lake, only a few miles distant. The river generally freezes over, however, for two or three weeks at a time, but seldom for the whole winter. Frazil ice may be expected.

Gauge.—Vertical staff gauge, located immediately above head of canyon, 20 yards from Canyon Siding station, on C.P.R. The control is permanent.

Channel.—At the gauge, permanent; below measuring section, shifting.

Discharge Measurements.—Seven measurements were made in 1914 from the highway bridge below the canyon, one-quarter mile from Erickson. This section is temporary. One measurement was made on December 21, under ice conditions, and a discharge of 261 c.f.s. was obtained.

General.—Goat river is a large stream discharging into Kootenay river immediately above Kootenay lake. The drainage area is about 275 square miles of mountainous country. There are however, no high peaks, and it is not probable that the stream is glacial fed. During August the river may get very low; in fact the discharge was lower at the end of August than at the end of December, 1914.

The canyon near Erickson affords a good power, which will probably be harnessed in the future. A head of at least 100 feet may be obtained, and the low flow is probably in the neighborhood of 100 c.f.s.

Accuracy.—Daily gauge readings are obtained. The gauge control is permanent. The measurements are fair, and the gauge-height discharge curve is very good. Accuracy, 5 per cent.

Discharge Measurements of Goat River near Erickson, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-feet.
May 8	C. E. R., G. K. B.	1672	99	549	4·55	3·9	2,500
May 28	J. A. Elliott	1909	99	589	5·00	3·5	2,940
June 18	C. E. R.	1672	103	711	6·02	4·95	4,280
July 21	D. O'B. G.	1929	87	431	1·7	0·00	735
Aug. 4	do	1929	79	367	0·95	−1·10	348
Oct. 18	do	1929	96	394	1·26	−0·69	498
Dec. 21	J. A. E., C. B. C.	1909	32	22·9	1·14	−1·20	251[1]

[1]Ice conditions.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Goat River near Erickson, B.C., for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	4·70	3,980
2	.....	.....	5·50	4,760
3	.....	.....	6·50	5,780
4	.....	.....	6·20	5,460
5	.....	.....	4·85	4,130
6	.....	.....	4·10	3,440
7	3·0	2,530	3·45	2,880
8	3·0	2,530	3·00	2,530
9	.....	3,080	2·60	2,240
10	4·4	3,710	2·20	1,970
11	.....	3,530	2·25	2,200
12	4·1	3,440	3·05	2,570
13	4·3	3,620	3·80	3,170
14	5·0	4,280	4·45	3,760
15	6·5	5,780	.....	3,989
16	6·40	5,670	5·00	4,280
17	5·90	5,160	4·80	4,080
18	5·60	4,860	5·15	4,430
19	5·60	4,860	4·65	3,930
20	4·95	4,230	3·95	3,300
21	4·75	4,030	2·80	2,380
22	5·20	4,470	2·70	2,310
23	5·20	4,470	2·05	1,860
24	5·35	4,610	1·85	1,730
25	5·15	4,430	2·80	2,380
26	4·45	3,760	3·55	2,960
27	3·95	3,300	3·10	2,610
28	3·50	2,920	2·80	2,380
29	3·00	2,530	2·60	2,240
30	3·15	2,650	2·85	2,410
31	3·95	3,300	.....	.....

Daily Gauge Height and Discharge of Goat River near Erickson, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·70	2,310	−0·95	400	−1·60	205	−1·10	355	0·10	785	−0·8	445
2	2·65	2,270	−1·00	385	−1·60	205	−1·10	355	0·40	930	−0·85	430
3	2·70	2,310	−1·10	355	−1·60	205	−1·00	385	1·30	1,410	−0·85	430
4	2·70	2,310	−1·10	355	−1·60	205	−1·15	340	1·30	1,410	−0·80	445
5	2·25	2,000	−1·10	355	−1·60	205	−1·10	355	1·45	1,490	−0·80	445
6	1·95	1,800	−1·10	355	−1·60	205	−1·15	340	1·90	1,760	−0·90	415
7	1·65	1,610	−1·20	325	−1·60	205	−1·10	355	1·50	1,520	−0·90	415
8	1·55	1,560	−1·20	325	−1·60	205	−1·10	355	1·9	1,760	−0·90	415
9	1·40	1,460	−1·20	325	−1·50	235	−1·10	355	1·75	1,670	−0·90	415
10	1·10	1,300	−1·20	325	−1·50	235	−1·08	361	1·45	1,490	−0·90	415
11	1·05	1,270	−1·20	325	−1·50	235	−1·05	370	1·1	1,300	−0·90	415
12	0·75	1,100	−1·20	325	−1·50	235	−1·00	385	0·8	1,130	−1·00	385
13	1·00	1,240	−1·20	325	−1·50	235	−1·00	385	0·35	900	ice	385
14	1·30	1,410	−1·20	325	−1·40	265	−1·00	385	0·05	765	.....	385
15	1·15	1,330	−1·20	325	−1·35	280	−0·90	415	0·0	745	.....	385
16	0·80	1,130	−1·20	325	−1·30	295	−0·70	480	−0·05	725	.....	385
17	0·50	980	−1·15	340	−1·20	325	−0·55	530	−0·05	725	.....	.....
18	0·35	900	−1·30	295	−0·90	415	−0·40	585	−0·15	685	.....	.....
19	0·30	880	−1·35	280	−0·50	550	−0·25	645	−0·20	665	.....	.....
20	0·25	850	−1·40	265	−0·40	585	−0·25	645	−0·25	645	.....	.....
21	0·10	785	−1·40	265	−0·55	530	−0·45	565	−0·30	625	.....	.....
22	−0·10	705	−1·40	265	−0·65	500	−0·60	515	−0·35	605	.....	.....
23	−0·30	625	−1·40	265	−0·85	430	−0·65	495	−0·40	585	.....	.....
24	−0·30	625	−1·40	265	−1·00	385	−0·70	480	−0·40	585	.....	.....
25	−0·45	565	−1·40	265	−1·00	385	−0·70	480	−0·50	550	.....	.....
26	−0·50	550	−1·50	235	−1·05	370	−0·70	480	−0·50	550	.....	.....
27	−0·50	550	−1·50	235	−1·10	355	−0·65	500	−0·50	550	.....	.....
28	−0·60	515	−1·50	235	−1·10	355	−0·60	515	−0·50	550	.....	.....
29	.....	480	−1·60	205	−1·10	355	−0·65	500	−0·50	550	.....	.....
30	−0·80	445	−1·60	205	−1·10	355	−0·50	550	−0·70	480	.....	.....
31	−0·90	415	−1·60	205	.....	.....	−0·40	585	.....	.....	.....	.....

Monthly Discharge of Goat River near Erickson, B.C., for 1914.

(Drainage area, 276 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	5,780	1,730	3,200	11·6	12·9	190,000	B
July	2,310	415	1,170	4·25	4·90	71,900	A
August	400	205	299	1·08	1·24	18,400	A
September	585	205	318	1·15	1·28	18,900	A
October	645	340	440	1·59	1·83	27,100	A
November	1,760	480	938	3·40	3·79	55,800	A

Kaslo Creek (3029).

Location.—At the second highway bridge from the mouth near Kaslo. Nelson district.

Records Available.—June to December, 1914.

Climatic Conditions.—From December 1, 1913, to November 30, 1914, the precipitation at Kaslo was 24·4 inches. The summers are hot and generally dry in July and August. The winters are mild, the temperature seldom going below 0°F. The snowfall is not very heavy, and considerable rain falls in the fall and spring. The creek freezes over during cold spells, but seldom for more than two weeks at a time. Frazil ice is a possibility.

Gauge.—A chain gauge is read daily by Mr. W. F. Hurst, of Kaslo.

Channel.—The bed of the stream is full of large boulders, but apparently permanent, and the water is very fast and not at right angles to the bridge.

Discharge Measurements.—Five well distributed measurements were made in 1914.

Accuracy.—Daily gauge readings are obtained, the measurements may not be very accurate, and the gauge height discharge curve seems fairly good. The results should be well within 15 per cent.

General.—Kaslo creek is a turbulent mountain stream, about 25 miles long (two forks), flowing eastward into Kootenay lake, near Kaslo. The drainage area is about 120 square miles of country containing valuable mineral deposits. Four miles from the mouth the stream divides into what are known as North and South Forks of Kaslo creek. It is along the North Fork that the old narrow gauge railway (Great Northern) was built during the rush several years ago. The narrow gauge has long been out of commission, and, in 1914, the C.P.R. completed their line from Kaslo to Sandon and Rosebery.

Kaslo creek and its tributaries are used still for mining purposes, and the town of Kaslo has a water-power development for lighting purposes, near the mouth.

Discharge Measurements of Kaslo Creek near Kaslo, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 23	J. A. E.	1,672	64	282	7·11	2·90	2,000
June 17	C. E. R.	1,672	73	349	9·35	3·75	3,270
July 22	"	1,672	65·9	191	3·86	1·95	737
Sept. 23	J. A. E.	1,929	62·9	131	2·70	1·25	354
Nov. 30	C. E. R., G. K. B.	1,929	63·0	96	2·04	0·85	195

Daily Gauge Height and Discharge of Kaslo Creek near Kaslo, B.C., for 1914.

Day.	May.		June.	
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	3·08	2,210
2	.....	.....	3·40	2,710
3	.....	.....	4·15	4,120
4	.....	.....	3·82	3,460
5	.....	.....	3·20	2,390
6	.....	.....	2·98	2,060
7	.....	.....	2·65	1,600
8	.....	.....	2·50	1,420
9	.....	.....	2·50	1,420
10	.....	.....	2·55	1,480
11	.....	.....	2·60	1,540
12	.....	.....	2·75	1,740
13	.....	.....	3·10	2,240
14	.....	.....	3·5	2,870
15	.....	.....	3·8	3,420
16	.....	.....	4·0	3,800
17	.....	.....	4·17	4,160
18	.....	.....	4·15	4,120
19	.....	.....	3·75	3,320
20	.....	.....	3·35	2,630
21	.....	.....	3·05	2,160
22	.....	.....	2·72	1,700
23	3·0	2,090	2·55	1,480
24	3·0	2,090	2·5	1,420
25	3·1	2,240	2·65	1,600
26	2·87	1,900	2·95	2,020
27	2·67	1,630	2·97	2,040
28	2·55	1,480	2·95	2,020
29	2·42	1,330	3·07	2,200
30	2·4	1,310	3·2	2,390
31	2·6	1,540	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kaslo Creek near Kaslo, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·32	2,580	2·0	880	1·20	330	1·28	370	1·3	380	0·83	185
2	3·45	2,790	1·92	810	1·18	321	1·30	405	1·45	458	0·85	192
3	3·57	2,990	1·92	810	1·15	307	1·25	355	1·4	430	0·85	192
4	3·6	3,040	1·83	727	1·22	340	1·20	330	1·27	365	0·73	154
5	3·3	2,550	1·65	585	1·17	316	1·10	285	1·3	380	0·75	160
6	3·25	2,470	1·72	636	1·10	245	1·08	277	1·3	380	0·77	166
7	3·15	2,320	1·8	700	1·20	330	1·08	277	1·25	355	0·83	185
8	3·1	2,240	1·57	530	1·25	355	1·02	253	1·25	355	0·7	145
9	3·05	2,160	1·45	458	1·15	307	1·00	245	1·12	294	0·7	145
10	3·05	2,160	1·42	441	1·02	253	0·98	238	1·15	307	.....	145
11	3·05	2,160	1·42	441	1·12	294	1·07	273	1·25	355	.....	135
12	3·17	2,340	1·45	458	1·15	307	1·0	245	1·15	307	.....	125
13	3·2	2,390	1·55	518	1·02	253	1·0	245	1·2	330	.....	120
14	3·15	2,320	1·45	458	1·05	265	0·97	235	1·05	265	.....	115
15	3·05	2,160	1·52	498	1·07	273	0·93	220	1·1	285	.....	115
16	2·67	1,630	1·55	518	1·00	245	0·95	227	0·92	217	.....	115
17	2·5	1,420	1·52	498	1·05	265	1·07	273	1·07	273	.....	115
18	2·6	1,540	1·37	415	1·27	365	1·27	365	0·95	227	.....	115
19	2·6	1,540	1·40	430	1·78	684	1·33	395	0·98	238	.....	115
20	2·65	1,600	1·35	405	1·52	498	1·25	355	1·05	265	.....	115
21	2·30	1,200	1·35	405	1·35	405	1·15	307	0·97	235	.....	115
22	2·00	880	1·37	415	1·30	380	1·12	294	0·92	217	.....	115
23	1·95	835	1·32	390	1·35	405	1·05	265	0·95	227	.....	115
24	2·08	960	1·28	370	1·30	405	1·02	253	0·98	238	.....	115
25	2·05	930	1·25	355	1·48	474	1·05	265	0·95	227	.....	115
26	1·95	835	1·25	355	1·60	550	1·05	265	0·95	227	.....	115
27	2·0	880	1·25	355	1·80	700	1·05	265	0·98	238	....	115
28	1·95	835	1·28	370	1·58	537	1·05	265	0·95	227	.....	115
29	1·9	790	1·32	390	1·42	441	1·05	265	1·02	253	.....	115
30	1·85	745	1·32	390	1·35	405	1·15	307	0·82	182	.....	115
31	1·95	835	1·25	355	.....	.....	1·25	355	.....	.....	.....	.....

Monthly Discharge of Kaslo Creek near Kaslo, for 1914.

(Drainage area, 170 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	4,160	1,420	2,390	14·1	15·7	142,000
July	3,040	700	1,750	10·3	11·9	108,000
August	880	355	495	2·91	3·36	30,400
September	684	245	375	2·20	2·46	22,300
October	395	220	289	1·70	1·96	17,800
November	458	182	291	1·71	1·91	17,300
December	192	115	133	0·78	0·90	8,180

Accuracy "C."

Kooskanax Creek Near Nakusp (3022).

Location.—At bridge over canyon, 1 mile from Nakusp and about 1 mile from the mouth. Nelson district.

Records Available.—May to December, 1914.

Climatic Conditions.—The precipitation at Nakusp, from December, 1913, to November 30, 1914, was 26.8 inches. The summers are hot and fairly dry. The winters are mild. Occasionally, for a day or two, the temperature will go below zero, but the mean temperature of winter months is probably 25° to 35°F. Frazil ice may be expected for a few days at a time only.

Gauge.—A chain is located at the bridge, and read by Mr. L. H. Rawlings twice a week.

Channel.—The river is confined between perpendicular walls, 38 feet apart at the gauging and measuring section. The control is a sand and gravel bar, and seems faily permanent.

Discharge Measurements.—Nine measurements were made in 1914.

Accuracy.—These results should be within 20 per cent. The gauge readings only being twice a week almost prohibit giving an accuracy during May, June, and July.

General.—Kooskanax creek is a stream about 25 miles long, rising in the divide between Trout lake and Upper Arrow lake, southeast of Nakusp, and discharging into Upper Arrow lake near Nakusp. The drainage area is about 125 square miles.

There is a power site in the canyon about a mile from the mouth, where, at some future date, the town of Nakusp might obtain a suitable development for lighting purposes and small industries. The canyon is about 100 feet long, 30 feet wide, and about 40 to 50 feet deep. The low-water flow is seldom less than 100 c.f.s. Mr. C. E. Webb made a preliminary report in March, 1914, on the power possibilities of this creek near Nakusp. His report is included in part 2 of this report.

Discharge Measurements of Kooskanax River near Nakusp, B.C., for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 19	C. E. Webb	1048	27	204	0·59	0·7	122
May 16	J. A. E. and G. K. B.	1672	26	274	5·63	4·2	1,540
June 13	G. K. B.	1927	26	273	4·30	3·50	1,150
" 20	G. K. B.	1927	26	275	5·40	3·80	1,480
" 28	J. A. E.	1909	27	293	4·73	3·34	1,390
Aug. 12	J.A. E.	1909	27	229	1·07	1·1	245
Sept 4	J. A. E., C. E. R.	1928	28	221	0·62	0·65	137
Oct. 28	J. A. E.	1909	29	240	1,28	1·15	309
Nov. 23	J. A. E., O. J. B.	1909	28	230	0·95	1·2	220

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge at Kooskanax Creek near Nakusp, for 1914.

Day.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	0·7	115	.....	920	.....	1,740
2	.....	.....	.....	125	.....	945	.....	1,780
3	.....	.....	135	135	2·06	975	4·1	1,820
4	.....	.....	.....	145	.....	1,010	.....	1,810
5	.....	.....	0·8	155	.....	1,045	.....	1,790
6	.....	.....	.....	195	2·8	1,080	.....	1,770
7	.....	.....	.....	235	.....	1,040	4·0	1,760
8	.....	.....	1·1	275	.....	1,000	.....	1,720
9	.....	.....	.....	305	.....	960	.....	1,680
10	.....	.....	.....	335	2·5	920	3·8	1,650
11	.....	.....	.....	365	.....	935	.....	1,590
12	.....	.....	1·4	395	.....	955	.....	1,530
13	.....	.....	.....	410	2·6	975	3·5	1,470
14	.....	.....	.....	425	.....	1,275	.....	1,480
15	.....	.....	1·5	440	.....	1,575	.....	1,500
16	.....	.....	.....	460	4·2	1,880	.....	1,510
17	.....	.....	.....	480	3·1	1,250	3·6	1,530
18	.....	.....	.....	500	.....	1,340	.....	1,570
19	0·7	115	1·7	530	.....	1,430	.....	1,610
20	.....	115	.....	620	3·6	1,530	3·8	1,650
21	0·7	115	.....	720	.....	1,560	.....	1,620
22	.....	115	.....	820	.....	1,590	.....	1,590
23	.....	115	2·5	920	.....	1,620	.....	1,560
24	0·7	115	.....	975	3·8	1,650	3·6	1,530
25	.....	112	.....	1,030	.....	1,660	.....	1,500
26	.....	109	2·8	1,080	.....	1,680	.....	1,470
27	.....	105	.....	1,010	3·9	1,700	.....	1,440
28	0·65	102	.....	940	.....	1,700	3·4	1,410
29	.....	105	2·4	870	.....	1,700	.....	1,410
30	.....	111	.....	895	.....	1,700	3·4	1,410
31	0·7	115	.....	.....	3·9	1,700	.....	

Daily Gauge Height and Discharge at Kooskanax Creek near Nakusp, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	1,470	.....	990	.....	128	.....	680	1·3	355	.....	235
2	.....	1,530	2·5	920	0·7	115	.....	690	.....	345	1·0	235
3	3·7	1,590	.....	820	.....	115	.....	700	.....	335	.....	225
4	.....	1,570	.....	720	.....	115	2·1	720	.....	325	.....	215
5	.....	1,560	1·9	620	.....	115	.....	700	1·2	315	.....	205
6	.....	1,550	.....	560	0·7	115	.....	685	.....	335	0·9	195
7	3·6	1,530	.....	500	.....	118	2·0	670	.....	365	.....	195
8	.....	1,500	.....	445	.....	120	.....	650	1·4	395	.....	195
9	.....	1,470	1·4	395	0·72	123	.....	630	.....	395	0·9	195
10	.....	1,440	.....	365	.....	121	.....	610	.....	395	....	195
11	3·4	1,410	.....	335	.....	119	1·85	597	1·4	395	.....	195
12	.....	1,380	1·2	315	.....	117	.....	590	.....	385	.....	195
13	.....	1,350	.....	305	0·7	115	.....	580	.....	375	0·9	195
14	.....	1,320	.....	295	.....	111	1·8	575	.....	365	.....	195
15	3·2	1,300	.....	285	.....	107	.....	545	1·3	355	.....	195
16	.....	1,300	1·1	275	0·65	102	.....	525	.....	370	0·9	195
17	.....	1,300	.....	261	.....	155	.....	505	.....	380	.....	185
18	.....	1,300	.....	248	.....	210	1·6	485	1·4	395	.....	175
19	3·2	1,300	1·0	235	.....	260	.....	470	.....	395	.....	165
20	.....	1,280	.....	225	1·20	315	.....	455	.....	395	0·8	155
21	.....	1,260	.....	215	.....	355	1·5	440	.....	395	.....	155
22	3·1	1,250	.....	205	.....	395	.....	415	1·4	395	.....	155
23	.....	1,250	0·9	195	1·50	440	.....	395	.....	365	.....	155
24	.....	1,250	.....	195	.....	485	.....	375	.....	335	.....	155
25	.....	1,250	.....	195	.....	530	1·3	355	1·2	315	.....	155
26	3·1	1·250	0·9	195	.....	575	.....	340	.....	295	.....	155
27	.....	1,230	.....	185	1·90	620	.....	330	.....	275	0·8	155
28	.....	1,210	.....	175	.....	630	1·2	315	.....	255	.....	140
29	3·0	1,200	.....	165	.....	650	.....	325	1·0	235	.....	130
30	.....	1,130	0·8	155	2·00	670	.....	335	.....	235	0·7	115
31	.....	1,060	.....	141	.....	.....	.....	345	.....	.....	.....	115

Monthly Discharge of Kooskanox Creek near Nakusp, B.C., for 1914.

(Drainage area, 125 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	1,080	115	530	4·25	4·74	31,500
May	1,880	920	1,330	10·6	12·2	81,800
June	1,820	1,410	1,600	12·8	14·3	95,200
July	1,590	1,060	1,350	10·8	12·4	83,000
August	990	141	362	2·90	3·34	22,300
September	670	102	272	2·18	2·43	16,200
October	720	315	517	4·14	4·77	31,800
November	395	235	336	2·69	3·00	20,000
December	235	115	178	1·42	1·64	10,900

Accuracy "D."

Kootenay River at Upper Bonnington Falls (3075).

Location.—At the head-race of the West Kootenay Power and Light Company's plant No. 2, at Upper Bonnington, 10 miles west of Nelson and about 15 miles from the mouth of the Kootenay, near Castlegar. Nelson district.

Records Available.—October, 1907, to December, 1914, through the courtesy of the West Kootenay Power and Light Company.

Climatic Conditions.—The climatic conditions are similar to those at Nelson (see Kootenay river near Nelson). The warming influence of Kootenay lake keeps the water of the river below the lake at a temperature such that the river never freezes over, and very little, if any, frazil ice and anchor ice is formed.

Gauge.—The elevation of the water each day was determined by means of measuring the distance to the surface of the water from a known point. These readings were taken by the West Kootenay Power and Light Company for their own information. The gauge is located at a point at the upstream end of the head-race, where part of the water is diverted to the turbines, and the remainder flows over the falls, some 200 feet below.

Method of Compilation.—The only metering section on Kootenay river between the lake and the mouth is near Glade, about 6 miles below Upper Bonnington. The only stream of any size entering between these points is Slocan river. The discharge curve for the Kootenay at Bonnington falls, near Nelson, and at Bonnington pool, is obtained by subtracting the discharge of Slocan river from the discharge of the Kootenay river near Glade. For more complete information on the studies carried on regarding the Kootenay between Kootenay lake and the mouth see report in Part 2, called, "Compilation of data on Kootenay river, between Kootenay lake and the mouth."

Accuracy.—As we do not know sufficient regarding the gauge, these data are not guaranteed, but it appears that they agree very well with similar data gathered in 1914 at Bonnington pool and near Nelson.

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1907.

Day.	October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	192·0	36,200	189·0	18,800	186·9	9,900
2	192·0	36,200	189·0	18,800	186·9	9,900
3	191·9	35,500	189·0	18,800	186·9	9,600
4	191·9	35,500	189·0	18,800	186·8	9,600
5	191·8	34,800	189·0	18,800	186·8	9,600
6	191·7	34,200	189·0	18,800	187·5	12,200
7	191·5	33,000	188·0	18,300	187·7	13,000
8	191·0	30,000	188·8	17,900	187·6	12,600
9	191·8	28,800	188·7	17,400	187·6	12,600
10	196·5	27,000	188·6	16,930	187·5	12,200
11	190·4	26,400	188·6	16,900	187·5	12,200
12	190·4	26,400	188·6	16,900	187·5	12,200
13	190·4	26,400	188·5	16,400	187·5	12,200
14	190·3	25,800	188·0	14,200	187·5	12,200
15	190·3	25,800	188·0	14,200	187·5	12,200
16	190·3	25,800	187·9	13,800	187·5	12,200
17	190·3	25,800	187·5	12,200	187·5	12,200
18	190·0	24,000	187·3	11,400	187·3	11,400
19	190·0	24,000	187·2	11,000	187·3	11,400
20	189·8	22,900	187·2	11,000	187·3	11,400
21	189·7	22,400	187·2	11,000	187·1	10,600
22	189·7	22,400	187·2	11,000	187·1	10,600
23	189·5	21,400	187·1	10,600	187·1	10,600
24	189·5	21,400	187·1	10,200	187·0	10,200
25	189·5	21,400	187·0	10,200	187·0	10,200
26	189·4	20,800	187·0	10,200	187·0	10,200
27	189·4	20,800	187·0	10,200	186·9	9,900
28	189·1	19,300	187·0	10,200	186·9	9,900
29	189·1	19,300	187·0	10,200	186·9	9,900
30	189·1	19,300	186·9	9,900	187·1	10,600
31	189·1	19,300	.....	.....	187·1	1 ,

Monthly Discharge of Kootenay River near Bonnington Falls, for 1907.

(Drainage area, 17,800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
October	36,200	19,300	26,200	1·47	1·70	1,610,000
November	18,800	9,900	14,200	0·80	0·89	845,000
December	13,000	9,600	11,100	0·62	0·72	682,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1908.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	187·0	10,200	186·1	7,500	185·9	7,000	187·4	11,800	193·0	43,200	196·5	73,000
2	166·9	9,900	186·0	7,200	185·9	7,000	187·4	11,800	193·3	45,300	196·7	75,000
3	186·9	9,900	186·0	7,200	185·9	7,000	187·4	11,800	193·5	46,700	196·8	76,000
4	186·8	9,600	186·0	7,200	185·9	7,000	187·4	11,800	193·5	46,700	196·9	77,000
5	186·7	9,300	186·0	7,200	185·9	7,000	187·4	11,800	193·6	47,400	197·0	79,000
6	186·7	9,300	186·0	7,200	185·9	7,000	187·4	11,800	193·8	48,800	197·2	81,000
7	186·6	9,000	186·0	7,200	185·9	7,000	187,4	11,800	194·1	51,200	197·5	84,000
8	186·6	9,000	186·0	7,200	185·9	7,000	187·4	11,800	194·5	54,500	197·8	88,000
9	186·6	9,000	186·0	7,200	185·9	7,000	187·4	11,800	194·9	58,100	198·0	91,000
10	186·6	9,000	186·0	7,200	185·9	7,000	187·4	11,800	195·1	59,900	198·3	94,000
11	186·6	9,000	186·0	7,200	185·9	7,000	187·5	12,200	195·3	61,700	198·5	98,500
12	186·6	9,000	186·0	7,200	185·9	7,000	187·5	12,200	195·5	63,500	198·8	101,000
13	186·6	9,000	186·0	7,200	185·9	7,000	187·6	12,600	195·6	64,400	199·0	104,000
14	186·7	9,300	186·0	7,200	186·0	7,200	187·7	13,000	195·9	67,100	199·2	107,000
15	186·7	9,300	186·0	7,200	186·0	7,200	188·0	14,200	196·0	68,000	199·3	108,000
16	186·5	8,700	186·0	7,200	186·1	7,500	188·3	15,400	196·2	70,000	199·5	110,000
17	186·4	8,400	186·0	7,200	186·2	7,800	188·5	16,400	196·3	71,000	199·7	113,000
18	186·4	8,400	186·0	7,200	186·4	8,400	189·0	18,800	196·4	72,000	199·7	113,000
19	186·5	8,700	186·0	7,200	186·5	8,700	189·4	20,800	196·5	73,000	199·7	113,000
20	186·6	9,000	186·0	7,200	186·6	9,000	190·0	24,000	196·4	72,000	199·7	113,000
21	186·6	9,000	186·0	7,200	186·6	9,000	190·5	27,000	196·4	72,000	199·6	111,000
22	186·6	9,000	186·0	7,200	186·7	9,300	191·0	30,000	196·4	72,000	199·5	110,000
23	186·5	8,700	186·0	7,200	186·8	9,600	191·5	33,000	196·4	72,000	199·3	108,000
24	186·5	8,700	186·0	7,200	186·9	9,900	191·9	33,300	196·4	72,000	199·1	106,000
25	186·4	8,400	186·0	7,200	186·9	9,990	192·2	37,600	196·4	72,000	199·0	104,000
26	186·4	8,400	186·0	7,200	186·9	9,900	192·5	39,700	196·4	72,000	198·9	102,000
27	186·3	8,100	186·0	7,200	187·0	10,200	192·8	41,800	196·4	72,000	198·7	99,500
28	186·2	7,800	186·0	7,200	187·0	10,200	193·0	43,200	196·4	72,000	198·5	96,500
29	186·4	8,400	186·0	7,200	187·1	10,600	193·0	43,200	196·4	72,000	198·4	95,000
30	186·4	8,400			187·4	11,800	193·0	43,200	196·4	72,000	198·3	94,000
31	186·2	7,800			187·4	11,800			196·5	73,000		

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1908—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	198·1	92,000	195·1	59,900	190·2	25,200	188·5	16,400	187·2	11,000	187·7	13,000
2	198·0	91,000	194·8	57,200	190·1	24,600	188·5	16,400	187·3	11,400	187·9	13,800
3	198·0	91,000	194·5	54,500	190·1	24,600	188·5	18,400	187·3	11,400	187·9	13,800
4	198·0	91,000	194·3	52,800	190·0	24,000	188·4	15,900	187·3	11,400	187·9	13,800
5	197·9	89,500	194·1	51,200	190·0	24,000	188·3	15,400	187·3	11,400	187·9	13,800
6	197·7	86,500	194·0	50,400	190·0	24,000	188·2	15,000	187·3	11,400	187·6	12,600
7	197·5	84,000	193·9	49,600	190·0	24,000	188·1	14,600	187·3	11,400	187·4	11,800
8	197·5	84,000	193·6	47,400	190·0	24,000	188·0	14,200	187·3	11,400	187·3	11,400
9	197·5	84,000	193·5	46,700	189·7	22,400	187·9	13,800	187·2	11,000	187·2	11,000
10	197·5	84,000	193·3	45,300	189·6	21,900	187·8	13,400	187·2	11,000	187·1	10,600
11	197·2	81,000	193·1	43,900	189·6	21,900	187·7	13,000	187·2	11,000	187·0	10,200
12	197·2	81,000	193·0	43,200	189·6	21,900	187·7	13,000	187·2	11,000	187·0	10,200
13	197·2	81,000	192·9	42,500	189·6	21,900	187·7	13,000	187·2	11,000	187·0	10,200
14	197·2	81,000	192·7	41,100	189·6	21,900	187·7	13,000	187·2	11,000	187·0	10,200
15	197·2	81,000	192·5	39,700	189·5	21,400	187·6	12,600	187·0	10,200	187·0	10,200
16	197·2	81,000	192·3	38,300	189·5	21,400	187·6	12,600	187·0	10,200	187·0	10,200
17	197·1	80,000	192·0	35,200	189·5	21,400	187·6	12,600	187·0	10,200	187·0	10,200
18	197·0	79,000	191·8	34,800	189·5	21,400	187·6	12,600	187·0	10,200	186·5	8,700
19	197·0	79,000	191·7	34,200	189·4	20,800	187·6	12,600	187·0	10,200	186·5	8,700
20	196·7	75,000	191·6	33,600	189·3	20,300	187·6	12,600	187·0	10,200	186·5	8,700
21	196·6	74,000	191·5	33,000	189·2	19,800	187·6	12,600	187·1	10,600	186·5	8,700
22	196·5	73,000	191·4	32,400	189·2	19,800	187·6	12,600	187·4	11,800	186·5	8,700
23	196·5	73,000	191·3	31,800	189·1	19,300	187·5	12,200	187·5	12,200	186·4	8,400
24	196·5	73,000	191·2	31,200	189·1	19,300	187·5	12,200	187·5	12,200	186·4	8,400
25	196·3	71,000	191·0	30,000	189·0	18,800	187·5	12,200	187·5	12,200	186·4	8,400
26	196·2	70,000	191·0	30,000	189·0	18,800	187·5	12,200	187·5	12,200	186·4	8,400
27	196·1	69,000	190·9	29,400	188·9	18,300	187·5	12,200	187·5	12,200	186·4	8,400
28	196·0	68,000	190·7	28,200	188·8	17,900	187·4	11,800	187·5	12,200	186·4	8,400
29	195·7	65,300	190·6	27,600	188·7	17,400	187·3	11,400	187·5	12,200	186·4	8,400
30	195·5	63,500	190·5	27,000	188·6	16,990	187·3	11,400	187·5	12,200	186·2	7,800
31	195·3	61,700	190·5	27,000	.....	.....	187·3	11,400	.....	.....	186·0	7,200

Monthly Discharge of Kootenay River near Bonnington Falls, for 1908.

(Drainage area, 17,800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	10,200	7,800	8,880	0·50	0·58	546,000
February	7,500	7,200	7,200	0·40	0·43	414,000
March	11,800	7,000	8,600	0·48	0·55	529,000
April	43,200	11,800	21,700	1·22	1·36	1,290,000
May	73,000	43,200	63,800	3·58	4·13	3,920,000
June	113,000	73,000	94,100	5·29	5·90	5,600,000
July	92,000	61,700	72,100	4·05	4·67	4,430,000
August	59,900	27,000	39,700	2·23	2·57	2,440,000
September	25,200	16,900	21,300	1·21	1·35	1,270,000
October	16,400	11,400	13,300	0·75	0·86	818,000
November	12,200	10,200	10,300	0·58	0·65	613,000
December	13,800	7,200	10,100	0·57	0·66	621,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1909.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	186·3	8,100	186·1	7,500	186·2	7,800	186·4	8,400	188·0	14,200	195·0	59,000
2	186·1	7,500	186·1	7,500	186·2	7,800	186·6	9,000	188·0	14,600	195·5	63,500
3	186·0	7,200	186·1	7,500	186·2	7,800	186·7	9,300	188·3	15,400	196·0	68,000
4	186·1	7,500	186·1	7,500	186·2	7,800	186·8	9,600	188·4	15,900	196·5	73,000
5	186·2	7,800	186·1	7,500	186·2	7,800	186·9	9,900	188·5	16,400	197·0	79,000
6	186·1	7,500	186·1	7,500	186·1	7,500	186·9	9,900	188·6	16,900	197·4	83,000
7	186·0	7,200	186·1	7,500	186·1	7,500	187·0	10,200	188·8	17,900	197·7	86,000
8	186·0	7,200	186·1	7,500	186·1	7,500	187·0	10,200	189·0	18,800	198·0	91,000
9	186·0	7,200	186·1	7,500	186·1	7,500	187·0	10,200	189·1	19,300	198·2	93,000
10	186·2	7,800	186·1	7,500	186·1	7,500	187·0	10,200	189·3	20,300	198·4	95,000
11	.....	7,800	186·2	7,800	186·1	7,500	187·0	10,200	189·4	20,800	198·6	98,000
12	Ice.	7,800	186·2	7,800	186·1	7,500	187·0	10,200	189·5	21,400	198·6	98,000
13	186·2	7,800	186·2	7,800	186·1	7,500	187·0	10,200	189·6	21,900	198·7	99,000
14	185·9	7,000	186·2	7,800	186·1	7,500	187·0	10,200	189·8	22,900	198·9	102,000
15	185·8	6,800	186·2	7,800	186·1	7,500	187·0	10,200	189·9	23,400	199·0	104,000
16	185·8	6,800	186·2	7,800	186·1	7,500	187·0	10,200	190·0	24,600	199·0	104,000
17	185·8	6,800	186·2	7,800	186·1	7,500	187·1	10,800	190·1	24,600	199·1	106,000
18	185·8	6,800	186·2	7,800	186·2	7,800	187·1	10,600	190·3	25,800	199·2	107,000
19	185·8	6,800	186·2	7,800	186·3	8,100	187·1	10,600	190·5	27,000	199·3	108,000
20	185·9	7,000	186·3	8,100	186·3	8,100	187·2	11,000	190·7	28,200	199·3	108,000
21	185·9	7,000	186·3	8,100	186·2	7,800	187·2	11,000	190·8	28,800	199·4	109,000
22	186·0	7,200	186·3	8,100	186·1	7,500	187·3	11,400	191·1	30,600	199·5	110,000
23	186·0	7,200	186·2	7,800	186·1	7,500	187·4	11,800	191·2	31,200	199·4	109,000
24	186·1	7,500	186·2	7,800	186·1	7,500	187·4	11,800	191·5	33,000	199·1	106,000
25	186·1	7,500	186·2	7,800	186·1	7,500	187·5	12,200	191·7	34,200	199·0	104,000
26	186·1	7,500	186·2	7,800	186·1	7,500	187·5	12,200	192·1	36,900	198·9	102,000
27	186·1	7,500	186·2	7,800	186·1	7,500	187·6	12,600	192·5	39,700	198·7	99,000
28	186·1	7,500	186·2	7,800	186·1	7,500	187·7	13,000	193·0	43,200	198·5	96,000
29	186·1	7,500	.....	.....	186·2	7,800	187·8	13,400	193·5	46,700	198·3	94,000
30	186·1	7,500	.....	.....	186·2	7,800	187·9	13,800	194·0	50,400	198·2	93,000
31	186·1	7,500	.....	.....	186·3	8,100	.....	.....	194·5	54,500	.....	.....

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1909.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	198·7	99,000	194·6	55,400	190·1	24,600	188·5	16,400	187·5	12,200	188·7	17,400
2	198·6	98,000	194·6	55,400	190·0	24,000	188·5	16,400	187·5	12,200	188·9	18,300
3	198·5	96,000	194·5	54,500	189·9	23,400	188·5	16,400	187·5	12,200	189·0	18,800
4	194·4	95,000	194·2	52,000	189·9	23,400	188·5	16,400	187·5	12,200	189·0	18,800
5	198·3	94,000	194·0	50,400	189·9	23,400	188·5	16,400	187·6	12,600	189·0	18,800
6	198·3	94,000	193·8	48,800	189·9	23,400	188·5	16,400	187·7	13,000	189·0	18,800
7	198·3	94,000	193·6	47,400	189·9	23,400	188·5	16,400	187·8	13,400	189·0	18,800
8	198·3	94,000	193·5	46,700	189·9	23,400	188·5	16,400	187·9	13,800	189·0	18,800
9	198·3	94,000	193·4	46,000	189·7	22,400	188·5	16,400	187·9	13,800	189·0	18,800
10	198·3	94,000	193·2	44,600	189·5	21,400	188·5	16,400	187·9	13,800	188·7	17,400
11	198·2	93,000	193·0	43,200	189·5	21,400	188·5	16,400	187·9	13,800	188·5	16,400
12	198·1	92,000	192·9	42,500	189·5	21,400	188·5	16,400	187·9	13,800	188·6	16,900
13	198·0	91,000	192·8	41,800	189·5	21,400	188·5	16,400	187·8	13,400	188·6	16,900
14	197·8	88,000	192·6	40,400	189·4	20,800	188·5	16,400	187·7	13,000	188·6	16,900
15	197·6	85,000	192·3	39,700	189·3	20,300	188·3	15,400	187·7	13,000	188·7	17,400
16	197·5	84,000	192·2	37,600	189·1	19,300	188·2	15,000	187·6	12,600	188·8	17,900
17	197·4	83,000	192·0	36,200	189·1	19,300	188·1	14,600	187·6	12,600	188·8	17,900
18	197·2	81,000	191·8	34,800	189·1	19,300	188·0	14,200	187·6	12,600	188·6	16,900
19	197·0	79,000	191·7	34,200	189·1	19,300	188·0	14,200	187·7	13,000	188·5	16,400
20	196·9	77,000	191·6	33,600	189·1	19,300	188·0	14,200	187·7	13,000	188·2	15,000
21	196·7	75,000	191·5	33,000	189·1	19,300	188·0	14,200	187·7	13,000	188·0	14,200
22	196·5	73,000	191·4	32,400	188·9	18,300	187·9	13,800	187·6	12,600	188·0	14,200
23	196·2	70,000	191·3	31,800	188·7	17,400	187·8	13,400	187·6	12,600	188·0	14,200
24	196·0	65,000	191·1	30,600	188·5	16,400	187·7	13,000	187·5	12,200	188·0	14,200
25	195·8	66,000	191·0	30,000	188·5	16,400	187·7	13,000	187·5	12,200	187·8	13,400
26	195·7	65,300	191·0	30,000	188·5	16,400	187·7	13,000	187·7	13,400	187·6	12,600
27	195·5	63,500	190·9	29,400	188·5	16,400	187·7	13,000	188·0	14,200	187·5	12,200
28	195·4	62,600	190·7	28,200	188·5	16,400	187·7	13,000	188·1	14,600	187·2	11,000
29	195·2	60,800	190·6	27,600	188·5	16,400	187·7	13,000	188·2	15,000	187·1	10,600
30	194·9	58,100	190·5	27,000	188·5	16,400	187·7	13,000	188·3	15,400	187·0	10,200
31	194·8	57,200	190·4	26,400	.....	.....	187·7	13,000	.....	.....	187·0	10,200

Monthly Discharge of Kootenay River near Bonnington Falls, for 1909.

(Drainage area, 17,800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square Mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	8,100	6,800	7,350	0·41	0·47	452,000
February	8,100	7,500	7,740	0·44	0·46	430,000
March	8,100	7,500	7,650	0·43	0·50	470,000
April	13,800	8,400	10,800	0·61	0·68	643,000
May	54,500	14,200	27,100	1·52	1·75	1,670,000
June	110,000	59,000	98,200	5·52	6·16	5,840,000
July	99,000	57,200	81,500	4·58	5·28	5,010,000
August	55,400	26,400	40,200	2·26	2·61	2,470,000
September	24,600	16,400	20,100	1·13	1·26	1,200,000
October	16,400	13,000	14,900	0·84	0·97	916,000
November	15,400	12,200	13,200	0·74	0·83	786,000
December	18,800	10,200	15,800	0,89	1·03	972,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1910.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	187·5	12,200	186·5	8,700	186·0	7,200	189·5	21,400	195·5	63,500	197·8	88,000
2	187·3	11,400	186·5	8,700	186·0	7,200	189·5	21,400	195·8	66,200	197·8	88,000
3	187·2	11,000	186·5	8,700	186·0	7,200	189·5	21,400	195·8	66,200	197·8	88,000
4	187·0	10,200	186·5	8,700	186·0	7,200	189·5	21,400	195·8	66,200	197·7	86,500
5	186·9	9,900	186·5	8,700	186·0	7,200	189·5	21,400	195·8	66,200	197·6	85,000
6	186·9	9,900	186·4	8,400	186·1	7,800	189·5	21,400	195·8	66,200	197·6	85,000
7	186·8	9,600	186·2	7,800	186·3	8,100	189·6	21,900	195·9	67,100	197·5	84,000
8	186·8	9,600	186·2	7,800	186·4	8,400	189·6	21,900	196·1	69,000	197·4	83,000
9	186·7	9,300	186·2	7,800	186·5	8,700	189·7	22,400	196·3	71,000	197·5	84,000
10	186·7	9,300	186·2	7,800	186·5	8,700	189·9	23,400	196·5	73,000	197·3	82,000
11	186·6	9,000	186·2	7,800	186·5	8,700	190·0	24,000	196·8	76,000	197·1	80,000
12	186·6	9,000	186·3	8,100	186·6	9,000	190·3	25,800	197·0	79,000	197·0	79,000
13	186·6	9,000	186·3	8,100	186·7	9,300	190·4	26,400	197·1	80,000	197·0	79,000
14	186·6	9,000	186·4	8,400	186·8	9,600	190·6	27,600	197·3	82,000	197·0	79,000
15	186·6	9,000	186·4	8,400	186·9	9,900	190·8	28,800	197·4	83,000	197·0	79,000
16	186·5	8,700	186·4	8,400	187·1	10,600	191·0	30,000	197·5	84,000	197·0	79,000
17	186·4	8,400	186·4	8,400	187·3	11,400	191·1	30,600	197·5	84,000	196·9	77,000
18	186·4	8,400	186·4	8,400	187·4	11,800	191·4	32,400	197·5	84,000	196·9	77,000
19	186·5	8,700	186·4	8,400	187·5	12,200	191·5	33,000	197·3	82,000	196·8	76,000
20	186·6	9,000	186·4	8,400	187·5	12,200	191·8	34,800	196·8	76,000	196·8	76,000
21	186·6	9,000	186·4	8,400	187·5	12,200	192·0	36,200	196·2	70,000	196·9	77,000
22	186·6	9,000	186·4	8,400	187·8	13,400	192·4	39,000	196·1	69,000	196·9	77,000
23	186·5	8,700	186·3	8,100	188·1	14,600	192·6	40,400	196·1	69,000	196·8	76,000
24	186·5	8,700	186·0	7,200	188·6	16,900	193·0	43,200	196·1	69,000	196·7	75,000
25	186·5	8,700	185·9	7,000	189·2	19,800	193·8	45,300	196·2	70,000	196·5	73,000
26	186·4	8,400	185·9	7,000	189·5	21,400	193·7	48,100	196·4	72,000	196·4	72,000
27	186·5	8,700	185·9	7,000	189·5	21,400	194·1	51,200	196·5	73,000	196·3	71,000
28	186·5	8,700	185·9	7,000	189·5	21,400	194·5	54,500	196·5	73,000	196·3	71,000
29	186·5	8,700	.....	.....	189·4	20,800	195·0	59,000	196·5	73,000	196·3	71,000
30	186·5	8,700	.....	.....	189·5	21,400	195·2	60,800	197·1	80,000	196·2	70,000
31	186·5	8,700	.....	.....	189·5	21,400	.....	.....	197·5	84,000	.....	.....

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1910.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	196·0	68,000	192·6	40,400	189·4	20,800	188·1	14,600	188·8	17,900	189·0	18,800
2	196·0	68,000	192·4	39,000	189·4	20,800	188·1	14,600	188·7	17,400	188·7	17,400
3	196·0	68,000	192·3	38,300	189·3	20,300	188·1	14,600	188·7	17,400	188·5	16,400
4	195·9	67,100	192·1	36,900	189·1	19,300	188·1	14,600	188·7	17,400	188·5	16,400
5	195·7	65,300	192·0	35,200	189·0	18,800	188·2	15,000	188·7	17,400	188·5	16,400
6	195·5	63,500	191·9	35,500	188·9	18,300	188·2	15,000	188·7	17,400	188·4	15,900
7	195·4	62,600	191·8	34,800	188·8	17,900	188·3	15,400	188·7	17,400	188·4	15,900
8	195·4	62,600	191·6	33,600	188·6	16,900	188·3	15,400	188·7	17,400	188·3	15,400
9	195·3	61,700	191·5	33,000	188·6	16,900	188·5	16,400	188·8	17,900	188·1	14,600
10	195·2	60,800	191·5	33,000	188·5	16,400	188·6	16,900	188·8	17,900	188·1	14,600
11	195·1	59,900	191·4	32,400	188·5	16,400	188·6	16,900	188·9	18,300	188·1	14,600
12	195·0	59,000	191·3	31,800	188·4	15,900	188·7	17,400	188·9	18,300	188·5	16,400
13	194·9	58,100	191·2	31,200	188·4	15,900	188·7	17,400	188·9	18,300	188·4	15,900
14	194·8	57,200	191·2	31,200	188·4	15,900	188·7	17,400	188·9	18,300	188·3	15,400
15	194·6	55,400	191·1	30,600	188·3	15,400	188·8	17,900	189·0	18,800	188·2	15,000
16	194·5	54,500	191·1	30,600	188·3	15,400	188·9	18,300	189·0	18,800	188·1	14,600
17	194·4	53,600	191·0	30,000	188·2	15,000	188·9	18,300	189·1	19,300	188·0	14,200
18	194·3	52,800	190·9	29,400	188·1	14,600	188·8	17,900	189·2	19,800	188·0	14,200
19	194·2	52,000	190·7	28,200	188·0	14,200	188·9	18,300	189·2	19,800	188·0	14,200
20	194·1	51,200	190·6	27,600	188·0	14,200	189·0	18,800	189·1	19,300	188·0	14,200
21	194·1	51,200	190·5	27,000	188·0	14,200	189·1	19,300	189·0	18,800	187·8	13,400
22	194·1	51,200	190·4	26,400	188·0	14,200	188·9	18,300	189·0	18,800	187·7	13,000
23	194·0	50,400	190·4	26,400	188·0	14,200	188·9	18,300	189·1	19,300	187·6	12,600
24	193·9	49,600	190·2	25,200	188·1	14,600	188·9	18,300	189·1	19,300	187·6	12,600
25	193·6	47,400	190·1	24,600	188·2	15,000	188·9	18,300	189·2	19,800	187·5	12,200
26	193·5	46,700	190·0	24,000	188·2	15,000	188·9	18,300	189·2	19,800	187·5	12,200
27	193·5	46,700	189·9	23,400	188·1	14,600	188·9	18,300	189·2	19,800	187·5	12,200
28	193·3	45,300	189·8	22,900	188·1	14,600	188·9	18,300	189·2	19,800	187·5	12,200
29	193·0	43,200	189·7	22,400	188·1	14,600	188·9	18,300	189·2	19,800	187·5	12,200
30	192·9	42,500	189·6	21,900	188·1	14,600	188·9	18,300	189·2	19,800	187·5	12,200
31	192·7	41,100	189·5	21,400			188·9	18,300			187·5	12,200

Monthly Discharge of Kootenay River near Bonnington Falls, for 1910.

(Drainage area, 17,800 sqaure miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	12,200	8,400	9,240	0·52	0·60	568,000
February	8,700	7,000	8,070	0·45	0·47	448,000
March	21,400	7,200	12,500	0·70	0·81	769,000
April	60,800	21,400	32,900	1·85	2·06	1,960,000
May	84,000	63,500	73,800	4·15	4·78	4,540,000
June	88,000	70,000	78,900	4·43	4·94	4,695,000
July	68,000	41,100	55,400	3·11	3·58	3,410,000
August	40,400	21,400	30,000	1·68	1·94	1,840,000
September	20,800	14,200	16,200	0·91	1·02	964,000
October	19,300	14,600	17,200	0·97	1·12	1,060,000
November	19,800	17,400	18,600	1·04	1·16	1,100,000
December	18,800	12,200	14,400	0·81	0·93	885,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1911.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	187·4	11,800	186·1	7,500	185·5	6,300	188·0	14,200	191·3	31,800	194·7	56,300
2	187·3	11,400	186·1	7,500	185·5	6,300	188·0	14,200	191·4	32,400	194·9	58,100
3	187·1	10,600	186·1	7,500	185·5	6,300	188·1	14,600	191·6	33,600	195·2	60,800
4	187·0	10,200	186·1	7,500	185·5	6,300	188·2	15,000	191·8	34,800	195·4	62,600
5	186·9	9,900	186·1	7,500	185·5	6,300	188·2	15,000	192·0	36,200	195·6	64,400
6	186·8	9,600	186·1	7,500	185·5	6,300	188·3	15,400	192·4	39,000	195·8	66,200
7	186·8	9,600	186·1	7,500	185·5	6,300	188·3	15,400	192·7	41,100	196·0	68,000
8	186·7	9,300	186·1	7,500	185·5	6,300	188·4	15,900	193·0	43,200	196·2	70,000
9	186·7	9,300	186·1	7,500	185·6	6,400	188·4	15,900	193·3	45,300	196·3	71,000
10	186·7	9,300	186·1	7,500	185·6	6,400	188·4	15,900	193·5	46,700	196·3	75,000
11	186·6	9,000	186·2	7,800	185·7	6,600	188·4	15,900	193·6	47,400	196·6	74,000
12	186·6	9,000	186·2	7,800	185·8	6,800	188·4	15,900	193·7	48,100	196·9	77,000
13	186·6	9,000	186·2	7,800	185·8	6,800	188·5	16,400	193·8	48,800	197·1	80,000
14	186·4	8,400	186·2	7,800	185·8	6,800	188·5	16,400	193·8	48,800	197·4	83,000
15	186·3	8,100	186·2	7,800	185·9	7,000	188·5	16,400	193·9	49,600	197·6	85,000
16	186·1	7,500	186·2	7,800	185·9	7,000	188·5	16,400	194·0	50,400	197·9	89,500
17	186·0	7,200	186·2	7,800	186·0	7,200	188·5	16,400	194·0	50,400	198·1	92,000
18	185·9	7,000	186·3	8,100	186·0	7,200	188·5	16,400	194·1	51,200	198·3	94,000
19	185·9	7,000	186·3	8,100	186·1	7,500	188·5	16,400	194·3	52,800	198·5	96,500
20	186·0	7,200	186·3	8,100	186·3	8,100	188·5	16,400	194·5	54,500	198·7	99,500
21	186·1	7,500	186·3	8,100	186·4	8,400	188·6	16,900	194·6	55,400	198·8	101,000
22	186·3	8,100	186·2	7,800	186·5	8,700	188·7	17,400	194·7	56,300	199·0	104,000
23	186·2	7,800	185·8	6,800	186·6	9,000	188·9	18,300	194·7	56,300	199·0	104,000
24	186·2	7,800	185·7	6,600	186·7	9,300	189·0	18,800	194·6	55,400	199·0	104,000
25	186·2	7,800	185·7	6,600	186·8	9,600	189·5	21,400	194·6	55,400	199·0	104,000
26	186·4	8,400	185·7	6,600	187·0	10,200	189·8	22,900	194·5	54,500	199·0	104,000
27	186·4	8,400	185·7	6,600	187·2	11,000	190·2	25,200	194·5	54,500	199·0	104,000
28	186·3	8,100	185·6	6,400	187·4	11,800	190·5	27,000	194·5	54,500	199·0	104,000
29	186·4	8,400	.....	.....	187·6	12,600	190·9	29,400	194·5	54,500	199·0	104,000
30	186·4	8,400	.....	.....	187·7	13,000	191·2	31,200	194·5	54,500	199·0	104,000
31	186·2	7,800	.....	.....	187·9	13,800	..	.....	194·5	54,500	.	.....

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1911.—*Con.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	198·9	102,000	194·3	52,800	190·5	27,000	188·7	17,400	187·2	11,000	187·0	10,200
2	198·8	101,000	194·2	52,000	190·4	26,400	188·7	17,400	187·1	10,800	186·9	9,900
3	198·7	99,500	194·0	50,400	190·4	26,400	188·6	16,900	187·1	10,600	186·7	9,300
4	198·5	96,500	193·7	48,100	190·4	26,400	188·5	16,400	187·0	10,200	186·6	9,000
5	198·4	95,000	193·6	47,400	190·4	26,400	188·5	16,400	187·0	10,200	186·5	8,700
6	198·2	93,000	193·5	46,700	190·3	25,800	188·5	16,400	187·0	10,200	186·5	8,700
7	198·0	91,000	193·4	46,000	190·2	25,200	188·4	15,900	187·0	10,200	186·5	8,700
8	197·8	88,000	193·3	45,300	190·2	25,200	188·3	15,400	187·0	10,200	186·4	8,400
9	197·7	86,000	193·1	43,900	190·1	24,600	188·3	15,400	187·0	10,200	186·4	8,400
10	197·5	84,000	193·0	43,200	190·0	24,000	188·2	15,000	186·9	9,900	186·4	8,400
11	197·3	82,000	193·0	43,200	189·9	23,400	188·2	15,000	186·9	9,900	186·3	8,100
12	197·2	81,000	193·0	43,200	189·9	23,400	188·2	15,000	186·8	9,600	186·3	8,100
13	197·1	80,000	192·8	41,800	189·8	22,900	188·2	15,000	186·7	9,300	186·3	8,100
14	197·0	79,000	192·7	41,100	189·7	22,400	188·2	15,000	186·5	8,700	186·3	8,100
15	197·0	79,000	192·5	39,700	189·7	22,400	188·0	14,200	186·4	8,400	186·3	8,100
16	196·9	77,000	192·4	39,000	189·6	21,900	187·9	13,800	186·4	8,400	186·3	8,100
17	196·7	75,000	192·2	37,600	189·6	21,900	187·8	13,400	186·4	8,400	186·3	8,100
18	196·6	74,000	192·1	36,900	189·5	21,400	187·8	13,400	186·4	8,400	186·3	8,100
19	196·5	73,000	191·9	35,500	189·5	21,400	187·7	13,000	186·5	8,700	186·3	8,100
20	196·3	71,000	191·7	34,200	189·4	20,800	187·7	13,000	186·5	8,700	186·2	7,800
21	196·1	69,000	191·6	33,600	189·4	20,800	187·6	12,600	186·5	8,700	186·2	7,800
22	195·9	67,100	191·5	33,000	189·3	20,300	187·6	12,600	186·6	9,000	186·1	7,500
23	195·7	65,300	191·4	32,400	189·3	20,300	187·6	12,600	186·7	9,300	186·1	7,500
24	195·6	64,400	191·3	31,800	189·2	19,800	187·5	12,200	186·7	9,300	186·1	7,500
25	195·5	63,500	191·2	31,200	189·2	19,800	187·5	12,200	186·8	9,600	186·0	7,200
26	195·3	61,700	191·1	30,600	189·0	18,800	187·5	12,200	186·9	9,900	186·0	7,200
27	195·2	60,800	190·9	29,400	188·9	18,300	187·5	12,200	187·0	10,200	186·0	7,200
28	195·0	59,000	190·8	28,800	188·9	18,300	187·5	12,200	187·0	10,200	186·0	7,200
29	194·9	58,100	190·7	28,200	188·8	17,900	187·4	11,800	187·0	10,200	186·0	7,200
30	194·7	56,300	190·6	27,600	188·8	17,900	187·3	11,400	187·0	10,200	186·0	7,200
31	194·5	54,500	190·5	27,000			187·2	11,000			185·8	6,800

Monthly Discharge of Kootenay River near Bonnington Falls, for 1911.

(Drainage area, 17,800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	11,800	7,000	8,670	0·49	0·56	533,000
February	8,100	6,400	7,480	0·42	0·44	415,000
March	13,800	6,300	8,120	0·46	0·53	499,000
April	31,200	14,200	18,100	1·01	1·13	1,080,000
May	56,300	31,800	48,100	2·70	3·11	2,960,000
June	104,000	56,300	85,300	4·78	5·33	5,080,000
July	102,000	54,500	77,000	4·32	4·98	4,730,000
August	52,800	27,000	38,800	2·18	2·51	1,540,000
September	27,000	17,900	22,400	1·26	1·41	1,330,000
October	17,400	11,000	14,100	0·79	0·91	867,000
November	11,000	8,400	9,610	0·54	0·60	572,000
December	10,200	6,800	8,090	0·45	0·52	497,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1912.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	185·8	6,800	185·0	5,800	185·4	6,200	185·2	6,000	189·8	22,900	195·0	59,000
2	185·8	6,800	185·0	5,800	185·3	6,100	185·2	6,000	189·9	23,400	194·9	58,100
3	185·8	6,800	185·0	5,800	185·3	6,100	185·5	6,300	190·0	24,000	194·9	58,100
4	185·8	6,800	185·2	6,000	185·3	6,100	185·5	6,300	190·0	24,000	195·0	59,000
5	185·8	6,800	185·3	6,100	185·1	5,900	185·6	6,400	190·0	24,000	194·8	57,200
		6,800										
6	185·8		185·1	5,900	185·0	5,800	185·9	7,000	190·1	24,600	194·8	57,200
7	185·8	6,800	185·1	5,900	185·2	6,000	186·1	7,500	190·1	24,600	194·8	57,200
8	186·0	7,200	185·1	5,900	185·0	5,800	186·1	7,500	190·2	25,200	194·7	56,300
9	184·9	5,700	185·1	5,900	185·0	5,800	186·5	8,700	190·5	27,000	194·7	56,300
10	185·0	5,800	185·1	5,900	185·0	5,800	186·5	8,700	190·7	28,200	194·7	56,300
11	185·0	5,800	185·3	6,100	185·0	5,800	186·9	8,900	192·0	30,000	194·5	54,500
12	185·0	5,800	185·3	6,100	185·0	5,800	187·1	10,600	191·3	31,800	194·5	54,500
13	185·0	5,800	185·0	5,800	185·0	5,800	187·1	10,600	191·5	33,000	194·7	56,300
14	185·0	5,800	185·0	5,800	185·0	5,800	187·6	12,600	193·0	36,200	194·8	57,200
15	185·0	5,800	185·0	5,800	185·0	5,800	187·9	13,800	192·3	38,300	194·9	56,100
16	185·0	5,800	184·9	5,700	185·0	5,800	188·0	14,200	192·6	40,400	195·0	59,000
17	185·0	5,800	185·1	5,900	185·0	5,800	188·2	15,000	193·0	43,200	195·0	59,000
18	185·0	5,800	184·9	5,700	185·0	5,800	188·4	15,900	193·3	45,300	195·1	59,000
19	185·0	5,800	184·9	5,700	184·9	5,700	188·7	17,400	193·5	46,700	195·1	59,900
20	185·0	5,800	184·9	5,700	185·0	5,800	189·0	18,300	193·7	48,100	195·2	60,800
21	185·0	5,800	185·0	5,800	185·0	5,800	189·1	19,300	194·0	50,400	195·2	60,800
22	185·0	5,800	185·5	6,300	184·9	5,700	189·2	19,800	194·2	52,000	175·2	60,800
23	185·0	5,800	185·5	6,300	185·0	5,800	189·3	20,300	194·4	53,600	195·3	61,700
24	185·0	5,800	185·4	6,200	184·9	5,700	189·4	20,800	194·5	54,500	195·4	62,600
25	185·0	5,800	185·0	5,800	185·0	5,800	189·4	20,800	194·6	55,400	195·5	63,500
26	185·0	5,800	184·9	5,700	184·8	5,600	189·4	20,800	194·7	56,300	195·5	63,500
27	185·0	5,800	184·9	5,700	184·8	5,600	189·6	21,900	194·7	56,300	195·5	63,500
28	185·0	5,800	184·9	5,700	184·9	5,700	189·6	21,900	194·8	57,200	195·5	63,500
29	185·0	5,800	184·9	5,700	184·9	5,700	189·7	22,400	195·0	59,000	195·4	62,600
30	185·0	5,800	.....	.....	184·9	5,700	189·7	22,400	195·0	59,000	195·0	59,000
31	185·0	5,800	.....	.....	184·9	5,700	.....	.....	195·1	59,900	.....	.....

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1912.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	195·0	59,000	192·9	42,500	190·4	26,400	188·5	16,400	187·6	12,600	187·5	12,200
2	195·0	59,000	192·8	41,800	190·3	25,800	188·5	16,400	187·5	12,200	187·4	11,800
3	195·0	59,000	192·7	41,100	190·2	25,200	188·4	15,900	187·4	11,800	187·4	11,800
4	194·5	54,600	192·6	40,400	190·1	24,600	188·2	15,000	175·3	11,400	187·3	11,400
5	194·5	54,500	192·5	39,700	190·0	24,000	188·1	14,600	187·3	11,400	187·2	11,000
6	194·4	53,600	192·4	39,000	190·0	24,000	188·1	14,600	187·3	11,400	187·1	10,600
7	194·3	62,800	192·4	39,000	190·0	24,000	188·1	14,600	187·3	11,400	187·2	11,000
8	194·0	50,400	192·2	37,600	190·0	24,000	188·0	14,200	187·3	11,400	187·2	11,000
9	194·0	50,400	192·1	36,900	190·0	24,000	188·0	14,200	187·4	11,800	187·1	10,600
10	194·0	50,400	192·0	35,200	190·0	24,000	188·0	14,200	187·5	12,200	187·1	10,600
11	194·0	50,400	191·9	35,500	189·7	22,400	188·0	14,200	187·5	12,200	187·1	10,600
12	193·8	48,800	191·9	35,500	189·8	22,900	187·9	13,800	187·5	12,200	187·1	10,600
13	193·8	48,800	191·9	35,500	189·7	22,400	187·9	13,800	187·5	12,200	187·0	10,200
14	193·9	49,600	191·6	33,600	189·8	22,900	187·9	13,800	187·6	12,600	187·0	10,200
15	193·9	49,600	191·6	33,600	189·8	22,900	187·9	13,800	187·7	13,000	187·0	10,200
16	193·9	49,600	191·5	33,000	189·7	22,400	187·7	13,000	187·8	13,400	186·9	9,900
17	193·9	49,600	191·4	32,400	189·6	21,900	187·7	13,000	188·0	14,200	186·9	9,900
18	193·9	49,600	191·3	31,800	189·5	21,400	187·7	13,000	188·0	14,200	186·8	9,600
19	193·7	48,100	191·1	30,600	189·3	20,300	187·7	13,000	188·0	14,200	186·8	9,600
20	193·7	48,100	191·0	30,000	189·3	20,300	187·7	13,000	188·0	14,200	186·7	9,300
21	193·7	48,100	191·0	30,000	189·3	20,300	187·6	13,400	187·9	13,800	186·7	9,300
22	193·5	46,700	191·0	30,000	189·1	19,300	187·8	13,400	187·9	13,800	186·7	9,300
23	193·6	46,700	191·0	30,000	189·0	18,800	187·7	13,000	188·0	14,200	186·9	9,900
24	193·5	46,700	191·0	30,000	189·0	18,800	187·7	13,000	188·0	14,200	186·8	9,600
25	193·4	46,000	191·0	36,000	189·0	18,800	187·8	13,400	188·9	13,800	186·8	9,500
26	193·1	43,900	190·8	28,000	189·0	18,800	187·7	13,000	188·9	13,800	186·7	9,300
27	193·0	43,200	190·6	27,600	188·8	17,900	187·7	13,000	188·8	13,400	186·6	9,000
28	192·9	42,500	190·6	27,600	188·8	17,900	187·7	13,000	188·8	13,400	186·7	9,300
29	193·0	43,200	190·6	27,600	189·8	17,900	187·7	13,000	188·7	13,000	186·7	9,300
30	192·9	42,500	190·6	27,600	188·6	16,900	187·7	13,000	188·5	12,200	186·3	8,100
31	192·9	42,500	190·6	27,600	.....	.....	187·7	13,000	.....	.....	186·1	7,500

Monthly Discharge of Kootenay River near Bonnington Falls, for 1912.

(Drainage area, 17,800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	7,200	5,700	6,070	0·34	0·39	373,000
February	6,300	5,700	5,880	0·33	0·36	338,000
March	6,200	5,600	5,820	0·33	0·38	358,000
April	22,400	6,000	14,000	0·79	0·88	833,000
May	59,900	22,900	40,500	2·27	2·62	2,490,000
June	63,500	54,500	59,200	3·32	3·70	3,520,000
July	59,000	42,500	49,300	2·77	3·19	3,030,000
August	42,500	27,600	33,600	1·88	2·17	2,070,000
September	26,400	16,900	21,700	1·22	1·36	1,290,000
October	16,400	13,000	13,800	0·78	0·90	848,000
November	14,200	11,400	12,800	0·71	0·79	762,000
December	12,200	7,500	10,100	0·57	0·66	621,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River at Bonnington Falls, for 1913.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	186·3	8,100	185·6	6,400	185·5	6,300	186·1	7,500	191·5	33,000	197·5	84,000
2	186·3	8,100	185·9	7,000	185·8	6,800	186·1	7,500	191·5	33,000	197·9	89,500
3	186·3	8,100	185·9	7,000	185·4	6,200	186·1	7,500	191·7	34,200	198·5	96,500
4	186·6	9,000	185·8	6,800	185·5	6,300	186·1	7,500	191·6	33,600	199·0	104,000
5	186·5	8,700	185·7	6,600	185·5	6,300	185·9	7,000	191·5	33,000	199·2	107,000
6	186·4	8,400	185·6	6,400	185·5	6,300	186·2	7,800	191·5	33,000	199·4	109,000
7	186·3	8,100	185·7	6,600	185·5	6,300	186·0	7,200	191·4	32,400	199·8	114,000
8	186·2	7,800	185·6	6,400	185·4	6,200	186·0	7,200	191·4	32,400	200·1	119,000
9	186·2	7,800	185·8	6,800	185·6	6,400	186·2	7,800	191·5	33,000	200·5	125,000
10	186·2	7,800	185·7	6,600	185·6	6,400	186·2	7,800	191·7	34,200	200·6	126,000
11	186·2	7,800	185·6	6,400	185·6	6,400	186·3	8,100	192·0	36,200	200·7	128,000
12	186·3	8,100	185·6	6,400	185·6	6,400	186·4	8,400	192·3	38,300	200·8	130,000
13	186·2	7,800	185·5	6,300	185·6	6,400	186·8	9,600	192·3	38,300	200·7	128,000
14	186·0	7,200	185·3	6,100	185·6	6,400	187·0	10,200	192·6	40,400	200·8	130,000
15	186·0	7,200	185·3	6,100	185·7	6,600	187·2	11,000	192·7	41,100	201·3	137,000
16	186·0	7,200	185·6	6,400	185·7	6,600	187·6	12,600	192·8	41,800	201·0	132,000
17	186·0	7,200	185·6	6,400	185·6	6,400	187·9	13,800	193·0	43,200	200·0	118,000
18	185·8	6,800	185·6	6,400	185·8	6,800	188·3	15,400	193·2	44,600	200·4	124,000
19	186·0	7,200	185·6	6,400	185·1	5,900	188·7	17,400	193·3	45,300	200·3	122,000
20	185·7	6,600	185·7	6,600	185·8	6,800	189·2	19,800	193·4	46,000	200·2	120,000
21	185·8	6,800	185·8	6,800	185·8	6,800	189·5	21,400	193·3	45,300	200·1	119,000
22	185·8	6,800	185·5	6,300	185·7	6,600	189·8	22,900	193·4	46,000	200·0	118,000
23	185·7	6,600	185·8	6,800	186·0	7,200	190·0	24,000	193·5	46,700	199·7	113,000
24	185·8	6,800	185·6	6,400	185·8	6,800	189·4	20,800	193·8	48,800	199·3	108,000
25	185·8	6,800	185·6	6,400	185·9	7,000	190·6	27,600	194·2	52,000	199·4	109,000
26	185·8	6,800	185·6	6,400	186·0	7,200	190·8	28,800	194·4	53,600	199·2	107,000
27	185·8	6,800	185·5	6,300	185·8	6,800	191·2	31,200	194·9	58,100	199·1	106,000
28	186·3	8,100	185·4	6,200	185·9	7,000	191·3	31,800	195·5	63,500	198·8	101,000
29	186·0	7,200	.....	.....	185·9	7,000	191·4	32,400	196·0	68,000	198·7	99,500
30	186·0	7,200	.....	.....	186·0	7,200	191·4	32,400	196·5	73,000	198·5	96,500
31	186·0	7,200	.....	.....	186·0	7,200	.....	.....	197·1	80,000	.....	.....

Daily Gauge Height and Discharge of Kootenay River at Bonnington Falls, for 1913.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	198·3	94,000	194·0	50,400	191·2	31,200	189·3	20,300	188·0	14,200	181·7	13,000
2	198·2	93,000	193·8	48,800	191·1	30,600	189·2	19,800	188·2	15,000	187·7	13,000
3	198·1	92,000	193·7	48,100	190·9	29,400	189·2	19,800	188·0	14,200	187·7	13,000
4	197·9	89,500	193·3	45,300	190·9	29,400	189·1	19,300	188·0	14,200	187·7	13,000
5	197·7	86,500	193·3	45,300	191·0	30,000	189·1	19,300	188·0	14,200	187·5	12,200
6	197·6	85,000	193·3	45,300	191·0	30,000	189·2	19,800	187·8	13,400	187·6	12,600
7	197·4	83,000	193·0	43,200	191·0	30,000	189·2	19,800	187·7	13,000	187·6	12,600
8	197·4	83,000	193·0	43,200	191·0	30,000	189·0	18,800	187·7	13,000	187·3	11,400
9	197·2	81,000	192·8	41,800	191·0	30,000	188·9	18,300	187·8	13,400	187·4	11,800
10	197·0	79,000	193·0	43,200	191·0	30,000	188·8	17,900	187·8	13,400	187·4	11,800
11	196·8	76,000	192·8	41,800	191·0	30,000	188·9	18,300	188·0	14,200	187·2	11,000
12	196·9	77,000	192·7	41,100	190·8	28,800	188·9	18,300	187·7	13,000	187·2	11,000
13	196·8	76,000	192·8	41,800	190·8	28,800	188·8	17,900	187·7	13,000	187·2	11,000
14	196·5	73,000	192·7	41,100	190·7	28,200	188·7	17,400	187·7	13,000	187·3	11,400
15	196·3	71,000	192·5	39,700	190·6	27,600	188·8	17,900	187·6	12,600	186·8	9,600
16	196·2	70,000	192·3	38,300	190·6	27,600	188·7	17,400	187·8	13,400	186·8	9,600
17	196·0	68,000	192·3	38,300	190·5	27,000	188·7	17,400	187·8	13,400	186·7	9,300
18	195·7	65,300	192·2	37,600	190·3	25,800	188·7	17,400	187·8	13,400	186·7	9,300
19	195·6	64,400	192·0	36,200	190·0	24,000	188·8	17,900	187·2	11,000	186·6	9,000
20	195·4	62,600	191·9	35,500	190·0	24,000	188·7	17,400	187·8	13,400	186·5	8,700
21	195·1	59,900	191·8	34,800	190·2	25,200	188·5	16,400	187·8	13,400	186·5	8,700
22	195·0	59,000	191·6	33,600	190·2	25,200	188·6	16,900	187·8	13,400	186·4	8,400
23	195·0	59,000	191·6	33,600	190·0	24,000	188·3	15,400	187·8	13,400	186·3	8,100
24	194·9	58,100	191·5	33,000	190·0	24,000	188·4	15,900	187·8	13,400	186·3	8,100
25	194·6	55,400	191·3	31,800	189·9	23,400	188·3	15,400	187·7	13,000	186·6	9,000
26	194·6	55,400	191·5	33,000	189·7	22,400	188·7	17,400	187·7	13,000	186·5	8,700
27	194·4	53,600	191·3	31,800	189·6	21,900	188·4	15,900	187·7	13,000	186·2	7,800
28	194·3	52,800	191·3	31,800	189·6	21,900	188·4	15,900	187·7	13,000	186·2	7,800
29	194·2	52,000	191·2	31,200	189·4	20,800	188·3	15,400	187·8	13,400	186·3	8,100
30	194·2	52,000	191·2	31,200	189·3	20,300	188·3	15,400	187·7	13,000	186·3	8,100
31	194·0	50,400	191·2	31,200	.....	.....	188·1	14,600	.....	.....	186·2	7,800

Monthly Discharge of Kootenay River near Bonnington Falls, for 1913.

(Drainage Area 17,800 square miles).

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	9,000	6,600	7,490	0·42	0·48	461,000
February	7,000	6,100	6,490	0·36	0·38	360,000
March	7,200	5,900	6,610	0·37	0·43	406,000
April	32,400	7,200	15,800	0·89	0·99	940,000
May	80,000	32,400	44,600	2·51	2·89	2,740,000
June	137,000	84,000	114,000	6·40	7·14	6,780,000
July	94,000	50,400	70,200	3·94	4·54	4,320,000
August	50,400	31,200	38,800	2·18	2·5	2,390,000
September	31,200	20,300	26,700	1·50	1·67	1,590,000
October	20,300	14,600	17,600	0·99	1·14	1,080,000
November	15,000	11,000	13,300	0·75	0·84	791,000
December	13,000	7,800	10,200	0·57	0·66	627,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1914.

Day	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	186·2	7,800	186·7	9,300	186·2	7,800	187·4	11,800	192·2	37,600	196·8	76,000
2	186·3	8,100	186·7	9,300	186·1	7,500	187·4	11,800	192·3	38,300	196·8	76,000
3	186·2	7,800	186·6	9,000	186·3	8,100	187·4	11,800	192·4	39,000	196·8	76,000
4	186·3	8,100	186·5	8,700	186·2	7,800	187·4	11,800	192·8	41,800	197·1	80,000
5	186·3	8,100	186·7	9,300	186·7	9,300	187·4	11,800	192·9	42,500	197·3	82,000
6	186·3	8,100	186·5	8,700	186·3	8,100	187·4	11,800	193·2	44,600	197·5	84,000
7	186·7	9,300	186·4	8,400	186·2	7,800	187·5	12,200	193·4	46,000	197·5	84,000
8	187·0	10,200	186·7	9,300	186·3	8,100	187·8	13,400	193·5	46,700	197·6	85,000
9	187·0	10,200	186·5	8,700	186·2	7,800	187·9	13,800	193·7	48,100	197·6	85,000
10	187·2	11,000	186·4	8,400	186·1	7,500	188·1	14,600	193·9	49,600	197·6	85,000
11	187·3	11,400	186·4	8,400	186·1	7,500	188·3	15,400	194·1	51,200	197·4	83,000
12	187·4	11,800	186·3	8,100	186·1	7,500	188·5	16,400	194·2	52,000	197·3	82,000
13	187·3	11,400	186·3	8,100	186·2	7,800	188·6	16,900	194·3	52,800	197·2	81,000
14	187·3	11,400	186·3	8,100	186·2	7,800	189·0	18,800	194·6	55,400	197·2	81,000
15	187·4	11,800	186·4	8,400	186·4	8,400	189·3	20,300	194·8	57,200	197·3	82,000
16	187·7	13,000	186·3	8,100	186·3	8,100	189·6	21,900	195·0	59,000	197·1	80,000
17	187·7	13,000	186·3	8,100	186·3	8,100	189·8	22,900	195·3	61,700	197·2	81,000
18	187·3	11,400	186·2	7,800	186·6	9,000	190·0	24,000	195·6	64,400	197·3	82,000
19	187·3	11,400	186·1	7,500	186·8	9,600	190·4	26,400	195·8	66,200	197·5	84,000
20	187·3	11,400	186·1	7,500	186·8	9,600	190·7	28,200	195·9	67,100	197·7	86,500
21	187·3	11,400	186·3	8,100	186·8	9,600	190·8	28,800	196·2	70,000	197·8	88,000
22	187·3	11,400	186·2	7,800	186·9	9,900	191·0	30,000	196·3	71,000	197·8	88,000
23	187·0	10,200	186·2	7,800	187·3	11,400	191·3	31,800	196·3	71,000	197·8	88,000
24	187·0	10,200	186·1	7,500	187·3	11,400	191·3	31,800	196·5	73,000	197·7	86,500
25	187·0	10,200	186·2	7,800	187·3	11,400	191·6	33,600	196·7	75,000	197·8	88,000
26	187·0	10,200	186·0	7,200	187·4	11,800	191·8	34,800	196·8	76,000	197·8	88,000
27	187·0	10,200	185·9	7,000	187·4	11,800	191·8	34,800	196·8	76,000	197·6	85,000
28	186·8	9,600	186·3	8,100	187·4	11,800	192·0	36,200	196·7	75,000	197·4	83,000
29	186·8	9,600	.....	.....	187·5	12,200	192·0	36,200	196·9	77,000	197·4	83,000
30	186·8	9,600	.....	.....	187·3	11,400	192·1	36,900	197·0	79,000	197·3	82,000
31	186·8	9,600	.....	.....	187·2	11,000	.....	.....	196·8	76,000	.....	.....

Daily Gauge Height and Discharge of Kootenay River near Bonnington Falls, for 1914—*Concluded.*

Day.	July.		August	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	197·2	81,000	194·2	52,000
2	197·2	81,000	194·0	50,400
3	197·3	82,000	193·8	48,800
4	197·1	80,000	193·6	47,400
5	197·2	81,000	193·4	46,000
6	197·3	82,000	193·3	45,300
7	197·2	81,000	193·2	44,600
8	197·1	80,000	193·1	43,900
9	197·3	82,000	193·0	43,200
10	197·2	81,000	192·7	41,100
11	197·1	80,000	192·4	39,000
12	197·1	80,000	192·3	38,300
13	197·1	80,000	192·2	37,600
14	197·0	79,000	192·0	36,200
15	197·0	79,000	192·0	36,200
16	196·9	77,000	191·8	34,800
17	196·8	76,000	191·7	34,200
18	196·8	76,000	191·5	33,000
19	196·6	74,000	191·5	33,000
20	196·3	71,000	191·3	31,800
21	196·3	71,000	191·2	31,200
22	196·2	70,000	191·1	30,600
23	196·0	68,000	191·1	90,600
24	195·8	66,200	190·9	23,400
25	195·5	63,500	190·8	28,800
26	195·5	63,500	190·7	28,200
27	195·2	60,800	190·7	28,200
28	194·8	57,200	190·5	27,000
29	194·8	57,200	190·3	25,800
30	194·5	54,500	190·2	25,200
31	194·3	52,800	190·2	25,200

Monthly Discharge of Kootenay River near Bonnington Falls, for 1914.

(Drainage area, 17,800 square miles).

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	11,800	7,800	10,300	0·58	0·67	633,000
February	9,300	7,000	8,230	0·46	0·48	457,000
March	12,200	7,500	9,250	0·52	0·60	569,000
April	36,900	11,800	22,400	1·26	1·41	1,330,000
May	79,000	37,600	59,400	3·33	3·84	3,650,000
June	88,000	76,000	23,100	4·66	5·20	4,940,000
July	82,000	52,800	73,000	4·10	4·73	4,490,000
August	52,000	25,200	36,300	2·03	2·34	2,230,000

SESSIONAL PAPER No. 25e

Kootenay River near Bonnington Pool (3076).

Location.—At the upper end of Bonnington or Slocan pool, one quarter mile from South Slocan, 12 miles from Nelson, and about 13 miles from the mouth. Nelson district.

Records Available.—June to December, 1914.

Climatic Conditions.—The climatic conditions are similar to those at Nelson (see Kootenay river near Nelson.)

Gauge.—Three vertical staff gauges, 10 feet long, have been used and read by Mr. John Anderson of South Slocan.

Method of Compilation.—Bonnington pool is above the mouth of Slocan river, and the same method of compilation is used as on Kootenay river at Bonnington falls, q.v. For more complete information see report in part 2 called "Compilation of data on Kootenay river between Kootenay lake and the mouth."

Accuracy.—These results should be within 15 per cent.

Daily Gauge Height and Discharge of Kootenay River near Bonnington Pool, for 1914.

Day.	June.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1	14·5	77,200
2	14·6	77,900
3	14·8	79,500
4	14·9	80,200
5	15·0	81,000
6	15·1	81,700
7	15·3	83,200
8	15·4	84,000
9	15·5	84,700
10	15·5	84,700
11	15·4	84,000
12	15·3	83,200
13	15·1	81,700
14	15·3	83,200
15	15·6	85,400
16	15·8	86,900
17	16·0	88,400
18	16·1	89,200
19	16·3	90,700
20	16·5	92,200
21	16·4	91,400
22	16·3	90,700
23	16·2	89,900
24	16·1	89,200
25	16·0	88,400
26	16·0	88,400
27	15·9	87,700
28	15·8	86,900
29	15·7	86,200
30	15·6	85,400

Daily Gauge Height and Discharge of Kootenay River near Bonnington Pool, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	15·5	84,700	10·8	51,500	6·04	23,500	5·14	19,000	4·94	18,100	4·94	18,100
2	15·4	84,000	10·6	50,200	5·94	23,000	5·14	19,000	4·95	18,100	4·94	18,100
3	15·3	83,200	10·4	88,800	5·74	22,000	5·14	19,000	4·97	18,200	4·89	17,800
4	15·2	82,500	10·2	47,500	5·64	21,500	5·14	19,000	4·98	18,400	4·84	17,600
5	15·3	83,200	10·0	46,200	5·44	20,500	5·14	19,000	5·54	21,000	4·79	17,400
6	15·5	84,700	9·8	44,900	5·44	20,500	5·14	19,000	5·64	21,500	4·74	17,100
7	15·5	84,700	9·6	43,600	5·44	20,500	5·09	18,800	5·69	21,800	4·74	17,100
8	15·5	84,700	9·4	42,400	5·44	20,500	5·04	18,600	5·74	22,000	4·64	16,600
9	15·4	84,000	9·2	41,200	5·44	20,500	5·04	18,600	5·79	22,200	4·51	16,100
10	15·3	83,200	9·0	40,000	5·44	20,500	4·99	18,400	5·94	23,000	4·49	15,800
11	15·2	82,500	8·8	38,800	5·44	20,500	4·94	18,100	5·94	23,000	4·34	15,100
12	15·1	81,700	8·6	37,600	5·34	20,000	4·89	17,900	5·89	22,800	4·29	14,800
13	15·1	81,700	8·24	35,500	5·34	20,000	4·85	17,600	5·84	22,500	4·14	14,100
14	15·0	81,000	8·14	35,000	5·24	19,500	4·85	17,600	5·84	22,500	4·09	13,800
15	15·0	81,000	7·94	33,800	5·24	19,500	4·80	17,400	5·89	22,800	4·04	13,600
16	14·9	80,200	7·94	33,800	5·24	19,500	4·75	17,100	5·79	22,200	3·94	13,200
17	14·9	80,200	7·84	33,300	5·14	19,000	4·75	17,100	5·79	22,200	3·78	12,400
18	14·8	79,500	7·74	32,700	5·04	18,600	4·84	17,600	5·64	21,500	.....	12,000
19	14·6	77,900	7·54	31,600	5·04	18,600	4·94	18,100	5·59	21,200	.....	12,000
20	14·2	75,000	7·44	31,000	5·04	18,600	4·95	18,100	5·54	21,000	3·53	11,200
21	13·8	72,100	7·34	30,500	5·04	18,600	4·95	18,100	5·44	20,500	3·43	10,800
22	13·6	70,700	7·24	29,900	5·09	18,800	4·95	18,100	5·34	20,000	3·43	10,800
23	13·3	68,600	7·44	31,000	5·09	18,800	4·95	18,100	5·24	19,500	3·33	10,400
24	13·0	66,500	7·24	29,900	5·09	18,800	4·95	18,100	5·19	19,200	3·33	10,400
25	12·7	64,400	7·04	28,800	5·14	19,000	4·94	18,100	5·14	19,000	3·33	10,400
26	12·3	61,500	6·84	27,700	5·14	19,000	4·94	18,100	5·14	19,000	3·33	10,400
27	12·0	59,400	6·64	26,600	5·14	19,000	4·89	17,900	5·14	19,000	3·23	10,100
28	11·8	58,000	6·54	26,100	5·15	19,000	4·89	17,900	5·09	18,800	3·23	10,100
29	11·5	56,000	6·44	25,500	5·15	19,000	4·84	17,600	4·94	18,100	3·23	10,100
30	11·2	54,100	6·34	25,000	5·14	19,000	4·84	17,600	4·89	17,900	3·23	10,100
31	11·2	54,100	6·14	24,000	.....	.....	4·84	17,600	.....	.....	3·13	9,800

Monthly Discharge of Kootenay River near Bonnington Pool, for 1914.

(Drainage area, 17,800 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	92,200	77,200	85,400	4·79	5·34	5,080,000	D
July	84,700	54,100	75,000	4·21	4·85	4,610,000	B
August	51,500	24,000	35,600	2·00	2·31	2,190,000	D
September	23,500	18,600	19,900	1·12	1·25	1,180,000	D
October	19,000	17,100	18,100	1·02	1·18	1,110,000	C
November	23,000	17,900	20,600	1·16	1·29	1,230,000	C
December	18,100	9,800	14,100	0·79	0·91	867,000	D

Kootenay River near Nelson (3077).

Location.—At Astley's wharf, Nelson, about 2 miles above the outlet of Kootenay lake, 25 miles from the mouth. Nelson District.

Records Available.—1913 and 1914.

Climatic Conditions.—The precipitation at Nelson, from December 1, 1913, to November 30, 1914, was 27.6 inches. This may be considered slightly less than usual. Considerable rain generally falls from spring till the end of June. July and August, and sometimes September, are usually dry months. October and November are generally unsettled, but not cold. The winters are mild. The thermometer seldom goes below zero, and then possibly only for one night during the winter. The average temperature throughout the winter is about 30° F. The precipitation through the winter months is fairly heavy, sometimes snow, sometimes rain. The lake no doubt has an effect on the climate. One effect of the lake is very apparent in that the river below the lake seldom, if ever, freezes. The main lake never freezes, and the west arm, on which Nelson is situated, only occasionally.

Gauge.—The gauge is a vertical staff, 20 feet long, situated on Astley's wharf, and read daily by Mr. F. A. Lidgate of Nelson.

Method of Compilation.—As in the case of Kootenay river at Bonnington falls and at Bonnington pool, discharges for the Nelson gauge are determined by subtracting the discharges of Slocan river from discharges of Kootenay river near Glade. To compensate for the inflow to Kootenay river below the outlet of the lake and above Glade, the discharge is reduced by 1 per cent.

DAILY GAUGE HEIGHT AND DISCHARGE of Kootenay River near Nelson, for 1913.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		7,600	0·60	6,550	0·50	6,350		8,250	6·1	31,500		86,300
2		7,800		6,520		6,350		8,710	6·1	31,500	15·1	92,300
3		8,000		6,490		6,350		9,180	6·1	31,500	15·8	97,700
4	1·15	8,200		6,460		6,350		9,640		31,300	16·6	104,000
5		8,000		6,430		6,350	1·70	10,100	6·0	31,000	17·3	110,000
6		7,800		6,400		6,350		10,100	6·0	31,000	17·9	114,000
7		7,610		6,380		6,350		10,100	5·9	30,400	18·3	118,000
8		7,420	0·50	6,350	0·50	6,350	1·70	10,100	5·9	30,400		122,000
9		7,230		6,340		6,400	1·70	10,100	6·1	31,000	19·3	126,000
10		7,040		6,330		6,450	1·75	10,300	6·3	32,600	19·5	127,000
11	0·70	6,850		6,315		6,500	1·85	10,700		34,000	19·9	130,000
12		6,850		6,300		6,550	1·95	11,100	6·8	35,500	20·1	132,000
13		6,850		6,290		6,600		12,100	7·0	36,700	20·3	134,000
14		6,850		6,280		6,650	2·40	13,000	7·4	39,100	20·25	133,000
15		6,850	0·40	6,270	0·65	6,760	2·90	15,400	7·6	40,300		132,000
16		6,850		6,280		6,760	3·20	16,800	7·7	40,900	20·0	131,000
17		6,850		6,290		6,830	3·40	17,800	7·8	41,500	19·7	129,000
18	0·70	6,850		6,300		6,900	3·70	19,200		42,100	19·2	125,000
19		6,810		6,315		6,960	4·0	20,700	8·0	42,700	18·9	122,000
20		6,775		6,330		7,020		22,600	8·1	43,300	18·7	121,000
21		6,730		6,340		7,080	4·8	24,600	8·1	43,300	18·35	118,000
22		6,685	0·50	6,350	0·80	7,150	5·0	25,700	8·3	44,500		115,000
23		6,640		6,350		7,100	5·2	26,700	8·5	45,800	17·5	111,000
24		6,595		6,350		7,060	5·3	27,200	8·9	48,300	17·4	110,000
25	0·60	6,550		6,350		7,020	5·4	27,700		51,600	17·1	108,000
26		6,550		6,350		6,980	5·5	28,300	9·9	54,900	17·0	107,000
27		6,550		6,350		6,940		29,200	10·6	59,700	16·6	104,000
28		6,550		6,350		6,900	5·85	30,100	11·4	65,300	16·3	102,000
29		6,550			0·70	6,850	6·0	31,000	12·1	70,200		100,000
30		6,550				7,320	6·1	31,500	12·8	75,200	15·85	98,000
31		6,550				7,780			13·5	80,300		

Daily Gauge Height and Discharge of Kootenay River near Nelson, for 1913.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	15·6	96,100	8·7	47,000	5·6	28,800	4·0	20,700	2·8	14,900	1·95	11,100
2	15·4	94,600	8·6	46,400	5·6	28,800	3·9	20,200	.....	14,900	1·95	11,100
3	15·2	93,100	.....	45,500	5·5	28,300	3·8	19,700	2·8	14,900	1·9	10,900
4	15·0	91,600	8·3	44,500	5·5	28,300	3·7	19,200	2·8	14,900	1·9	10,900
5	14·65	88,800	8·2	43,900	5·6	28,800	.....	18,900	2·8	14,900	1·85	10,700
6	.....	86,800	8·05	43,000	5·7	29,300	3·6	18,700	2·7	14,400	1·85	10,700
7	14·1	84,700	8·0	42,700	.....	29,300	3·6	18,700	2·7	14,499	.....	10,700
8	13·9	83,200	7·9	42,100	5·7	29,300	3·6	18,700	2·6	13,900	1·85	10,700
9	13·6	81,000	7·8	41,500	5·7	29,300	3·5	18,300	.....	13,400	1·85	10,700
10	13·5	80,300	.....	40,900	5·7	29,300	3·5	18,300	2·4	13,000	1·85	10,700
11	13·2	78,100	7·6	40,300	5·6	28,800	3·45	18,000	2·3	12,600	1·8	10,500
12	13·0	76,700	7·5	39,700	5·5	28,300	.....	17,900	2·2	12,200	1·8	10,500
13	.....	74,500	7·4	39,100	5·4	27,700	3·4	17,800	2·1	11,800	1·7	10,100
14	12·4	72,300	7·3	38,500	.....	27,200	3·3	17,300	2·1	11,800	.....	9,900
15	12·2	70,900	7·3	38,500	5·2	26,700	3·3	17,300	2·1	11,800	1·6	9,700
16	11·7	67,400	7·2	37,900	5·1	26,200	3·3	17,300	.....	11,800	1·6	9,700
17	11·45	65,600	.....	37,300	5·0	25,700	3·3	17,300	2·1	11,800	1·6	9,700
18	11·05	62,800	7·0	36,700	5·0	25,700	3·2	16,800	2·1	11,800	1·6	9,700
19	10·85	61,400	6·8	35,500	4·9	25,100	.....	16,800	2·1	11,800	1·55	9,500
20	.....	59,800	6·7	34,900	4·8	24,600	3·2	16,800	2·05	11,600	1·55	9,500
21	10·4	58,300	6·6	34,300	.....	24,100	3·2	16,800	2·05	11,600	.....	9,400
22	10·2	56,900	6·5	33,800	4·6	23,600	3·2	16,800	2·05	11,600	1·5	9,300
23	10·1	56,200	6·4	33,200	4·6	23,600	3·2	16,800	.....	11,600	1·45	9,100
24	10·0	55,600	.....	32,400	4·5	23,100	3·2	16,800	2·05	11,600	1·4	8,950
25	9·85	54,600	6·1	31,500	4·5	23,100	3·1	16,300	2·05	11,600	1·3	8,650
26	9·8	54,200	6·0	31,000	4·4	22,600	.....	16,300	2·1	11,800	1·25	8,500
27	.....	52,900	6·0	31,000	4·3	22,100	3·1	16,300	2·05	11,600	1·2	8,350
28	9·4	51,600	6·0	31,000	.....	21,600	3·0	15,900	2·05	11,600	.....	8,200
29	9·3	50,900	5·9	30,400	4·1	21,100	3·0	15,900	2·0	11,400	1·1	8,050
30	9·1	49,600	5·8	29,800	4·0	20,700	3·0	15,900	.....	11,200	1·1	8,050
31	8·9	48,300	.....	29,800	.....	.....	2·9	15,400	.....	.....	1·1	8,050

Monthly Discharge of Kootenay River near Nelson, for 1913.

(Drainage area, 77,700 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	8,200	6,550	7,020	0·40	0·43	432,000
February	6,550	6,270	6,360	0·36	0·38	353,000
March	7,780	6,350	6,750	0·38	0·44	415,000
April	31,500	8,250	17,900	1·01	1·13	1,060,000
May	80,300	30,400	43,500	2·46	2·84	2,675,000
June	134,000	86,300	115,000	6·50	7·25	6,840,000
July	96,100	48,300	69,700	3·94	4·54	4,286,000
August	47,000	29,800	37,500	2·12	2·44	2,310,000
September	29,300	20,700	26,000	1·47	1·64	1,550,000
October	20,700	15,400	17,500	0·99	1·14	1,086,000
November	14,900	11,200	12,600	0·71	0·79	750,000
December	11,100	8,650	9,730	0·55	0·63	598,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River near Nelson, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·1	8,050	1·6	9,700	0·9	7,450	1·9	10,900	6·90	36,100	13·00	76,700
2	1·1	8,050	1·5	9,300	0·9	7,450	1·9	10,900	7·10	37,300	13·15	77,700
3	1·1	8,050	1·3	8,650	0·9	7,450	2·0	11,400	7·50	39,700	13·15	77,700
4	1·1	8,050	1·2	8,350	0·9	7,450	2·0	11,400	7·90	42,100	13·70	81,700
5	1·1	8,050	1·1	8,050	0·95	7,600	2·04	11,600	8·10	43,300	13·90	83,200
6	1·2	8,350	1·0	7,750	0·95	7,600	2·10	11,800	8·20	43,900	14·00	84,000
7	1·4	8,950	1·0	7,750	0·95	7,600	2·20	12,200	8·40	45,100	14·10	84,700
8	1·5	9,300	1·0	7,750	0·98	7,690	2·45	13,200	8·70	47,000	14·10	84,700
9	1·7	10,100	1·0	7,750	1·0	7,750	2·55	13,700	8·90	48,300	14·10	84,700
10	1·9	10,900	1·0	7,750	1·0	7,750	2·60	13,900	9·05	49,300	14·00	84,000
11	1·95	11,100	1·0	7,750	1·0	7,750	2·90	15,400	9·20	50,200	13·90	83,200
12	2·0	11,400	1·0	7,750	1·0	7,750	3·00	15,900	9·40	51,600	13·80	82,400
13	2·0	11,400	1·0	7,750	1·0	7,750	3·10	16,300	9·70	53,500	13·70	81,700
14	2·0	11,400	1·0	7,750	1·0	7,750	3·50	18,300	9·90	54,900	13·70	81,700
15	2·0	11,400	0·95	7,600	1·1	8,050	4·00	20,700	10·40	58,300	13·80	82,400
16	2·0	11,400	0·9	7,450	1·2	8,350	4·40	22,600	10·70	60,400	13·80	82,400
17	2·0	11,400	0·9	7,450	1·3	8,650	4·60	23,600	11·05	62,800	13·95	83,600
18	2·0	11,400	0·9	7,450	1·4	8,950	4·80	24,600	11·40	65,300	14·15	85,000
19	2·1	11,800	0·9	7,450	1·5	9,300	5·10	26,200	11·80	68,100	14·45	87,400
20	2·0	11,400	0·8	7,150	1·6	9,700	5·40	27,700	12·00	69,500	14·60	88,500
21	1·9	10,900	0·8	7,150	1·7	10,100	5·60	28,800	12·20	70,900	14·60	88,500
22	1·9	10,900	0·8	7,150	1·75	10,300	5·80	29,800	12·40	72,300	14·70	89,200
23	1·8	10,500	0·8	7,150	1·8	10,500	6·00	31,000	12·60	73,800	14·70	89,200
24	1·7	10,100	0·8	7,150	1·8	10,500	6·20	32,000	12·80	75,200	14·60	88,500
25	1·7	10,100	0·8	7,150	1·85	10,700	6·30	32,600	13·00	76,700	14·50	87,800
26	1·7	10,100	0·9	7,450	1·9	10,900	6·40	33,200	13·20	78,100	14·40	87,000
27	1·7	10,100	0·9	7,450	2·0	11,400	6·50	33,800	13·20	78,100	14·20	85,400
28	1·8	10,500	0·9	7,450	2·0	11,400	6·60	34,300	13·25	78,400	14·10	84,700
29	1·75	10,300	.....	.....	1·95	11,100	6·70	34,900	13·25	78,400	13·90	83,200
30	1·7	10,100	.....	.....	1·9	10,900	6·80	35,500	13·20	78,100	13·90	83,200
31	1·7	10,100	.....	.....	1·9	10,900	.....	.....	13·10	77,400	.....	.....

Daily Gauge Height and Discharge of Kootenay River near Nelson, for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	13·70	81,700	9·25	50,500	4·70	24,100	3·65	18,900	3·30	17,300	3·45	18,000
2	13·70	81,700	9·00	49,000	4·60	23,600	3·65	18,900	3·40	17,800	3·40	17,800
3	13·70	81,700	8·80	47,600	4·55	23,300	3·60	18,700	3·55	18,500	3·35	17,500
4	13·70	81,700	8·60	46,400	4·50	23,100	3·55	18,500	3·70	19,200	3·35	17,500
5	13·80	82,400	8·40	45,100	4·40	22,600	3·60	18,700	3·90	20,200	3·25	17,000
6	13·80	82,400	8·20	43,900	4·25	21,800	3·55	18,500	4·05	20,900	3·20	16,800
7	13·80	82,400	8·00	42,700	4·10	21,100	3·50	18,300	4·15	21,300	3·15	16,500
8	13·80	82,400	7·90	42,100	4·05	20,900	3·45	18,000	4·25	21,800	3·10	16,300
9	13·80	82,400	7·60	40,300	4·00	20,700	3·45	18,000	4·30	22,100	3·00	15,900
10	13·80	82,400	7·50	39,700	4·00	20,700	3·40	17,800	4·35	22,300	2·85	15,100
11	13·80	82,400	7·30	38,500	3·90	20,200	3·40	17,800	4·40	22,600	2·70	14,400
12	13·70	81,700	7·10	37,300	3·85	19,900	3·35	17,500	4·40	22,600	2·60	13,900
13	13·60	81,000	6·90	36,100	3·75	19,400	3·35	17,500	4·35	22,300	2·45	13,200
14	13·50	80,300	6·60	34,300	3·65	18,900	3·30	17,300	4·40	22,600	2·35	12,800
15	13·40	79,500	6·40	33,200	3·55	18,500	3·25	17,000	4·40	22,600	2·25	12,400
16	13·30	78,800	6·20	32,000	3·60	18,700	3·25	17,000	4·35	22,300	2·20	12,200
17	13·15	77,700	6·10	31,500	3·55	18,500	3·20	16,800	4·30	22,100	2·10	11,800
18	13·00	76,700	6·10	31,500	3·50	18,300	3·25	17,000	4·25	21,800	2·05	11,600
19	12·85	75,500	6·00	31,000	3·55	18,500	3·30	17,300	4·15	21,300	1·90	10,900
20	12·65	74,100	5·90	30,400	3·60	18,700	3·35	17,500	4·05	20,900	1·80	10,500
21	12·45	72,700	5·80	29,800	3·60	18,700	3·40	17,800	3·95	20,400	1·70	10,100
22	12·15	70,500	5·70	29,300	3·65	18,900	3·40	17,800	3·90	20,200	1·70	10,100
23	11·85	68,400	5·60	28,800	3·65	18,900	3·45	18,000	3·80	19,700	1·61	9,740
24	11·55	66,300	5·50	28,300	3·60	18,700	3·40	17,800	3·75	19,400	1·61	9,740
25	11·15	63,500	5·40	27,700	3·65	18,900	3·40	17,800	3·70	19,200	1·61	9,740
26	10·90	61,800	5·30	27,200	3·55	18,500	3·35	17,500	3·70	19,200	1·60	9,700
27	10·60	59,700	5·20	26,700	3·60	18,700	3·30	17,300	3·65	18,900	1·55	9,500
28	10·30	57,600	5·10	26,200	3·65	18,900	3·30	17,300	3·55	18,500	1·55	9,500
29	9·95	55,200	5·00	25,700	3·65	18,900	3·25	17,000	3·50	18,300	1·55	9,500
30	9·65	53,200	4·90	25,100	3·60	18,700	3·20	16,800	3·50	18,300	1·50	9,300
31	9·45	51,900	4·80	24,600	.....	.....	3·25	17,000	.....	.....	1·50	9,300

Monthly Discharge of Kootenay River near Nelson, for 1914.

(Drainage area, 17,700 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	11,800	8,050	10,200	0·58	0·67	627,000	.....
February	9,700	7,150	7,730	0·44	0·46	42,960	.....
March	11,400	7,450	9,010	0·51	0·59	554,000	.....
April	35,500	10,900	21,900	1·24	1·38	1,300,000	C
May	78,400	36,100	60,100	3·40	3·92	3,700,000	B
June	89,200	76,700	84,100	4·75	5·30	5,000,000	B
July	82,400	51,900	73,900	4·18	4·82	4,540,000	B
August	50,500	24,600	34,000	1·92	2·21	2,090,000	C
September	24,100	18,300	20,000	1·13	1·26	1,190,000	C
October	18,900	16,800	17,700	1·00	1·15	1,090,000	C
November	22,600	17,300	20,500	1·16	1·29	1,220,000	C
December	18,000	9,300	12,500	0·71	0·82	769,000	C

SESSIONAL PAPER No. 25e

Kootenay River near Glade (3014).

Location.—Ten miles from the mouth below the mouth of Slocan river; 16 miles from Nelson at the ferry cable near Glade B.C. Nelson district.

Records Available.—July, 1913, to December, 1914.

Climatic Conditions.—The climatic conditions are similar to those at Nelson. (See Kootenay river near Nelson.) The river is open all the year round.

Gauge.—Four 5-foot gauges reading from 0 to 5 feet, 5 to 10 feet 10 to 15 feet and 15 to 20 feet are used and read twice daily by F. Striloiff of Glade.

Channel.—The channel is straight for one half mile above and below section and very uniform. There are riffles 1,000 yards above and below the section which is ideal for metering purposes.

Discharge Measurements.—Seven measurements in 1913 and seven in 1914 were made from a cable car used on the ferry cable.

Accuracy.—Accurate gauge readings are obtained, accurate measurements were taken and the gauge height–discharge curve is very satisfactory. The results at this station are considered to be within 5 per cent.

Daily Gauge Height and Discharge of Kootenay River near Glade, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·55	8,700	2·25	11,400	1·55	8,700	2·7	13,100	8·10	43,200	13·4	88,600
2	1·55	8,700	2·25	11,400	1·45	8,330	2·7	13,100	8·40	45,400	13·6	90,600
3	1·55	8,700	2·35	11,800	1·45	8,330	2·7	13,100	8·80	48,400	14·1	95,600
4	1·65	9,100	2·35	11,800	1·55	8,700	2·8	13,500	8·95	49,500	14·2	96,600
5	1·65	9,100	2·15	11,000	1·55	8,700	2·7	13,100	9·35	52,600	14·2	96,600
6	1·85	9,900	2·05	10,700	1·55	8,700	2·95	14,200	9·50	53,800	14·2	96,600
7	2·35	11,800	1·85	9,900	1·55	8,700	3·25	15,400	9·5	53,800	14·1	95,600
8	2·50	12,300	1·85	9,900	1·55	8,700	3·45	16,200	9·85	56,600	14·0	94,600
9	2·45	12,100	1·75	9,500	1·60	8,900	3·55	16,600	10·1	58,600	13·9	93,600
10	2·50	12,300	1·75	9,500	1·60	8,900	3·8	17,700	10·3	60,300	13·95	94,100
11	2·65	12,900	1·75	9,500	1·60	8,900	3·95	18,400	10·4	61,100	13·8	92,600
12	2·65	12,900	1·65	9,100	1·60	8,900	4·15	19,250	10·6	62,800	13·75	92,100
13	2·65	12,900	1·65	9,100	1·60	8,900	4·50	20,900	10·8	64,500	13·75	92,100
14	2·65	12,900	1·65	9,100	1·60	8,900	4·85	22,600	11·05	66,600	13·85	93,100
15	2·65	12,900	1·65	9,100	1·70	9,300	5·35	25,500	11·35	69,400	14·05	95,100
16	2·70	13,100	1·65	9,100	1·80	9,700	5·75	27,800	11·75	73,000	14·2	96,600
17	2·75	13,400	1·55	8,700	1·80	9,700	5·90	28,700	11·95	74,900	14·4	98,600
18	2·65	12,900	1·55	8,700	2·10	10,900	6·10	29,900	12·15	76,800	14·55	100,000
19	2·55	12,500	1·55	8,700	2·10	10,900	6·30	31,200	12·30	78,200	14·7	102,000
20	2·55	12,500	1·55	8,700	2·30	11,600	6·80	34,300	12·5	80,000	14·7	102,000
21	2·65	12,900	1·55	8,700	2·30	11,600	6·80	34,300	12·7	81,900	14·65	102,000
22	2·55	12,500	1·55	8,700	2·36	11,800	6·90	35,000	12·9	83,800	14·6	101,000
23	2·45	12,200	1·45	8,330	2·40	12,000	7·20	37,000	13·05	85,200	14·5	99,600
24	2·45	12,200	1·45	8,330	2·50	12,300	7·40	38,300	13·3	87,600	14·4	98,600
25	2·45	12,200	1·45	8,330	2·60	12,700	7·50	39,000	13·45	89,100	14·3	97,600
26	2·35	11,800	1·45	8,330	2·70	13,100	7·80	41,100	13·5	89,600	14·3	97,600
27	2·35	11,800	1·45	8,330	2·70	13,100	7·80	41,100	13·45	89,100	14·2	96,600
28	2·25	11,400	1·45	8,330	2·70	13,100	7·80	41,100	13·45	89,100	14·05	95,100
29	2·25	11,400			2·70	13,100	7·90	41,800	13·35	88,100	13·95	94,100
30	2·15	11,000			2·60	12,700	8·00	42,500	13·25	87,200	13·85	93,100
31	2·15	11,000			2·60	12,700			13·2	86,700		

Daily Gauge Height and Discharge of Kootenay River near Glade, for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	13·85	93,100	9·95	57,400	5·5	26,400	4·4	20,400	4·15	19,200	4·2	19,500
2	13·8	92,600	9·8	56,200	5·4	25,800	4·4	20,400	4·25	19,800	4·1	19,000
3	13·85	93,100	9·6	54,600	5·3	25,200	4·35	20,200	4·35	20,200	4·1	19,000
4	13·85	93,100	9·4	53,000	5·2	24,600	4·3	20,000	4·45	20,600	4·1	19,000
5	13·85	93,100	9·2	51,400	5·1	24,100	4·3	20,000	4·75	22,200	4·0	18,600
6	13·85	93,100	9·0	49,900	5·0	23,500	4·3	20,000	4·9	22,900	4·0	18,600
7	13·9	93,600	8·8	48,400	4·9	22,900	4·25	19,800	5·0	23,500	4·0	18,600
8	13·85	93,100	8·7	47,600	4·8	22,400	4·20	19,500	5·2	24,600	3·8	17,700
9	13·75	92,100	8·6	46,800	4·7	21,900	4·20	19,500	5·1	24,100	3·7	17,300
10	13·7	91,600	8·4	45,400	4·6	21,400	4·20	19,500	5·3	25,200	3·6	16,900
11	13·65	91,100	8·2	43,900	4·5	20,900	4·2	19,500	5·3	25,200	3·5	16,400
12	13·5	89,600	8·0	42,500	4·5	20,900	4·1	19,000	5·3	25,200	3·3	15,600
13	13·5	89,600	7·9	41,800	4·4	20,400	4·0	18,600	5·4	25,800	3·1	14,800
14	13·45	89,100	7·7	40,400	4·2	19,500	4·0	18,600	5·3	25,200	3·0	14,400
15	13·4	88,600	7·5	39,000	4·2	19,500	4·0	18,600	5·3	25,200	2·9	14,000
16	13·35	88,100	7·3	37,700	4·2	19,500	4·0	18,600	5·3	25,200	2·8	13,500
17	13·15	86,200	7·1	36,300	4·2	19,500	3·9	18,100	5·2	24,600	2·7	13,100
18	13·0	84,700	7·0	35,700	4·25	19,800	4·1	19,000	5·1	24,100	2·6	12,700
19	12·85	83,300	7·0	35,700	4·35	20,200	4·2	19,500	5·0	23,500	2·6	12,700
20	12·6	81,000	6·7	33,700	4·35	20,200	4·1	19,000	4·85	22,600	2·4	12,000
21	12·4	79,100	6·5	32,400	4·30	20,000	4·2	19,500	4·7	21,900	2·3	11,600
22	12·15	76,800	6·4	31,800	4·3	20,000	4·2	19,500	4·7	21,900	2·3	11,600
23	12·0	75,400	6·4	31,800	4·3	20,000	4·2	19,500	4·55	21,200	2·2	11,200
24	11·75	73,000	6·4	31,800	4·3	20,000	4·2	19,500	4·5	20,900	2·2	11,200
25	11·35	69,400	6·3	31,200	4·35	20,200	4·15	19,200	4·4	20,400	2·2	11,200
26	11·3	68,900	6·1	29,900	4·4	20,400	4·1	19,000	4·4	20,400	2·2	11,200
27	11·1	67,100	6·0	29,300	4·4	20,400	4·1	19,000	4·4	20,400	2·15	11,000
28	10·35	60,700	5·9	28,700	4·4	20,400	4·1	19,000	4·25	19,800	2·10	10,900
29	10·3	60,300	5·8	28,100	4·45	20,600	4·1	19,000	4·3	20,000	2·1	10,900
30	10·3	60,300	5·7	27,500	4·4	20,400	4·1	19,000	4·3	20,000	2·0	10,500
31	10·65	58,200	5·6	26,900	.....	.....	4·0	18,600	.....	.....	2·0	10,500

Discharge Measurements of Kootenay River near Glade, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 13	C. E. Webb	1,048	549	4,580	2·82	2·52	12,900
Mar. 9	C. E. R.	1,672	530	4,000	2·22	1·57	8,900
June 1	J. A. E.	1,909	690	11,370	7·79	13·35	88,600
July 20	J. A. E., G. K. B.	1,909	685	10,800	7·54	12·60	81,400
Aug. 11	C. E. R., D. O'B. G.	1,929	640	7,916	5·46	8·22	43,200
" 13	D. O'B. G., Lawley	1,929	630	7,700	5·25	7·80	40,400
Dec. 11	J. A. E., G. K. B.	1,909	556	5,020	3·42	3·45	17,200

SESSIONAL PAPER No. 25e

Monthly Discharge of Kootenay River near Glade, for 1914.

(Drainage area, 19,100 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	13,400	8,700	11,700	0·61	0·70	719,000	A
February	11,800	8,330	9,430	0·49	0·51	524,000	A
March	13,100	8,330	10,400	0·54	0·62	610,000	A
April	42,500	13,100	26,500	1·39	1·55	1,380,000	A
May	89,600	43,200	70,600	3·70	4·27	4,340,000	A
June	102,000	88,600	96,100	5·03	5·61	5,720,000	A
July	93,600	58,200	82,300	4·31	4·97	5,060,000	A
August	57,400	26,900	39,600	2·07	2·39	2,430,000	C
September	26,400	19,500	21,400	1·12	1·25	1,270,000	A
October	20,400	18,100	19,300	1·01	1·16	1,190,000	A
November	25,800	19,200	22,500	1·18	1·32	1,340,000	A
December	19,500	10,500	14,400	0·75	0·86	885,000	A

Nakusp Creek near Nakusp (3021.)

Location.—Station is located west of Brouse and near R. H. Baird's ranch, about 2 miles from Nakusp. Nelson district.

Records Available.—March 20th to December 31, 1914.

Climatic Conditions.—Similar to Kooskanax creek, q.v.

Gauge.—Vertical staff enamel gauge, about 40 feet below measuring section. Read twice a week. March to December, 1914, by Mr. R. H. Baird.

Channel.—Sandy, with vegetation, and subject to shift. Beaver dams of recent construction above the section have a marked effect on the channel.

Accuracy.—Beavers were working in the vicinity of the gauge. The gauge readings are infrequent. Although results are probably within 20 per cent, they are not guaranteed.

General.—Nakusp creek rises on the west slope of the Goat mountains and flows westward, emptying into Upper Arrow lakes about 1 mile below Nakusp. This creek drains an area of approximately 40 square miles. The probable future use of Nakusp creek waters is irrigation and domestic supply.

Discharge Measurements of Nakusp Creek near Nakusp, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 20	C. E. Webb	1048	20·5	13·9	2·25	1·8	31·3
June 13	G. K. B.	1927	16·0	12·6	4·28	2·2	54·0
" 21	G. K. B.	1927	16·0	11·4	4·01	2·2	45·8
" 29	J. A. E.	1909	15·0	12·1	3·77	1·9	45·6
Aug. 12	J. A. E.	1909	15·0	8·35	2·53	1·5	21·2
Sept. 3	J. A. E. and C. E. R.	1927	17·0	14·7	0·87	1·38	12·9
Oct. 28	J. A. E.	1909	14·5	6·72	3·13	1·65	21·0
Nov. 21	J. A. E., O. J. B.	1909	15·0	9·85	2·82	1·8	28·7

Daily Gauge Height and Discharge of Nakusp Creek River near Nakusp, for 1914.

Day.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	29·4	.....	69·0	2·3	55·3
2	.....	.....	1·8	30·0	.....	77·0	.....	53·0
3	.....	.....	.....	30·7	2·8	85·4	.....	51·0
4	.....	.....	.....	31·4	.....	82·0	2·2	49·9
5	.....	.....	1·85	32·2	.....	79·0	.....	49·9
6	.....	.....	.....	35·3	.....	76·0	.....	49·9
7	.....	.....	.....	38·4	2·6	73·0	2·2	49·9
8	.....	.....	.....	41·5	.....	75·0	.....	49·9
9	.....	.....	2·1	44·5	.....	77·0	.....	49·9
10	.....	.....	.....	49·9	2·7	79·0	.....	49·9
11	.....	.....	.....	49·9	.....	77·0	2·2	49·9
12	.....	.....	2·3	55·3	.....	75·0	.....	49·9
13	.....	.....	.....	57·6	2·6	73·0	.....	49·9
14	.....	.....	.....	59·0	.....	71·0	2·2	49·9
15	.....	.....	2·4	61·0	.....	70·0	.....	48·5
16	.....	.....	.....	69·0	.....	68·0	.....	47·0
17	.....	.....	.....	77·0	2·5	67·0	.....	46·0
18	.....	.....	.....	84·5	.....	64·0	2·1	44·5
19	.....	.....	2·9	91·9	.....	61·0	.....	47·0
20	1·8	30·0	.....	89·8	.....	58·0	.....	48·5
21	.....	30·0	.....	87·6	2·3	55·3	2·2	49·9
22	.....	30·0	2·8	85·4	.....	55·3	.....	48·0
23	.....	30·0	.....	82·0	.....	55·3	.....	47·0
24	1·8	30·0	.....	79·0	2·3	55·3	.....	46·0
25	.....	29·4	.....	76·0	.....	57·0	1·9	34·5
26	.....	28·5	2·6	73·0	.....	58·0	.....	34·5
27	1·75	27·8	.....	70·0	.....	59·0	.....	34·5
28	.....	27·8	.....	67·0	2·4	61·0	1·9	34·5
29	1·75	27·8	.....	64·0	.....	59·0	1·9	34·5
30	.....	28·3	2·4	61·0	.....	58·0	1·9	34·5
31	.....	28·8	.....	.....	.....	57·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Nakusp Creek River near Nakusp, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge charge.	Discharge. Height.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	34·5	.....	21·2	.....	14·9	.....	27·0	.....	30·0	.....	30·0
2	1·9	34·5	1·6	21·2	.....	14·1	.....	24·1	1·8	30·0	1·8	30·0
3	.....	34·5	.....	21·2	.....	13·4	1·60	21·2	.....	30·0	.....	28·9
4	.....	34·5	.....	21·2	1·38	12·7	.....	22·6	1·8	30·0	.....	27·7
5	1·9	34·5	1·6	21·2	.....	15·5	.....	22·6	.....	30·0	.....	26·6
6	.....	34·5	.....	21·2	.....	18·4	1·70	25·5	.....	30·0	1·7	25·5
7	.....	34·5	1·6	21·2	1·6	21·2	.....	24·4	1·8	30·0	.....	25·5
8	.....	34·5	1·6	21·2	.....	22·1	.....	23·4	.....	30·0	.....	25·5
9	1·9	34·5	.....	20·2	.....	22·9	.....	22·3	.....	33·1	.....	25·5
10	.....	34·5	.....	19·1	.....	23·8	1·60	21·2	.....	36·3	1·7	25·5
11	.....	34·5	.....	18·1	.....	24·6	.....	22·3	2·0	39·4	.....	25·0
12	.....	34·5	1·5	17·1	1·7	25·5	.....	23·4	.....	39·4	.....	25·0
13	1·9	34·5	.....	16·5	1·7	25·5	.....	24·4	.....	39·4	2·4	25·6
14	.....	33·0	.....	16·0	.....	25·5	1·7	25·5	.....	39·4	.....	24·0
15	.....	32·0	.....	15·5	.....	25·5	.....	24·4	2·0	39·4	.....	24·0
16	.....	31·0	.....	15·0	1·7	25·5	.....	23·4	.....	36·3	.....	23·0
17	1·8	30·0	.....	14·5	1·75	27·8	.....	22·3	.....	33·1	2·2	23·0
18	.....	28·0	.....	14·0	.....	28·0	1·6	21·2	1·8	30·0	.....	24·0
19	.....	27·0	1·4	13·4	.....	29·0	.....	22·3	.....	30·0	2·0	24·0
20	1·7	25·5	.....	13·4	.....	30·0	.....	23·4	.....	30·0	.....	25·0
21	.....	23·4	.....	13·4	1·8	30·0	.....	24·4	1·8	30·0	.....	25·0
22	1·6	21·2	1·4	13·4	.....	27·0	1·7	25·5	.....	30·0	.....	25·0
23	.....	21·2	.....	13·9	.....	24·1	.....	25·5	.....	30·0	1·7	25·5
24	.....	21·2	.....	14·3	1·60	21·2	.....	25·5	.....	30·0	.....	26·0
25	.....	21·2	.....	14·7	.....	19·2	1·7	25·5	1·8	30·0	.....	27·0
26	1·6	21·2	1·45	15·2	1·50	17·1	.....	25·5	.....	30·0	.....	28·0
27	.....	21·2	.....	15·8	.....	20·0	1·7	25·5	.....	30·0	.....	29·0
28	.....	21·2	.....	16·5	.....	23·0	.....	26·0	.....	30·0	1·8	30·0
29	1·6	21·2	1·5	17·1	.....	26·0	.....	27·0	1·8	30·0	.....	30·0
30	.....	21·2	.....	16·4	1·80	30·0	.....	28·0	.....	30·0	.....	30·0
31	.....	21·2	.....	15·6	.....	.....	.....	29·0	.....	.....	.....	30·0

Monthly Discharge of Nakusp Creek near Nakusp, for 1914.

(Drainage area, 40 square miles.)

	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	91·9	29·4	60·1	1·50	1·67	3,580
May	85·4	55·3	67·3	1·68	1·94	4,140
June	55·3	34·5	46·3	1·16	1·29	2,760
July	34·5	21·2	28·7	0·72	0·83	1,760
August	21·2	13·4	17·1	0·43	0·50	1,050
September	30·0	12·7	22·8	0·57	0·64	1,360
October	29·0	21·2	24·3	0·61	0·70	1,490
November	39·4	30·0	32·2	0·81	0·90	1,920
December	30·0	.....	26·4	0·66	0·76	1,620

Pend D'Oreille River near Waneta (3017).

Location.—The gauging section is located 9 miles above the mouth at Waneta, near Mr. A. G. Lang's ranch.

Records Available.—May, 1913, to December, 1914.

Climatic Conditions.—The precipitation is light over practically the whole Pend d'Oreille drainage. At the mouth (Waneta), from December 1, 1913, to November 30, 1914, the precipitation was 27·2 inches. The summers are hot and fairly dry. The winters are mild, the temperature seldom going below zero. The river in Canada seldom freezes over, and frazil ice is not often a serious factor.

Gauge.—Staff gauges are used and read two or three times a week, except during high water, when they are read daily, by Mr. A. C. Lang.

Channel.—The Pend d'Oreille, during its course through Canada, is very torrentuous, and there is no favourable metering section. The section chosen is very fast in high water, satisfactory at low water stages, and appears to have a permanent control.

Discharge Measurements.—Five measurements were made in 1914, and twelve in 1912 and 1913.

Accuracy.—The gauge readings are somewhat infrequent; the stream is flashy during May and June. The measurements, except at low water, are only surface measurements. The results in May and June cannot be guaranteed closer than 15 per cent and, during the other months, 10 per cent.

Discharge Measurements of Pend D'Oreille River near Waneta B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
June 11	C. E. R., W. J. B	1048	440	12,400	10·37	26·8	128,300
Nov. 6	C. E. R., C. N. W	1048	260	3,350	3·32	3·2	11,260
1914.							
April 18	C. E. W., D. O'B. G	1048	284	4,380	4·66	6·05	20,200
June 3	J. A. R., G. K. B	1909	380	9,260	3·52	18·95	78,900
July 18	J. A. R., D. O'B. G	1909	310	6,350	6·08	10·6	38,600
Nov. 12	J. A. R., G. K. B	1909	285	4,860	4·63	5·6	22,500

(All areas recomputed from soundings of January and February, 1915.)

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Pend D'Oreille River near Waneta, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·1	10,600	2·9	11,900	.....	12,100	.....	18,000	12·2	44,000	.....	75,800
2	2·1	10,600	.....	11,600	.....	12,300	.....	17,000	.....	44,300	18·6	76,000
3	2·1	10,600	2·5	11,300	3·1	12,600	5·1	17,900	.....	44,600	18·9	77,800
4	2·3	10,900	.....	10,800	.....	12,800	.....	18,400	.....	44,900	.....	76,800
5	2·5	11,300	.....	10,300	.....	12,900	.....	18,900	12·5	45,200	.....	75,900
6	2·8	11,900	1·7	9,800	3·3	13,000	.....	19,400	.....	46,300	18·4	75,000
7	2·9	12,100	.....	10,000	.....	13,100	5·8	20,000	.....	47,400	.....	75,000
8	3·1	12,600	.....	10,200	3·4	13,200	.....	20,800	13·2	48,500	.....	75,000
9	3·3	13,000	.....	10,400	.....	13,300	.....	21,600	.....	49,500	18·4	75,000
10	3·3	13,000	2·2	10,700	3·5	13,400	.....	22,500	.....	50,500	.....	74,200
11	3·3	13,000	.....	10,800	.....	13,500	6·9	23,400	.....	51,500	.....	73,500
12	3·3	13,000	.....	10,900	.....	13,600	7·0	23,800	14·1	52,600	.....	72,800
13	3·3	13,000	.....	11,000	.....	13,600	.....	25,200	.....	55,200	17·9	72,100
14	3·3	13,000	2·4	11,100	.....	13,700	7·8	26,600	.....	57,800	.....	71,500
15	3·3	13,000	.....	11,200	.....	13,800	.....	27,700	15·7	60,500	.....	71,000
16	3·2	12,800	2·5	11,300	3·7	13,900	.....	28,800	.....	61,300	.....	70,500
17	3·2	12,800	.....	11,300	.....	14,400	.....	30,000	.....	62,100	17·5	70,000
18	3·2	12,800	.....	11,200	.....	15,900	9·1	31,200	.....	62,900	.....	68,500
19	3·2	12,800	.....	11,100	.....	15,500	.....	32,000	.....	63,700	.....	67,000
20	3·2	12,800	2·4	11,100	4·5	16,100	.....	32,800	16·5	64,500	16·7	65,600
21	3·1	12,600	.....	11,100	.....	16,500	9·7	33,600	.....	66,300	.....	64,500
22	3·1	12,600	.....	11,200	.....	16,900	.....	34,500	.....	68,500	.....	63,500
23	3·1	12,600	.....	11,300	4·9	17,300	.....	35,400	17·6	70,600	16·1	62,500
24	3·1	12,600	2·5	11,300	.....	17,600	.....	36,300	.....	71,300	.....	61,700
25	3·1	12,600	.....	11,300	.....	18,000	10·6	37,200	.....	72,000	.....	60,900
26	3·1	12,600	.....	11,500	.....	18,400	.....	38,000	18·0	72,700	.....	60,200
27	3·1	12,600	.....	11,700	5·4	18,800	.....	38,800	.....	73,100	15·5	59,500
28	3·0	12,300	2·8	11,900	.....	18,600	11·2	59,600	.....	73,500	.....	58,500
29	3·0	12,300	.....	.....	.....	18,400	.....	41,000	.....	74,000	.....	57,500
30	3·0	12,300	.....	.....	5·21	18,200	.....	42,500	18·3	74,500	.....	56,500
31	3·0	12,300	.....	.....	.....	18,100	.....	.....	18·5	75,500	14·7	55,500

Daily Gauge Height and Discharge of Pend D'Oreille River near Waneta, for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Geuge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	54,700	7·5	25,600	.....	12,800	.....	11,300	.....	16,000	6·0	20,600
2	.....	54,000	.....	24,000	3·1	12,600	.....	11,400	4·8	17,000	.....	20,500
3	.....	53,300	.....	24,400	.....	12,300	2·6	11,500	.....	17,300	.....	20,400
4	14·1	52,600	7·0	23,800	.....	12,100	2·6	11,500	.....	17,600	5·9	20,300
5	.....	51,000	.....	23,300	2·8	11,900	.....	11,500	.....	18,000	.....	20,000
6	.....	49,500	.....	22,800	.....	11,800	.....	11,500	.....	18,400	.....	19,700
7	13·1	48,000	.....	22,300	.....	11,800	2·6	11,500	5·4	18,800	5·6	19,400
8	.....	47,000	6·4	21,800	2·7	11,700	.....	11,500	.....	18,900	.....	19,200
9	.....	46,000	.....	21,100	.....	11,500	.....	11,600	.....	19,000	.....	19,000
10	.....	45,000	.....	20,400	.....	11,300	2·7	11,700	5·5	19,100	5·4	18,800
11	12·2	44,000	5·7	19,700	.....	11,100	.....	11,800	.....	19,200	.....	17,900
12	.....	43,000	.....	19,100	2·3	10,900	.....	11,900	.....	19,300	.....	17,000
13	.....	42,100	.....	18,600	.....	10,900	2·9	12,100	.....	19,500	4·5	16,100
14	11·6	41,200	.....	18,100	.....	11,000	.....	12,100	5·7	19,700	.....	15,500
15	.....	40,200	5·0	17,600	2·4	11,100	.....	12,200	.....	20,000	.....	14,900
16	.....	39,200	.....	17,100	.....	11,300	.....	12,300	.....	20,300	.....	14,400
17	.....	38,200	.....	16,600	.....	11,500	3·0	12,300	.....	20,600	3·7	13,900
18	10·6	37,200	4·5	16,100	.....	11,700	.....	12,600	6·1	20,900	.....	13,700
19	.....	36,100	.....	15,800	2·8	11,900	.....	13,000	.....	21,100	.....	13,500
20	.....	35,000	.....	15,500	.....	11,900	3·5	13,400	.....	21,300	.....	13,300
21	9·8	34,000	.....	15,200	.....	11,800	.....	13,500	6·3	21,500	3·4	13,200
22	.....	33,200	4·1	15,000	2·7	11,700	.....	13,700	.....	21,400	.....	13,100
23	.....	32,400	.....	14,700	.....	11,700	3·7	13,900	.....	21,300	.....	13,000
24	.....	31,600	.....	14,400	.....	11,600	.....	14,100	6·2	21,200	.....	12,900
25	9·0	30,800	.....	14,100	.....	11,500	.....	14,300	.....	21,100	5·2	12,800
26	.....	29,900	3·7	13,900	2·6	11,500	.....	14,500	.....	21,000	.....	12,800
27	.....	29,000	.....	13,600	.....	11,500	3·9	14,500	6·1	20,900	.....	12,700
28	8·3	28,100	3·5	13,400	.....	11,400	.....	14,600	.....	20,800	.....	12,600
29	.....	27,400	.....	13,300	.....	11,300	.....	14,700	.....	20,700	3·1	12,600
30	.....	26,800	3·4	13,200	2·5	11,300	.....	14,800	.....	20,600	.....	12,600
31	.....	26,200	.....	13,000	.....	.....	4·1	15,000	.....	.....	.....	12,600

Monthly Discharge of Pend D'Oreille River near Waneta, for 1914.

(Drainage area, 26,600 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
January	13,000	10,600	12,400	0·47	0·54	762,000
February	11,900	9,800	11,000	0·41	0·43	611,000
March	18,800	12,100	15,100	0·57	0·66	928,000
April	42,500	17,900	28,500	1·07	1·19	1,700,000
May	75,500	44,000	59,700	2·25	2·59	3,670,000
June	77,800	55,500	70,700	2·66	2·97	4,210,000
July	54,700	26,200	39,600	1·49	1·72	2,430,000
August	25,600	13,000	18,000	0·68	0·78	1,110,000
September	12,800	10,900	11,600	0·44	0·49	690,000
October	15,000	11,300	12,800	0·48	0·55	787,000
November	21,500	16,000	19,800	0·74	0·83	1,180,000
December	20,600	12,600	15,800	0·59	0·68	972,000

Sawmill Creek near New Denver (3025).

Location.—Station is at bridge at mouth. Nelson district.

Records Available.—April to December, 1914.

Climatic Conditions.—The summers are hot and fairly dry, though sometimes the precipitation is heavy. The winters are quite mild, the thermometer seldom going below zero. (Slightly colder than Nelson.) The creek freezes over for a week or so at a time during a cold spell.

Gauge.—Vertical staff enamel gauge, read daily from April to December, 1914, by Mr. G. R. Nicol, of the Steelite Powder Company, Ltd.

Channel.—Very rocky. Not liable to shift.

Discharge Measurements.—Six measurements were made in 1914.

Accuracy.—The 1914 results should be within 15 per cent.

General.—Saw-mill creek rises on the slopes of the Valhalla and Ruby Mountains, and flows eastward, emptying into Slocan lake at a point directly opposite New Denver. It drains a well-timbered area of about 21 square miles. It has been utilized for power for a saw-mill at its mouth, and may in future be used to generate power for the Steelite Powder Company's plant, situated at the mouth.

Discharge Measurements of Saw-mill Creek near Slocan Lake opposite New Denver, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 16	C. E. W., D. O'B. G.	1,048	23·5	29·9	2·24	0·93	67·0
May 13	J. A. E., G. K. B.	1,672	24·0	37·6	3·68	1·40	138·0
June 16	G. K. B.	1,927	24·0	55·8	5·72	2·05	319·0
July 8	J. A. E., D. O'B. G.	1,929	24·0	43·5	4·45	1·45	195·0
Aug. 17	D. O'B. G.	1,929	24·0	27·4	1·67	0·6	45·9
Nov. 4	J. A. E., G. K. B.	1,909	24·0	18·6	1·9	0·3	35·4

Daily Gauge Height and Discharge Saw-mill Creek, near New Denver, B.C., for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1	.....	.....	1·10	99	1·65	216
2	.....	.....	1·20	114	2·05	330
3	.....	.....	1·3	133	2·55	482
4	.....	.....	1·25	124	2·30	405
5	.....	.....	1·15	106	1·85	270
6	.....	.....	1·1	99	1·60	202
7	.....	.....	1·1	99	1·42	158
8	.....	.....	1·15	106	1·28	129
9	.....	.....	1·3	133	1·28	129
10	.....	.....	1·3	133	1·24	122
11	.....	.....	1·3	133	1·28	129
12	.....	.....	1·35	143	1·36	145
13	.....	.....	1·45	165	1·59	200
14	.....	.....	1·56	192	1·91	288
15	.....	.....	1·71	232	2·07	336
16	.....	.....	1·8	256	2·2	375
17	.....	.....	1·7	229	2·3	405
18	.....	.....	1·66	218	2·17	366
19	0·9	71	1·54	187	1·95	300
20	0·9	71	1·52	182	1·65	216
21	0·85	66	1·53	184	1·5	177
22	0·85	66	1·62	207	1·37	147
23	0·9	71	1·71	232	1·27	127
24	0·85	66	1·78	251	1·22	118
25	0·9	71	1·72	234	1·28	129
26	0·9	71	1·58	197	1 47	170
27	0·9	71	1·44	163	1·48	172
28	0·85	66	1·32	137	1·44	163
29	0·85	66	1·28	129	1·52	182
30	0·95	77·5	1·30	133	1·53	185
31	.....	.....	1·40	153	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge Saw-mill Creek, near New Denver, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1	1·7	229	0·92	73·6	0·34	25·4	0·60	43·0	0·41	29·7	0·2	17·0
2	1·77	248	0·87	68·0	0·32	24·2	0·57	40·9	0·42	30·4	0·17	15·5
3	1·88	279	0·86	67·0	0·33	24·8	0·54	38·8	0·40	29·0	0·2	17·0
4	1·83	265	0·89	70·0	0·35	26·0	0·5	36·0	0·37	27·2	0·17	15·5
5	1·78	251	0·78	59·0	0·32	24·2	0·45	32·5	0·41	29·7	0·17	15·5
6	1·72	234	0·79	60·0	0·32	24·2	0·4	29·0	0·40	29·0	0·16	15·0
7	1·62	207	0·83	64·0	0·30	23·0	0·4	29·0	0·37	27·2	0·15	14·5
8	1·52	182	0·74	55·0	0·33	24·8	0·4	29·0	0·37	27·2	0·10	12·0
9	1·48	172	0·62	44·6	0·31	23·6	0·37	27·2	0·35	26·0	0·15	14·5
10	1·42	158	0·59	42·3	0·35	26·0	0·37	27·2	0·35	26·0	Frozen	13·0
11	1·43	160	0·58	41·6	0·45	32·5	0·35	26·0	0·33	24·8	.....	12·0
12	1·47	170	0·61	43·8	0·38	27·8	0·33	24·8	0·35	26·0	.....	11·0
13	1·5	177	0·62	44·6	0·33	24·8	0·33	24·8	0·35	26·0	.....	10·0
14	1·49	175	0·58	41·6	0·30	23·0	0·3	23·0	0·3	23·0	.....	10·0
15	1·51	180	0·6	43·0	0·36	26·6	0·3	23·0	0·3	23·0	.....	10·0
16	1·25	125	0·58	41·6	0·30	23·0	0·3	23·0	0·25	20·0	.....	10·0
17	1·22	118	0·62	44·6	0·34	25·4	0·48	34·6	0·27	21·2	.....	10·0
18	1·2	114	0·58	41·6	0·71	52·0	0·5	36·0	0·27	21·2	.....	10·0
19	1·17	110	0·57	40·9	0·83	64·0	0·51	36·7	0·24	19·4	.....	10·0
20	1·20	114	0·55	39·5	0·62	44·6	0·5	36·0	0·25	20·0	.....	10·0
21	1·12	102	0·57	49·0	0·56	40·2	0·45	32·5	0·23	18·8	.....	10·0
22	1·02	87	0·56	40·2	0·54	38·8	0·42	30·4	0·2	19·0	.....	10·0
23	1·02	87	0·53	38·1	0·59	42·3	0·38	27·8	0·2	19·0	.....	10·0
24	1·02	87	0·48	34·6	0·62	44·6	0·37	27·2	0·2	19·0	.....	10·0
25	1·02	87	0·43	31·1	0·64	46·2	0·35	25·0	0·2	19·0	.....	10·0
26	0·95	77·5	0·43	31·1	0·80	61·0	0·34	25·4	0·23	18·8	.....	10·0
27	0·9	71	0·43	31·1	0·91	72·3	0·33	24·8	0·2	19·0	.....	10·0
28	0·87	68	0·44	31·8	0·76	57·0	0·30	23·0	0·23	18·8	.....	10·0
29	0·92	73·6	0·44	31·8	0·68	49·4	0·30	23·0	0·23	18·8	.....	10·0
30	0·85	66	0·43	31·1	0·62	44·6	0·36	26·6	0·20	17·0	.....	10·0
31	0·9	71	0·39	28·4	.....	.....	0·37	27·2	.....	.....	.....	10·0

Monthly Discharge of Saw-mill Creek, near New Denver, for 1914.

(Drainage area, 21 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	256	99	168	8·0	9·22	10,300	D
June	482	118	226	10·8	12·0	13,400	D
July	279	66	147	6·96	8·02	9,040	D
August	73·6	28·4	45	2·14	2·47	2,770	C
September	72·3	23·0	36·2	1·72	1·92	2,150	C
October	43·0	23·0	29·5	1·40	1·61	1,810	C
November	30·4	17·0	22·8	1·08	1·20	1,360	C
December	17·0	.....	11·7	0·56	0·65	719	

Slocan River near Crescent Valley (3017).

Location.—In Slocan Junction precinct, Nelson Water district, about 1 mile from the mouth on the highway bridge near Crescent Valley.

Records Available.—1913 and 1914.

Climatic Conditions.—Similar to Nelson. (See Kootenay river, near Nelson.)

Gauge.—Vertical staff gauge fastened to the bridge cribbing and read daily by Mr. Paul Peterson of Crescent Valley.

Channel.—Straight above and below the section and inclined to shift. One side of the channel is generally filled with logs during the summer. The control is not satisfactory.

Discharge Measurements.—Seven measurements were made in 1913 and five in 1914.

Accuracy.—The results during medium and low stages should be within 10 per cent or 15 per cent, but the high water results cannot be guaranteed.

General.—By subtracting the discharge of Slocan river from the discharge of Kootenay river near Glade, the discharge of Kootenay river at Bonnington pool and Bonnington falls is obtained. By subtracting 1 per cent of the discharges at Bonnington pool or Bonnington falls the discharge of Kootenay river near Nelson is obtained.

Discharge Measurements of Slocan River, near Crescent Valley, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 8.....	C. E. W., C. E. R.....	1048	237	652	2·47	4·4	1,600
1914.							
Mar. 6.....	C. E. R., A. J. V.....	1672	210	470	1·91	3·45	897
May. 30.....	J. A. E.....	1909	219	1,470	5·43	8·10	7,980
Aug. 13.....	C. E. R., G. K. B.....	1928	224	845	3·01	5·1	2,540
Nov. 10.....	J. A. E.....	1969	132	579	4·11	4·82	2,380
Dec. 9.....	J. A. E., G. K. B.....	1929	128	468	2·62	3·95	1,230

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Slocan River near Crescent Valley, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·4	850	3·8	1,100	3·6	970	4·1	1,340	6·4	3,980	9·05	7,290
2	3·5	900	3·8	1,100	3·6	970	4·1	1,340	7·2	4,950	9·40	7,770
3	3·5	960	4·0	1,240	3·6	970	4·1	1,340	7·7	5,570	11·40	10,800
4	3·6	970	3·9	1,170	3·5	900	4·1	1,340	7·6	5,450	11·85	11,700
5	3·7	1,040	3·8	1,100	3·5	900	4·2	1,440	7·3	5,070	11·00	10,100
6	4·0	1,240	3·9	1,170	3·5	900	4·3	1,550	7·05	4,760	10·20	8,900
7	4·8	2,090	3·9	1,170	3·5	900	5·1	2,440	7·0	4,700	10·00	8,600
8	4·7	1,980	3·9	1,170	3·2	750	5·2	2,550	7·2	4,950	9·7	8,190
9	4·5	1,750	3·9	1,170	3·2	750	5·2	2,550	7·6	5,450	9·25	7,570
10	4·4	1,650	3·9	1,170	3·2	750	5·3	2,670	8·1	6,080	9·40	7,770
11	4·3	1,550	3·8	1,100	3·2	750	5·3	2,570	7·75	5,630	9·15	7,430
12	4·2	1,440	3·7	1,040	3·3	800	5·4	2,780	7·8	5,670	9·10	7,500
13	4·1	1,340	3·6	970	3·3	800	6·0	3,500	8·1	6,080	9·25	7,570
14	4·1	1,340	3·6	970	3·3	800	6·2	3,740	8·3	6,330	9·65	8,120
15	4·1	1,340	3·6	970	3·3	800	6·70	4,340	8·65	6,770	10·00	8,600
16	4·0	1,240	3·6	970	3·4	850	7·2	4,950	9·3	7,630	10·35	9,110
17	4·0	1,240	3·7	1,040	3·4	850	7·05	4,760	9·3	7,630	10·7	9,640
18	4·0	1,240	3·6	970	4·0	1,240	6·70	4,340	9·1	7,360	10·55	9,410
19	4·0	1,240	3·6	970	4·0	1,240	7·1	4,820	9·1	7,360	10·5	9,340
20	4·0	1,240	3·6	970	4·0	1,240	7·2	4,950	9·0	7,220	10·0	8,600
21	4·0	1,240	3·6	970	4·0	1,240	7·0	4,700	9·0	7,220	9·7	8,190
22	4·0	1,240	3·6	970	4·0	1,240	6·4	3,980	9·1	7,360	9·25	7,560
23	3·9	1,170	3·7	1,040	4·0	1,240	6·3	3,860	9·1	7,360	9·0	7,220
24	3·7	1,040	3·6	970	4·1	1,340	6·3	3,860	9·2	7,500	8·7	6,840
25	3·8	1,100	3·6	970	4·1	1,340	6·3	3,860	9·65	8,120	8·35	6,390
26	3·9	1,170	3·6	970	4·0	1,240	6·3	3,860	9·2	7,500	8·75	6,900
27	3·9	1,170	3·6	970	4·0	1,240	6·3	3,860	9·1	7,360	8·75	6,900
28	3·8	1,170	3·6	970	4·0	1,240	6·2	3,760	8·75	6,900	8·75	6,900
29	3·6	970	.....	.....	4·1	1,340	6·1	3,620	8·2	6,200	8·8	6,960
30	3·7	1,040	.....	.....	4·1	1,340	6·2	3,740	8·2	6,200	9·1	7,360
31	3·8	1,100	.....	.....	4·1	1,340	.....	.....	8·6	6,710	..	. .

Daily Gauge Height and Discharge of Slocan River near Crescent Valley, for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge-Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Fischarge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	9·15	7,420	5·4	2,780	4·1	1,340	4·4	1,650	5·0	2,320	4·2	1,440
2	9·20	7,500	5·4	2,780	4·1	1,340	4·4	1,650	5·2	2,550	4·2	1,440
3	9·55	7,980	5·4	2,780	4·0	1,240	4·4	1,650	5·1	2,440	4·2	1,440
4	9·65	8,120	5·3	2,670	4·0	1,240	4·4	1,650	5·1	2,440	4·1	1,340
5	9·65	8,120	5·3	2,670	4·0	1,240	4·3	1,550	5·1	2,440	4·1	1,340
6	9·65	8,120	5·3	2,670	4·0	1,240	4·3	1,550	5·1	2,440	4·1	1,340
7	9·65	8,120	5·2	2,550	4·0	1,240	4·3	1,550	5·1	2,440	4·0	1,240
8	9·6	8,050	5·4	2,780	4·0	1,240	4·2	1,440	5·0	2,320	4·0	1,240
9	9·3	7,630	5·3	2,670	4·0	1,240	4·2	1,440	5·0	2,320	4·0	1,240
10	9·3	7,630	5·3	2,670	4·0	1,240	4·2	1,440	5·0	2,320	4·0	1,240
11	9·3	7,630	5·2	2,550	4·0	1,240	4·2	1,440	4·4	1,650	4·0	1,240
12	9·3	7,630	5·2	2,550	4·0	1,240	4·2	1,440	4·4	1,650	4·0	1,240
13	9·3	7,630	5·2	2,550	4·0	1,240	4·2	1,440	5·0	2,320	3·4	850
14	9·2	7,500	5·1	2,440	4·0	1,240	4·2	1,440	4·4	1,650	3·4	850
15	9·2	7,500	5·0	2,320	4·0	1,240	4·2	1,440	4·4	1,650	3·3	800
16	8·7	6,840	4·4	1,650	4·0	1,240	4·2	1,440	4·4	1,650	3·3	800
17	8·25	6,260	4·4	1,650	4·0	1,240	4·2	1,440	4·3	1,550	3·3	800
18	8·15	6,140	4·4	1,650	4·1	1,340	4·3	1,550	4·3	1,550	3·2	750
19	8·05	6,010	4·4	1,650	4·25	1,490	4·4	1,650	4·3	1,550	3·2	750
20	7·35	5,130	4·3	1,550	4·3	1,550	5·0	2,320	4·3	1,550	3·2	750
21	7·15	4,880	4·3	1,550	4·3	1,550	5·0	2,320	4·3	1,550	3·2	750
22	7·05	4,700	4·3	1,550	4·3	1,550	4·4	1,650	4·2	1,440	3·2	750
23	6·7	4,340	4·3	1,550	4·3	1,550	4·4	1,650	4·2	1,440	3·2	750
24	6·7	4,340	4·2	1,440	4·3	1,550	4·3	1,550	4·2	1,440	3·2	750
25	6·3	3,860	4·2	1,440	4·3	1,550	4·3	1,550	4·2	1,440	3·2	750
26	6·2	3,740	4·2	1,440	4·3	1,550	4·3	1,550	4·2	1,440	3·3	800
27	6·1	3,620	4·2	1,440	4·4	1,650	4·3	1,550	4·2	1,440	3·3	800
28	6·0	3,500	4·2	1,440	4·4	1,650	4·3	1,550	4·2	1,440	3·3	800
29	6·05	3,500	4·2	1,440	4·4	1,650	4·3	1,550	4·2	1,440	3·3	800
30	6·1	3,620	4·1	1,340	4·4	1,650	4·4	1,650	4·2	1,440	3·3	800
31	5·75	3,500	4·1	1,340	.....	.....	4·4	1,650	.....	.....	3·3	800

Monthly Discharge of Slocan River near Crescent Valley, for 1914.

(Drainage area, 1,300 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	2,090	850	1,260	0·97	1·12	77,500	C
February	1,240	970	1,050	0·81	0·84	58,300	C
March	1,340	750	1,040	0·80	0·92	64,000	C
April	4,950	1,340	3,280	2·52	2·81	195,000	D
May	8,120	3,980	6,360	4·89	5·64	391,000	.....
June	11,700	3,390	8,170	6·29	7·02	486,000	.....
July	8,120	3,500	6,150	4·73	5·45	378,000	.....
August	2,780	1,340	2,050	1·58	1·82	126,000	C
September	1,650	1,240	1,390	1·07	1·19	82,700	B
October	2,320	1,440	1,590	1·22	1·41	97,800	B
November	2,550	1,440	1,840	1·42	1·58	109,000	B
December	1,440	750	989	0·76	0·88	60,800	C

Akolkolex River near Wigwam (3000).

Location.—Section 35, township 21, range 1, west 6th, about 1 mile from Wigwam, where the wagon road crosses the river just above the falls. Revelstoke District.

Records Available.—From May 1, 1913, to December 31, 1914.

Climatic Conditions.—Summers hot and moderately dry. Heavy snowfall during winters. Thermometer rarely goes below zero. Stream at section seldom freezes except for a day or two. Anchor ice seldom forms for more than one or two days at a time.

Gauge.—Chain gauge is used, referred to three bench-marks. From May to October inclusive, gauge readings are taken three times a week; during the rest of the year once a week, by J. A. Lewis, Wigwam.

Channel.—Straight for one hundred yards above and below section. Water is swift, and flows through a rock box canyon, for 150 yards above and below the section. The control is rock and appears very permanent.

Discharge Measurements.—Measurements are made from the upstream side of the wagon bridge. It is difficult to obtain accurate soundings in high water. In 1913 ten well-distributed measurements were made, and in 1914 seven measurements were made.

Accuracy.—Apparently accurate measurements were made, but due to the infrequency of readings, the mean monthly discharge cannot be guaranteed to within 10 per cent or 15 per cent. December gauge readings were at times affected by ice. Discharges below height 2·0 cannot be guaranteed.

Discharge Measurements of Akolkolex River near Wigwam, B.C., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 18	C. E. Webb	1,048	30	121	1·48	1·35	179
May 19	J. A. Elliott	1,672	36	275	4·95	5·30	1,360
June 26	"	1,909	37	312	5·34	6·10	1,670
July 21	"	1,909	35	239	3·88	4·30	929
Aug. 10	"	1,909	37	190	2·82	3·10	537
Sept. 6	J. A. E. & C. E. R	1,927	40	171	2·18	2·40	373
Oct. 10	"	1,909	37	150	2·18	2·20	329

Daily Gauge Height and Discharge of Akolkolex River near Wigwam, B.C., for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·3	177	1·3	177	1·1	150	1·24	168	4·45	1,020	7·25	2,405
2	1·3	177	1·3	177	1·13	154	1·25	169	5·1	1,300	8·2	2,950
3	1·4	193	1·3	177	1·13	154	1·27	172	4·9	1,210	7·6	2,600
4	1·4	193	1·25	169	1·13	154	1·29	175	4·7	1,130	7·0	2,270
5	1·5	210	1·25	169	1·13	154	1·3	177	4·4	1,000	6·4	1,940
6	1·5	210	1·25	169	1·13	154	1·61	228	4·4	1,000	6·1	1,790
7	1·6	226	1·25	169	1·13	154	1·92	277	4·5	1,040	5·8	1,640
8	1·6	226	1·25	169	1·13	154	2·24	338	4·6	1,080	5·5	1,490
9	1·6	226	1·25	169	1·13	154	2·33	356	4·7	1,130	5·1	1,300
10	1·5	210	1·2	162	1·13	154	2·44	378	4·9	1,210	5·35	1,415
11	1·5	210	1·2	162	1·13	154	2·57	405	5·2	1,350	5·6	1,540
12	1·5	210	1·2	162	1·13	154	2·78	455	5·4	1,440	5·9	1,690
13	1·4	193	1·2	162	1·13	154	2·99	509	5·61	1,545	6·2	1,840
14	1·4	193	1·2	162	1·3	177	3·2	570	5·82	1,650	6·7	2,100
15	1·4	193	1·2	162	1·3	177	3·27	591	6·03	1,755	7·1	2,320
16	1·4	193	1·15	156	1·4	193	3·34	613	6·23	1,855	7·6	2,600
17	1·4	193	1·15	156	1·5	210	3·4	632	5·92	1,700	7·85	2,750
18	1·3	177	1·15	156	1·5	210	3·38	625	5·61	1,545	8·1	2,890
19	1·3	177	1·13	154	1·5	210	3·36	619	5·3	1,390	7·4	2,490
20	1·3	177	1·13	154	1·5	210	3·34	613	5·6	1,540	6·7	2,100
21	1·3	177	1·13	154	1·5	210	3·3	600	5·9	1,690	6·1	1,790
22	1·3	177	1·13	154	1·5	210	3·3	600	6·2	1,840	5·7	1,590
23	1·3	177	1·13	154	1·5	210	3·3	600	6·4	1,940	5·3	1,390
24	1·3	177	1·12	152	1·5	210	3·3	600	6·2	1,840	4·89	1,206
25	1·3	177	1·12	152	1·5	210	3·31	603	6·0	1,740	5·49	1,485
26	1·3	177	1·12	152	1·4	193	3·32	606	5·8	1,640	6·1	1,790
27	1·3	177	1·1	150	1·4	193	3·34	613	5·3	1,390	6·15	1,815
28	1·3	177	1·1	150	1·3	177	3·49	662	4·8	1,170	6·2	1,840
29	1·3	177	.....	.....	1·3	177	3·64	714	4·4	1,000	6·5	2,000
30	1·3	177	.....	.....	1·3	177	3·8	770	5·35	1,415	6·8	2,150
31	1·3	177	.....	.....	1·3	177	.....	.....	6·3	1,890	.....	.....

Daily Gauge Height and Discharge of Akolkolex River near Wigwam, B.C., for 1914.—*Concluded.*

Day.	July.		August		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Se.c-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	7·0	2,270	5·03	1,265	2·35	360	2·9	485	3·1	540	2·0	290
2	7·45	2,520	5·01	1,255	2·4	370	2·85	472	3·1	540	1·95	282
3	7·9	2,780	5·0	1,250	2·75	447	2·8	460	3·0	512	1·9	274
4	7·85	2,750	4·75	1,150	3·1	540	2·68	430	3·0	512	1·85	266
5	7·8	2,720	4·5	1,040	2·75	447	2·56	403	2·9	485	1·8	258
6	7·5	2,550	3·6	700	2·4	370	2·45	380	2·8	460	1·75	250
7	7·2	2,380	3·5	665	2·59	410	2·39	368	2·6	412	1·6	226
8	6·89	2,204	3·4	632	2·78	455	2·33	356	2·6	412	1·5	210
9	7·17	2,362	3·3	600	2·78	455	2·27	344	2·55	401	1·4	193
10	7·45	2,520	3·1	540	2·8	460	2·2	330	2·55	401	1·2	162
11	7·37	2,472	3·55	682	2·8	460	2·17	324	2·5	390	1·2	162
12	7·3	2,430	4·0	845	2·6	412	2·14	318	2·45	380	1·1	150
13	7·05	2,295	4·1	885	2·4	370	2·1	310	2·4	370	1·1	150
14	6·8	2,150	4·2	925	2·1	310	2·3	350	2·3	350	1·2	162
15	6·56	2,030	3·9	805	2·0	290	2·5	390	2·2	330	1·3	177
16	6·03	1,755	3·6	700	1·9	274	2·7	435	2·1	310	.....	150
17	5·5	1,490	3·3	600	2·28	346	2·9	485	2·0	290	.....	150
18	5·55	1,515	3·3	600	2·67	428	2·8	460	2·0	290	.....	150
19	5·6	1,540	3·3	600	2·58	407	2·7	435	2·0	290	.....	150
20	5·33	1,405	3·6	700	2·49	388	2·6	412	2·0	290	.....	150
21	5·06	1,280	3·9	805	2·4	370	2·51	392	2·0	290	.....	150
22	4·78	1,162	3·6	700	2·45	380	2·42	374	2·0	290	.....	150
23	4·54	1,056	3·3	600	2·5	390	2·33	356	2·0	290	.....	150
24	4·3	963	2·9	485	2·6	412	2·25	340	1·95	282	.....	150
25	4·3	963	3·0	512	2·7	435	2·2	330	1·95	282	.....	150
26	4·2	925	3·1	540	2·8	460	2·17	324	2·0	290	.....	150
27	4·2	925	3·44	645	2·95	498	2·14	318	2·05	300	.....	150
28	4·16	909	3·78	763	3·1	540	2·1	310	2·1	310	.....	150
29	4·12	893	3·29	597	2·8	460	2·3	350	2·05	300	.....	150
30	4·58	1,072	2·8	460	2·95	498	2·5	390	2·0	290	.....	150
31	5·05	1,275	2·3	350	.....	.....	2·8	460	.....	.....	.....	150

Monthly Discharge of Akolkolex River near Wigwam, B.C., for 1914.

(Drainage area, 105 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
January	226	177	194	1·81	2·07	11,700	D
February	177	150	161	1·53	1·59	8,940	D
March	210	150	178	1·70	1·96	10,900	D
April	770	168	481	4·58	5·11	28,600	C
May	1,890	1,000	1,430	13·6	15·7	87,900	C
June	2,950	1,300	1,970	18·8	21·0	117,000	
July	2,780	893	1,790	17·0	19·6	110,000	C
August	1,260	350	739	7·04	8·12	45,400	B
September	540	274	415	3·95	4·41	24,700	B
October	485	310	384	3·66	4·22	23,600	B
November	540	282	363	3·46	3·86	21,600	B
December	290	150	181	1·72	1·98	11,100	

Beaver River near Six-mile Creek (3001).

Location.—Township 29, range 25, west 5th, mer. 4 miles from mouth, about 150 yards from the railway station at Six-mile creek, on downstream side of the lumber company's bridge. Revelstoke district.

Records Available.—May 24 to November 1, 1913; April 1 to December 31, 1914.

Climatic Conditions.—Summers hot and fairly dry. Winters severe (30°F.) with heavy snowfall. Ice conditions exist generally from the end of November till the end of March. Frazil ice is to be contended with.

Gauge.—Chain gauge used is referred to three bench-marks. Mr. Wm. McCreary reads the gauge daily at 5 p.m., at which time during the summer freshet, the river is considered to be at a mean height for the day.

Channel.—Straight for 100 yards above and below the section. The river is very swift during high water, and accurate soundings can only be made at low water. During the freshet in June, July, and August, water flows through two or three small side channels. The control is not very permanent.

Discharge Measurements.—Measurements are made from the downstream side of the bridge. In 1913 ten discharge measurements were made, one of which was made under ice conditions on December 3, giving a discharge of 330 c.f.s.

Accuracy.—The gauge-height-discharge curve shows a fairly close accuracy, though the section does not appear to be good. The fact that during the summer the river varies greatly on a warm day depreciates the accuracy of the gauge reading. The 1914 data are guaranteed to be within 20 per cent only, with the exception of December, which are not guaranteed at all.

Discharge Measurements of Beaver River at Six-Mile Creek, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 22	J. A. E.	1,909	140	390	6·30	3·24	2,440
" 10	"	1,909	140	489·7	5·87	3·35	2,870
Sept. 8	"	1,927	140	373	5·62	2·70	2,100
Oct. 24	"	1,909	51	157	4·26	1·0	670

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Beaver River near Six-mile, Creek, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1	.....	900	2·6	1,940	3·55	3,240
2	.....	900	3·3	2,840	4·60	5,380
3	.....	900	3·3	2,840	5·1	6,710
4	.....	900	2·85	2,220	4·5	5,140
5	.....	900	2·6	1,940	4·1	4,260
6	.....	900	2·5	1,840	3·9	3,860
7	.....	900	2·45	1,790	3·6	3,330
8	.....	900	2·6	1,940	3·3	2,840
9	.....	900	2·8	2,160	3·3	2,840
10	.....	900	2·8	2,160	3·4	2,990
11	.....	900	2·9	2,290	3·7	3,500
12	.....	900	2·9	2,290	4·0	4,050
13	.....	900	3·2	2,700	4·2	4,460
14	.....	900	3·35	2,910	4·6	5,380
15	.....	900	3·4	2,990	5·0	6,430
16	.....	900	3·5	3,160	5·1	6,710
17	.....	900	3·4	2,990	5·2	6,980
18	1·4	920	3·2	2,700	4·7	5,640
19	1·7	1,130	3·1	2,560	4·6	5,380
20	1·7	1,130	3·3	2,840	4·5	5,140
21	1·6	1,060	3·1	2,560	3·6	3,500
22	1·5	985	3·4	2,990	3·5	3,160
23	1·5	985	3·65	3,410	3·2	2,700
24	1·7	1,130	3·7	3,500	3·2	2,700
25	1·6	1,060	3·2	2,700	3·7	3,500
26	1·6	1,060	3·1	2,560	3·8	3,680
27	1·75	1,165	2·9	2,290	4·0	4,050
28	1·8	1,200	2·8	2,160	3·9	3,860
29	1·8	1,200	2·7	2,040	4·2	4,460
30	2·1	1,460	2·9	2,290	4·8	5,880
31	.....	.....	3·0	2,420	.....	.....

Daily Gauge Height and Discharge of Beaver River near Six-mile Creek, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·1	6,710	4·5	5,140	2·90	2,290	2·0	1,370	1·1	735	0·9	615
2	5·2	6,980	5·1	6,710	2·80	2,160	1·8	1,200	1·2	785	0·9	615
3	5·5	7,860	4·9	6,160	3·30	2,840	1·6	1,060	1·1	735	0·9	615
4	5·3	7,280	4·4	4,920	3·00	2,420	1·5	985	1·1	735	0·8	550
5	5·2	6,980	4·1	4,260	3·10	2,560	1·2	785	1·0	670	0·8	550
6	5·1	6,710	4·0	4,050	3·00	2,420	1·3	860	1·0	670	0·8	550
7	4·9	6,160	3·6	3,330	2·90	2,290	1·2	785	1·1	735	0·8	550
8	4·8	5,880	3·3	2,840	2·90	2,290	1·25	823	1·0	670	0·9	615
9	4·8	5,880	3·8	3,680	2·20	1,550	1·3	860	1·1	735	0·9	615
10	5·0	6,430	3·4	2,990	2·30	1,640	1·2	785	1·2	785	0·9	615
11	5·2	6,980	3·3	2,840	2·70	1,740	1·3	860	1·1	735	0·9	615
12	5·3	7,280	3·4	2,990	2·20	1,550	1·2	785	1·2	785	0·9	615
13	5·4	7,560	3·5	3,160	2·40	1,740	1·1	735	1·1	735	1·0	670
14	5·2	6,980	3·3	2,840	2·30	1,640	1·2	785	1·1	735	1·1	735
15	4·8	5,880	3·4	2,990	2·20	1,550	1·2	785	1·1	735	0·9	615
16	3·9	3,860	3·7	3,500	2·00	1,370	1·4	920	1·0	670	0·9	615
17	4·5	5,140	3·7	3,500	2·10	1,460	1·5	985	1·1	735	0·9	615
18	5·0	6,430	3·9	3,860	2·20	1,550	1·3	860	1·1	735	0·8	550
19	5·3	7,280	3·8	3,680	2·20	1,550	1·0	670	1·0	670	0·8	550
20	4·7	5,640	4·0	4,050	2·40	1,740	1·1	735	1·1	735	0·8	550
21	3·7	3,500	3·6	3,330	2·10	1,460	1·0	670	1·1	735	0·8	550
22	3·5	3,160	3·7	3,500	1·90	1,280	1·1	735	1·1	735	0·8	550
23	3·7	3,500	3·8	3,680	1·70	1,130	1·1	735	1·1	735	1·1	735
24	3·8	3,680	3·5	3,160	1·60	1,060	1·0	670	1·1	735	1·4	920
25	3·6	3,330	3·6	3,330	1·80	1,200	1·0	670	1·0	670	0·9	615
26	3·7	3,500	3·4	2,990	2·30	1,640	0·95	643	1·0	670	0·8	550
27	3·5	3,160	3·3	2,840	2·40	1,740	1·0	670	1·0	670	0·8	550
28	3·3	2,840	3·2	2,700	2·20	1,550	0·9	615	1·0	670	0·8	550
29	3·7	3,500	3·25	2,700	2·30	1,640	1·0	670	0·9	615	0·9	615
30	4·3	4,680	3·20	2,700	2·10	1,460	1·1	735	0·9	615	0·8	550
31	4·0	4,050	2·80	2,160	.....	.....	1·0	670	.....	.....	0·8	550

Monthly Discharge of Beaver River near Six-mile Creek, for 1914.

Drainage area 400 square miles.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	1,460	.....	993	2·48	2·86	61,100
May	3,500	1,790	2,520	6·30	7·26	155,000
June	6,980	2,700	4,390	11·0	12·3	261,000
July	7,860	2,840	5,450	13·6	15·7	335,000
August	6,710	2,160	3,570	8·92	10·3	220,000
September	2,840	1,060	1,750	4·38	4·89	104,000
October	1,370	615	810	2·02	2·33	49,800
November	785	615	712	1·78	1·99	42,400
December	920	550	604	1·51	1·74	37,100

Accuracy "D."

SESSIONAL PAPER No. 25e

Blaeberry River near Moberly (3002).

Location.—SW. $\frac{1}{4}$ section 29, township 28, range 22, west 5th, 11 miles north of Golden, about one mile from mouth, on downstream side of C. P. R. bridge.

Records Available.—April 15, 1912, to November 14, 1912; June 1, 1913, to November 30, 1913; April 1, 1914, to November 30, 1914.

Climatic Conditions.—Summers hot and dry, with occasional heavy rains, causing large discharge. Winters severe (as low as −50°F), with light snowfall. Ice conditions exist generally from the middle of November to the 1st of April. Frazil ice.

Gauge.—Vertical staff gauge, used and read three times a week by Mr. R. M. Cooper, during the open season.

Channel.—Channel is straight for about 50 yards above and below the station. The water is swift and controlled by a sandbar about 100 yards downstream. This bar probably shifts. Exceedingly high water on the Columbia may affect the gauge readings.

Discharge Measurements.—Measurements are made from downstream side of the railway bridge. In 1912 eight meterings were made, one of which was made on the 21st of February under ice conditions, the discharge was 53 c.f.s. In 1913, nine meterings were made, which formed a gauge-height-discharge curve varying considerably from that of 1912. A new curve was plotted from five measurements made in 1914, due to shift of bar.

Accuracy.—Due to the infrequency of gauge readings and the apparent non-permanency of the control the results are considered only to be within 15 per cent.

Discharge Measurements of Blaeberry River near Blaeberry, C.P.R. Bridge, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 12	J. A. E.	1909	82	357	5·15	3·10	1,840
July 27	"	1909	78	323	3·96	2·60	2,180
Aug. 5	"	1909	78	322	4·53	2·80	1,460
Sept 10	"	1927	78	230	2·50	1·75	573
Oct. 13	"	1909	66	188	2·19	1·3	412

Daily Gauge Height and Discharge of Blaeberry River near Golden, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·6	505	2·0	730	3·0	1,720
2	.....	550	.....	730	.....	1,980
3	1·8	600	.....	600	.....	2,440
4	1·4	425	1·9	660	3·8	2,940
5	.....	442	.....	695	.....	3,020
6	1·5	460	2·0	730	3·9	3,120
7	.....	425	.....	660	.....	2,360
8	1·3	390	1·8	600	3·0	1,720
9	.....	390	.....	642	.....	1,480
10	.....	425	.....	681	.....	1,360
11	1·4	425	2·0	730	2·6	1,260
12	.....	407	.....	765	.....	1,720
13	1·3	390	2·1	800	3·4	2,290
14	.....	390	.....	880	.....	2,680
15	1·3	390	2·3	965	3·9	3,120
16	.....	390	.....	1,040	.....	3,120
17	.....	355	.....	1,160	.....	2,940
18	1·2	355	2·6	1,260	3·8	2,940
19	.....	355	.....	1,160	.....	2,850
20	1·2	355	2·4	1,060	3·7	2,760
21	.....	355	.....	1,110	.....	2,060
22	.....	390	2·5	1,160	2·8	1,480
23	1·3	390	.....	1,100	.....	1,600
24	.....	372	.....	1,010	3·0	1,720
25	1·2	355	2·3	965	.....	1,660
26	.....	407	.....	922	2·9	1,600
27	1·5	460	2·2	880	.....	1,660
28	1·6	505	.....	922	3·0	1,720
29	1·7	550	2·3	965	.....	2,210
30	.....	630	.....	1,310	3·7	2,760
31	.....	.....	.....	1,310	.....	.....

Daily Gauge Height and Discharge of Blaeberry River near Golden for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	2,760	3·4	2,290	2·4	1,060	1·8	600	0·9	279	Frozen.	
2	3·7	2,760	.....	2,440	.....	1,010	.....	550	.....	290		
3	.....	2,940	3·6	2,600	2·3	965	1·6	505	1·0	300		
4	3·9	3,120	.....	2,680	.....	922	.....	527	.....	290		
5	.....	3,020	3·7	2,760	2·2	880	1·7	550	0·9	279		
6	3·8	2,940	.....	2,600	.....	800	.....	600	.....	267		
7	.....	2,760	3·5	2,440	2·0	730	1·9	660	0·8	256		
8	3·6	2,600	.....	1,980	.....	695	.....	630	.....	267		
9	.....	2,440	2·9	1,600	1·9	660	1·8	600	0·9	279		
10	3·4	2,290	.....	1,540	.....	575	.....	550	.....	279		
11	.....	2,600	2·8	1,480	1·6	505	.....	505	0·9	279		
12	.....	2,940	.....	1,420	.....	505	.....	460	.....	279		
13	4·0	3,290	2·7	1,360	.....	550	1·4	425	.....	256		
14	.....	2,760	.....	1,420	1·7	550	1·4	425	0·7	236		
15	3·4	2,290	2·8	1,480	.....	505	.....	425	.....	246		
16	.....	2,440	.....	1,420	1·5	460	1·4	425	0·8	256		
17	3·6	2,600	2·7	1,360	.....	488	.....	390	.....	267		
18	.....	2,600	.....	1,260	1·6	505	1·2	355	0·9	279		
19	.....	2,440	2·5	1,160	.....	505	.....	390	.....	290		
20	3·4	2,290	.....	1,060	.....	505	1·4	425	1·0	300		
21	.....	2,140	2·3	965	1·6	505	.....	425	.....	300		
22	3·2	1,980	.....	965	1·0	482	.....	390	.....	324		
23	.....	1,780	.....	965	1·5	460	1·3	390	1·1	324		
24	2·9	1,600	2·3	965	.....	442	.....	355	.....	312		
25	.....	1,480	.....	922	1·4	425	.....	324	1·0	300		
26	.....	1,480	2·2	880	.....	460	0·9	279	.....	290		
27	2·7	1,360	.....	880	.....	505	.....	279	0·9	279		
28	.....	1,480	.....	965	1·7	550	0·9	279	.....	256		
29	2·9	1,600	2·4	1,060	.....	527	.....	267	0·7	236		
30	.....	1,780	.....	1,060	1·6	505	0·8	256	.....	236		
31	3·2	1,980	.....	1,060	.....	.....	.....	267	.....	.....		

Monthly Discharge of Blaeberry River near Golden, for 1914.

(Drainage area 325 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
March	600	355	428	1·32	1·47	25,500	D
April	1,310	600	905	2·78	3·20	55,600	C
May	3,120	1,260	2,210	6·80	7·59	132,000	C
June	3,290	1,360	2,340	7·20	8·30	144,000	C
July	2,760	880	1,520	4·68	5·40	93,500	C
August	1,060	425	608	1·87	2·09	36,200	C
September	660	256	422	1·30	1·50	25,900	C
October	324	236	278	0·86	0·96	16,500	C

Bugaboo Creek (3003).

Location.—About 3 miles southwest of Spillimacheen Landing, 40 miles south of Golden, on downstream side of highway bridge 1 mile from mouth. Revelstoke district.

Records Available.—June to October, 1912; June to November, 1913; April 1 to December 15, 1914.

Climatic Conditions.—Summers hot and dry. Winters severe as low as 40° F. with light snowfall. The creek usually freezes over in November and does not open again till April. Frazil ice.

Gauge.—Vertical staff gauge, fastened to pier of bridge, and read daily during the open season by Mr. Jas. Montgomery.

Channel.—Straight for 100 feet above and below the gauge, the water is swift during freshet, there is one channel in low water and there are two at high stages.

Discharge Measurements.—Meterings are taken from the downstream side of the bridge, four being taken in 1912, eight in 1913, and three in 1914. A new curve was plotted in 1914, using 1912, 1913, and 1914 measurements.

Accuracy.—The control is apparently permanent. Daily gauge readings are obtained, and the 1914 curve appears reliable. Above a gauge height of 1·4 the results should be within 10 per cent and below 1·4, 15 per cent and 20 per cent.

Discharge Measurements of Bugaboo Creek near Spillimacheen Landing, for 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 17	J. A. Elliott	1,909	60	187	10·21	3·00	1,910
July 31	"	1,909	60	151	6·40	2·35	970
Oct. 23	"	1,909	34	96	1·71	1·10	164

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Bugaboo Creek near Spillimacheen, for 1914.

Day.	April.		May.		June.	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·45	58	1·5	310	2·1	690
2	0·45	58	1·72	415	2·3	915
3	0·5	60	1·95	560	2·9	1,760
4	0·52	62	1·72	415	3·0	1,910
5	0·6	72	1·63	370	2·45	1,105
6	0·7	86	1·52	319	2·25	856
7	0·8	100	1·5	310	2·12	712
8	0·72	89	1·52	319	2·1	690
9	0·77	96	1·75	430	2·02	618
10	0·72	89	1·8	455	2·05	600
11	0·73	91	1·9	520	2·15	745
12	0·8	100	1·87	500	2·3	915
13	0·9	120	1·82	468	2·4	1,040
14	1·0	140	1·85	487	2·7	1,460
15	1·0	140	2·1	690	3·0	1,910
16	1·1	170	2·2	800	3·25	2,285
17	1·1	170	2·15	745	3·1	2,060
18	1·05	155	2·05	645	3·4	2,510
19	1·07	161	1·95	560	3·05	1,985
20	1·2	200	1·9	520	2·75	1,535
21	1·13	179	1·9	520	2·6	1,315
22	1·15	185	1·92	536	2·32	938
23	1·15	185	2·05	645	2·2	800
24	1·17	191	2·2	800	2·12	712
25	1·22	206	2·25	856	2·23	834
26	1·17	191	2·1	690	2·4	1,040
27	1·2	200	1·95	560	2·38	1,015
28	1·2	200	1·87	500	2·42	1,066
29	1·23	209	1·77	440	2·5	1,170
30	1·3	230	1·72	415	2·6	1,315
31	.....	.....	1·85	487	.....	.....

Daily Gauge Height and Discharge of Bugaboo Creek near Spillimacheen, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·75	1,540	2·5	1,170	1·80	455	1·55	333	1·27	221	1·05	155
2	3·0	1,910	2·5	1,170	1·75	430	1·50	310	1·35	250	1·1	170
3	3·45	2,580	2·42	1,066	1·80	455	1·50	310	1·25	215	1·0	140
4	3·1	2,060	2·4	1,040	1·80	455	1·40	270	1·2	200	0·95	130
5	3·1	2,060	2·25	856	1·85	488	1·40	270	1·2	200	1·05	155
6	3·25	2,280	2·25	856	1·70	405	1·55	250	1·1	170	1·15	185
7	3·1	2,060	2·4	1,040	1·70	405	1·38	262	1·1	170	1·2	200
8	2·95	1,840	2·1	690	1·80	455	1·38	262	1·07	161	1·3	230
9	2·9	1,760	2·0	600	1·70	405	1·35	250	1·07	161	1·25	215
10	2·77	1,560	1·95	560	1·60	355	1·30	230	1·1	170	1·15	185
11	2·85	1,680	1·9	520	1·70	405	1·30	230	1·1	170	0·95	130
12	3·1	2,060	2·05	645	1·55	333	1·30	230	1·1	170	0·95	130
13	3·0	1,910	2·1	690	1·40	270	1·30	230	1·0	140	0·85	110
14	3·15	2,140	2·1	690	1·40	270	1·30	230	0·9	120	0·75	93
15	2·9	1,760	2·15	745	1·40	270	1·27	221	0·9	120	0·7	86
16	2·67	1,410	2·05	645	1·30	230	1·25	215	0·8	100	Frozen.	
17	2·47	1,130	2·15	745	1·30	230	1·25	215	0·75	93		
18	2·6	1,320	2·0	600	1·50	310	1·35	250	0·65	79		
19	2·72	1,490	1·95	560	2·00	600	1·32	238	0·75	93		
20	2·70	1,460	2·05	645	1·65	380	1·3	230	1·0	140		
21	2·40	1,040	2·1	690	1·50	310	1·22	206	1·05	155		
22	2·20	800	2·1	690	1·40	270	1·15	185	1·0	140		
23	2·20	800	1·95	560	1·50	310	1·1	170	1·0	140		
24	2·30	915	1·85	488	1·50	310	1·1	170	1·1	170		
25	2·40	1,040	1·82	468	1·55	333	1·0	140	1·15	185		
26	2·3	910	1·85	488	1·85	488	1·1	170	1·0	140		
27	2·2	800	2·00	600	1·95	560	1·1	170	0·95	130		
28	2·3	920	2·00	600	1·75	430	1·1	170	1·0	140		
29	2·2	800	1·90	520	1·60	355	1·1	170	1·0	140		
30	2·3	920	1·95	560	1·50	310	1·15	185	1·15	185		
31	2·45	1,100	1·85	488	.....	.....	1·35	250	.....	.....		

Monthly Discharge of Bugaboo Creek near Spillimacheen, for 1914.

(Drainage area, 190 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.	
March	230	58	139·8	0·736	0·82	8,320	D.
April	856	310	525	2·76	3·18	32,300	B.
May	2,510	600	1,217	6·40	7·14	72,400	B.
June	2,585	800	1,486	7·82	9·02	91,400	B.
July	1,170	468	700	3·68	4·24	43,000	B.
August	560	230	375	1·97	2·20	22,300	B.
September	333	140	226	1·19	1·37	13,900	B.
October	250	79	156	0·82	0·92	9,300	D.

Canyon Creek (3051).

Location.—Township 26, range 22, west 5th, mer. about one-half mile from Columbia river, and 6 miles from Golden. The spillways and the sluice of Columbia River Lumber Company's dam are used as weirs. Revelstoke district.

Records Available.—June 15 to December 30, 1914.

Climatic Conditions.—Summers hot and little rainfall. Winters severe, as low as −50° F., with 10 to 15 feet of snow. (See Columbia River, Golden.)

NOTE.—It was intended to publish the "Records Available" in this result but, through an oversight, this is impossible. The results however, will be available at this office after April 1, 1915.

COLUMBIA RIVER, GOLDEN (3005.)

Location.—SW. ¼ sec. 12, township 27, range 22, west 5th, mer. above mouth of Kicking Horse river, one mile from Golden, B.C., 100 yards below the Columbia River Lumber Company's mill.

Records Available.—During the open season from 1903–14. Gauge heights from 1903-11 were obtained through the courtesy of the Columbia River Lumber Company. One ice measurement made in February, 1912, gave a discharge of 795 c.f.s., and one made in February, 1914, gave a discharge of 894 c.f.s.

Climatic Conditions.—In 1914 the precipitation amounted to 14·19 inches of which about 3 or 4 feet was snow. The summers are warm and fairly dry. The winters are very severe, as low as 50 ° F., during some winters, with a fairly heavy snowfall. Ice conditions generally exist from the middle of November till the end of March. Frazil ice may be expected.

Gauge.—Vertical staff gauge, referred to three bench-marks, and read daily by Mr. Jas. T. Wood during the open season.

Channel.—The section is located in the middle of a straight stretch of river of 1,500 feet. At low water there is a pronounced riffle 300 yards below the gauge, but at high water this riffle disappears.

Discharge Measurements.—Measurements are made from boat held by temporary cable about 100 yards below mill. Eight discharge measurements were made in 1912, five in 1913, and three in 1914.

Accuracy.—The gauge readings are good. Great difficulty is encountered in metering river at high water, and during June and July accuracy is not guaranteed to within 20 per cent, but in the remaining months it is probably within 15 per cent.

DISCHARGE MEASUREMENTS of Columbia River at Golden, B.C., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 2	C. E. W., W. J. G.	1,048	175	616	1·45		894[1]
July 30	J. A. Elliott	1,909	390	2,540	4·09	7·95	10,400
Oct. 14	"	1,909	200	855	2·65	2·48	2,260

[1]Ice conditions.

Daily Gauge Height and Discharge of Columbia River near Golden, B.C. for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	1,900	3·15	3,020	6·15	7,120
2	.....	1,900	4·00	4,060	7·85	10,020
3	.....	1,900	4·05	4,120	7·50	9,350
4	.....	1,900	4·08	4,160	7·40	9,160
5	2·10	1,920	4·12	4,220	7·20	8,800
6	2·10	1,920	4·15	4,250	7·10	8,630
7	2·10	1,920	4·20	4,320	7·25	8,890
8	2·10	1,920	4·22	4,350	7·38	9,130
9	2·12	1,940	4·30	4,460	7·40	9,160
10	2·20	2,000	4·05	4,120	7·40	9,160
11	2·30	2,100	5·65	6,360	7·28	8,940
12	2·20	2,000	5·42	6,020	7·20	8,800
13	2·15	1,960	5·30	5,845	7·20	8,800
14	2·05	1,880	5·10	5,560	7·30	8,980
15	2·30	2,100	5·00	5,420	7·10	8,630
16	2·75	2,560	6·85	8,230	8·65	11,850
17	3·70	3,680	6·58	7,860	8·20	10,700
18	3·60	3,560	6·48	7,640	9·75	15,800
19	3·60	3,560	6·28	7,320	9·55	15,000
20	3·60	3,560	6·20	7,190	9·50	14,800
21	3·70	3,680	6·26	7,190	9·50	14,800
22	3·72	3,700	6·20	7,190	9·50	14,800
23	3·72	3,700	6·25	7,270	9·45	14,600
24	3·70	3,680	6·20	7,190	9·40	14,400
25	3·70	3,680	6·15	7,120	9·40	14,400
26	3·60	3,560	6·02	6,920	9·40	14,400
27	3·60	3,560	6·00	6,890	9·45	14,600
28	3·50	3,440	6·00	6,890	9·50	14,800
29	3·50	3,440	6·02	6,920	9·50	14,800
30	3·40	3,320	6·10	7,040	9·50	14,800
31	.....	.....	6·30	7,350	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Columbia River near Golden, B.C., for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	9·45	14,600	7·80	9,920	5·30	5,840	3·8	3,800	2·1	1,920
2	9·40	14,400	7·70	9,730	5·25	5,770	3·7	3,680	2·32	2,120
3	9·48	14,720	7·70	9,730	5·25	5,770	3·6	3,560	2·4	2,200
4	9·25	13,800	7·65	9,640	5·10	5,560	3·47	3,400	2·4	2,200
5	9·32	14,080	7·65	9,640	4·95	5,350	3·35	3,260	2·4	2,200
6	9·52	14,880	7·65	9,640	4·80	5,140	3·0	2,840	2·3	2,100
7	9·65	15,400	7·65	9,640	4·70	5,000	3·0	2,840	2·25	2,050
8	10·25	18,050	7·60	9,540	4·65	4,930	2·9	2,730	2·2	2,000
9	10·42	18,900	7·55	9,440	4·60	4,860	2·85	2,670	2·15	1,960
10	10·60	19,800	7·40	9,160	4·55	4,790	2·8	2,620	2·10	1,920
11	10·65	19,950	7·20	8,800	4·55	4,790	2·8	2,620	2·1	1,920
12	10·60	19,890	7·25	8,890	4·45	4,660	2·7	2,510	2·05	1,880
13	10·50	19,300	7·0	8,470	4·10	4,190	2·6	2,400	2·0	1,840
14	10·50	19,300	6·80	8,150	3·70	3,680	2·5	2,300	1·90	1,760
15	10·60	19,800	6·65	7,910	3·30	3,200	2·4	2,200	1·90	1,760
16	10·50	19,300	6·45	7,590	3·00	2,840	2·4	2,200	1·90	1,760
17	10·50	19,300	6·30	7,350	3·00	2,840	2·35	2,150	Frozen.	1,700
18	10·55	19,550	6·30	7,350	3·10	2,960	2·3	2,100	.....	1,700
19	10·10	17,300	6·25	7,270	3·20	3,080	2·3	2,100	.....	1,600
20	9·90	16,400	6·25	7,270	3·70	3,680	2·27	2,070	.....	1,600
21	9·70	15,600	6·26	7,270	3·80	3,800	2·25	2,050	.....	1,600
22	9·50	14,800	6·25	7,270	3·60	3,560	2·25	2,050	.....	1,600
23	9·30	14,000	6·20	7,190	3·50	3,440	2·2	2,000	.....	1,600
24	9·10	13,300	6·00	6,890	3·50	3,440	2·2	2,000	.....	1,600
25	8·80	12,300	5·85	6,670	3·32	3,220	2·2	2,000	.....	1,600
26	8·65	11,850	5·80	6,590	3·20	3,080	2·15	1,960	.....	1,600
27	8·45	11,320	5·75	6,510	3·50	3,440	2·15	1,960	.....	1,600
28	8·20	10,700	5·60	6,290	3·80	3,800	2·15	1,960	.....	1,700
29	8·05	10,400	5·40	5,990	.....	3,800	2·1	1,920	.....	1,700
30	7·90	10,110	4·40	5,990	.....	3,800	2·1	1,920	.....	1,700
31	7·85	10,020	5·35	5,920	.....	.....	2·1	1,920	.....	.....

Monthly Discharge of Columbia River at Golden, B.C., for 1914.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
April	3,700	1,900	2,731	1·092	1·218	182,450	C
May	8,230	3,020	6,044	2·405	2·773	369,700	D
June	15,800	7,120	11,604	4·642	5·179	691,200	C
July	19,950	10,020	15,582	6·233	7·186	959,000	C
August	9,920	5,920	7,991	3·196	3·685	491,600	D
September	5,810	2,840	4,149	1·66	1·85	246,000	C
October	3,800	1,920	2,440	0·98	1·13	150,000	C
November	2,200	. . .	1,820	0·73	0·81	108,000	

Columbia River near Trail (3008).

Location.—Fifteen miles above international boundary, above mouth of Pend d'Oreille river, below mouth of Kootenay, at the highway bridge near Trail, B.C., Nelson district.

Records Available.—May, 1913, to December, 1914.

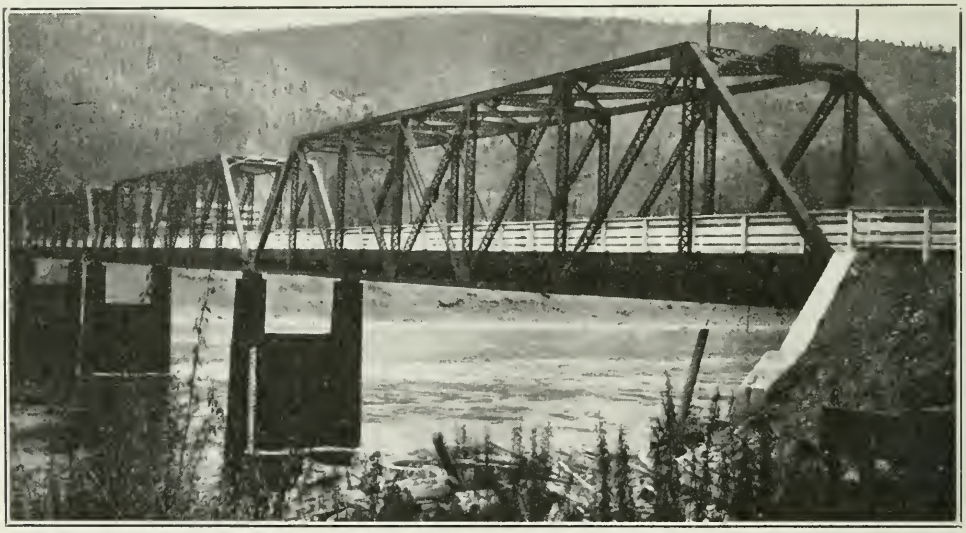
Climatic Conditions.—The climate at Trail is similar to Nelson, but a little more extreme, i.e., a little hotter in summer and colder in winter. The total precipitation is about the same. See Kootenay river near Nelson.

Gauge.—A chain gauge, 60.8 feet long, is read daily by Mr. C. A. Broderick.

Channel.—The river winds from the left (looking downstream), about 100 yards above the bridge; below, the river is straight for 400 yards. The control, a pronounced riffle 100 yards below the bridge, appears permanent.

Discharge Measurements.—Measurements are made from the upstream side of the traffic bridge. Eighteen well-distributed measurements have been made.

Accuracy.—Daily gauge readings have been obtained. Reliable measurements were made throughout the year. The gauge-height-discharge curve appears to be very good. The results should be within 10 per cent.



Nelson District (I)—Highway Bridge on Columbia river near Trail, showing metering section on upstream side of bridge.

Discharge Measurements of Columbia River near Trail, B.C., for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 15	C. E. Webb	1018	485	6,250	3·57	9·50	22,300
April 17	D. O. B. G., C. E. W.	1048	493	7,120	3·51	10·50	25,000
June 2	J. A. E., G. K. B.	1909	616	15,600	9·68	28·3	151,000
July 17	D. O. B. G., J. A. E.	1909	640	19,200	11·09	33·70	213,000
Nov. 11	J. A. E., G. K. B.	1909	515	9,110	5·43	14·6	49,000
1915.							
Jan. 4	do	1929	475	6,834	3·42	10·0	23,400

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Columbia River near Trail, B.C., for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	9·7	22,000	8·9	18,600	8·0	15,500	10·2	24,250	17·9	71,300	28·4	163,500
2	9·6	21,500	8·9	18,600	8·0	15,500	10·1	23,750	18·3	74,400	28·3	163,000
3	9·6	21,500	8·8	18,300	8·0	15,500	10·2	24,250	18·8	78,400	28·5	165,000
4	9·6	21,500	8·8	18,300	8·0	15,500	10·3	24,750	19·4	83,200	28·9	169,000
5	9·5	21,000	8·7	17,900	8·0	15,500	10·4	25,250	19·8	86,400	29·4	174,000
6	9·5	21,000	8·7	17,900	8·0	15,500	10·5	25,750	20·3	90,400	29·8	178,000
7	9·5	21,000	8·6	17,600	8·0	15,500	10·7	26,800	20·6	92,800	30·1	182,000
8	9·5	21,000	8·6	17,600	8·1	15,800	10·9	27,800	21·1	96,800	30·4	184,500
9	9·4	20,600	8·5	17,200	8·2	16,200	11·3	20,300	21·5	100,000	30·4	185,000
10	9·5	21,000	8·5	17,200	8·2	16,200	11·5	30,500	21·9	104,000	30·2	183,000
11	9·5	21,000	8·4	16,900	8·2	16,200	11·7	31,550	22·1	104,000	30·0	181,000
12	9·5	21,000	8·4	16,900	8·2	16,200	11·9	32,600	22·4	107,000	29·9	179,000
13	9·6	21,500	8·4	16,900	8·2	16,200	12·3	34,750	22·8	110,000	29·8	178,000
14	9·6	21,500	8·3	16,500	8·3	16,500	12·7	36,950	23·4	115,500	30·0	181,000
15	9·6	21,500	8·3	16,500	8·3	16,500	13·2	40,200	23·9	120,500	30·5	186,000
16	9·5	21,000	8·2	16,200	8·3	16,500	13·8	43,500	24·6	126,000	30·9	190,000
17	9·5	21,000	8·2	16,200	8·3	16,500	14·1	45,600	25·2	132,000	31·3	195,000
18	9·5	21,000	8·2	16,200	8·4	16,900	14·5	47,850	25·7	137,000	32·1	204,000
19	9·4	20,600	8·2	16,200	8·6	17,600	15·0	51,500	26·4	144,000	32·7	210,000
20	9·4	20,600	8·2	16,200	8·5	17,200	15·5	54,800	26·7	146,500	33·4	218,000
21	9·4	20,600	8·2	16,200	8·7	17,900	15·8	56,700	26·9	149,000	33·4	218,000
22	9·3	20,200	8·1	15,800	8·8	18,300	16·1	58,800	27·2	152,000	33·6	220,000
23	9·3	20,200	8·1	15,800	8·9	18,600	16·3	60,000	27·4	153,500	33·4	218,000
24	9·3	20,200	8·1	15,800	9·1	19,400	16·6	62,100	27·7	157,000	32·7	210,000
25	9·2	19,800	8·1	15,800	9·3	20,200	16·8	63,400	28·0	160,000	31·0	192,000
26	9·2	19,800	8·1	15,800	9·5	21,000	17·0	64,800	28·2	162,000	31·8	200,000
27	9·2	19,800	8·0	15,500	9·7	22,000	17·2	66,200	28·4	164,000	31·7	199,000
28	9·1	19,400	8·0	15,500	9·9	23,000	17·4	67,600	28·6	166,000	31·6	197,500
29	9·1	19,400	.....	.....	10·0	23,500	17·5	68,400	28·7	167,000	31·4	195,500
30	9·0	19,000	.....	.....	10·1	24,000	17·6	69,100	28·6	166,000	31·3	194,500
31	9·0	19,000	.....	.....	10·2	24,500	.....	.....	28·5	165,000	.....	.....

Daily Gauge Height and Discharge of Columbia River, near Trail, B.C., for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	31·3	195,000	26·0	140,500	19·7	85,200	15·2	52,500	13·8	43,800	13·0	39,000
2	31·4	196,000	25·8	138,000	19·5	84,000	15·2	52,800	13·7	43,200	12·9	38,400
3	31·6	197,500	25·7	137,000	19·3	82,000	15·3	53,400	13·8	43,800	12·9	38,400
4	32·1	203,500	25·0	135,500	19·1	80,400	15·3	53,400	13·9	44,400	12·8	37,800
5	32·7	209,500	25·5	134,500	18·9	78,800	15·4	54,100	14·0	45,000	12·8	37,800
6	33·1	215,000	25·4	133,500	18·7	77,200	15·3	53,400	14·2	46,200	12·7	37,200
7	33·7	220,500	25·2	132,000	18·5	75,600	15·2	52,800	14·4	47,500	12·7	37,200
8	33·7	221,000	25·1	130,500	18·3	74,000	15·2	52,800	14·7	49,400	12·6	36,700
9	33·6	220,000	24·9	128,500	18·1	72,400	15·1	52,200	14·9	50,800	12·5	36,200
10	33·7	220,500	24·5	125,000	17·9	71,650	15·0	51,500	15·0	51,500	12·4	35,600
11	33·7	221,000	24·0	121,000	17·9	70,950	15·0	51,500	14·9	50,800	12·2	34,500
12	33·6	219,500	23·6	117,000	17·7	69,450	14·9	50,800	14·8	50,100	12·1	34,000
13	33·6	220,000	23·2	114,000	17·5	68,000	14·9	50,800	14·8	50,100	11·9	32,900
14	33·7	221,000	22·9	111,000	17·3	66,550	14·8	50,100	14·8	50,100	11·7	31,800
15	33·7	221,500	22·6	109,000	17·1	65,500	14·7	49,400	14·7	49,400	11·5	30,800
16	33·8	222,000	22·4	105,500	16·9	63,750	14·5	48,200	14·6	48,800	11·3	29,600
17	33·7	221,000	22·2	104,500	16·7	62,400	14·4	47,500	14·6	48,800	11·1	28,500
18	33·6	220,000	21·9	104,000	16·5	61,050	14·3	46,800	14·5	48,200	10·9	27,600
19	33·3	217,000	21·8	102,500	16·3	59,700	14·3	46,800	14·4	47,500	10·6	27,200
20	33·0	214,000	21·6	101,000	16·1	58,450	14·4	47,500	14·3	46,800	10·6	26,400
21	32·5	207,500	21·5	100,000	15·9	57,050	14·4	47,150	14·1	45,600	10·5	26,000
22	31·9	200,500	21·4	99,200	15·8	56,350	14·3	46,800	13·9	44,400	10·4	25,500
23	31·2	194,000	21·3	98,400	15·7	55,700	14·3	46,800	13·7	43,200	10·4	25,500
24	30·5	186,000	21·2	97,600	15·6	55,100	14·4	47,500	13·6	42,600	10·3	25,000
25	29·9	180,000	21·1	96,800	15·5	54,450	14·4	47,500	13·5	42,000	10·3	25,000
26	29·4	173,500	20·9	94,800	15·4	53,750	14·3	46,800	13·4	41,400	10·2	24,500
27	28·7	167,000	20·7	93,200	15·3	53,400	14·3	46,800	13·3	40,800	10·2	24,500
28	28·2	161,500	20·5	91,600	15·2	52,800	14·2	46,200	13·2	40,200	10·1	24,000
29	27·6	155,500	20·3	90,000	15·2	52,800	14·1	45,600	13·1	39,600	10·0	23,500
30	26·9	149,000	20·1	88,400	15·1	52,200	14·0	45,000	13·1	39,600	9·9	23,000
31	26·4	144,000	19·9	87,200	.....	.....	13·9	44,400	.....	.....	9·8	22,500

Monthly Discharge of Columbia River, near Trail, for 1914.

(Drainage area, 34,000 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	22,000	19,000	20,700	0·61	0·70	1,270,000
February	18,600	15,500	16,800	0·49	0·51	933,000
March	24,500	15,500	17,800	0·52	0·60	1,090,000
April	69,100	23,700	43,900	1·24	1·38	2,610,000
May	167,000	71,300	125,000	3·68	4·24	7,690,000
June	220,000	163,000	190,000	5·60	6·25	11,300,000
July	222,000	144,000	200,000	5·89	6·79	12,300,000
August	140,000	87,200	112,000	3·29	3·79	6,890,000
September	85,200	52,200	65,700	1·93	2·15	3,910,000
October	54,100	44,400	46,300	1·36	1·57	2,850,000
November	51,500	39,600	45,900	1·35	1·51	2,730,000
December	39,000	22,500	30,500	0·89	1·03	1,880,000

Accuracy "B".

Dutch Creek, near Fairmont Springs (3035).

Location.—At highway bridge of Golden to Cranbrook road, half a mile from the mouth, which is almost at the outlet of Columbia lake. Revelstoke district.

Records Available.—April to August, 1914.

Climatic Conditions.—Summers, hot days, generally cool at nights, with very little rain. Winters, severe, as low as—40°F., with a light snowfall. Frazil ice. The precipitation at the mouth is similar to that at Athalmer, q.v. Toby creek.

Gauge.—Vertical staff gauges were used throughout 1914. Gauge was changed owing to shifts in channel. Gauge was read by Mr. W. Magurn, an engineer on construction, Kootenay Central railway.

Channel.—The channel is wide, sandy, and shifting.

Discharge Measurements.—Measurements are made from highway bridge at mouth. In 1914, seven measurements were made.

Co-operation.—The station was maintained in 1914 by co-operation with the Water Rights Branch (Provincial).

Accuracy.—Owing to a large shift, due to high water in June, results after May are not guaranteed.

General.—Dutch creek rises on the easterly slope of the Selkirk range, and drains an area of about 250 square miles. It empties into Columbia lake, just above the outlet, and is the first large tributary of the Columbia river.

At present there is no development of power on Dutch creek, and the probable use of the water will be irrigation.

Discharge Measurements of Dutch Creek, near Fairmont Springs, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 8	D. O'B. G	1,048	42·5	120	2·54	1·20	305
April 10	O. J. B. (Prov.)	1,048		122	0·86	0·40	104
May 19	"	1,048		214	3·36	1·70	719
June 18	J. A. Elliott	1,909	93	386	7·16	3·00	2,760
Aug. 1	"	1,909	70	146	3·60	1·58	525
Sept. 22	O. J. B. (Prov.)			91	2·4	0·98	217
Oct. 20	J. A. E.		34	90·6	2·04	0·98	221

Daily Gauge Height and Discharge of Dutch Creek near Fairmont Springs' B.C., for 1914.

Day.	April.		May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·2	85	0·98	220	1·95	1,020	2·6	2,050	1·48	499
2	0·2	85	1·25	340	2·05	1,160	2·65	2,140	1·38	421
3	0·2	85	1·4	435	2·45	1,790	2·85	2,490	1·63	638
4	0·3	95	1·3	365	2·7	2,220	2·8	2,400	1·33	386
5	0·3	95	1·3	365	2·7	2,220	2·53	1,940	1·28	355
6	0·3	95	1·2	315	2·4	1,700	1·93	991	1·08	249
7	0·35	100	1·1	265	2·0	1,080	2·13	1,280	1·08	249
8	0·4	105	1·1	265	1·7	715	2·08	1,210	1·08	249
9	0·4	105	1·3	365	1·6	605	2·23	1,430	1·08	249
10	0·45	110	1·35	400	1·6	605	.....	1,350	1·03	234
11	0·5	115	1·4	435	1·6	605	.....	1,300	1·08	249
12	0·53	118	1·4	435	1·7	715	.....	1,200	1·18	305
13	0·53	118	1·45	475	2·0	1,080	.....	1,150	1·33	386
14	0·55	120	1·5	515	2·35	1,620	.....	1,100	1·28	355
15	0·58	122	1·7	715	2·7	2,220	.....	1,050	1·23	330
16	0·58	122	1·8	825	2·85	2,490	.....	1,000	1·33	386
17	0·58	122	1·85	887	2·9	2,580	1·88	925	1·28	355
18	0·58	122	1·7	715	3·05	2,850	1·93	991	1·38	421
19	0·63	133	1·7	715	3·1	2,940	1·98	1,060	1·33	386
20	0·64	135	1·75	770	3·1	2,940	1·93	991	1·38	421
21	0·63	133	1·75	770	2·7	2,220	1·78	803	1·18	305
22	0·68	145	1·8	825	2·25	1,460	1·83	863	0·98	220
23	0·68	145	1·78	803	2·0	1,080	1·78	803	0·88	195
24	0·7	150	1·7	715	2·05	1,160	1·43	459	.....	175
25	0·75	162	1·75	770	2·25	1,460	1·58	587	.....	160
26	0·7	150	1·80	825	2·2	1,380	1·48	499	.....	160
27	0·7	150	1·75	770	2·3	1,540	1·43	459	.....	150
28	0·7	150	1·55	560	2·3	1,540	1·53	542	.....	150
29	0·7	150	1·5	515	2·35	1,620	1·53	542	.....	130
30	0·8	175	1·75	770	2·4	1,700	1·53	542	.....	130
31	.....	.....	1·9	950	.....	.....	1·48	499	.....	120

Monthly Discharge of Dutch Creek near Fairmont Springs, B.C., for 1914.

(Drainage area, 250 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	175	85	123·0	0·49	0·55	7,320
May	950	220	584·0	2·34	2·70	36,000
June	2,940	605	1,610·0	6·45	7·20	95,800
July	2,490	459	1,120·0	4·48	5·16	68,900
August	638	.....	291·0	1·16	1·34	17,900

Accuracy "C".

Field Springs, 1, 2, and 3 (3062, 3063, and 3064).

Location.—In township 28-18-5, about one-quarter mile east of the C.P.R. hotel at Field. Revelstoke district.

Records Available.—October 16 to December 31, 1914.

Climatic Conditions.—Summers: the days are generally hot and the nights cool; June is generally a wet month, but some years July and August are

very dry, and at the end of August the springs may be very low. Winters: snow generally falls in October or November and remains till April, but the snowfall is not nearly as great as at Glacier; the temperature however, at times goes very low (—50°F.).

Discharge Measurements.—Discharges are obtained on the two largest springs and a little creek (carrying pratically all the water which comes to the surface) by means of weirs. Weir No. 1 is on a small creek immediately beyond the springs (starting from the hotel). This weir is located near the foot of a 25-foot fall on this creek. Weir No. 3 is on the smaller of the two springs gauged, as it shows that during extreme cold weather this spring ceases to flow. Weir No. 2 is immediately below the confluence of two or three small springs. Weir No. 2 is a rectangular weir 1.6 feet wide. Weirs Nos. 1 and 3 are triangle weirs, with a 90°.

These weirs were established to determine if there was sufficient water for a water supply for Field and also for the C.P.R. shops at Field.

DAILY GAUGE HEIGHT AND DISCHARGE Weir No. 1, of Field Springs near Field, B.C., for 1914.

DAY.	October.		November.		December.	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	0·26	0·088	0·2	0·044
2	.....	.....	0·26	0·088	0·2	0·044
3	.....	.....	0·24	0·071	0·2	0·044
4	.....	.....	0·25	0·079	0·2	0·044
5	.....	.....	0·26	0·088	0·2	0·044
6	.....	.....	0·24	0·075	0·17	0·030
7	.....	.....	0·25	0·079	0·17	0·030
8	.....	.....	0·24	0·071	0·17	0·030
9	.....	.....	0·24	0·071	0·17	0·030
10	.....	.....	0·25	0·079	0·16	0·026
11	.....	.....	0·24	0·071	0·16	0·026
12	.....	.....	0·24	0·071	0·16	0·026
13	.....	.....	0·24	0·071	0·13	0·015
14	.....	.....	0·24	0·071	0·13	0·015
15	.....	.....	0·22	0·056	0·12	0·014
16	0·28	0·106	0·24	0·071	0·13	0·015
17	0·29	0·115	0·23	0·064	0·13	0·015
18	0·29	0·115	0·23	0·064	0·13	0·015
19	0·29	0·120	0·24	0·071	0·13	0·015
20	0·29	0·115	0·24	0·071	0·12	0·012
21	0·28	0·106	0·22	0·056	0·12	0·012
22	0·27	0·097	0·21	0·050	0·12	0·012
23	0·27	0·097	0·21	0·050	0·10	0·008
24	0·27	0·097	0·21	0·050	0·10	0·008
25	0·27	0,097	0·23	0·064	0·09	0·006
26	0·27	0·097	0·21	0·050	0·09	0·006
27	0·26	0·093	0·21	0·050	0·08	0·004
28	0·26	0·088	0·21	0·050	0·09	0·006
29	0·26	0·088	0·2	0·044	0·08	0·005
30	0·26	0·088	0·2	0·044	0·08	0·004
31	0·28	0·106			0·08	0·005

Monthly Discharge of Field Springs at No. 1 Weir, Field, B.C., for 1914.

Month.	Discharge in Gallons.			
	Maximum daily flow.	Minimum daily flow.	Mean.	Mean daily flow.
October	64,600	47,400	·101	54,400
November	47,400	23,700	·066	35,530
December	23,700	2,690	·020	10,770

Daily Gauge Height and Discharge, Weir No. 2, Field Springs, near Field, B.C., for 1914.

Day.	October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				·280	0·16	·340
2				·280	0·16	·340
3			0·14	·280	0·16	·340
4			0·14	·280	0·16	·340
5			0·13	·251	0·16	·340
6			0·15	·310	0·15	·310
7			0·14	·280	0·15	·310
8			0·14	·280	0·15	·310
9			0·14	·280	0·15	·310
10			0·15	·310	0·15	·310
11			0·15	·310	0·15	·310
12			0·15	·310	0·15	·310
13			0·14	·280	0·13	·251
14			0·14	·280	0·14	·280
15			0·13	·251	0·15	·310
16	0·25	·666	0·13	·251	0·15	·310
17	0·24	·627	0·13	·251	0·14	·280
18	0·26	·707	0·13	·251	0·14	·280
19	0·27	·748	0·14	·280	0·14	·280
20	0·26	·707	0·15	·310	0·16	·340
21	0·25	·666	0·14	·280	0·16	·340
22	0·245	·647	0·14	·280	0·16	·340
23	0·25	·666	0·15	·310	0·16	·340
24	0·245	·647	0·15	·310	0·16	·340
25			0·18	·406	0·16	·340
26			0·16	·340	0·16	·340
27			0·16	·340	0·16	·340
28			0·16	·340	0·15	·310
29			0·17	·372	0·15	·310
30			0·16	·340	0·16	·340
31					0·15	·310

Monthly Discharge of Field Springs, No. 2 Weir, Field, B.C., for 1914.

Month.	Discharge in Gallons.			
	Maximum daily flow.	Minimum daily flow.	Mean.	Mean daily flow.
November	218,000	135,000	0·297	159,900
December	183,000	135,000	0·302	163,000

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge Weir No. 3, Field Springs near Field, B.C., for 1914.

Day.	October.		November.		December.	
	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·23	0·064	0·19	0·038
2			0·22	0·056	0·19	0·038
3			0·19	0·038	0·19	0·038
4			0·19	0·038	0·19	0·038
5			0·2	0·044	0·19	0·038
6			0·19	0·038	0·19	0·038
7			0·18	0·034	0·19	0·038
8			0·18	0·034	0·21	0·050
9			0·18	0·034	0·21	0·050
10			0·19	0·038	0·21	0·050
11			0·19	0·038	0·2	0·044
12			0·18	0·034	0·2	0·044
13			0·18	0·034	0·16	0·026
14			0·18	0·036	0·12	0·012
15			0·18	0·034		
16	0·07	0·003	0·18	0·034	No water	
17	0·16	0·026	0·19	0·038	flowing.	
18	0·18	0·034	0·19	0·038		
19	0·19	0·042	0·18	0·034		
20	0·19	0·038	0·19	0·038		
21	0·18	0·036	0·19	0·038		
22	0·18	0·034	0·19	0·038		
23	0·19	0·038	0·19	0·038		
24	0·18	0·034	0·19	0·038		
25	0·18	0·034	0·22	0·056		
26	0·18	0·034	0·19	0·038		
27	0·18	0·034	0·19	0·038		
28	0·18	0·034	0·19	0·038		
29	0·18	0·034	0·19	0·038		
30	0·19	0·038	0·19	0·038		
31	0·22	0·056				

Monthly Discharge of Field Springs at No. 3 Weir, Field, B.C., for 1914.

Month	Discharge in Gallons			
	Maximum daily flow	Minimum daily flow	Mean	Mean daily flow
October	25,600	14,000	0·024	18,300
November	34,200	18,300	0·0391	21,080
December	26,900		0·017	9,150

Monthly Discharge of Field Springs River near Field for Total Discharge from three weirs.

Month	Gallons per day
	Mean
October	72,700
November	210,000
December	183,000

Note—See miscellaneous measurements "Field Creek"
Weir No. 2 not included

Findlay Creek near Canal Flats (3036).

Location.—At highway bridge, on Findlay creek road, about 15 miles from mouth and 7 miles from Thunder Hill, B.C. Revelstoke district.

Records Available.—April 1 to December 31, 1914.

Climatic Conditions.—Precipitation at section similar to Invermere. (See Toby Creek.) Summers hot and dry. Winters severe, as low as—40°F., with light snowfall. Frazil ice.

Gauge.—Vertical staff gauge, near Mason's cabin, about 1½ miles below measuring section. Gauge is read by Mr. Octave Mason.

Channel.—Rocky above and below section. Not liable to shift.

Discharge Measurements.—Six measurements, one of which was high water, were made from the highway bridge in 1914.

Co-operation.—This station was maintained in 1914 by co-operation between the British Columbia Hydrographic Survey and the Provincial Water Rights Branch.

Accuracy.—The result should be within 20 per cent.

General.—Findlay creek rises on the easterly slope of the Selkirk mountains, and flows into Kootenay river about 3 miles south of Canal Flats. Findlay creek drains an area of about 320 square miles. Up to the present this creek has been used for lumbering and placer mining.

Discharge Measurements of Findlay Creek at Canal Flats, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 24	O. J. B. (Prov.)			104·0	2·81	0·89	294·0
1914							
April 13	O. J. B. (Prov.)			84·9	2·56	0·72	211·0
June 18	J. A. Elliott	1909	59	374·8	10·52	6·20	3,940·0
Aug. 1	"	1909	49	184·0	5·77	2·70	1,060·0
Sept. 23	O. J. B. (Prov.)			107·4	2·90	1·09	314·0
Oct. 20	J. A. E.	1909	44	105·3	3·11	0·9	327·0

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Findlay Creek near Canal Flats, B.C., for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge..
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·3	860	2·1	760	2·8	1,120
2	2·3	860	2·2	810	3·6	1,640
3	2·2	810	2·0	710	4·2	2,100
4	2·2	810	1·7	580	5·2	2,970
5	2·1	760	1·5	500	4·8	2,610
6	2·1	760	1·5	500	4·4	2,260
7	2·1	760	1·6	540	3·8	1,770
8	2·1	760	1·7	580	3·2	1,370
9	2·1	760	2·0	710	2·8	1,120
10	1·0	348	2·1	760	2·8	1,120
11	1·0	348	2·2	810	3·1	1,300
12	.....	327	2·1	760	3·4	1,510
13	0·8	306	2·2	810	3·6	1,640
14	0·8	306	2·7	1,060	4·6	2,430
15	0·9	325	3·3	1,440	4·9	2,700
16	0·9	325	3·8	1,770	5·7	3,460
17	0·8	306	3·5	1,570	5·4	3,160
18	0·7	288	3·4	1,510	6·2	3,950
19	1·1	372	3·3	1,440	5·6	3,360
20	1·2	400	3·0	1,240	4·8	2,610
21	0·8	306	3·0	1,240	4·1	2,010
22	0·8	306	3·0	1,240	3·4	1,510
23	0·8	306	3·0	1,240	3·1	1,300
24	0·8	306	3·3	1,440	2·9	1,180
25	0·8	306	3·5	1,570	3·4	1,510
26	0·7	288	3·2	1,370	3·7	1,700
27	0·7	288	2·8	1,120	3·6	1,640
28	0·8	306	2·6	1,010	3·6	1,640
29	0·8	306	2·4	910	3·6	1,640
30	0·8	306	2·4	910	3·8	1,770
31	.....	.....	.....	1,015	.....	.....

Daily Gauge Height and Discharge of Findlay Creek near Canal Flats, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·6	3,360	2·8	1,120	1·2	400	0·9	325	0·9	325	0·5	252
2	4·6	2,430	.....	1,080	1·4	460	0·9	325	0·7	288	0·5	252
3	5·0	2,790	.....	1,040	1·3	430	0·9	325	0·7	288	0·5	252
4	4·8	2,610	.....	1,000	1·4	460	0·9	325	0·7	288	0·5	252
5	5·4	3,160	.....	970	1·2	400	0·8	306	0·7	288	0·5	252
6	5·0	2,790	.....	940	.....	390	0·9	325	0·8	306	0·5	252
7	4·7	2,520	.....	900	.....	380	0·9	325	0·8	306	0·5	252
8	4·2	2,100	.....	860	.....	370	0·9	325	0·6	270	0·5	252
9	4·4	2,260	.....	830	.....	360	0·9	325	0·6	270	0·5	252
10	4·1	2,010	.....	800	.....	350	0·9	325	0·6	270	0·5	252
11	3·9	1,850	.....	770	.....	340	0·8	306	0·7	288	0·5	252
12	4·4	2,260	.....	740	0·9	325	0·8	306	0·6	270	0·5	252
13	4·3	2,180	.....	710	0·8	306	0·8	306	0·5	252	0·5	252
14	4·8	2,610	.....	680	0·7	288	0·8	306	0·5	252	0·5	252
15	4·7	2,520	.....	650	0·8	306	0·8	306	0·6	270	0·5	252
16	3·7	1,700	1·8	620	0·8	306	0·8	306	0·6	270	0·5	252
17	3·3	1,440	1·9	660	1·2	400	0·9	325	0·7	288	0·4	238
18	3·3	1,440	1·4	460	2·0	710	0·9	325	0·6	270	0·4	238
19	3·4	1,510	1·7	580	1·8	620	0·9	325	0·6	270	0·4	238
20	3·8	1,770	.....	620	1·4	460	0·7	288	0·6	270	0·4	238
21	3·2	1,370	1·9	660	1·2	400	0·7	288	0·6	270	0·4	238
22	2·4	910	1·7	580	1·0	348	0·7	288	0·6	270	0·4	238
23	2·4	910	1·4	460	0·9	325	0·6	270	0·6	270	0·4	238
24	2·7	1,060	1·4	460	1·1	372	0·6	270	0·6	270	0·4	238
25	2·6	1,010	1·2	400	1·0	348	0·6	270	0·6	270	0·4	238
26	2·6	1,010	1·0	348	.....	374	0·6	270	0·7	288	0·4	238
27	2·5	960	1·4	460	1·2	400	0·6	270	0·5	252	0·6	238
28	2·6	1,010	1·4	460	1·2	400	0·6	270	0·5	252	0·4	238
29	2·6	1,010	1·5	500	1·1	372	0·6	270	0·5	252	0·4	238
30	2·4	910	1·6	540	1·0	348	0·8	306	0·5	252	0·4	238
31	2·6	1,010	1·4	460	.....	.....	0·7	288	.....	.....	0·4	238

Monthly Discharge of Findlay Creek at Canal Flats, for 1914.

(Drainage Area, 320 square miles).

Month.	Discharge in Second-Feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	860	288	461	1·44	1·61	27,400
May	1,770	500	1,030	3·22	3·71	63,360
June	3,950	1,120	2,000	6·25	6·97	119,000
July	3,360	910	1,820	5·68	6·55	112,000
August	1,120	400	688	2·15	2·48	42,300
September	710	288	392	1·23	1·37	23,300
October	325	270	303	0·95	1·10	18,600
November	325	252	275	0·86	0·96	16,400
December	252	.....	245	0·77	0·89	15,100

Accuracy "D."

Horsethief Creek near Wilmer (3008).

Location.—On the east slope of the Selkirk mountains, on traffic bridge, 4 miles from Wilmer, and 1 mile from the mouth. Revelstoke district.

Records Available.—Open season, 1912-13-14; ice measurements, November, 1913, 147 c.f.s.

Climatic Conditions.—The precipitation at the mouth is similar to Wilmer, which, from December 1, 1913, to November 30, 1914, was 15.5 inches, of which about 3 feet was snow. The summers generally are hot in the days and cool in nights. The winters are severe, as low as −40° F., some seasons. Frazil ice is evident.

Gauge.—Vertical staff gauge, referred to three bench-marks, nailed to one bridge abutment. Capt. Ch. de Crespigny reads the gauge three times a week.

Channel.—The measuring section is not a desirable one. The control does not appear permanent, and there may be a backwater effect from the Columbia. Accurate measurements may not be obtained.

Discharge Measurements.—Meterings are taken from the bridge. Four measurements were made in 1912, and nine in 1913, and four in 1914.

Accuracy.—A big shift occurred in the early part of July, which made it impossible to publish results after July 15. The results before July 15 cannot be guaranteed.

Discharge Measurements of Horsethief Creek near Wilmer, B.C., for 1914.

(Drainage Area, 170 square miles.)

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 4	D. O'B. G.	1048	85	166	2·17	1·55	361[1]
June 19	J. A. E.	1909	101	335	7·47	2·65	2,500
Aug. 2	"	1909	89	288	6·41	1·85	1,810[1]
Oct. 21	"	1909	62	51·1	4·49	0·9	230

[1]Flow in older channel affects gauge. Old gauge 0·5. Reading is no use.

Daily Gauge Height and Discharge of Horsethief Creek near Wilmer, B.C., for 1914.

Day.	April.		May.		June.		July.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	.....	135	1·5	385	.....	1,100	.....	1,650
2	0·8	135	.....	400	.....	1,400	.....	1,990
3.	.....	135	.....	420	.....	1,710	2·6	2,320
4	3·35	135	.....	440	2·5	2,020	.....	2,550
5.	0·8	135	1·6	460	2·2	1,320	.....	2,770
6	.....	140	1·6	460	.....	1,140	2·8	3,000
7.	.....	145	.....	460	2·0	950	2·9	3,400
8.	0·9	150	1·6	460	.....	870	.....	3,400
9.	.....	158	.....	480	1·9	790	2·9	3,400
10.	.....	167	.....	500	.....	840	.....	3,550
11.	1·0	175	.....	520	.....	900	.....	3,700
12.	.....	175	1·7	540	2·0	950	3·0	3,850
13.	.....	175	.....	540	.....	1,200	2·9	3,400
14.	1·0	175	.....	540	.....	1,540	2·7	2,650
15.	.....	225	1·7	540	.....	1,880	.....	2,090
16.	.....	275	.....	745	2·6	2,320	.....	.....
17.	1·4	325	2·0	950	.....	2,320	.....	.....
18.	.....	325	2·0	950	2·6	2,320	.....	.....
19.	.....	325	2·0	950	.....	2,070	.....	.....
20.	.....	325	.....	910	.....	1,820	.....	.....
21.	.....	325	.....	870	.....	1,570	.....	.....
22.	.....	325	.....	830	2·2	1,320	.....	.....
23.	1·4	325	1·9	790	.....	1,270	.....	.....
24.	....	325	.....	870	.....	1,220	.....	.....
25.	.....	325	2·0	950	.....	1,170	.....	.....
26.	.....	325	1·95	870	2·1	1,120	.....	.....
27.	1·4	325	1·9	790	.....	1,120	.....	.....
28.	.....	325	.....	720	.....	1,120	.....	.....
29	.....	325	1·8	650	2·1	1,120	.....	.....
30.	.....	385	.....	720	2·2	1,320	.....	.....
31.	.....	.....	1·9	790	.....	.....	.....	.....

Monthly Discharge of Horsethief Creek near Wilmer, B.C., for 1914.

(Drainage area 170 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	385	135	240	1·41	1·57	14,300
May	950	385	650	3·85	4·44	40,000
June	2,320	790	1,390	8·20	9·15	82,700

Hospital Creek (Weir) (3053).

Location.—At dam above intake of old smelter flume, 1½ miles from Golden. Revelstoke district.

Records Available.—October to November, 1914. See miscellaneous measurments.

Climatic Conditions.—Similar to Golden. See Columbia river near Golden.

Weir.—Ten-foot Cippoletti weir.

Accuracy.—Readings are only made once a week by Mr. K. C. Robertson. Accuracy, 20 per cent.

Co-operation.—The weir was established by Mr. O. J. Bergoust, Provincial Water Rights Branch. Mr. Bergoust kindly sends us copies of gauge readings.

General.—Hospital creek is a small stream flowing into Columbia river, a mile below Golden. Its only importance is in relation to its being a possible source of a water supply for Golden.

Daily Gauge Height and Discharge of Hospital Creek, near Golden, for 1914.

Day.	October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge.
	Inches.	Sec.-ft.	Inches.	Sec.-ft.	Inches.	Sec.-ft.
1	.....	8·38	3·85	6·12	.....	3·36
2	.....	8·38	.....	5·92	.....	3·33
3	.....	8·38	.....	5·73	.....	3·30
4	.....	8·38	.....	5·53	.....	3·26
5	.....	8·38	.....	5·33	.....	3·32
6	4·75	8·38	.....	5·14	2·5	3·19
7	.....	8·10	.....	4·94	.....	.....
8	.....	7·90	3·25	4·74	.....	.....
9	.....	7·60	.....	4·52	.....	.....
10	.....	7·30	.....	4·30	.....	.....
11	4·25	7·08	.....	4·07	.....	.....
12	.....	7·03	.....	3·85	.....	.....
13	.....	6·99	.....	3·63	.....	.....
14	.....	6·95	.....	3·41	.....	.....
15	.....	6·91	2·5	3·19	.....	.....
16	.....	6·87	.....	3·30	.....	.....
17	.....	6·83	.....	3·40	.....	.....
18	4·12	6·79	.....	3·50	.....	.....
19	.....	6·66	.....	3·60	.....	.....
20	.....	6·53	.....	3·70	.....	.....
21	.....	6·40	.....	3·80	.....	.....
22	.....	6·27	2·85	3·90	.....	.....
23	.....	6·14	.....	3·83	.....	.....
24	.....	6·01	.....	3·76	.....	.....
25	3·75	5·88	.....	3·70	.....	.....
26	.....	5·91	.....	3·63	.....	.....
27	.....	5·95	.....	3·56	.....	.....
28	.....	5·98	.....	3·49	.....	.....
29	.....	6·02	2·62	3·42	.....	.....
30	.....	6·05	.....	3·39	.....	.....
31	.....	6·09	.....	.....	.....	.....

Monthly Discharge of Hospital Creek, at Golden, B.C., for 1914.

(Drainage area, 18 square miles.)

Month.	Discharge in Second-Feet.				Run-Off	
	Maximum	Minimum.	Mean	Per square mile	Depth in inches on Drainage area.	Total in acre-feet
October	8·38	5·88	7·00	0·39	0·45	430
November	6·12	3·19	4·15	0·23	0·26	247

Illecillewaet River, near Glacier (3010.)

Location.—In township 26, range 26, west 5, at the foot-bridge immediately above the railway bridge, 200 yards from C.P.R. hotel, Glacier. Revelstoke district.

Records Available.—June to December, 1913; open season, 1914.

Climatic Conditions.—The precipitation from December 1, 1913 to November 30, 1914, was 56·2 inches. The snowfall during that period was about 30 feet. The maximum snowfall since 1880, as recorded by the C.P.R., occurred in the winter of 1912–13, when 45 feet 1 inch of snow fell. The winters are not very severe, being slightly colder than Revelstoke. Frazil ice is to be contended with. The summers are short and the thermometer seldom goes over 85° F.

Gauge.—Vertical staff, marked in feet and inches, was used till November, when it was replaced by an enamel gauge marked in feet and tenths.

Channel.—The bed is rocky, and, during freshet, the water is very swift. The control appears permanent.

Discharge Measurements.—Twelve were made in 1913, and five in 1914, from foot-bridge near hotel.

Accuracy.—These results, though probably within 20 per cent, are not guaranteed.

Discharge Measurements of Illecillewaet River near Glacier, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 10.....	J. A. E.....	1909	36	35	4·29	0·85	150
July 25.....	do	1909	34	52·2	4·39	1·20	229
Sept. 9.....	do	1927	34	35·2	3·50	0·97	123
Oct. 12.....	do	1909	29	19·95	1·75	0·49	35
Nov. 19.....	do	1909	16	10·5	2·64	0·3	27·7[1]

[1]New gauge. (See notes).

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Illecillewaet River, near Glacier, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·23	168	2·06	443
2			1·31	188	2·56	693
3			1·31	188	2·56	693
4			1·23	168	1·23	168
5			1·06	132	1·06	132
6			1·06	132	1·06	132
7			1·14	148	1·06	132
8			1·31	188	0·98	117
9			1·39	210	0·89	101
10			1·39	210	1·06	132
11			1·48	235	1·06	132
12	0·64	65	1·64	285	1·39	210
13	0·73	77	1·81	344	1·48	235
14	0·64	65	1·81	344	1·48	235
15	0·64	65	1·81	344	1·89	373
16	0·64	65	1·81	344	1·89	373
17	0·64	65	1·73	315	1·98	409
18	0·64	65	1·73	315	1·73	315
19	0·73	77	1·73	315	1·48	235
20	0·64	65	1·73	315	1·23	168
21	0·64	65	1·81	344	1·23	168
22	0·64	65	1·81	344	1·23	168
23	0·64	65	1·81	344	0·98	117
24	0·73	77	1·89	373	0·98	117
25	0·73	77	1·81	344	1·06	132
26	0·73	77	1·56	260	1·14	148
27	0·81	89	1·39	210	1·14	148
28	0·81	89	1·39	210	1·31	188
29	1·06	132	1·31	188	1·48	235
30	1·06	132	1·56	260	1·73	315
31			1·81	344		

DAILY GAUGE HEIGHT AND DISCHARGE of Illecillewaet River, near Glacier, for 1914.—*Concluded.*

DAY.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·89	373	2·48	649	1·64	285	0·64	65	.....	48	0·26	29
2	2·06	443	2·48	649	1·56	260	0·56	56	.....	48	0·26	29
3	2·31	560	2·31	560	1·64	285	0·39	39	.....	48	0·26	29
4	2·23	520	2·06	443	1·56	260	0·64	65	.....	47	0·26	29
5	2·23	520	2·31	560	1·23	168	0·56	56	.....	46	0·26	29
6	2·31	560	2·23	520	1·48	235	0·56	56	.....	45	0·26	29
7	2·06	443	2·06	443	1·64	285	0·64	65	.....	44	0·26	29
8	1·98	409	1·48	235	1·23	168	0·64	65	.....	43	0·26	29
9	2·06	443	1·48	235	0·98	117	0·56	56	.....	42	.....	29
10	2·31	560	1·56	260	0·98	117	0·56	56	.....	41	.....	29
11	2·39	602	1·56	260	0·98	117	0·48	48	.....	40	.....	29
12	2·39	602	1·39	210	1·06	132	0·56	56	.....	40	.....	29
13	2·39	602	1·23	168	0·73	77	0·56	56	.....	39	.....	29
14	2·23	520	1·48	235	0·73	77	0·64	65	.....	39	.....	29
15	1·89	373	1·64	285	0·64	65	0·81	89	0·39	39	.....	29
16	1·48	235	1·64	285	0·56	56	0·73	77	0·39	39	.....	29
17	1·73	315	1·73	315	0·73	77	0·64	65	0·39	39	.....	29
18	2·23	520	1·73	315	1·06	132	0·64	65	0·39	39	.....	29
19	2·06	443	1·64	285	0·81	89	0·56	56	0·36	37	.....	29
20	1·73	315	1·64	285	0·56	56	0·56	56	0·36	37	.....	29
21	1·48	235	1·73	315	0·56	56	0·39	39	0·36	37	0·26	29
22	1·48	235	1·56	260	0·64	65	0·39	39	0·36	37	0·26	29
23	1·48	235	1·56	260	0·64	65	0·39	39	0·36	37	0·21	26
24	1·39	210	1·64	285	0·98	117	0·39	39	0·36	37	0·26	29
25	1·39	210	1·73	315	1·06	132	0·39	39	0·36	37	0·21	26
26	1·31	188	1·56	260	0·89	101	0·39	39	0·36	37	0·26	29
27	1·31	188	1·56	260	0·89	101	0·48	48	0·31	33	0·26	29
28	1·89	373	1·64	285	0·56	56	0·48	48	0·31	33	0·21	26
29	1·89	373	1·64	285	0·56	56	0·39	39	0·31	33	0·21	26
30	2·31	560	1·64	285	0·64	65	0·39	39	0·26	29	0·16	23
31	2·48	649	1·64	285	.....	.....	0·48	48	.....	.....	0·16	23

MONTHLY DISCHARGE of Illecillewaet River, near Glacier, for 1914.

MONTH.	DISCHARGE IN SECOND-FEET.		
	Maximum.	Minimum.	Mean.
May	373	132	262
June	693	101	238
July	649	188	413
August	649	168	332
September	285	56	130
October	89	39	53·8
November	48	29	38·3
December	29	23	28·2

ILLECILLEWAET RIVER NEAR REVELSTOKE (3009).

Location.—This station is located within 1 mile of the city of Revelstoke, and 1 mile from the mouth of the river; the gauge is located on traffic bridge in SW. ¼ section 26, township 23, range 2, west 6th ; the measuring section is located on traffic bridge in NE. ¼ section 22, township 23, range 2, west 6th.

Records Available.—October to December, 1911; May to December, 1912; April to November, 1913; March to November, 1914; Ice measurement, on February 27th, 1912, gave discharge of 197 c.f.s.; on January, 7th, 1914, gave 500 c.f.s.

Gauge.—A chain gauge, referred to two bench-marks, is used and read by Miss S. Moran of Revelstoke.

Channel.—Measuring section is half a mile below gauge. The section at the gauge is very fast in high water, and at the measuring section there is a possibility of backwater from the Columbia during high water. The control at the gauge appears permanent.

Discharge Measurements.—Fourteen measurements were made in 1914, and a new curve was plotted.

Accuracy.—All measurements made this year are less than 10 per cent off the curve. Daily gauge readings are obtained but the chain gauge gives some trouble to the reader. The results should be within 15 per cent.

Climatic Conditions.—At Revelstoke the precipitation from December 1, 1913, to November 30, 1914, was approximately 40·5 inches. The snowfall was approximately 10 feet (C.P.R. records), and the precipitation during the months December to March was 18 inches, practically all of which would be snow at higher altitudes. The winters are not very severe, seldom below 10° F. Frazil ice may be expected. The summers are very hot, sometimes 95° and 100° F.

DISCHARGE MEASUREMENTS of Illecillewaet River, near Revelstoke, B.C., for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 17	C. E. Webb	1,048	120	299·5	1·61	1·57	478
May 18	J. A. Elliott	1,672	122	704	5·21	4·80	3,670
June 9	"	1,909	123	661	5·25	4·70	3,450
" 26	"	1,909	137	820	6·33	5·70	5,190
July 25	"	1,909	136	763	4·63	4·50	3,540
Aug. 11	"	1,909	125	556	3·71	3·75	2,060[1]
" 11	"	1,909	92	658	3·87	3·75	2,500[2]
Sept 5	C. E. R., J. A. E	1,927	130	506	3·57	3·24	1,800[1]
Oct 9	J. F. E	1,909	118	364	2·50	2·38	910
Sept 5	J. A. P., C. E. R	1,927	107	682	3·04	3·39	2,080[2]
Oct 26	R. G. S., G. E. W		147	325	2·49	1·95	809
" 9	J. A. E.	1,9 9	87	482	2·16	2·49	1,040[2]
" 26	"	1,9.9	95	400	1·76	1·95	705[2]
Nov. 17	"	1,9.9	115	316	2·27	1·73	718

[1] At regular measuring section.
[2] At gauge section

Daily Gauge Height and Discharge of Illecillewaet River, near Revelstoke, for 1914.

Day.	March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		400	1·7	520	3·8	2,460	5·2	4,350
2		400	1·6	460	4·35	3,140	5·85	5,360
3		400	1·5	400	4·7	3,620	6·75	6,900
4		400	1·5	400	4·75	3,690	6·30	6,120
5		400	2·1	790	4·8	3,760	5·60	4,960
6	1·6	460	2·3	935	4·8	3,760	5·00	4,050
7	1·6	460	2·8	1,370	4·7	3,620	4·80	3,760
8	1·6	460	2·85	1,420	4·5	3,340	4·5	3,340
9	1·5	400	2·95	1,520	4·5	3,340	4·7	3,620
10	1·6	460	3·0	1,570	4·4	3,210	5·35	4,580
11	1·5	400	2·7	1,270	4·2	2,950	5·35	4,580
12	2·3	935	2·95	1,520	4·2	2,950	5·6	4,960
13	1·6	460	3·2	1,770	5·05	4,120	5·9	5,450
14	1·6	460	3·4	1,990	5·2	4,350	6·50	6,460
15	2·0	720	3·4	1,990	5·25	4,420	6·50	6,460
16	2·9	1,470	3·4	1,990	5·10	4,200	6·60	6,630
17	1·8	585	3·35	1,940	5·05	4,120	6·70	6,810
18	1·65	490	3·5	2,100	4·75	3,690	6·70	6,810
19	1·75	552	3·2	1,770	4·85	3,830	6·40	6,290
20	1·85	618	3·1	1,670	4·65	3,550	6·30	6,120
21	1·85	618	3·1	1,670	5·1	4,200	5·50	4,800
22	1·8	585	3·1	1,670	5·25	4,425	4·95	3,980
23	1·8	585	3·1	1,670	5·5	4,800	4·70	3,620
24	1·7	520	3·2	1,770	5·55	4,880	4·60	3,480
25	1·7	520	3·35	1,940	5·50	4,800	4·70	3,620
26	1·7	520	3·35	1,940	5·20	4,350	5·70	5,120
27	1·7	520	3·45	2,040	5·00	4,050	5·50	4,800
28	1·7	520	3·45	2,040	4·80	3,760	5·50	4,800
29	1·7	520	3·5	2,100	4·45	3,280	5·50	4,800
30	1·7	520	3·65	2,280	4·15	3,880	5·90	5,450
31	1·7	520			4·50	3,340		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Illecillewaet River, near Revelstoke, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·9	5,450	4·9	3,900	3·40	1,990	2·9	1,470	2·4	1,010	1·30	290
2	6·45	6,380	4·75	3,690	3·25	1,820	2·8	1,370	2·4	1,010	1·40	340
3	6·8	6,990	5·05	4,120	3·25	1,820	2·6	1,180	2·2	860	1·40	340
4	6·9	7,170	4·6	3,480	3·45	2,040	2·40	1,010	2·4	1,010	1·50	400
5	6·95	7,260	4·6	3,480	3·70	2,340	2·30	935	2·4	1,010	1·40	340
6	6·5	6,460	4·6	3,480	3·45	2,040	2·25	900	2·15	825	1·6	460
7	6·25	6,040	4·4	3,210	3·25	1,820	2·20	860	2·2	860	1·6	460
8	5·75	5,200	3·65	2,280	3·40	1,990	2·30	935	2·4	1,010	Frozen	
9	5·8	5,280	3·4	1,990	2·90	1,470	2·25	900	2·2	860		
10	5·95	5,540	3·6	2,220	2·70	1,270	2·30	935	2·1	790		
11	6·25	6,040	3·8	2,460	2·65	1,220	2·2	860	2·00	720		
12	6·4	6,290	4·0	2,700	2·70	1,270	2·2	860	2·00	720		
13	6·3	6,120	4·25	3,020	2·40	1,010	2·1	790	2·00	720		
14	6·4	6,290	4·0	2,700	2·30	935	2·1	790	1·90	650		
15	6·7	6,810	4·1	2,820	2·10	790	2·2	860	1·70	520		
16	5·4	4,650	4·05	2,760	2·10	790	2·1	790	1·90	650		
17	5·05	4,120	3·85	2,520	1·90	650	2·5	1,090	1·70	520		
18	5·3	4,500	4·05	2,760	2·50	1,090	2·3	935	1·70	520		
19	5·35	4,580	4·05	2,760	2·50	1,090	2·2	860	1·70	520		
20	5·45	4,720	3·90	2,580	2·10	790	2·1	790	1·90	650		
21	5·2	4,350	4·10	2,820	2·35	970	2·25	898	1·80	585		
22	4·45	3,280	4·10	2,820	2·40	1,010	2·1	790	1·80	585		
23	4·15	2,880	4·10	2,820	2·40	1,010	2·0	720	1·30	290		
24	4·4	3,210	3·55	2,160	2·65	1,220	2·1	790	1·65	490		
25	4·5	3,340	3·80	2,460	2·7	1,270	2·0	720	1·80	585		
26	4·1	2,820	3·90	2,580	2·9	1,470	1·7	520	1·90	650		
27	4·1	2,820	3·95	2,640	2·9	1,470	1·8	585	1·80	585		
28	4·15	2,880	3·80	2,460	2·9	1,470	1·8	585	1·80	585		
29	4·5	3,340	3·45	2,040	2·8	1,370	1·7	520	1·70	520		
30	4·5	3,340	3·50	2,100	2·5	1,090	1·7	520	1·70	520		
31	4·75	3,690	3·45	2,040			2·4	1,010				

Monthly Discharge of Illecillewaet River, near Revelstoke, for 1914.

(Drainage area, 480 square miles.)

Month	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
March	1,470		545	1·13	1·30	33,500	
April	2,280	400	1,550	3·23	3·60	92,200	C
May	4,880	2,460	3,790	7·90	9·11	233,000	B
June	6,900	3,340	5,100	10·6	11·8	303,000	B
July	7,260	2,820	4,900	10·2	11·8	303,000	B
August	4,120	1,990	2,770	5·77	6·65	170,000	B
September	2,340	650	1,350	2·81	3·14	80,300	B
October	1,470	520	867	1·80	2·08	53,300	B
November	1,010	290	694	1·45	1·62	41,300	B

Incomappleux River near Beaton (also called Fish Creek) (3030).

Location.—Immediately outside the southern limit of the Railway Belt, 2 miles from the mouth, near Beaton, on the northeast arm, Arrow lakes, Revelstoke district.

Records Available.—May to December, 1914.

Climatic Conditions.—The precipitation is similar at the mouth to that of Revelstoke. The snowfall is very heavy in the hills. The river is glacial fed. The winters are not very severe, as low as 10° F. Frazil ice may be expected. The summers are hot.

Gauge.—A chain gauge located near his ranch is read daily by Mr. Jas. Burbridge.

Channel.—At the gauge the water is fast, the control has not been studied. The measuring section is satisfactory.

Discharge Measurements.—Six well-distributed measurements were made in 1914.

Accuracy.—The measurements should be fairly accurate, the gauge readings are daily but the gauge is not very reliable.

General.—The Incomappleux river is a stream about 42 miles long. It has its source in the Selkirks behind Glacier, from mountains 8,000 to 10,000 feet high. It flows through a heavily timbered country in which extensive limits are held by the Arrow Lake Lumber Company and the Dominion Saw-mills. There is practically no agricultural land in the whole valley. There are several mining claims, particularly around Cambourne, about 5 miles from the mouth. The stream is swift, from 50 to 100 feet wide, and from 3 feet to 10 feet in depth. The river is not navigable, but is suitable for logging purposes.

Incomappleux River.

General Power Possibilities.—There is a canyon on this river about 22 miles from the mouth. This canyon is about 3,000 feet long, and in it there is a fall of 100 feet. The width varies from 60 to 100 feet at the bottom, and the walls, which are of a broken rock formation, are high and steep.

There is very little natural storage, so, for a large development, artificial storage is required. By installing a very high dam (200 to 400 ft.) at a point in the canyon where the desired rock formation may be obtained, water could be penned back over a large flat on which lies the old townsite of Camborne. With a head of 300 feet and this storage, a probable 24-hour, 12-months development of 30,000 H.P. could be obtained. This would be an expensive installation.

Small summer industrial power of from 100 to 300 H.P. may be obtained on the following tributaries:—

Sable creek
Pool creek
Lexington creek
Boyd creek

The flow in each case is small but high heads may be obtained.

SESSIONAL PAPER No. 25e

Discharge Measurements of Incomappleux River, near Beaton, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 21	J./A. Elliott	1672	96	763	4·46	4·8	3,410
June 19	G./K. B.	1927	96	973	5·41	6·1	5,360
June 27	J. A. E.	1909	98	902	6·11	5·6	5,520
Sept. 4	"	1927	98	752	4·01	4·15	3,020
Oct. 27	"	1909	91	564	1·65	2·8	935
Nov. 20	"	1909	92	490	1·57	2·6	768

Fol. 847

Daily Gauge Height and Discharge of Incomappleux River, near Beaton, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			4·2	2,750	5·65	4,030
2			4·8	3,630	5·80	5,340
3			5·25	4,370	6·90	7,360
4			4·45	3,100	6·70	6,980
5			4·25	2,820	5·70	5,160
6			4·05	2,540	5·15	4,200
7			4·0	2,470	4·70	3,470
8			4·0	2,470	4·45	3,100
9			4·5	3,170	4·50	3,170
10			4·45	3,100	4·65	3,390
11			4·5	3,170	4·90	3,790
12			4·7	3,470	5·30	4,460
13			4·9	3,790	5·65	5,070
14			5·2	4,290	6·30	6,240
15			5·2	4,290	6·75	7,070
16			5·3	4,460	6·7	6,980
17			5·1	4,120	6·95	7,460
18			4·85	3,710	7·0	7,560
19			4·65	3,390	6·55	6,690
20			4·55	3,240	5·95	5,610
21	3·6	1,930	4·75	3,550	5·35	4,540
22	3·55	1,860	5·05	4,030	5·05	4,030
23	3·5	1,800	5·35	4,540	4·75	3,550
24	3·6	1,930	5·45	4,710	4·65	3,390
25	3·65	2,000	5·35	4,540	4·90	3,790
26	3·60	1,930	4·95	3,870	5·50	4,800
27	3·65	2,000	4·55	3,240	5·55	4,890
28	3·7	2,060	4·3	2,890	5·45	4,710
29	3·7	2,060	4·1	2,610	5·50	4,800
30	3·9	2,330	4·1	2,610	5·90	5,520
31			4·35	2,960		

Daily Gauge Height and Discharge of Incomappleux, River near Beaton, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	6·4	6,420	5·8	5,340	3·80	2,190	3·85	2,260	3·35	1,620	2·5	690
2	6·95	7,460	5·75	5,250	3·85	2,260	3·75	2,120	3·45	1,740	2·5	690
3	7·45	8,430	5·75	5,250	4·10	2,610	3·50	1,800	3·3	1,560	2·4	595
4	7·45	8,430	5·3	4,460	4·35	2,960	3·35	1,620	3·3	1,560	2·4	595
5	7·55	8,630	4·95	3,870	3·95	2,400	3·25	1,500	3·25	1,500	2·4	595
6	7·25	8,030	5·35	4,540	3·65	2,000	3·20	1,440	3·15	1,380	2·3	510
7	6·9	7,360	5·15	4,200	3·85	2,260	3·20	1,440	3·1	1,320	2·2	435
8	6·55	6,690	4·35	2,960	4·15	2,680	3·20	1,440	3·1	1,320	2·2	435
9	6·35	6,330	4·0	2,470	3·65	2,000	3·15	1,380	3·05	1,260	2·1	375
10	6·55	6,690	4·35	2,960	3·40	1,680	3·05	1,260	3·0	1,200	2·1	375
11	6·75	7,070	4·14	2,680	3·75	2,120	3·05	1,260	3·0	1,200	2·0	325
12	7·35	8,230	4·45	3,100	3·35	1,620	3·0	1,200	2·9	1,090	2·0	325
13	7·25	8,030	4·65	3,390	3·15	1,380	2·95	1,140	2·9	1,090	1·9	320
14	7·10	7,750	4·85	3,710	3·10	1,320	2·85	1,040	2·8	990	2·1	320
15	7·55	8,630	4·9	3,790	3·05	1,260	2·9	1,090	2·8	990	Frozen.	320
16	5·80	5,340	4·75	3,550	2·95	1,140	3·05	1,260	2·6	790		320
17	5·35	4,540	4·8	3,630	2·90	1,090	3·5	1,800	2·6	790		320
18	5·75	5,250	4·55	3,240	3·40	1,680	3·4	1,680	2·6	790		320
19	6·15	5,970	4·65	3,390	3·90	2,330	3·35	1,620	2·6	790		320
20	6·15	5,970	5·05	4,030	3·40	1,680	3·25	1,500	2·6	790		320
21	5·05	4,030	4·9	3,790	3·25	1,500	3·05	1,260	2·6	790		320
22	4·5	3,170	4·8	3,630	3·10	1,320	2·9	1,090	2·6	790		320
23	4·45	3,100	4·10	2,610	3·15	1,380	2·9	1,090	2·6	790		320
24	4·9	3,790	4·10	2,610	3·35	1,620	2·85	1,040	2·6	790		320
25	4·85	3,710	4·10	2,610	3·45	1,740	2·8	990	2·6	790		320
26	4·5	3,170	4·20	2,750	3·70	2,060	2·8	990	2·7	890		320
27	4·4	3,030	4·30	2,890	4·35	2,960	2·8	990	2·7	890		320
28	4·65	3,390	4·40	3,030	3·65	2,000	2·75	940	2·7	890		320
29	4·55	3,240	4·20	2,750	3·45	1,740	2·7	890	2·6	790		320
30	5·1	4,120	4·20	2,750	3·45	1,740	3·15	1,380	2·6	790		320
31	5·65	5,070	3·85	2,260			3·25	1,500				320

Monthly Discharge of Incomappleux River, near Beaton, for 1914.

(Drainage area 460 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	Accuracy.
May	4,710	2,470	3,480	7·56	8·72	214,000	B
June	7,560	3,100	5,040	10·9	12·2	300,000	C
July	8,630	3,030	5,840	12·7	14·6	359,000	C
August	5,340	2,260	3,470	7·54	8·69	213,000	B
September	2,960	1,090	1,890	4·10	4·57	112,000	B
October	2,260	890	1,360	2,96	3·41	83,600	B
November	1,740	790	1,060	2·30	2·57	63,100	B
December	690	.....	400	0·87	1·00	24,600	

Kicking Horse River near Golden (3011).

Location.—In NE. ¼, section 12, township 27, range 22, west 5th, on traffic bridge, in the town of Golden, Revelstoke district.

Records Available.—Open season, 1912, 1913, and 1914. Metering under ice conditions, February 22, 1912, 172 c.f.s. Metering under ice conditions February 28, 1914, 276 c.f.s.

Climatic Conditions.—The precipitation at Golden, from December 1, 1913, to November 30, 1914, amounted to about 14 inches. This may be considered lighter than usual. The snowfall was 3 or 4 feet. The summers are hot and quite dry, while the winters are very severe, the temperature, some seasons, going down to —50° F. for a night. Frazil ice will be found in the Kicking Horse at this point, as well as practically up to its source.

Gauge.—A vertical staff gauge is used, and read two or three times daily by Mr. W. Wenman, of Golden.

Channel.—Straight for 200 yards above and below the station. Control is a sand bar about 100 yards down stream from section.

Discharge Measurements.—Ten were made in 1911-12, five in 1913, and six in 1914.

Accuracy.—The channel has shifted slightly since 1913, and a new curve was plotted for 1914. The measurements are accurate, the curve only fair, and the gauge readings are very reliable. The results should be within 10 per cent.

DISCHARGE MEASUREMENTS of Kicking Horse River, near Golden, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Feb. 28	C. E. Webb	1,048	126	283·6	0·98		2,780[1]
June 11	J. A. E	1,909	180	644·0	5·51	4·25	3,550
July 28	"	1,909	155	605·0	5·12	4·10	3,100
Aug. 6	"	1,909	155	692·0	5·94	4·50	4,110
Sept. 11	"	1,927	98	391·0	3·30	2·9	1,290
Oct. 14	C. E. R	1,929	81	329·0	2·77	2·32	912

[1]Not very reliable. Frazil ice.

Daily Gauge Height and Discharge of Kicking Horse River, near Golden, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·58	1,040	4·15	3,350
2			2·85	1,280	4·70	4,630
3			3·2	1,660	5·50	6,620
4			2·95	1,380	5·85	7,570
5			2·75	1,200	5·25	5,990
6			2·65	1,100	4·85	4,990
7			2·6	1,060	4·50	4,150
8			2·65	1,100	4·30	3,680
9			2·95	1,380	4·20	3,460
10			3·07	1,510	4·15	3,350
11			3·17	1,620	4·30	3,680
12			3·2	1,660	4·60	4,390
13			3·4	1,950	4·90	5,110
14			3·65	2,360	5·25	5,990
15			4·0	3,030	5·55	6,750
16	1·9	550	4·2	3,460	5·85	7,570
17	1·92	563	4·15	3,350	6·17	8,510
18	1·78	474	4·02	3,070	6·05	8,150
19	1·95	582	3·83	2,690	5·9	7,710
20	2·05	648	3·8	2,630	5·45	6,500
21	1·9	550	3·67	2,390	5·0	5,350
22	2·02	628	3·75	2,540	4·7	4,630
23	1·91	556	4·05	3,130	4·25	3,570
24	2·1	680	4·25	3,570	4·0	3,030
25	2·02	628	4·35	3,800	4·15	3,350
26	2·0	615	4·1	3,240	4·57	4,330
27	2·0	615	3·85	2,720	4·4	3,910
28	2·0	615	3·7	2,440	4·52	4,200
29	2·08	667	3·6	2,270	4·65	4,510
30	2·21	762	3·4	1,950	4·90	5,110
31			3·65	2,360		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kicking Horse River, near Golden, for 1914—*Concluded*.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·3	6,120	4·61	4,410	3·65	2,360	3·08	1,520	2·0	615	1·60	370
2	5·67	7,070	4·61	4,410	3·70	2,440	3·05	1,480	2·05	647	1·60	370
3	5·8	7,430	4·75	4,750	3·70	2,440	2·90	1,330	2·0	615	1·80	485
4	5·97	7,910	4·55	4,270	3·80	2,630	2·90	1,330	2·0	615	1·68	418
5	5·9	7,710	4·35	3,800	3·60	2,270	2·79	1,230	2·0	615	1·52	330
6	5·9	7,710	4·5	4,150	3·20	1,660	2·60	1,060	1·95	582	1·62	382
7	5·7	7,150	4·55	4,270	3·37	1,900	2·60	1,060	1·9	550	1·56	350
8	5·4	6,370	3·97	2,970	3·51	2,120	2·50	980	1·87	530	1·4	280
9	5·3	6,120	3·75	2,540	3·15	1,600	2·75	1,200	1·9	550	Ice.	250
10	5·2	5,860	3·57	2,220	2·80	1,240	2·70	1,150	1·85	517	. . .	230
11	5·35	6,240	3·6	2,270	2·80	1,240	2·5	980	1·85	517	. . .	210
12	5·35	6,240	3·82	2,670	2·77	1,210	2·52	996	1·85	517	. .	200
13	5·75	7,290	4·02	3,070	2·57	1,040	2·4	900	1·8	485	. .	200
14	5·67	7,070	4·2	3,460	2·50	980	2·35	865	1·72	441	. . .	200
15	5·65	7,020	3·9	2,820	2·45	940	2·35	865	1·45	300	. .	200
16	5·07	5,520	3·94	2,900	2·40	900	2·35	865	1·14	185	. .	200
17	4·85	4,990	3·96	2,950	2·30	830	2·35	865	1·35	260	. .	200
18	4·95	5,230	3·9	2,820	2·45	940	2·35	865	1·5	320	. .	200
19	4·89	5,090	3·8	2,630	3·35	1,880	2·35	865	1·5	320	. .	200
20	5·2	5,860	4·1	3,240	2·85	1,280	2·35	865	1·5	320	. .	200
21	4·78	4,820	4·14	3,330	2·45	940	2·31	837	1·6	370	. . .	200
22	4·27	3,610	4·27	3,610	2·50	980	2·10	680	1·75	458	. .	200
23	4·05	3,140	4·00	3,030	2·50	980	2·10	680	1·75	458	. . .	200
24	4·25	3,570	3·75	2,540	2·52	996	2·07	660	1·75	458	. . .	200
25	4·27	3,610	3·50	2,100	2·70	1,150	2·02	628	1·67	412	. .	200
26	4·1	3,240	3·75	2,540	3·05	1,480	2·0	615	1·65	400	. . .	200
27	4·02	3,070	3·94	2,900	3·60	2,270	2·0	615	1·65	400	. . .	200
28	4·02	3,070	3·88	2,780	3·25	1,730	1·95	582	1·65	400	. . .	200
29	4·27	3,610	4·00	3,030	3·20	1,660	1·94	576	1·62	382	. .	200
30	4·25	3,570	3·88	2,780	2·95	1,380	1·92	563	1·62	382	. .	200
31	4·46	4,110	3·75	2,540	. . .	.	2·0	615				200

Monthly Discharge of Kicking Horse River, near Golden, for 1914.

(Drainage area, 700 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
May	3,800	1,040	2,220	3·17	3·66	136,000
June	8,510	3,030	5,140	7·34	8·19	306,000
July	7,910	3,070	5,460	7·80	8·99	336,000
August	4,750	2,100	3,160	4·51	5·20	194,000
September	2,630	830	1,480	2·11	2·35	88,100
October	1,520	563	914	1·30	1·50	56,200
November	647	185	454	0·65	0·72	27,000
December	485		248	0·35	0·40	15,200

Accuracy "B".

Kicking Horse River, near Field (3012).

Location.—In township 28, range 18, west 5th, below the mouth of Yoho river, on the first traffic bridge, 3¼ miles east of Field. Revelstoke district.

Records Available.—June to November, 1912 and 1913; June to December, 1914.

Climatic Conditions.—The precipitation at Field is considerably greater than at Golden, (see Kicking Horse, near Golden), but much less than at Glacier, (see Illecillewaet river, near Glacier). The summers are short, with some very hot days, and nights generally cool. The rainfall in the summer months varies greatly, but is generally much less in July and August than in June. The winters are cold, with occasional severe storms, as low as 50°F. some seasons. The river near Field is generally frozen for three or four months, and frazil ice is always to be contended with.

Gauge.—A chain gauge is used, and read three times a week by Mr. Alex. Stuart, of Field.

Channel.—The channel is straight for 50 yards above and below the station, the water is very swift during freshet, the control is fairly permanent, but shifted slightly in 1914.

Discharge Measurements.—Eight well-distributed measurements in 1912, eight in 1913, and five in 1914, were made from the traffic bridge above-mentioned.

Accuracy.—A slight shift in the channel was noted, but the 1912 curve was still used. The gauge is read only two or three times a week, and during the summer the data cannot be guaranteed within 20 per cent. Later in the fall the results should be within 15 per cent.

Discharge Measurements of Kicking Horse River, near Field, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 14	J. A. E.	1,909	72	218	6·41	5·6	1,410
Sept. 21	C. E. R.	1,927	55	116	2·35	4·10	272
Oct. 16	J. A. E.	1,909	52	103	1·93	3·65	199
Sept. 12	"	1,927	60	137	2·84	4·3	390
July 29	"	1,909	75	227	6·49	5·5	1,470

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kicking Horse River, near Field, for 1914.

Day.	June.	
	Gauge Height.	Discharge.
	Feet.	Sec.-ft.
1		1,820
2		1,880
3		1,940
4	6·0	1,940
5	6·10	2,100
6	6·0	1,940
7		1,880
8		1,820
9		1,760
10		1,700
11		1,650
12		1,590
13		1,530
14	5·7	1,470
15		1,745
16	6·15	2,180
17		2,120
18		2,080
19	6·05	2,020
20		1,510
21	5·45	1,110
22		838
23	4·9	560
24		580
25		600
26	5·0	625
27		668
28	5·1	710
29		1,090
30	5·7	1,470
31		

Daily Gauge Height and Discharge of Kicking Horse River, near Field, for 1914—(*Con.*)

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	1,860	.....	2,530	5·50	1,180	.....	260	3·4	140	3·1	110
2	6·2	2,260	6·45	2,660	5·50	1,180	.....	245	.....	135	.....	110
3	6·55	2,840	6·2	2,260	5·55	1,250	.....	230	3·3	130	3·1	110
4	6·6	2,920	6·3	2,420	5·50	1,180	2·90	215	.....	130	.....	110
5	6·45	2,660	.....	2,260	.....	1,020	3·90	215	3·3	130	.....	110
6	6·5	2,750	6·1	2,100	5·25	862	.....	215	3·3	130	.....	110
7	6·55	2,840	5·9	1,780	5·45	1,110	3·90	215	.....	130	.....	110
8	6·25	2,340	.....	1,352	.....	770	4·20	275	3·3	130	.....	110
9	6·25	2,340	5·3	925	4·65	425	4·15	265	.....	130	.....	110
10	6·3	2,420	.....	1,050	4·45	345	.....	240	3·3	130	.....	110
11	.....	2,700	5·5	1,180	4·40	330	.....	220	.....	125	.....	110
12	.....	2,980	5·6	1,320	.....	292	3·8	200	3·2	120	.....	110
13	6·8	3,260	.....	1,630	4·10	255	3·75	192	3·2	120	.....	110
14	6·8	3,260	6·0	1,940	4·55	380	.....	200	.....	130	.....	110
15	6·7	3,090	.....	1,700	.....	298	3·85	208	.....	139	.....	110
16	.....	2,680	5·7	1,470	3·90	215	3·8	200	3·45	148	.....	110
17	6·2	2,260	5·7	1,470	3·75	192	.....	192	.....	144	.....	110
18	.....	2,420	5·7	1,470	3·95	225	3·7	185	3·4	140	.....	110
19	6·4	2,580	.....	1,660	.....	220	.....	178	.....	135	.....	110
20	6·4	2,580	5·95	1,860	.....	214	3·6	170	3·3	130	.....	110
21	.....	1,950	5·9	1,780	3·85	208	.....	159	.....	125	.....	110
22	5·6	1,320	.....	1,620	3·80	200	3·45	148	3·2	120	.....	110
23	5·4	1,050	5·7	1,470	3·80	200	3·45	148	.....	115	.....	110
24	5·6	1,320	5·45	1,110	4·00	235	.....	148	3·1	110	.....	110
25	.....	1,250	5·55	1,250	4·20	275	3·45	148	.....	110	.....	110
26	5·5	1,180	.....	1,350	.....	290	3·40	140	3·1	110	3·1	110
27	5·5	1,180	.....	1,450	.....	300	.....	135	.....	110	3·0	100
28	5·5	1,180	5·75	1,550	4·35	315	.....	130	3·1	110	.....	100
29	5·8	1,620	.....	1,450	4·30	300	3·25	125	.....	110	3·0	100
30	6·2	2,260	.....	1,360	4·20	275	3·35	135	.....	110	.....	100
31	.....	2,400	.....	1,270	.....	.....	.....	138	.....	.....	.....	100

Monthly Discharge of Kicking Horse River at Field, for 1914.

(Drainage area, 130 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
June	2,180	560	1,500	11·5	12·8	89,300	.....
July	3,260	1,050	2,250	17·3	19·9	138,000	D
August	2,660	925	1,770	13·6	15·7	109,000	C
September	1,250	192	485	3·73	4·16	28,900	C
October	275	125	196	1·51	1·74	12,100	C
November	148	110	126	0·97	1·08	7,500	C
December	110	100	108	0·83	0·96	6,640	.....

Kicking Horse River near No. 2 Tunnel (3013).

Location.—In township 28, range 18, west 5th, above mouth of Yoho river, immediately above C.P.R. bridge over the Kicking Horse between Nos. 1 and 2 tunnels, 5 miles east of Field. Revelstoke district.

Records Available.—July to October, 1912; April, 1913, to December, 1914.

Climatic Conditions.—Similar to Field, with possibly a little more snow.

Gauge.—An enamel iron vertical staff gauge is used, and read twice daily by Mr. C. E. Hamilton, of Field. This gauge is situated immediately above C.P.R. bridge, between Nos. 1 and 2 tunnels.

Channel.—Channel is straight for 25 yards above and below the section. The control is not permanent.

Discharge Measurements.—Twelve measurements were made in 1912-13, and six in 1914. A shift occurred in 1914 and a new curve was plotted.

Accuracy.—The measuring section at high water is not very satisfactory. The control below the gauge is not permanent. The results, though probably within 20 to 25 per cent, are not guaranteed.

Discharge Measurements of Kicking Horse River, near No. 2 Tunnel, near Field, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 14	J. A. E.	1,909	23	69	5·84	3·40	[1]403
July 29	"	1,909	20	51·1	5·16	1·95	[1]264
Aug. 7	"	1,909	18	57·8	5·16	2·15	[1]300
Sept. 21	C. E. R.	1,927	57	39·2	2·76	1·20	[2]108
" 12	J. A. E.	1,927	14	28·6	3·19	1·20	[1]91·4
Oct. 16	"	1,909	14	27·2	3·08	0·95	[1]83·8

[1]From C. P. R. bridge.
[2]Wading, different section.

Daily Gauge Height and Discharge of Kicking Horse, River near No. 2 Tunnel, near Field, B.C., for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·8	23	0·8	23	0·7	15	0·7	15	1·4	90	2·25	216
2	0·8	23	0·8	23	0·7	15	0·7	15	1·4	90	2·55	266
2	0·8	23	0·8	23	0·7	15	0·7	15	..	103	3·50	440
4	0·8	23	0·8	23	0·7	15	0·7	15	1·6	116	3·65	469
5	0·8	23	0·8	23	0·7	15	0·7	15	1·5	103	3·10	365
6	0·8	23	0·8	23	0·7	15	0·7	15	1·5	103	2·8	2)
7	0·8	23	0·8	23	0·7	15	0·7	15	1·4	90	2·60	275
8	0·8	23	0·8	23	0·7	15	0·7	15	1·5	103	2·40	241
9	0·8	23	0·8	23	0·7	15	0·7	15	1·6	116	2·30	224
10	0·8	23	0·8	23	0·7	15	0·75	19	1·6	116	2·20	207
11	0·8	23	0·8	23	0·7	15	0·8	23	1·7	130	2·30	224
12	0·8	23	0·8	23	0·7	15	0·8	23	1·7	130	2·55	266
13	0·8	23	0·8	23	0·7	15	0·8	23	1·8	145	2·95	338
14	0·8	23	0·8	23	0·7	15	0·8	23	1·95	168	3·45	430
15	0·8	23	0·7	15	0·7	15	0·8	23	2·1	191	3·85	508
16	0·8	23	0·7	15	0·7	15	0·8	23	2·2	207	3·95	528
17	0·8	23	0·7	15	0·7	15	0·85	28	2·2	207	4·00	537
18	0·8	23	0·7	15	0·7	15	0·9	32	2·1	191	3·50	440
19	0·8	23	0·7	15	0·7	15	0·9	32	2·0	175	3·30	403
20	0·8	23	0·7	15	0·7	15	0·9	32	2·0	175	2·90	329
21	0·8	23	0·7	15	0·7	15	0·9	32	1·9	160	2·55	266
22	0·8	23	0·7	15	0·7	15	0·9	32	1·95	168	2·25	216
23	0·8	23	0·7	15	0·7	15	0·9	32	2·15	199	2·0	175
24	0·8	23	0·7	15	0·7	15	0·9	32	2·25	216	1·8	145
25	0·8	23	0·7	15	0·7	15	1·0	42	2·4	241	1·9	160
26	0·8	23	0·7	15	0·7	15	1·0	42	2·3	224	2·05	183
27	0·8	23	0·7	15	0·7	15	1·1	53	2·1	191	2·05	183
28	0·8	23	0·7	15	0·7	15	1·1	53	1·95	168	2·1	191
29	0·8	23	.....	.....	0·7	15	1·15	59	1·8	145	2·3	224
30	0·8	23	.....	.....	0·7	15	1·3	77	1·75	138	2·65	284
31	0·8	23	.....	.....	0·7	15	.....	.....	1·85	152	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kicking Horse River, near No. 2 Tunnel, Field, B.C., for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·05	356	2·25	328	1·55	166	1·40	138	0·7	40	0·6	
2	3·3	403	2·35	356	1·45	147	1·40	138	0·7	40	0·6	31
3	3·5	440	2·35	356	1·45	147	1·30	121	0·7	40	0·6	31
4	3·5	440	2·4	367	1·45	147	1·30	121	0·7	40	0·6	31
5	3·25	394	2·1	290	1·45	147	1·20	105	0·7	40	0·6	31
6	3·2	384	2·1	290	1·30	121	1·20	105	0·7	40	0·6	31
7	3·1	365	2·15	302	1·30	121	1·15	98	0·6	31	0·6	31
8	2·9	329	1·95	254	1·30	121	1·25	113	0·6	31	0·6	31
9	2·85	320	1·7	197	1·30	121	1·30	121	0·6	31	0·6	31
10	3·05	356	1·55	166	1·20	105	1·25	113	0·6	31	0·6	31
11	3·05	356	1·6	176	1·25	113	1·1	90	0·6	31	0·6	31
12	3·2	384	1·6	176	1·20	105	1·1	90	0·6	31	0·6	31
13	3·4	421	1·7	197	1·10	90	1·1	90	0·6	31	0·6	31
14	3·35	412	1·8	219	1·10	90	1·0	76	0·6	31	0·6	31
15	3·35	412	1·8	219	1·00	76	1·0	76	0·6	31	0·6	31
16	2·75	362	1·75	208	1·00	76	1·0	76	0·6	31	0·6	31
17	2·45	250	1·75	208	0·90	63	1·0	76	0·6	31	0·6	31
18	2·45	250	1·75	208	0·90	63	1·0	76	0·6	31	0·6	31
19	2·65	284	1·75	208	1·20	105	1·0	76	0·6	31	0·6	31
20	3·00	347	1·85	230	1·25	113	0·9	63	0·6	31	0·5	24
21	2·40	367	1·9	242	1·25	113	0·9	63	0·6	31	0·5	24
22	2·05	278	2·1	290	1·20	105	0·8	51	0·6	31	0·4	19
23	1·85	230	1·9	242	1·15	98	0·8	51	0·6	31	0·4	19
24	1·90	242	1·75	208	1·30	121	0·8	51	0·6	31	0·4	19
25	2·00	265	1·7	197	1·30	121	0·8	51	0·6	31	0·4	19
26	1·95	254	1·7	197	1·45	147	0·8	51	0·6	31	0·4	19
27	1·85	230	1·7	197	1·85	230	0·8	51	0·6	31	0·4	19
28	1·9	242	1·7	197	1·65	186	0·7	40	0·6	31	0·4	19
29	1·95	254	1·7	197	1·45	147	0·7	40	0·6	31	0·4	19
30	1·95	254	1·70	197	1·40	138	0·7	40	0·6	31	0·4	19
31	2·25	328	1·65	186			0·7	40			0·4	19

Monthly Discharge of Kicking Horse River, near Field, B.C., for 1914.

(Drainage area, 50 square miles.) No 2 Tunnel.

Month.	Discharge in Second-Feet				Run-Off	
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage area	Total in acre-feet
January	23	23	23·0	0·46	0·53	1,410
February	23	15	19·0	0·38	0·40	1,060
March	15	15	15·0	0·30	0·35	922
April	77	15	29·0	0·58	0·65	1,730
May	241	90	153·0	3·06	3·53	9,410
June	537	145	302	6·04	6·74	18,000
July	409	230	328	6·56	7·56	20,200
August	367	166	246	4·72	5·44	14,500
September	230	63	121	2·42	2·70	7,200
October	138	40	83·5	1·67	1·92	5,130
November	40	31	32·8	0·66	0·74	1,950
December	31	19	26·7	0·53	0·61	1,640

No. 2 Creek, near Forster's Landing (3015).

Location.—No. 2 creek flows easterly into Columbia river from the Selkirk range, about 6 miles from Wilmer. The gauging station is located about 1 mile from the mouth, on the highway bridge on road from Wilmer to Forster's Landing.

Records Available.—June to October, 1912; May to October, 1913; April to November, 1914.

Climatic Conditions.—The precipitation at the mouth is similar to that at Wilmer, which from December 1, 1913, to November 30, 1914, was 15.5 inches. The summers are hot, cool nights, and very dry, almost semi-arid. The winters are about four and one-half months long, and, at times, very severe. In 1911 the temperature was as low as −33°F. Frazil ice is prevalent.

Gauge.—A staff gauge is used, and read by Mrs. Colin Mackay of Morinish Ranch, Wilmer.

Channel.—Not satisfactory. Water swift and broken. A new station has been established at the bridge on the upper road which will be used in 1915.

Discharge Measurements.—Four measurements were made in 1914, and thirteen in 1912 and 1913.

Accuracy.—Due to the poor section the measurements are not guaranteed.

Discharge Measurements of No. 2 Creek, near Forsters' Landing, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 4	D.O.B.G.	1,048	35	69·8	5·25	0·25	366
June 19	J. A. E.	1,909	86·5	240	7·29	2·25	1,750
Aug 2	"	1,909	91·0	170	5·86	1·70	997
Oct. 22	"	1,909	33·0	79·2	2·07	1·0	161[1]

[1] New section.

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge at No. 2 Creek, near Forster's Landing, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	0·0	216	0·8	530
2	.....	.....	0·1	252	1·0	620
3	.....	.....	0·3	328	1·6	967
4	.....	.....	0·2	290	2·0	1,380
5	.....	.....	0·2	290	1·5	895
6	.....	.....	0·1	252	.....	760
7	.....	.....	0·2	290	1·0	620
8	.....	.....	0·1	252	·9	574
9	.....	.....	0·3	328	·8	530
10	.....	.....	0·3	328	·9	574
11	.....	.....	0·4	367	1·1	667
12	.....	.....	0·4	367	1·1	667
13	.....	.....	0·5	407	1·3	774
14	.....	.....	0·5	407	1·5	895
15	.....	.....	0·7	488	1·9	1,260
16	.....	.....	0·9	574	2·1	1,520
17	−0·2	145	0·8	530	2·4	1,980
18	−0·2	145	0·7	488	2·4	1,980
19	−0·2	145	0·7	488	2·0	1,380
20	−0·0	216	0·6	447	1·8	1,160
21	−0·1	180	0·6	447	1·6	967
22	−0·1	180	0·7	488	1·3	774
23	−0·1	180	0·7	488	1·1	667
24	−0·1	180	0·9	574	1·0	620
25	−0·1	180	1·0	620	1·3	774
26	−0·1	180	0·9	574	1·3	774
27	−0·1	180	0·7	488	1·3	774
28	−0·1	180	0·6	447	1·5	895
29	0·0	216	0·5	407	1·6	967
30	0·0	216	0·4	367	1·6	967
31	.....	.....	0·6	447	.....	.....

Daily Gauge Height and Discharge at No. 2 Creek, near Foster's Landing, for 1914.—*Concluded.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·7	1,060	1·7	1,060	0·7	488	0·3	328	0·1	252	.....	.....
2	2·0	1,380	1·7	1,060	0·7	488	0·25	309	0·2	290	.....	.....
3	2·3	1,820	1·8	1,160	0·8	530	0·2	290	.....	290	.....	.....
4	2·7	2,500	1·8	1,160	0·9	574	.....	290	0·2	290	.....	.....
5	2·75	2,590	1·5	895	0·8	530	.....	290	.....	270	.....	.....
6	3·0	3,040	1·4	830	0·6	447	0·2	290	0·1	252	.....	.....
7	2·4	1,980	1·9	1,260	0·7	488	0·2	290	0·1	252	.....	.....
8	2·2	1,670	1·3	774	0·8	530	.....	290	0·1	252	.....	.....
9	2·2	1,670	1·0	620	0·5	407	.....	290	0·0	216	.....	.....
10	2·1	1,520	1·0	620	0·5	407	.....	290	.....	216	.....	.....
11	2·1	1,520	1·1	667	0·5	407	0·2	290	.....	216	.....	.....
12	2·4	1,980	1·2	720	0·4	387	0·1	252	0·0	216	.....	.....
13	2·8	2,680	1·1	667	0·5	407	0·2	290	.....	216	.....	.....
14	2·9	2,860	1·1	667	0·3	328	0·2	290	.....	216	.....	.....
15	3·1	3,220	1·1	667	0·3	328	0·1	252	0·0	216	.....	.....
16	2·1	1,520	1·2	720	0·2	290	0·2	290	.....	216	.....	.....
17	2·0	1,380	1·0	620	0·4	367	0·2	290	0·0	216	.....	.....
18	2·0	1,380	1·0	620	0·8	530	0·2	290	0·0	216	.....	.....
19	2·0	1,380	1·05	646	0·4	367	0·2	290	.....	200	.....	.....
20	2·1	1,520	1·1	667	0·3	328	0·2	290	.....	200	.....	.....
21	1·8	1,160	1·0	620	0·3	328	0·1	252	.....	190	.....	.....
22	1·4	830	1·1	667	0·3	328	0·1	252	.....	180	.....	.....
23	1·4	830	0·9	574	0·3	328	0·1	252	.....	170	.....	.....
24	1·5	895	0·9	574	0·5	407	0·1	252	.....	160	.....	.....
25	1·5	895	0·8	530	0·5	407	0·1	252	.....	150	.....	.....
26	1·4	830	0·95	597	0·5	407	0·1	252	.....	145	.....	.....
27	1·4	830	0·9	574	0·5	407	0·1	252	.....	145	.....	.....
28	1·5	895	1·1	667	0·5	407	0·1	252	.....	145	.....	.....
29	1·4	830	0·9	574	0·5	407	0·1	252	.....	145	.....	.....
30	1·4	830	1·0	620	0·3	328	0·1	252	.....	145	.....	.....
31	1·7	1,060	0·8	530	.....	.....	0·2	290	.....	.....	.....	.....

Monthly Discharge of No. 2 Creek, near Forster's Landing, for 1914.

(Drainage area, 120 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	216	.....	151	1·26	1·41	8,980
May	620	216	411	3·42	3·94	25,300
June	1,980	530	930	7·75	8·65	55,300
July	3,220	830	1,570	13·1	15·1	96,500
August	1,260	530	730	6·08	7·01	44,900
September	574	290	412	3·43	3·83	24,500
October	328	252	277	2·31	2·66	17,000
November	290	.....	206	1·72	1·92	12,300

Sinclair Creek, near Sinclair (3034).

Location.—At highway bridge on Golden to Windermere road. About 1 mile from mouth. Revelstoke district.

Records Available.—July 20 to December 31, 1914.

Climatic Conditions.—Summer is hot, with cool nights. Slightly more precipitation than at Invermere. The winter is of about four and one-half month's duration. Minimum temperature is as low as –40°F. The creek seldom freezes over.

Gauge.—Vertical staff gauge, read by Mr. J. A. McCullough.

Channel.—Sandy and shifting. Several shifts occurred from April to July, 1914.

Discharge Measurements.—Eight measurements were made in 1914.

Co-operation.—This station was maintained in 1914 by co-operation between the British Columbia Hydrographic Survey and the Provincial Water Rights Branch.

Accuracy.—Owing to serious shifts in the channel the data cannot be guaranteed.

General.—Sinclair creek rises in the westerly slope of the Rockies and flows through Sinclair pass to Columbia river, into which it empties about 12 miles below Windermere lake. About 2½ miles above the mouth it receives the waters of the Sinclair Hot Springs, which have a warming influence upon it. The use of the water of Sinclair creek is practically confined to irrigation. The drainage area is 30 square miles.

Discharge Measurements of Sinclair Creek, near Sinclair, B.C., for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 18	O. J. B. (Prov.)		16·0	16·90	1·72	1·02	29·00
May 5	D. O. B. G	1048	16·0	26·7	3·60	1·45	96·20
May 25	J. K. B. (Prov.)		16·0	27·54	4·93	1·70	135·80
June 25	J. A. E	1939	18·0	34·0	4·21	2·45	143·00
July 21	O. J. B		16·0	21·37	2·42	1·98	51·50
Aug. 3	J. A. E.	1909	16·0 ·	18·90	2·07	1·80	39·30
Aug. 24	J. K. B. (Prov).		16·0	16·72	1·80	1·62	30·10
Sept. 21	do do		16·7	17·84	2·04	1·74	36·40
Sept. 28	O. J. B. (Prov.)		16·0	17·77	1·80	1·76	32·10

[1]Marked shift in channel between April and July.

Daily Gauge Height and Discharge of Sinclair Creek, near Sinclair, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·8	40·0	1·6	27·0	1·7	33·2	1·65	30·1	1·5	21·3
2	.....	.....	1·7	33·2	1·6	27·0	1·7	33·2	1·67	31·5	1·5	21·3
3	.....	.....	1·8	40·0	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
4	.....	.....	1·8	40·0	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
5	.....	.....	1·8	40·0	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
6	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
7	.....	.....	1·8	40·0	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
8	.....	.....	1·8	40·0	1·6	27·0	1·7	33·2	1·67	31·5	1·5	21·3
9	.....	.....	1·7	33·2	1·6	27·0	1·7	33·2	1·67	31·5	1·5	21·3
10	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
11	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
12	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
13	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·67	31·5	1·5	21·3
14	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·65	30·1	1·5	21·3
15	.....	.....	1·7	33·2	1·5	21·3	1·7	33·2	1·65	30·1	1·5	21·3
16	.....	.....	1·7	33·2	1·6	27·0	1·7	33·2	1·65	30·1	1·5	21·3
17	.....	.....	1·6	27·0	1·6	27·0	1·7	33·2	1·65	30·1	1·5	21·3
18	.....	.....	1·6	27·0	1·6	27·0	1·7	33·2	1·65	30·1	1·5	21·3
19	2·0	55·8	1·6	27·0	1·6	27·0	1·7	33·2	1·60	27·0	1·4	16·6
20	2·0	55·8	1·6	27·0	1·6	27·0	1·7	33·2	1·60	27·0	1·4	16·6
21	2·0	55·8	1·6	27·0	1·7	33·2	1·7	33·2	1·60	27·0	1·4	16·6
22	2·0	55·8	1·6	27·0	1·7	33·2	1·7	33·2	1·6	27·0	1·4	16·6
23	2·0	55·8	1·6	27·0	1·7	33·2	1·7	33·2	1·6	27·0	1·4	16·6
24	2·0	55·8	1·6	27·0	1·7	33·2	1·65	30·1	1·6	27·0	1·4	16·6
25	2·0	55·8	1·6	27·0	1·8	40·0	1·65	30·1	1·6	27·0	1·4	16·6
26	1·9	47·5	1·6	27·0	1·8	40·0	1·65	30·1	1·6	27·0	1·4	16·6
27	1·9	47·5	1·6	27·0	1·8	40·0	1·65	30·1	1·6	27·0	1·4	16·6
28	1·8	40·0	1·6	27·0	1·75	36·6	1·65	30·1	1·5	21·3	1·4	16·6
29	1·8	40·0	1·6	27·0	1·7	33·2	1·65	30·1	1·5	21·3	1·4	16·6
30	1·8	40·0	1·6	27·0	1·7	33·2	1·65	30·1	1·5	21·3	1·4	16·6
31	1·8	40·0	1·6	27·0	.....	.....	1·65	30·1	.....	.....	1·4	16·6

Monthly Discharge of Sinclair Creek, near Sinclair, for 1914.

(Drainage area, 30 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
August	40	27	31·5	1·05	1·21	1,940
September	40	21·3	27·8	0·93	1·04	1,650
October	33·2	30·1	32·4	1·08	1·24	1,990
November	31·5	21·3	38·8	0·96	1·07	1,710
December	21·3	16·6	19·3	0·64	0·74	1,190

Spillimacheen River, near Spillimacheen (3019).

Location.—The station is located at highway bridge near mouth, about 4 miles from Spillimacheen. Revelstoke district.

Records Available.—June to October, 1912; June to November, 1913; April to December, 1914.

Climatic Conditions.—The summer is generally hot and dry with cold nights. Winter is about four and a half months' duration, heavy snowfall and low temperatures (-40° F.). The river is generally frozen from November to April.

Gauge.—Vertical staff enamel gauge is used, and read two or three times a week by Mr. Jas. Montgomery.

Channel.—The channel is straight above and below the section for 50 yards. The control is a gravel bar, and there is a pronounced riffle at low water, 25 yards below the section.

Discharge Measurements.—Measurements are made from the downstream side of the highway bridge. In 1912, six measurements were made; in 1913, eight; and in 1914, three.

Accuracy.—Gauge readings are infrequent, the measuring section is good, there is a possibility of backwater from the Columbia at high water. These results should be within 10 per cent.

DISCHARGE MEASUREMENTS of Spillimacheen River near Spillimacheen Landing, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 17.....	J. A. E.....	1909	135	670	8·88	3·3	5,920
July 31.....	"	1909	124	585	5·84	2·45	3,430
Oct. 23.....	"	1909	114	374	1·28	0·40	480

Daily Gauge Height and Discharge of Spillimacheen River, near Spillimacheen, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	−0·2	200	.....	1,390	1·8	2,100
2	−0·2	200	1·8	2,100	.....	3,600
3	−0·2	200	2·0	2,500	3·1	5,330
4	−0·2	200	.....	2,100	.....	4,500
5	−0·2	200	.....	1,450	.....	3,720
6	.....	200	1·4	1,450	2·2	2,980
7	.....	325	.....	1,590	.....	2,980
8	0·1	325	.....	1,750	2·2	2,980
9	.....	325	1·75	2,010	.....	2,860
10	.....	325	1·8	2,100	2·1	2,750
11	0·1	325	.....	2,100	.....	2,980
12	0·1	325	.....	2,200	.....	3,220
13	.....	375	1·85	2,200	2·4	3,480
14	.....	425	.....	2,300	2·9	4,780
15	0·4	500	.....	2,500	.....	5,330
16	.....	500	2·2	2,980	.....	5,330
17	.....	500	2·3	3,220	3·3	5,900
18	0·4	500	.....	2,980	.....	5,330
19	0·45	535	.....	2,500	.....	4,780
20	.....	575	1·9	2,300	2·7	4,240
21	.....	575	.....	2,500	2·8	4,500
22	·055	615	.....	2,750	.....	3,980
23	.....	650	2·2	2,980	.....	3,480
24	.....	690	2·3	3,220	2·15	2,860
25	0·7	725	.....	2,980	.....	2,980
26	0·65	690	.....	2,750	.....	3,220
27	.....	690	2·0	2,500	2·4	3,480
28	.....	725	.....	2,500	2·45	3,600
29	0·7	725	.....	2·100	.....	3,720
30	0·9	905	1·8	2,100	2·6	3,980
31	.....	.....	1·9	2,300	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Spillimacheen River, near Spillimacheen, for 1914—*Concluded*.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	4,640	.....	3,220	.....	1,640	.....	1,060	0·5	575	.....	375
2	3·1	5,330	2·4	3,480	1·50	1,590	.....	1,000	.....	550	0·2	375
3	.....	5,330	.....	3,220	.....	1,590	1·0	1,000	.....	525	.....	360
4	3·1	5,330	.....	2,980	.....	1,590	0·9	965	0·4	500	.....	340
5	3·2	5,620	2·0	2,500	1·50	1,590	.....	845	.....	475	0·1	325
6	3·3	5,900	.....	2,560	1·40	1,450	.....	785	.....	450	0·0	275
7	.....	5,900	.....	2,750	.....	1,390	0·7	725	0·3	425	.....	275
8	3·3	5,900	2·1	2,750	.....	1,330	.....	700	0·3	425	.....	275
9	.....	5,900	1·8	2,100	.....	1,260	.....	675	.....	425	0·0	275
10	.....	5,620	.....	2,100	1·20	1,200	0·6	650	.....	425	.....	275
11	3·2	5,620	.....	2,500	.....	1,150	0·55	612	0·3	425	.....	275
12	3·3	5,900	2·0	2,500	1·10	1,100	.....	575	.....	425	0·0	275
13	.....	5,900	.....	2,560	0·90	965	.....	537	.....	425	0·0	275
14	.....	5,620	.....	2,500	.....	820	0·4	500	0·3	425	.....	250
15	3·2	5,620	2·0	2,500	.....	735	.....	550	0·2	375	.....	250
16	.....	5,060	2·1	2,750	0·65	650	.....	600	.....	375	.....	250
17	.....	5,060	.....	2,750	.....	1,050	0·6	650	.....	375	.....	225
18	2·8	4,500	.....	2,750	.....	1,350	0·7	725	0·2	375	.....	225
19	2·9	4,780	2·1	2,750	1·60	1,750	.....	675	.....	355	.....	225
20	.....	4,240	.....	2,670	1·50	1,590	.....	625	.....	345	.....	225
21	.....	3,720	.....	2,580	.....	1,280	0·5	575	0·1	325	.....	250
22	2·2	2,980	2·0	2,500	.....	960	.....	525	0·1	325	.....	250
23	.....	3,220	1·75	2,610	0·60	650	.....	475	.....	360	.....	250
24	.....	3,480	.....	1,980	.....	830	0·3	425	.....	390	.....	250
25	2·5	3,720	.....	1,950	.....	1,020	.....	425	0·3	425	.....	250
26	2·3	3,220	1·75	1,920	1·20	1,260	.....	425	.....	415	.....	250
27	.....	3,220	.....	1,980	1·20	1,290	0·3	425	.....	410	.....	250
28	.....	2,980	.....	2,040	.....	1,130	.....	465	0·25	400	.....	250
29	2·2	2,980	1·80	2,100	.....	1,070	.....	505	0·2	375	.....	250
30	.....	2,980	1·6	1,750	1·0	1,050	.....	575	.....	375	.....	250
31	.....	2,980	.....	1,700	.....	.....	0·5	575	.....	.....	.....	250

Monthly Discharge of Spillimacheen River at Spillimacheen, for 1914.

(Drainage area 580 square miles).

Month.	Discharge in Second-Feet				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
April	9·5	260	468·0	0·81	0·90	27,880	D
May	3,220	1,390	2,340	4·03	4·65	144,000	B
June	5,900	2,100	3,840	6·61	7·38	228,000	B
July	5,930	2,980	4,620	7·97	9·19	284,000	B
August	3,480	1,700	2,460	4·24	4·89	151,000	B
September	1,750	650	1,200	2·08	2·32	71,400	B
October	1,060	425	635	1·09	1·29	39,000	D
November	575	325	416	0·72	0·80	24,800	D
December	375		270	0·47	0·54	16,600	

Toby Creek, near Athalmer (3020).

Location.—One and one-half miles from Athalmer, 1 mile from mouth, on highway bridge on road from Athalmer to Wilmer.

Records Available.—June to September, 1912; May to October, 1913; April to November, 1914.

Climatic Conditions.—The climatic conditions at the mouth of Toby creek are similar to Invermere. The precipitation at Invermere from December 1, 1913, to November 30, 1914, was 13 inches. The summer days are hot and the evenings cool. The winters are about four months long, and at times very severe. The thermometer has gone as low as –40° F. Chinook winds occasionally strike the locality and a great change in temperature results. Toby creek remains frozen for about four months, and frazil ice is prevalent.

Gauge.—Vertical staff gauge is used and read daily by Mr. H. H. Peters, Cyderdale Ranch, Wilmer.

Channel.—The channel is straight above the section, but widens out below. Two channels are formed by a central pier in the bridge. The water is not at right angles to the bridge, and is swift.

Discharge Measurements.—Five measurements were made in 1912, nine in 1913, and three in 1914, from the highway bridge.

Accuracy.—Gauge readings are good, the measurements are not reliable, due to a possibility of backwater from the Columbia. Accuracy, 20 per cent.

Discharge Measurements of Toby Creek, near Athalmer, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 5	D. O'B. G	1048	160	316	2·00	1·20	631
June 19	J. A. E	1909	198	627	4·79	3·15	3,000
Oct. 22	"	1909	185	159	1·87	0·6	298

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Toby Creek, near Athalmer, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·9	440	2·0	1,490
2			1·25	682	2·45	2,060
3			1·50	915	3·0	2,800
4			1·20	640	2·9	2,670
5			1·30	725	2·4	2,000
6			1·25	682	2·2	1,740
7			1·20	640	2·0	1,490
8			1·25	682	1·8	1,250
9			1·50	915	1·7	1,130
10			1·55	968	1·7	1,130
11			1·55	968	1·8	1,250
12			1·60	1,020	2·0	1,490
13			1·60	1,020	2·2	1,740
14			1·70	1,130	2·4	2,000
15			2·20	1,740	2·9	2,670
16	0·75	370	2·30	1,870	3·2	3,080
17	0·75	370	2·10	1,610	3·4	3,360
18	0·75	370	2·10	1,610	3·2	3,080
19	0·90	440	1·95	1,430	3·0	2,800
20	0·9	440	1·90	1,370	2·8	2,530
21	0·9	440	1·90	1,370	2·4	2,000
22	0·9	440	1·90	1,370	2·35	1,940
23	0·85	415	1·90	1,370	2·10	1,610
24	0·85	415	2·00	1,490	2·0	1,490
25	0·75	370	1·90	1,370	2·1	1,610
26	0·75	370	1·85	1,310	2·05	1,550
27	0·75	370	1·8	1,250	2·0	1,490
28	0·75	370	1·7	1,130	2·05	1,550
29	0·75	370	1·6	1,020	2·2	1,740
30	0·8	390	1·55	967	2·5	2,130
31			1·7	1,130		

Daily Gauge Height and Discharge of Toby Creek, near Athalmer, for 1914—*Concluded.*

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·7	2,390	2·5	2,130	1·3	725	0·70	350	0·7	350
2	2·9	2,670	2·5	2,130	1·2	640	0·70	350	0·7	350
3	3·2	3,080	2·2	1,740	1·3	725	0·70	350	0·65	335
4	3·1	2,940	2·25	1,800	1·35	772	0·70	350	0·60	320
5	3·25	3,150	2·2	1,740	1·5	915	0·70	350	0·60	320
6	3·2	3,080	2·3	1,870	1·35	772	0·70	350	0·60	320
7	3·2	3,080	2·4	2,000	1·30	725	0·70	350	0·55	305
8	3·1	2,940	1·7	1,130	1·20	610	0·70	350	0·55	305
9	3·0	2,800	1·5	915	1·0	500	0·70	350	0·55	305
10	2·85	2,600	1·4	820	0·90	440	0·70	350	0·55	305
11	3·15	3,010	1·5	915	1·00	500	0·70	350	0·55	305
12	3·3	3,220	1·9	1,370	1·00	500	0·70	350	0·50	290
13	3·4	3,360	2·0	1,490	0·85	415	0·65	335	0·50	290
14	3·3	3,220	2·0	1,490	0·80	390	0·70	350	0·50	290
15	2·9	2,670	1·95	1,430	0·70	350	0·70	350	Freeze-up.	280
16	2·5	2,135	1·9	1,370	0·80	390	0·70	350	..	270
17	2·5	2,130	1·5	915	0·70	350	0·65	335	..	260
18	2·7	2,390	1·5	915	0·80	390	0·65	335	..	250
19	3·05	2,870	1·7	1,130	0·70	350	0·65	335	..	250
20	2·6	2,260	1·5	915	0·70	350	0·65	335	..	250
21	2·1	1,610	1·7	1,130	0·70	350	0·60	320	..	240
22	1·9	1,370	1·5	915	0·70	350	0·60	320	..	240
23	1·9	1,370	1·5	915	0·70	350	0·55	305	..	240
24	1·9	1,370	1·35	772	0·70	350	0·55	305	..	240
25	1·9	1,370	1·5	915	0·70	350	0·55	305	..	240
26	2·0	1,490	1·45	867	0·70	350	0·55	305	..	230
27	2·1	1,610	1·5	915	0·75	370	0·55	305	..	230
28	2·1	1,610	1·35	772	0·70	350	0·60	320	..	230
29	1·9	1,370	1·35	772	0·70	350	0·60	320	..	220
30	2·15	1,680	1·3	725	0·70	350	0·70	350	..	210
31	2·2	1,740	1·3	725	..	..	0·70	350	..	..

Monthly Discharge of Toby Creek near Athalmer for 1914.

(Drainage area, 180 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.
June	1,870	440	1,120	6·23	7·18	68,900
July	3,360	1,130	1,960	10·9	12·2	117,000
August	3,360	1,370	2,340	13·0	15·0	144,000
September	2,130	725	1,210	6·72	7·75	74,400
October	915	350	479	2·66	2·97	28,500
November	350	305	336	1·87	2·16	20,700
December	350	..	276	1·53	1·71	16,400

Accuracy "C".

North Vermilion Creek, near Edgewater (3032).

Location.—The station is about 200 yards above the Golden-Windermere highway bridge. Revelstoke district.

Records Available.—April 15, to September 30, 1914.

Climatic Conditions.—Similar to South Vermilion creek.

Gauge.—Vertical staff gauge at measuring section. Read during 1914 by Mrs. S. B. Harrison.

Channel.—Clean and gravelly. Not subject to shifts.

Discharge Measurements.—Seven measurements were made in 1914, by wading.

Co-operation.—The station was maintained in 1914 by co-operation between the British Columbia Hydrographic Survey and the Provincial Water Rights Branch.

Accuracy.—The data should be within 15 per cent.

General.—North Vermilion creek rises on the westerly slope of the Rocky mountains and flows westward into the Columbia river. This creek drains an area of about 20 square miles. The water of North Vermilion creek is utilized by the Columbia Valley Orchards, Ltd., for irrigation.

DISCHARGE MEASUREMENTS of North Vermilion Creek, near Edgewater, for 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 18	O. J. B. (Prov.)		13·0	8·85	2·38	0·70	21·10
May 6	D. O'B. G.	1048	14·0	16·7	4·00	1·30	66·70
May 26	J. K. B. (Prov.)		15·2	27·7	5·04	1·95	139·10
June 17	J. A. E.	1909	24·0	45·0	6·53	2·80	294·00[1]
July 27	O. J. B. (Prov.)		13·0	16·05	3·71	1·25	59·80
Aug. 21	J. K. B. (Prov.)		13·7	13·21	2·63	1·00	34·80
Sept. 29	O. J. B. (Prov.)		13·0	13·32	3·32	1·15	44·30

[1]Different section.

Daily Gauge Height and Discharge of North Vermilion creek, near Edgewater, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	5·0	.....	44·2	2·3	195·0	2·3	195·0	.....	49·9	0·9	30·4
2	.....	6·0	1·2	52·4	.....	252·0	.....	232·0	1·15	48·3	.....	30·4
3	.....	6·0	1·6	93·4	2·9	315·0	2·7	273·0	.....	48·3	0·9	30·4
4	.....	6·0	.....	82·2	.....	284·0	.....	304·0	1·15	48·3	.....	30·4
5	.....	7·0	1·3	62·0	2·6	252·0	3·0	337·0	.....	49·9	0·9	30·4
6	.....	7·0	1·30	62·0	.....	222·0	.....	348·0	1·2	52·4	.....	30·4
7	.....	7·0	1·25	57·2	2·3	195·0	3·1	360·0	.....	48·3	0·9	30·4
8	.....	8·0	.....	67·0	.....	178·0	.....	326·0	1·1	44·2	.....	30·4
9	.....	8·0	1·4	72·0	2·1	162·0	2·8	294·0	.....	44·2	0·9	30·4
10	.....	8·0	1·5	82 2	.....	170·0	.....	273·0	1·1	44·2	.....	30·4
11	.....	9·0	.....	84·4	2·2	178·0	2·6	252·0	.....	44·2	0·85	27·8
12	.....	9·0	1·55	87·8	.....	186·0	.....	186·0	1·1	44·2	.....	28·8
13	.....	9·0	.....	93·4	2·3	195·0	1·9	132 0	.....	40·6	0·90	30·4
14	0·3	9·0	1·65	99·2	.....	232·0	.....	118·0	1·0	37·0	.....	30·4
15	.....	11·0	.....	112·0	2·7	273·0	1·7	105·0	.....	37·0	0·90	30·4
16	.....	13·6	1·9	132·0	.....	298·0	.....	105·0	1·0	37·0	.....	31·7
17	.....	16·8	2·2	178·0	2·95	326·0	1·7	105·0	.....	37·0	0·95	33·7
18	.....	20·6	.....	162·0	.....	326·0	.....	99·2	1·0	37·0	.....	33·7
19	.....	25·2	.....	146·0	2·95	326·0	1·6	93·4	.....	37·0	0·95	33·7
20	0·9	30·4	1·9	132·0	.....	337·0	.....	77·1	1·0	37·0	1·00	37·0
21	0·9	30·4	.....	139·0	3·05	348·0	1·3	62·0	.....	37·0	.....	35·0
22	.....	27·8	2·0	146·0	.....	326·0	.....	62·0	1·0	37·0	0·95	33·7
23	0·8	25·2	.....	170·0	2·85	304·0	1·3	62·0	.....	37·0	.....	31·7
24	.....	30·4	2·3	195·0	.....	246·0	.....	62·0	1·0	37·0	0·9	30·4
25	1·0	37·0	.....	170·0	2·3	195·0	1·3	62·0	.....	37·0	.....	30·4
26	.....	37·0	1·95	139·0	.....	170·0	.....	57·2	1·0	37·0	0·9	30·4
27	.....	37·0	.....	122·0	2·0	146·0	1·2	52·4	.....	35·0	1·1	44·2
28	1·0	37·0	1·7	105·0	.....	154·0	.....	48·3	0·95	33·7	.....	40·0
29	.....	37·0	.....	105·0	2·1	162·0	1·1	44·2	.....	31·7	.....	40·0
30	1·0	37·0	1·7	105·0	.....	178·0	.....	48·3	0·90	30·4	.....	30·0
31	.....	.....	1·75	112·0	.....	.....	1·2	52·4	.....	30·4	.....	.....

Monthly Discharge of North Vermilion Creek near Edgewater, for 1914.

(Drainage area, 20 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
April	37·0	.....	18·6	0·93	1·04	1,110	.....
May	195·0	44·2	110·0	5·50	6·34	6,760	D
June	348·0	146·0	238·0	11·9	13·3	14,200	D
July	360·0	44·2	156·0	7·80	8·99	9,590	D
August	52·4	30·4	40·3	2·02	2·33	2,480	C
September	44·2	27·8	32·2	1·61	1·80	1,920	C

South Vermilion Creek, near Edgewater (3033).

Location.—The station on South Vermilion creek is about 40 feet above the highway bridge of the Golden-Windermere road, and about one-half mile above the mouth. Revelstoke district.

Records Available.—April to September, 1914.

Climatic Conditions.—Summer is hot, with cold nights. Precipitation is about the same as that of Golden. Winter is of about four and one-half months duration. Minimum temperature about −40° F.

Gauge.—Vertical staff gauge, read in 1914 by Mr. A. Braisher, driver of Rocky Mountain mail stage.

Channel.—Gravelly, and does not seem subject to shifts.

Discharge Measurements.—Eight measurements were made in 1914, by wading.

Co-operation.—This station was maintained in 1914 by co-operation with the Provincial Water Rights Branch.

Accuracy.—Data should be within 20 per cent.

General.—South Vermillion creek rises on the westerly slope of the Rocky mountains and flows westward into the Columbia river. It drains an area of about 10 square miles. The use of the creek is confined to irrigation.

DISCHARGE MEASUREMENTS of South Vermilion Creek, near Edgewater, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
April 18	O. J. B. (Prov.)		14·6	7·50	1·58	0·40	11·90
May 6	D. O'B. G	1,048	14·5	12·30	2·59	0·60	31·90
" 25	J. K. B. (Prov.)		15·0	15·64	4·16	0·95	65·20
June 21	J. A. E.	1,909	14·5	22·40	4·78	1·20	107·00
July 27	O. J. B. (Prov.)		14·0	11·95	2·77	0·79	33·10
Aug. 3	J. A. E.	1,909	14·5	12·80	2·74	0·70	35·20
" 24	J. K. B. (Prov.)		14·5	11·69	1·90	0·55	22·20
Sept. 30	"		14·0	9·53	2·08	0·58	19·80

Daily Gauge Height and Discharge of South Vermilion Creek, near Edgewater, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	6·0	0·75	43·8	.....	75·0	1·2	105·0	0·7	38·2	0·55	23·6
2	.....	6·0	0·7	38·2	1·10	89·6	.....	105·0	.....	38·2	.....	23·6
3	.....	6·0	.....	36·2	.....	116·0	1·2	105·0	0·7	38·2	0·55	23·6
4	.....	6·0	.....	34·2	1·45	145·0	.....	100·4	.....	35·2	.....	21·0
5	.....	6·0	0·65	33·1	.....	126·0	1·15	97·3	0·65	33·1	0·50	19·2
6	.....	6·0	.....	31·1	1·20	105·0	.....	92·7	.....	33·1	0·50	19·2
7	.....	6·0	0·6	28·1	1·10	89·6	1·1	89·6	.....	33·1	.....	19·2
8	.....	7·0	.....	30·1	.....	85·2	.....	89·6	0·65	33·1	0·50	19·2
9	.....	7·0	0·65	33·1	1·05	82·3	.....	75·0	.....	30·1	.....	19·2
10	.....	7·0	0·75	43·8	.....	88·1	1·0	75·0	0·6	28·1	0·50	19·2
11	.....	8·0	.....	41·5	1·12	92·7	0·95	68·3	.....	28·1	.....	20·1
12	.....	8·0	0·72	40·4	.....	98·8	0·95	68·3	0·6	28·1	0·52	21·0
13	.....	8·5	.....	44·9	1·2	105·0	.....	82·3	0·65	33·1	0·50	19·2
14	0·35	8·55	0·8	49·2	1·35	129·0	1·15	97·3	0·6	28·1	.....	19·2
15	.....	9·73	.....	64·3	.....	137·0	.....	83·8	0·6	28·1	0·50	19·2
16	0·4	11·5	1·05	82·3	1·45	145·0	0·97	71·0	.....	28·1	0·52	21·0
17	.....	11·5	1·0	75·0	.....	145·0	.....	68·3	0·6	28·1	.....	21·9
18	0·4	11·5	.....	72·3	1·45	145·0	.....	65·6	.....	25·4	0·55	23·6
19	0·45	15·3	0·95	68·3	.....	137·0	0·90	61·6	0·55	23·6	.....	26·3
20	.....	17·7	.....	64·3	1·35	129·0	.....	61·6	.....	23·6	0·60	28·1
21	0·50	19·2	0·9	61·6	1·20	105·0	0·90	61·6	0·55	23·6	.....	28·1
22	.....	16·9	.....	61·6	.....	97·3	.....	57·9	0·55	23·6	0·59	27·2
23	0·45	15·3	0·9	61·6	1·10	89·6	0·85	55·4	.....	23·6	.....	26·3
24	.....	15·3	0·95	68·3	.....	94·2	.....	61·6	0·55	23·6	0·58	26·3
25	0·45	15·3	.....	68·3	1·15	97·3	0·95	68·3	.....	23·6	.....	25·4
26	0·5	19·2	0·95	68·3	.....	97·3	0·8	49·3	0·55	23·6	0·57	25·4
27	.....	19·2	.....	64·3	1·15	97·3	.....	49·3	.....	23·6	.....	25·0
28	0·5	19·2	0·88	59·1	1·10	89·6	0·8	49·3	.....	23·6	.....	23·0
29	.....	21·0	.....	54·2	.....	91·1	.....	47·1	.....	23·6	.....	21·0
30	0·55	23·6	0·8	49·3	1·12	92·7	0·75	43·8	0·55	23·6	.....	20·0
31	.....	.....	0·9	61·6	.....	.....	.....	40·4	.....	23·6	.....	.....

Monthly Discharge of South Vermilion, near Edgewater, for 1914.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	23·6	.....	11·9	1·19	1·33	708
April	82·3	28·1	52·6	5·26	6·06	3,230
May	145·0	82·3	107·0	10·7	11·9	6,370
June	105·0	40·4	72·4	7·24	8·35	4,450
July	38·2	23·6	28·2	2·82	3·25	1,730
August	28·1	19·2	22·5	2·25	2·51	1,340

Accuracy "D".

Windermere Creek, near Windermere (3055).

Location.—The station is about 5 miles from the mouth, and above Tegart's diversion. It is about 7 miles from the town of Windermere. Revelstoke district.

Records Available.—April 1 to September 30, 1914.

Climatic Conditions.—Same as Invermere. (See Toby creek.)

Gauge.—Vertical staff gauge at station. Read tri-weekly by Mr. Lloyd Tegart.

Channel.—Broken gravelley, and subject to shifts.

Discharge Measurements.—Four in 1913; six in 1914, by wading.

Co-operation.—Station maintained in 1914 by co-operation with the Provincial Water Rights Branch.

Accuracy.—Results on Windermere creek are not guaranteed.

General.—Windermere creek flows from the westerly slope of the Rockies, rising in Tegart's pass and flowing to Windermere lake, draining an area of 15 square miles. It is practically all used for irrigation and domestic purposes.

DISCHARGE MEASUREMENTS of Windermere Creek, near Windermere, B.C., for 1913-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1913.							
Sept. 26	O. J. B. (Prov.)	6,018		6·50	3·14	0·60	20·4
Nov. 7	"	6,018		5·42	3·23	0·50	17·5
July 22	"	6,018		8·30	3·08	0·60	25·6
1914.							
April 14	O. J. B. (Prov.)	6,018	10·0	4·74	2·60	0·43	12·3
May 12	"	6,018	10·0	5·06	3·30	0·48	16·7
June 20	J. A. E.	1,909	13·0	13·7	4·46	1·15	61·1
July 28	O. J. B. (Prov.)	6,018	13·5	9·4	3·38	0·77	31·8
Aug. 26	J. K. Bell (Prov.)	6,018	14·4	9·3	3·60	0·70	33·4
Sept. 30	"	6,018	12·3	7·5	3·30	0·70	24·9

Daily Gauge Height and Discharge of Windermere Creek, near Windermere, for 1914.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	12·0	.....	15·3	1·1	57·2	.....	54·4	.....	38·8	.....	29·8
2	.....	12·0	.....	15·2	.....	69·1	1·07	54·9	0·85	38·8	0·72	30·1
3	.....	13·0	.....	15·1	1·4	81·0	.....	54·9	.....	38·8	.....	31·0
4	.....	13·0	0·45	15·0	.....	77·8	.....	54·9	0·85	38·8	0·75	32·0
5	0·42	13·5	.....	15·3	1·32	74·6	1·07	54·9	.....	37·6	0·80	35·3
6	.....	13·5	.....	15·6	.....	71·8	.....	51·8	.....	36·5	.....	35·3
7	.....	13·5	0·47	15·9	1·25	69·0	.....	48·8	0·80	35·3	0·80	35·3
8	0·42	13·5	.....	16·3	.....	69·1	0·95	45·8	.....	35·3	.....	37·0
9	.....	13·5	.....	16·7	1·1	57·2	.....	46·2	0·80	35·3	0·85	38·8
10	.....	13·5	.....	17·0	.....	63·1	.....	46·6	.....	35·3	.....	38·8
11	.....	13·5	0·50	17·4	1·25	69·0	.....	47·0	0·80	35·3	.....	38·8
12	0·42	13·5	.....	18·0	.....	69·0	0·97	47·3	.....	35·3	0·85	38·8
13	.....	14·0	.....	18·5	1·25	69·0	.....	47·3	.....	35·3	.....	38·8
14	.....	14·0	0·53	19·0	1·3	73·0	.....	47·3	0·80	35·3	0·85	38·8
15	0·44	14·5	.....	21·8	.....	71·6	0·97	47·3	.....	32·0	.....	39·1
16	.....	14·7	0·63	24·6	.....	70·3	.....	46·1	0·70	28·8	.....	39·6
17	.....	14·9	0·75	32·0	1·25	69·0	.....	44·8	.....	28·8	0·87	40·1
18	.....	15·1	.....	30·4	.....	67·0	.....	43·5	0·70	28·8	.....	41·2
19	0·46	15·4	0·70	28·8	1·2	65·0	0·90	42·2	0·70	28·8	0·90	42·2
20	.....	15·6	.....	28·8	1·1	57·2	0·90	42·2	.....	28·8	.....	40·5
21	.....	15·8	0·70	28·8	.....	52·2	.....	39·5	.....	28·8	.....	38·8
22	0·47	15·9	.....	30·4	.....	47·2	0·82	36·7	0·70	28·8	.....	37·2
23	.....	15·8	0·75	32·0	0·9	42·2	.....	38·5	.....	28·8	.....	35·6
24	.....	15·6	.....	33·7	.....	44·6	.....	40·3	.....	28·8	0·88	34·0
25	.....	15·5	0·80	35·5	.....	47·0	0·90	42·2	0·70	28·8	.....	34·0
26	0·46	15·4	.....	34·7	1·0	49·5	.....	42·2	.....	28·8	.....	34·0
27	.....	15·4	.....	34·0	.....	50·8	0·90	42·2	0·70	28·8	0·88	34·0
28	.....	15·4	0·77	33·4	.....	52·1	.....	41·4	.....	28·8	.....	33·6
29	0·46	15·4	.....	32·7	1·05	53·4	.....	40·5	0·70	28·8	.....	33·2
30	.....	15·4	0·75	32·0	.....	53·9	.....	39·6	.....	29·1	0·66	32·7
31	.....	.....	.....	44·6	.....	.....	0·85	38·8	.....	29·5	.....	.....

Monthly Discharge of Windermere Creek, near Windermere, for 1914.

Month.	Discharge, in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	15·9	.....	14·4	0·96	1·07	857
April	35·3	15·0	24·8	1·65	1·90	1,520
May	61·0	42·2	61·9	4·13	4·61	3,680
June	58·9	36·7	45·5	3·03	3·49	2,800
July	38·8	28·8	32·4	2·16	2·49	1,990
August	42·2	29·8	36·3	2·42	2·70	2,160

Bull River, near Mouth (3039).

Location.—At mouth, near Bull River settlement, 6 miles from Wardner, in south-east Kootenay, Cranbrook district.

Records Available.—May to November, 1914.

Climatic Conditions.—The summers are hot and dry. The winters are very severe, with a light snowfall in the lower altitudes. Ice conditions exist generally

from some time in November till about the first of April. During this period extreme low flow may be anticipated, and frazil ice is to be expected.

Gauge.—A vertical staff gauge, situated about 100 yards below Bull River Lumber Company's (C.P.R.) dam, one-quarter mile from Bull river and 1 mile from the mouth.

Channel.—Channel is straight for 100 yards above and below the gauge.

Discharge Measurements.—Nine well-distributed measurements were made from the railway bridge in 1914.

Accuracy.—The channel at the measuring section shifted considerably during June and possibly the first week in July. The daily gauge readings are reliable. The results during May, June, and July, are considered to be within 20 per cent, and after July, 10 per cent.

General.—Bull river is a stream about 30 miles long. It rises in the Rockies, amongst peaks from 8,000 to 10,000 feet above sea-level, and flows generally in a southwesterly direction through various canyons and over shifting gravel beds into the Kootenay, near the settlement of Bull river, 6 miles from Wardner, B.C. The stream generally is from 30 to 150 feet wide, but about 6 miles from the mouth it is confined in a deep rock canyon, in places not over 15 feet in width at the top. This canyon extends for about 400 feet, and in this distance the river drops 175 feet, about half of this being a perpendicular fall 100 feet from the head of the canyon. A little over 1 mile from the mouth the river is controlled by the Bull River Lumber Company's dam, built to form a pond for logs.

A company owns timber limits towards the source of the stream, and every year this company has been driving logs down the river to their mill near the mouth, where the logs are sawn into ties.

Some seven or eight years ago a company commenced the installation of a hydro-electric development at the above mentioned canyon, about 6 miles from the mouth. A cedar flume, 16 feet by 8 feet, and some 10,000 feet in length was constructed. By means of this flume a head of about 250 feet was obtained. The installation has not been completed to date, in fact practically nothing has been done since the flume was constructed.

Cranbrook District (V)—Bull river looking up from metering section.

Discharge Measurements of Bull River, at Mouth, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity	Gauge Height	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Apr. 28	H. B. H. & C. E. R.	1048	94	502	3·78	2·02	1,870
May 15	D. O. B. Gill.	1048	122	677	7·01	4·10	4,880[1]
June 6	" "	1048	121	698	6·19	3·50	3,770[1]
" 15	" "	1048	121	642	7·04	4·10	4,980[1]
July 30	D. O. B. G. & R. H. H.	1929	79	388	3·39	1·30	1,310
" 26	"	1929	91	442	3·16	1·40	1,400
Oct. 8	"	1929	94·5	425	1·60	0·74	685
" 13	"	1929	94·5	419	1·59	0·70	668
Dec. 17	J. A. E. & C. B. C.	1909	37	117	1·19		14.[2]

[1] Soundings incorrect.

[2] Ice conditions.

Daily Gauge Height and Discharge of Bull River, at Mouth, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·1	2,600	3·9	4,660
2			3·4	3,950	4·7	5,830
3			4·0	4,800	5·5	7,060
4			3·6	4,230	5·2	6,590
5			3·0	3,390		5,340
6			2·7	2,990	3·5	4,090
7			2·4	2,600	3·4	3,950
8			2·4	2,660	2·9	3,250
9			3·3	3,810	2·4	2,690
10			3·3	3,810	2·4	2,600
11			3·3	3,810	2·5	2,730
12			3·0	3,390	2·8	3,120
13			3·3	3,810	3·2	3,660
14			3·6	4,230	3·7	3,990
15			4·1	4,940	4·1	4,940
16			4·3	5,230	4·3	5,230
17			4·2	5,080	4·4	5,380
18			4·2	5,080	5·1	6,440
19			3·95	4,730	4·6	5,680
20			3·8	4,510	4·1	4,940
21			3·3	3,810	3·4	3,950
22			3·5	4,090	3·1	3,520
23			3·4	3,950	2·7	2,990
24			3·8	4,510	2·4	2,600
25			3·9	4,660	3·0	3,390
26			3·6	4,230	3·0	3,390
27			3·4	3,950	2·9	3,250
28	2·0	2,100	3·0	3,390	3·0	3,390
29	1·9	1,970	2·7	2,990	3·1	3,520
30	2·0	2,100	2·6	2,860		3,590
31			3·1	3,520		

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Bull River, at Mouth, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·2	3,660	1·3	1,290	0·50	475	0·7	665	1·9	1,970	0·6	570
2	3·4	3,950	1·3	1,296	0·50	475	0·9	860	2·1	2,220	0·6	570
3	3·4	3,959	1·3	1,290	0·40	390	0·9	860	1·7	1,740	0·6	570
4	3·5	4,090	1·2	1,180	0·40	390	0·9	850	1·7	1,740	0·5	475
5	3·4	3,950	1·1	1,070	0·40	390	0·8	760	1·9	1,970	0·5	475
6	3·3	3,810	1·0	960	0·40	390	0·8	760	1·7	1,740	0·6	570
7	.....	3,660	1·0	960	0·40	390	0·7	665	1·7	1,740	0·4	390
8	.....	3,400	1·0	960	0·50	475	0·7	665	1·5	1,510	0·4	390
9	.....	3,200	0·9	860	0·50	475	0·7	665	1·3	1,290	Frozen.	
10	.....	3,000	0·9	860	0·50	475	0·7	665	1·3	1,290		
11	2·6	2,860	0·8	769	0·50	475	0·7	665	1·3	1,290		
12	2·5	2,730	0·8	760	0·50	475	0·7	665	1·2	1,180		
13	2·7	2,990	0·8	760	0·50	475	0·7	665	1·2	1,180		
14	2·5	2,730	0·8	769	0·50	475	0·8	760	1·0	960		
15	2·5	2,730	0·8	760	0·50	475	1·0	960	0·7	665		
16	2·4	2,600	0·8	760	0·50	475	1·1	1,070	0·6	570		
17	2·1	2,220	0·8	760	0·60	570	1·1	1,070	0·6	570		
18	2·1	2,220	0·9	860	0·70	665	1·1	1,070	0·6	570		
19	2·0	2,100	0·7	665	1·60	1,620	1·5	1,510	0·6	570		
20	2·0	2,100	0·7	665	1·20	1,180	1·4	1,400	0·8	760		
21	1·9	1,970	0·7	665	1·00	960	1·2	1,180	0·8	760		
22	1·7	1,740	0·7	665	0·90	860	1·0	960	0·7	665		
23	1·5	1,510	0·7	665	1·00	960	0·9	860	0·7	665		
24	1·5	1,510	0·7	665	1·00	960	0·9	860	0·6	570		
25	1·5	1,510	0·6	570	1·00	960	0·9	860	0·6	570		
26	1·5	1,510	0·6	570	1·00	960	0·9	860	0·9	860		
27	1·5	1,510	0·6	570	1·20	1,180	0·8	760	0·7	665		
28	1·5	1,510	0·6	570	1·00	960	0·8	760	0·7	665		
29	1·4	1,400	0·6	570	0·90	860	0·8	760	0·6	570		
30	1·3	1,290	0·6	570	0·80	760	0·8	760	0·6	570		
31	1·3	1,290	0·5	475	.....	.....	1·0	960	.....	.....		

Monthly Discharge of Bull River, at Mouth, for 1914.

(Drainage Area, 420 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area	Total in acre-feet	
May	5,230	2,600	3,920	9·33	10·8	241,000	D
June	7,060	2,600	4,190	9·98	11·2	249,000	D
July	4,090	1,120	2,410	5·74	6·62	148,000	D
August	1,290	475	800	1·90	2·19	49,190	B
September	1,620	390	688	1·64	1·83	40,900	B
October	1,510	665	866	2·06	2·37	53,200	B
November	2,220	570	1,070	2·55	2·84	63,670	B

Cherry Creek, near Wasa (3038).

Location.—About 1 mile above the mouth, near Wasa, in south-east Kootenay. Cranbrook district.

Records Available.—May to November, 1913; May to September, 1914.

Climatic Conditions.—Summers hot and dry, winters severe (as low as −50°F.). with a light snowfall. Generally similar to Cranbrook (see St. Marys river).

Gauge.—Vertical staff gauge, marked in feet and inches, located on highway bridge about 1 mile from mouth.

Channel.—Channel is regular and affords a good measuring section. Slight shifts are possible.

Discharge Measurements.—Discharges from May to June 30, 1913, were plotted from a curve based on measurements made by Mr. H. B. Hicks, District Engineer, Provincial Water Rights Branch. The 1914 curve was plotted from five discharge measurements made in 1914 after June 30. Measurements made in 1913 after June 30 fit on the 1914 curve, so 1913 discharges after June 30 were plotted from the 1914 curve.

Accuracy.—1913, 20 per cent; 1914, 10 per cent and 15 per cent.

Co-operation.—During 1914 this station was maintained by co-operation with the Provincial Water Rights Branch.

General.—Cherry creek is a small tributary of the Kootenay, flowing in from the right near Wasa in southeast Kootenay. The drainage area, as taken from the only available maps, appears in the neighbourhood of 80 square miles. The stream is used for irrigation.

Discharge Measurements of Cherry Creek, near Wasa, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 28.....	D. O. B. G., R. H. H.....	1530	16·5	32·8	4·61	1·133	152
July 15.....	R. H. H. (Prov.).....	.....	16·5	30·2	3·05	0·958	92·2
July 24.....	D. O. B. G.....	1929	16·5	24·2	2·34	0·604	56·7
Aug. 31.....	H. B. H. (Prov.).....	.....	16·5	13·7	1·18	0·062	16·2
Sept. 25.....	" "	.....	16·5	16·3	1·37	0·229	22·3

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Cherry Creek, near Wasa, for 1913.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Inches.	Sec.-ft.	Inches.	Sec.-ft.
1	.....	40·0	26·5	353·0
2	.....	45·0	27·2	370·0
3	.....	50·0	26·2	346·0
4	.....	55·0	27·0	365·0
5	.....	60·0	27·0	365·0
6	9·5	65·0	26·5	353·0
7	10·5	75·0	25·0	318·0
8	12·5	97·0	24·0	295·0
9	13·25	106·0	25·5	329·0
10	15·5	137·0	26·2	346·0
11	17·0	160·0	26·0	341·0
12	16·5	152·0	26·0	341·0
13	16·5	152·0	23·0	273·0
14	15·5	137·0	22·5	262·0
15	15·0	130·0	22·0	252·0
16	15·0	130·0	21·0	232·0
17	15·0	130·0	17·0	160·0
18	15·0	130·0	14·5	123·0
19	14·0	116·0	14·0	116·0
20	13·0	103·0	13·5	109·0
21	13·0	103·0	15·0	130·0
22	15·0	130·0	14·5	123·0
23	15·0	130·0	14·5	123·0
24	17·25	164·0	14·0	116·0
25	22·0	252·0	14·5	123·0
26	24·0	295·0	14·5	123·0
27	24·0	295·0	14·0	116·0
28	24·0	295·0	16·0	144·0
29	23·0	273·0	14·5	123·0
30	24·2	300·0	14·0	116·0
31	24·0	295·0	.....	

Daily Gauge Height and Discharge of Cherry Creek, near Wasa, for 1913.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	13·7	119·0	4·75	34·0	3·75	28·5	3·0	24·0	1·5	18·0
2	14·5	131·0	4·75	34·0	4·0	30·0	3·0	24·0	1·5	18·0
3	13·75	120·0	4·75	34·0	3·5	27·0	3·0	24·0	1·5	18·0
4	13·5	116·0	4·5	32·5	3·25	25·5	3·0	24·0	1·5	18·0
5	13·75	120·0	4·0	30·0	3·0	24·0	3·0	24·0	1·5	18·0
6	13·0	110·0	4·0	30·0	3·0	24·0	3·0	24·0	1·5	18·0
7	12·5	102·0	4·0	30·0	3·0	24·0	3·0	24·0	1·5	18·0
8	12·0	97·0	4·0	30·0	3·5	27·0	3·0	24·0	1·5	18·0
9	12·0	97·0	4·0	30·0	3·0	24·0	3·0	24·0	1·5	18·0
10	11·0	85·0	4·0	30·0	3·0	24·0	3·0	24·0	1·5	18·0
11	11·0	85·0	4·0	30·0	3·0	24·0	3·0	24·0	2·0	20·0
12	10·0	75·0	4·0	30·0	3·0	24·0	3·0	24·0	2·0	20·0
13	10·0	75·0	4·0	30·0	3·0	24·0	3·0	24·0	2·0	20·0
14	10·0	75·0	4·0	30·0	3·0	24·0	3·5	27·0	2·0	20·0
15	9·25	67·5	4·0	30·0	3·0	24·0	3·5	27·0	2·0	20·0
16	9·0	65·0	4·0	30·0	3·0	24·0	3·5	27·0	2·0	20·0
17	8·0	56·0	4·0	30·0	3·0	24·0	3·5	27·0	2·0	20·0
18	7·5	52·5	4·0	30·0	3·0	24·0	3·5	27·0	2·0	20·0
19	7·0	49·0	4·0	30·0	3·0	24·0	3·5	27·0	2·0	20·0
20	7·0	49·0	4·0	30·0	3·0	24·0	3·0	24·0	1·0	16·0
21	7·0	49·0	4·5	32·5	3·0	24·0	3·0	24·0	.....	16·0
22	7·0	49·0	4·0	30·0	3·0	24·0	3·0	24·0	.....	16·0
23	6·0	42·0	4·0	30·0	3·5	27·0	2·0	20·0	.....	16·0
24	6·0	42·0	4·0	30·0	3·5	27·0	2·0	20·0	.....	16·0
25	6·0	42·0	4·0	30·0	3·5	27·0	2·5	22·0	.....	16·0
26	6·0	42·0	4·0	30·0	3·5	27·0	2·5	22·0	.....	16·0
27	5·5	38·5	4·0	30·0	3·5	27·0	2·5	22·0	.....	16·0
28	5·0	35·0	4·0	30·0	3·0	24·0	2·5	22·0	.....	16·0
29	5·0	35·0	4·0	30·0	3·0	24·0	1·5	18·0	.....	16·0
30	5·0	35·0	4·0	30·0	3·0	24·0	1·5	18·0	.....	16·0
31	5·0	35·0	4·0	30·0	.....	.....	1·5	18·0	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Cherry Creek, near Wasa, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Inches.	Sec.-ft.	Inches.	Sec.-ft.	Inches.	Sec.-ft.
1	.....	.....	14·75	132·0	13·25	112·0
2	.....	.....	15·75	150·0	15·0	137·0
3	.....	.....	16·5	163·0	18·25	193·0
4	.....	.....	17·75	183·0	22·0	268·0
5	.....	.....	17·0	170·0	24·0	312·0
6	.....	.....	16·5	163·0	20·5	236·0
7	.....	.....	15·0	137·0	18·0	188·0
8	.....	.....	13·25	112·0	16·5	163·0
9	.....	.....	.....	116·0	13·75	120·0
10	.....	.....	13·75	120·0	13·0	110·0
11	.....	.....	15·0	137·0	12·75	105·0
12	.....	.....	16·75	166·0	12·5	102·0
13	.....	.....	14·75	132·0	13·75	1.0·0
14	8·75	62·8	15·0	137·0	16·0	155·0
15	9·0	65·0	15·0	137·0	18·5	197·0
16	9·5	70·0	15·25	142·0	19·5	216·0
17	9·5	70·0	16·75	166·0	20·5	236·0
18	8·75	62·8	17·75	183·0	21·5	256·0
19	9·5	70·0	17·25	175·0	23·5	301·0
20	13·0	110·0	16·75	166·0	21·5	256·0
21	14·5	130·0	15·75	150·0	18·5	197·0
22	14·0	124·0	15·0	137·0	16·5	163·0
23	13·25	112·0	14·25	126·0	15·5	146·0
24	13·75	120·0	14·0	124·0	13·5	116·0
25	14·75	132·0	14·25	126·0	13·5	116·0
26	14·5	130·0	14·0	124·0	17·25	175·0
27	14·0	124·0	16·0	155·0	15·2	141·0
28	14·0	124·0	16·0	155·0	15·0	137·0
29	14·0	124·0	14·5	130·0	12·2	99·0
30	14·25	126·0	13·5	116·0	12·0	97·0
31	.....	.....	12·25	100·0	.....	.....

Daily Gauge Height and Discharge of Cherry Creek, near Wasa, for 1914.

Day.	July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Inches.	Sec.-ft.	Inches.	Sec.-ft.	Inches.	Sec.-ft.	Inches.	Sec.-ft.
1	12·0	97·0	3·0	24·0	1·0	16·0	2·0	20·0
2	13·0	110·0	3·0	24·0	1·0	16·0	2·0	20·0
3	13·0	110·0	3·0	24·0	1·0	16·0	3·0	24·0
4	13·0	110·0	2·7	22·8	1·0	16·0	3·0	24·0
5	14·0	124·0	2·5	22·0	1·0	16·0	3·0	24·0
6	13·2	112·0	2·5	22·0	1·0	16·0	3·0	24·0
7	12·5	102·0	2·5	22·0	2·0	20·0	3·0	24·0
8	11·5	91·0	2·5	22·0	2·0	20·0	.....	.....
9	11·0	85·0	2·5	22·0	2·0	20·0	.....	.....
10	10·2	77·0	2·5	22·0	1·0	16·0	.....	.....
11	9·5	70·0	2·5	22·0	0·5	14·0	.....	.....
12	9·0	65·0	2·5	22·0	0·5	14·0	.....	.....
13	8·2	57·8	2·5	22·0	0·5	14·0	.....	.....
14	10·7	82·0	2·5	22·0	0·5	14·0	.....	.....
15	12·0	97·0	2·5	22·0	0·5	14·0	.....	.....
16	11·0	85·0	2·5	22·0	1·25	17·0	.....	.....
17	8·7	62·3	2·5	22·0	4·0	30·0	.....	.....
18	8·0	56·0	2·5	22·0	4·0	30·0	.....	.....
19	7·2	50·4	2·5	22·0	4·75	33·8	.....	.....
20	7·0	49·0	2·5	22·0	4·75	33·8	.....	.....
21	7·0	49·0	2·0	20·0	4·0	30·0	.....	.....
22	7·0	49·0	2·0	20·0	4·0	30·0	.....	.....
23	6·2	43·4	2·0	20·0	4·0	30·0	.....	.....
24	6·5	45·5	2·0	20·0	3·5	27·0	.....	.....
25	5·8	40·6	2·0	20·0	3·0	24·0	.....	.....
26	5·0	35·0	2·0	20·0	2·5	22·0	.....	.....
27	5·0	35·0	1·0	16·0	2·5	22·0	.....	.....
28	5·0	35·0	1·0	16·0	3·0	24·0	.....	.....
29	5·0	35·0	1·0	16·0	3·0	24·0	.....	.....
30	5·0	35·0	1·0	16·0	3·0	24·0	.....	.....
31	5·0	35·0	1·0	16·0	.....	.....	.....	.....

Monthly Discharge of Cherry Creek, near Wasa, for 1913.

(Drainage area, 80 square miles).

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	300	.....	145·0	1·81	2·09	8,920
June	370	109	230·0	2·87	3·20	13,700
July	131	35	70·6	0·88	1·02	4,340
August	34	30	30·5	0·38	0·44	1,870
September	30	24	25·1	0·31	0·35	1,490
October	27	18	23·5	0·29	0·33	1,440
November	20	.....	17·9	0·22	0·24	1,060

Accuracy "D."

SESSIONAL PAPER No. 25e

Monthly Discharge of Cherry Creek, near Wasa, B.C., for 1914.

(Drainage area, 80 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	183	100	143	1·79	2·06	8,790	B 1
June	312	97	176	2·2	2·46	10,500	C
July	124	35	68·7	0·86	0·99	4,220	B
August	24	16	20·9	0·26	0·30	1,290	B
September	33·8	14	21·5	0·27	0·30	1,280	B

Elk River, near Elko (3048).

Location.—At the cable station 50 yards above the traffic bridge one-quarter mile from Elko in south east Kootenay. Cranbrook district.

Cranbrook District (1)—Photograph showing Elk river cable station above Canyon.

Records Available.—April to November, 1914.

Climatic Conditions.—At Elko, the precipitation from December 1, 1913, to November 30, 1914, was 18.7 inches. The summers are hot and dry. The winters are very severe, as low as -50° F. some seasons, with generally only a light snowfall; 1913-14, approximately 3 feet. Frazil ice may be expected.

Gauge.—A chain gauge was established at the highway bridge, near Elko in November, 1913, and has been read since then by Mr. Wm. Leacey and Mr. Jas. McKee. When the cable station was established in May a new gauge was put in at the section (50 yards above highway bridge). Mr. McKee also read this gauge.

Channel.—The channel below the highway bridge is confined in a canyon, and there is no possibility of shift, though log jams might occasionally affect the gauge readings. The channel above and below the cable station is straight for approximately 40 yards. There is a distinct riffle 30 yards below the section at low water, but at high water it is drowned by the water backing up in its endeavour to get through the narrow canyon below. The low-water control below the cable station may shift somewhat in high water.

Discharge Measurements.—Measurements are made from the cable station. The section is ideal at all stages, except extreme high water, when it is impossible to obtain accurate soundings. In 1914 eight measurements were made, one of which was made on December 18, under ice conditions. Discharge, 630 c.f.s.

Accuracy.—The measurements should be very reliable. Daily gauge readings were obtained, but before July the chain gauge caused trouble. The gauge-height discharge curve appears to be very good. The results after July should be within 5 per cent, and before July 15 per cent.

General.—Elk river is about 150 miles long. It rises near Kananaskis pass, N. latitude 50° 35′, W. longitude 115° 05′, and flows practically due south for about 100 miles, passing through Fernie, and veering slightly to the west passes through Elko and discharges into Kootenay river about 15 miles above the international boundary line. The Elk drains a very mountainous country. The precipitation is not very heavy, being considerably less in this district than in the vicinity of either Field or Glacier.

Elk river is used for lumbering only at present. There is an excellent power site near Elko. Immediately below the highway bridge, Elko, the river enters a canyon about three-quarters of a mile long. In this canyon there is a fall of about 175 feet. A low flow of 400 or 500 c.f.s. may be expected any year, and this is not necessarily a minimum flow. It is anticipated that this power will, at some future date, be harnessed. In order to obtain reliable data a cable station was established a little over 100 yards above this canyon. Very satisfactory open-flow data were obtained in 1914, and in the coming winter one or two low-water measurements will be made.

SESSIONAL PAPER No. 25e

Discharge Measurements of Elk River, near Traffic bridge, Elko, 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 5	D. O'B. G	1048	218	1,380	7·81	8·95	10,800
June 17	do	1048	211	1,140	7·47	7·95	8,570
June 19	do	1048	213	1,200	7·42	8·15	8,950
July 30	do	1929	195	515	3·48	4·12	1,790
July 26	do	1929	195	536	3·51	4·2	1,880
Oct. 7	do	1929	194	455	2·95	3·55	1,360
Oct. 14	do	1929	195	458	3·07	3·60	1,410
Dec. 18	J. A. E., C. B. C	1909	70	281	2·24	2·8	630

Ice conditions.

Daily Gauge Height and Discharge of Elk River, near Elko, B.C., for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·7	930	5·4	3,380	6·6	5,520
2	2·75	952	6·0	4,380	7·3	6,980
3	2·8	975	6·7	5,710	8·5	9,690
4	2·8	975	6·5	5,340	9·15	11,300
5	2·85	997	6·0	4,380	8·95	10,800
6	3·5	1,330	5·7	3,850	8·05	8,640
7	3·5	1,330	5·5	3,540	7·2	6,770
8	3·6	1,390	5·8	4,020	6·7	5,710
9	3·6	1,390	6·1	4,560	6·2	4,740
10	3·6	1,390	6·3	4,920	5·9	4,200
11	3·7	1,450	6·3	4,920	5·65	3,770
12	3·9	1,600	6·3	4,920	5·85	4,110
13	4·2	1,860	6·3	4,920	6·25	4,830
14	4·5	2,170	6·6	5,520	6·85	6,020
15	4·6	2,290	7·1	6,550	7·2	6,770
16	4·7	2,410	7·5	7,410	7·7	7,850
17	4·55	2,230	7·9	8,290	7·95	8,400
18	4·35	2,010	7·9	8,290	8·2	8,990
19	4·8	2,530	7·7	7,850	8·15	8,880
20	5·3	3,240	7·6	7,630	7·85	8,180
21	5·0	2,790	7·3	6,980	7·35	7,090
22	4·8	2,530	7·2	6,770	6·65	5,620
23	5·0	2,790	7·0	6,360	6·0	4,380
24	4·9	2,660	7·2	6,770	5·7	3,850
25	4·8	2,530	7·3	6,980	5·7	3,850
26	4·75	2,470	7·3	7,410	5·95	4,290
27	4·7	2,410	7·4	7,200	5·65	3,770
28	4·6	2,290	6·9	6,120	5·45	3,460
29	4·5	2,170	6·4	5,120	5·75	3,940
30	4·6	2,290	6·3	4,920	5·55	3,620
31			6·5	5,340		

Daily Gauge Height and Discharge of Elk River, near Elko, B.C., for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·6	3,690	4·05	1,720	3·3	1,220	3·5	1,330	4·0	1,680	3·3	1,220
2	5·7	3,850	4·05	1,720	3·2	1,170	3·5	1,330	4·7	2,410	3·25	1,200
3	5·85	4,110	4·0	1,680	3·2	1,170	3·55	1,360	4·6	2,290	3·3	1,220
4	6·0	4,380	3·95	1,640	3·2	1,170	3·6	1,390	4·4	2,060	3·25	1,200
5	6·1	4,560	3·95	1,640	3·2	1,170	3·65	1,420	4·9	2,660	3·05	1,100
6	6·05	4,470	3·92	1,610	3·2	1,170	3·6	1,390	4·9	2,660	3·1	1,120
7	5·95	4,290	3·87	1,570	3·2	1,170	3·55	1,360	4·55	2,230	2·9	1,020
8	5·9	4,200	3·9	1,600	3·2	1,170	3·55	1,360	4·3	1,960	2·8	975
9	5·8	4,020	3·9	1,600	3·25	1,200	3·55	1,360	4·15	1,810	2·7	930
10	5·7	3,850	3·9	1,600	3·1	1,120	3·55	1,360	4·05	1,720	2·55	872
11	5·6	3,690	3·8	1,520	3·15	1,140	3·6	1,390	4·2	1,860	.....	840
12	5·5	3,540	3·8	1,520	3·1	1,120	3·6	1,390	4·1	1,760	.....	810
13	5·4	3,380	3·7	1,450	3·1	1,120	3·55	1,360	4·0	1,680	.....	780
14	5·45	3,460	3·7	1,450	3·1	1,120	3·6	1,390	3·9	1,600	.....	750
15	5·4	3,380	3·6	1,390	3·15	1,140	3·8	1,520	3·6	1,390	.....	720
16	5·3	3,240	3·6	1,390	3·15	1,140	4·0	1,680	3·4	1,270	.....	690
17	5·2	3,080	3·75	1,480	3·25	1,200	4·1	1,760	3·45	1,300	.....	660
18	5·0	2,790	3·85	1,560	3·35	1,240	4·15	1,810	3·5	1,330	.....	630
19	4·8	2,530	3·75	1,480	3·8	1,520	4·35	2,010	3·5	1,330	.....	630
20	4·75	2,470	3·75	1,480	3·9	1,600	4·4	2,060	3·5	1,330	.....	630
21	4·7	2,410	3·65	1,420	3·8	1,520	4·15	1,810	3·5	1,330	.....	630
22	4·65	2,350	3·55	1,360	3·7	1,450	4·0	1,680	3·45	1,300	.....	630
23	4·5	2,170	3·55	1,360	3·6	1,390	3·9	1,600	3·4	1,270	.....	630
24	4·3	1,960	3·55	1,360	3·55	1,360	3·8	1,520	3·4	1,270	.....	640
25	4·25	1,910	3·55	1,360	3·55	1,360	3·75	1,480	3·4	1,270	.....	650
26	4·2	1,860	3·52	1,340	3·55	1,360	3·7	1,450	3·7	1,450	.....	660
27	4·15	1,810	3·45	1,300	3·55	1,360	3·7	1,450	3·6	1,390	.....	670
28	4·15	1,810	3·45	1,300	3·55	1,360	3·6	1,390	3·6	1,390	.....	680
29	4·15	1,810	3·35	1,240	3·55	1,360	3·6	1,390	3·55	1,360	.....	690
30	4·12	1,780	3·35	1,240	3·5	1,330	3·6	1,390	3·45	1,300	.....	700
31	4·05	1,720	3·3	1,220	.....	.....	3·7	1,450	.....	.....	.....	710

Monthly Discharge of Elk River, near Elko, B.C. for 1914.

(Drainage area, 1,600 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
April	3,240	930	1,950	1·22	1·36	116,000	C
May	8,290	3,380	5,820	3·63	4·18	358,000	C
June	11,300	3,460	6,230	3·89	4·34	371,000	C
July	4,560	1,720	3,050	1·91	2·20	188,000	B
August	1,720	1,220	1,470	0·92	1·06	90,400	A
September	1,600	1,120	1,260	0·79	0·88	75,000	A
October	2,060	1,330	1,500	0·94	1·08	92,200	A
November	2,660	1,270	1,660	1·04	1·16	98,800	A
December	1,220	.....	847	0·53	0·61	52,100	.....

Gold Creek, near Newgate (3047).

Location.—At highway bridge, half-a-mile from mouth, opposite Flagstone, and 7 miles from international boundary line at Newgate, south-east Kootenay. Cranbrook district.

Records Available.—May to August, 1914.

Climatic Conditions.—Winters, severe, with light snowfall. Summers, hot and dry.

Gauge.—Wooden staff, 4 feet long, located on downstream side of bridge. Gauge is read three times a week by Mr. F. Neuendorp.

Channel.—Fairly smooth, unbroken, gravel bar below.

Discharge Measurements.—Five-well distributed measurements were made from the bridge in 1914.

Accuracy.—The measurements are very reliable. Three gauge readings a week are obtained. The gauge-height-discharges curve is very good. Accuracy during high water, 15 per cent, during low water, 10 per cent.

Co-operation.—This section was maintained in 1914 by co-operation with the Water Rights Branch (Provincial).

General.—Gold creek rises in the hills south of Cranbrook and flows in a south-easterly direction for about 35 miles, discharging into Kootenay river opposite Flagstone, and about 7 miles above the international boundary line. The drainage area is about 230 square miles. The precipitation throughout the drainage is very light, probably not exceeding 20 inches. Gold creek may be termed an irrigation stream.

DISCHARGE MEASUREMENTS of Gold Creek, near Flagstone, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 17.....	D. O. B. G., R. H. H	1048	63·5	192	5·97	2·35	1,150
June 18.....	D. O. B. G., H. B. H.....	1048	60	112	3·02	1·35	339
July 11.....	R. H. H. (Prov.).....	.....	62	744	1·65	0·75	123
July 28.....	D. O'B. G., R. H. H	1929	62	48·45	1·11	0·37	53·8
Sept. 11.....	H. B. H. (Prov.).....	.....	.....	30·0	0·69	0·05	20·6

Daily Gauge Height and Discharge of Gold Creek, near Gateway, for 1914

Day.	May.		June.		July.		August.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·75	595	.....	646	.....	172	.....	46
2	.....	793	1·9	710	.....	169	.....	43
3	22·2	990	.....	710	0·9	169	0·25	40
4	.....	920	.....	710	.....	184	.....	40
5	2·05	845	1·9	710	1·05	210	0·25	40
6	.....	830	.....	630	.....	175	.....	37
7	.....	755	1·65	525	0·85	148	0·20	35
8	1·9	710	.....	460	.....	140	.....	37
9	.....	830	1·45	398	.....	134	0·25	40
10	2·1	890	.....	381	0·75	123	.....	38
11	.....	890	.....	366	.....	123	0·20	35
12	.....	845	1·35	344	0·75	123	.....	32
13	2·05	845	.....	344	.....	123	.....	30
14	.....	960	1·35	341	.....	111	0·10	26
15	2·3	1,100	1·35	344	0·70	111	.....	26
16	.....	1,160	1·3	317	.....	100	0·10	26
17	2·4	1,210	.....	302	0·60	90	.....	40
18	.....	1,130	1·25	294	.....	87	0·40	60
19	.....	1,030	.....	280	0·55	82	.....	50
20	2·15	940	.....	266	.....	78	0·25	40
21	.....	910	1·15	250	0·50	75	.....	57
22	2·1	890	.....	238	.....	75	0·50	75
23	.....	910	1·1	230	.....	68	.....	50
24	.....	920	.....	280	0·45	68	0·15	30
25	2·15	940	.....	338	.....	64	.....	28
26	.....	845	1·45	398	0·40	60	0·10	26
27	1·95	755	.....	317	.....	57	.....	29
28	.....	686	1·15	250	0·35	53	0·15	30
29	1·8	630	.....	210	.....	53	.....	28
30	.....	616	0·95	175	0·35	53	0·10	26
31	1·75	595	.....	.....	.....	49	.....	26

Monthly Discharge of Gold Creek, near Gateway, for 1914.

(Drainage area, 230 square miles.)

Month	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage	Total in Acre-feet.	
May	1,210	595	868	3·78	4·36	53,400	C.
June	710	175	392	1·70	1·90	23,300	C.
July	210	49	107	0·46	0·53	6,580	B.
August	60	26	37·6	0·16	0·18	2,310	B.

Kootenay River, near Wardner (3041).

Location.—At the highway bridge near Wardner, above the mouth of Elk river, below the mouths of Bull and St. Mary's rivers and about 35 miles from the international boundary line. Cranbrook district.

Records Available.—April to December, 1914.

Climatic Conditions.—The precipitation at Wardner in 1914 was about 17 inches. The summers are hot and dry and the winters are severe. Cold

spells, a week or two in duration, occur, when the temperature will go down to -30° F. (and in some cases the thermometer has gone down to -50° F.) The river is generally affected by ice from December to March. Frazil ice is prevalent.

Gauge.—A vertical staff gauge, 12 feet long, is read daily by Mrs. C. Barnes, of Wardner.

Channel.— The channel is straight and uniform, but piles have been driven down the centre of the river for logging purposes.

Discharge Measurements.—One measurement in 1913, and nine in 1914, were made from the traffic bridge.

Accuracy.—Daily gauge readings are obtained, reliable measurements were made, and the gauge height discharge curve is very good. The results should be within 5 per cent.

General.—Kootenay river rises in the Beaverfoot range of the Rockies, in township 24, range 16, west 5th meridian, and flows in a south by southeasterly direction through Wardner, a distance of about 100 miles. The valley of the Kootenay is broad and fertile, and is gradually being opened for agricultural developments. The fall of the river is very gradual, and will not be used for power between Canal Flats and Wardner. The river is most suitable for logging, and each year drives come down from valuable limits at the headwaters.

Discharge Measurements of Kootenay River, near Wardner, for 1913-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 23	C. E. W., C. E. R.	1,048	460	2,100	1·64	2·00	3,460
1914							
May 19	D. O. B. G., R. H. H.	1,048	482	4,860	4·83	8·00	23,500
June 7	" "	1,048	482	4,840	4·85	8·00	23,500
" 15	" "	1,048	483	5,450	5·55	9·30	30,200
" 20	" "	1,048	488	6,070	6·41	10·65	38,900
July 25	" "	1,929	467	3,350	3·38	5·00	11,300
" 31	" "	1,929	467	3,210	3·33	4·70	10,700
Oct. 7	" "	1,929	464	2,490	2·08	2·95	5,210
" 13	" "	1,929	465	2,469	2·11	2·88	5,180
Dec. 13	J. A. E., C. B. C.	1,909	131	774	2·11	1·7	1,637[1]

[1]Ice conditions.

Daily Gauge Height and Discharge of Kootenay River, near Wardner, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·1	1,000	1·2	1,200	1·0	800	1·05	900	4·1	8,700	6·95	18,400
2	1·1	1,000	1·2	1,200	1·0	800	1·05	900	4·85	11,000	8·30	24,800
3	1·1	1,000	1·3	1,400	1·0	800	1·05	900	6·25	15,800	9·65	32,400
4	1·2	1,200	1·4	1,700	1·0	800	1·00	800	6·85	18,000	10·75	39,500
5	.....	1,200	1·4	1,700	1·0	800	1·0	800	6·3	15,900	11·25	43,000
6	.....	1,200	.....	1,700	1·0	800	1·1	1,000	5·75	14,000	9·25	30,000
7	.....	1,200	.....	1,700	0·9	600	1·3	1,400	5·40	12,600	8·20	4,300
8	.....	1,200	.....	1,700	1·0	800	1·75	2,600	5·07	11,600	8·40	25,300
9	.....	1,200	.....	1,700	1·0	800	1·8	2,70[illegible]	5·47	12,900	7·35	20,200
10	.....	1,200	.....	1,700	1·0	800	1·9	2,900	6·10	15,200	6·50	16,600
11	.....	1,200	.....	1,700	1·0	800	2·0	3,200	6·3	15,900	6·35	16,000
12	.....	1,200	.....	1,700	1·0	800	2·15	3,600	6·3	15,900	6·80	17,800
13	.....	1,200	.....	1,700	0·95	700	2·5	4,400	6·3	15,900	7·45	20,600
14	.....	1,200	.....	1,700	0·95	700	2·85	5,300	6·65	17,200	8·4	25,300
15	.....	1,200	.....	1,700	1·00	800	2·97	5,610	7·52	21,000	9·35	30,600
16	.....	1,200	.....	1,700	1·10	1,000	3·25	6,400	8·2	24,300	9·9	33,800
17	.....	1,200	.....	1,700	1·10	1,000	3·32	6,540	8·32	24,900	10·42	37,200
18	.....	1,200	.....	1,700	1·10	1,000	3·2	6,300	8·4	25,300	10·77	39,600
19	1·2	1,200	1·3	1,400	1·10	1,000	3·15	6,150	8·07	23,600	11·02	41,300
20	1·2	1,200	1·2	1,200	1·05	900	3·72	7,560	7·65	21,600	10·65	38,800
21	1·2	1,200	1·3	1,400	1·05	900	4·0	8,400	7·3	20,000	9·58	32,000
22	1·1	1,000	1·3	1,400	1·05	900	3·82	7,860	7·15	19,400	8·4	25,300
23	1·1	1,000	1·1	1,000	1·05	900	3·7	7,500	7·37	20,300	7·45	20,600
24	1·0	800	1·0	800	1·05	900	3·7	7,500	7·55	21,200	6·87	18,100
25	0·9	600	1·0	800	1·05	900	3·8	7,800	7·8	22,300	6·7	17,400
26	1·0	800	1·0	800	1·05	900	3·85	7,950	7·85	22,600	7·42	20,500
27	1·1	1,000	1·0	800	1·05	900	3·80	7,800	7·3	20,000	7·42	20,500
28	1·1	1,000	1·0	800	1·05	900	3·80	7,800	6·85	18,000	7·27	19,900
29	1·1	1,000	.....	.....	1·05	900	3·70	7,500	6·3	15,900	7·32	20,100
30	1·1	1,000	.....	.....	1·05	900	3·70	7,500	5·97	14,700	7·60	21,400
31	1·2	1,200	.....	.....	1·05	900	.....	.....	6·10	15,200	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Kootenay River, near Wardner, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	7·9	22,700	4·70	10,500	2·98	5,640	3·22	6,340	2·92	5,460	2·05	3,350
2	8·4	25,300	4·85	11,000	2·88	5,360	3·17	6,210	3·4	6,700	1·92	2,960
3	8·8	27,400	4·82	10,900	2·82	5,240	3·22	6,340	3·37	6,640	1·95	3,050
4	9·07	29,000	4·72	10,600	2·85	5,300	3·22	6,340	3·27	6,440	1·97	3,110
5	9·27	30,200	4·67	10,400	2·85	5,300	3·12	6,060	3·23	6,360	1·90	2,900
6	9·15	29,500	4·45	9,750	2·85	5,300	3·02	5,760	3·39	6,680	1·85	2,800
7	8·88	27,900	4·35	9,450	2·72	5,040	2·95	5,550	3·25	6,400	1·80	2,700
8	8·42	25,400	4·45	9,750	2·70	5,000	2·92	5,460	3·02	5,760	1·75	2,600
9	8·07	23,600	4·25	9,150	2·75	5,100	2·88	5,360	2·92	5,460	1·75	2,600
10	7·8	22,300	3·97	8,310	2·70	5,000	2·92	5,460	2·8	5,200	1·67	2,440
11	7·55	21,200	3·80	7,800	2·62	4,760	2·95	5,550	2·77	5,140	1·45	1,850
12	7·40	20,400	3·80	7,800	2·55	4,550	2·95	5,550	2·8	5,200	1·50	2,000
13	7·52	21,000	3·75	7,650	2·65	4,850	2·87	5,340	2·77	5,140	1·07	940
14	8·00	23,300	3·72	7,560	2·58	4,640	2·82	5,240	2·7	5,000	1·02	840
15	7·97	23,000	3·72	7,560	2·50	4,400	2·82	5,240	2·5	4,400	.....	1,000
16	7·67	21,800	3·7	7,500	2·55	4,550	2·90	5,400	2·3	3,900	.....	1,160
17	6·87	18,100	3·7	7,500	2·53	4,490	2·90	5,400	2·15	3,600	.....	1,320
18	6·35	16,000	3·67	7,410	2·65	4,850	2·95	5,550	2·12	3,540	.....	1,480
19	6·32	16,000	3·53	7,060	3·00	5,700	3·12	6,060	2·35	4,000	.....	1,640
20	6·27	15,800	3·4	6,700	3·60	7,200	3·25	6,400	2·2	3,700	.....	1,600
21	6·32	16,000	3·4	6,700	3·55	7,100	3·15	6,150	2·2	3,700	.....	1,600
22	5·9	14,400	3·37	6,640	3·32	6,540	3·00	5,700	2·3	3,900	.....	1,600
23	5·35	12,400	3·40	6,700	3·17	6,210	2·90	5,400	2·3	3,900	.....	1,600
24	5·05	11,600	3·3	6,500	3·02	5,760	2·77	5,140	2·3	3,900	.....	1,600
25	5·00	11,400	3·22	6,340	3·12	6,060	2·72	5,040	2·25	3,800	.....	1,600
26	5·05	11,600	3·1	6,000	3·25	6,400	2·73	5,060	2·2	3,700	.....	1,600
27	4·92	11,200	3·07	5,910	3·42	6,760	2·65	4,850	2·22	3,740	.....	1,600
28	4·87	11,000	3·05	5,850	3·67	7,410	2·60	4,700	2·2	3,700	.....	1,600
29	4·85	11,000	3·00	5,700	3·65	7,350	2·60	4,700	2·2	3,700	.....	1,600
30	4·77	10,700	2·98	5,640	3·42	6,760	2·60	4,700	2·17	3,640	.....	1,600
31	4·70	10,500	3·08	5,940	.....	.....	2·62	4,760	.....	.....	.....	1,600

Monthly Discharge of Kootenay River, near Wardner, for 1914.

(Drainage area, 5,200 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per Square Mile.	Depth in inches on Drainage Area.	Total in Acre-feet.	
January	1,200	600	1,100	0·21	0·24	67,600	
February	1,700	800	1,420	0·27	0·28	78,900	
March	1,000	600	852	0·16	0·18	52,400	B
April	8,400	800	4,920	0·95	1·06	293,000	B
May	25,300	8,700	18,100	3·48	4·01	1,110,000	A
June	43,000	17,400	26,400	5·08	5·67	1,570,000	A
July	30,200	10,500	19,100	3·67	4·23	1,170,000	A
August	11,000	5,040	7,820	1·50	1·73	481,000	A
September	7,410	4,400	5,620	1·08	1·20	334,000	A
October	6,400	4,700	5,510	1·06	1·22	339,000	A
November	6,700	3,540	4,750	0·91	1·02	283,000	A
December	3,350	840	1,940	0·37	0·43	119,000	

Linklater Creek, near Newgate (3045).

Location.—At Smith's ranch, 6 miles north of international boundary line; at Newgate, 4 miles from mouth of Gold creek. Cranbrook district.

Records Available.—May to September, 1913.

Climatic Conditions.—The precipitation is light, generally not in excess of 20 inches. The summers are hot and dry. Winters are severe, during some cold spells the thermometer going down to -40° F.

Gauge.—Three-foot vertical staff gauge, nailed to bridge. Mr. Jas. Bean reads gauge daily.

Channel.—Moderately swift, fairly smooth, and unbroken.

Discharge Measurements.—Five well-distributed measurements were made in 1914.

Co-operation.—This station was maintained by co-operation between the Provincial Water Rights Branch and the British Columbia Hydrographic Survey.

Accuracy.—Daily gauge readings are obtained, the measurements should be accurate. The results are within 15 per cent.

General.—Linklater creek is a small irrigation stream, about 15 miles long, flowing from the northwest into Kootenay river near Newgate. The drainage area is about 40 square miles (as obtained from the only available maps.)

Discharge Measurements of Linklater Creek, near Smith's ranch, Gateway, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
May 17	D. O. B. G., R.H.H	1,048	20·0	30·0	3·30	1·30	99·0
June 18	" H.D.H	1,048	20·0	21·5	2·66	0·85	57·1
July 11	R. H. H. (Prov.)		20·0	13·0	1·66	0·50	21·7
July 28	D.O.B.G., R. H.H	1,909	20·0	10·6	1·35	0·40	14·3
Sept. 11	H.B.H. (Prov.)			8·70	1·41	0·30	12·3

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Linklater Creek, near Gateway, for 1914.

Day.	May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·6	30·0	1·1	77·0	0·60	30·0	0·33	12·8	0·28	10·9
2	0·8	48·0	1·3	96·0	0·55	26·0	0·33	12·8	0·28	10·9
3	1·0	67·0	1·35	100·0	0·55	26·0	0·32	12·4	0·28	10·9
4	0·9	58·0	1·25	91·0	0·55	26·0	0·32	12·4	0·28	10·9
5	0·75	43·5	1·1	77·0	0·63	32·7	0·32	12·4	0·29	11·2
6	0·70	39·0	1·0	67·0	0·55	26·0	0·32	12·4	0·29	11·2
7	0·75	43·5	0·85	53·0	0·50	22·0	0·32	12·4	0·29	11·2
8	0·70	39·0	0·8	48·0	0·50	22·0	0·33	12·8	0·30	11·5
9	0·90	58·0	0·75	43·5	0·47	20·2	0·34	13·3	0·30	11·5
10	0·90	58·0	0·75	43·5	0·45	19·0	0·32	12·4	0·30	11·5
11	0·85	53·0	0·75	43·5	0·45	19·0	0·31	12·0	0·30	11·5
12	0·85	53·0	0·85	53·0	0·45	19·0	0·30	11·5	0·30	11·5
13	0·85	53·0	0·9	58·0	0·50	22·0	0·30	11·5	0·30	11·5
14	1·0	67·0	0·9	58·0	0·45	19·0	0·29	11·2	0·30	11·5
15	1·2	86·0	0·9	58·0	0·45	19·0	0·28	10·9	0·30	11·5
16	1·25	91·0	0·9	58·0	0·40	16·0	0·28	10·9	0·31	12·0
17	1·3	96·0	0·9	58·0	0·40	16·0	0·55	26·0	0·34	13·3
18	1·2	86·0	0·85	53·0	0·40	16·0	0·45	19·0	0·37	14·6
19	1·2	86·0	0·80	48·0	0·40	16·0	0·35	13·8	0·40	16·0
20	1·1	77·0	0·75	43·5	0·40	16·0	0·33	12·8	0·40	16·0
21	1·05	72·0	0·73	41·7	0·40	16·0	0·35	13·8	0·37	14·6
22	1·1	77·0	0·65	34·5	0·38	15·1	0·33	12·8	0·32	12·4
23	1·15	81·5	0·70	39·0	0·37	14·6	0·30	11·5	0·31	12·0
24	1·2	86·0	0·75	43·5	0·37	14·6	0·35	13·8	0·30	11·5
25	1·25	91·0	0·92	59·8	0·38	15·1	0·30	11·5	0·30	11·5
26	1·1	77·0	0·80	48·0	0·38	15·1	0·30	11·5	0·29	11·2
27	0·95	62·5	0·70	39·0	0·37	14·6	0·29	11·2	0·29	11·2
28	0·9	58·0	0·70	39·0	0·35	13·8	0·29	11·2	0·30	11·5
29	0·85	53·0	0·65	34·5	0·35	13·8	0·29	11·2	0·30	11·5
30	0·95	62·5	0·60	30·0	0·35	13·8	0·29	11·2	0·30	11·5
31	1·0	67·0			0·33	12·8	0·29	11·2		

Monthly Discharge of Linklater Creek, near Newgate, for 1914.

(Drainage area 42 square miles.)

Month.	Discharge in Second-Feet				Run-Off	
	Maximum.	Minimum.	Mean	Per square mile	Depth in inches on Drainage area	Total in acre-feet
May	96	30	65·5	1·56	1·80	4,030
June	106	30	54·1	1·30	1·45	3,240
July	32·7	12·8	19·0	0·45	0·52	1,170
August	26·0	11·2	12·8	0·30	0·35	787
September	15·0	10·9	12·0	0·29	0·32	714

Accuracy "C."

Mark Creek, near Marysville (3037).

Location.—At the mouth of the creek near Marysville, about 14 miles from Cranbrook. Cranbrook district.

Records Available.—May to December, 1914.

Climatic Conditions.—At Marysville the precipitation each year is a little greater than at Cranbrook, which in 1914 was 16 inches. The summers are hot and dry. The winters are severe. Cold spells lasting for a week or so often occur, when the thermometer may reach -40° F. and -50° F. The creek freezes over in November or December and remains frozen till March. Frazil ice is present.

Gauge.—An enamel gauge, 6 feet long, is read daily by Mr. W. M. Burdette, of Marysville.

Channel.—Straight, rocky, and water is generally broken. The section may fill but the control appears permanent.

Discharge Measurements.—Eight well-distributed measurements were made in 1914.

Co-operation.—This station was maintained by co-operation between the British Columbia Hydrographic Survey and the Water Rights Branch of the province.

Accuracy.—The measurements are fair, daily readings are obtained, and the gauge heights discharge curve seems very good. The results should be within 10 per cent.

General.—Mark creek is a stream about 15 or 20 miles long, flowing from the northwest into St. Mary's river near Marysville. The drainage area is about 90 square miles (as estimated from the only available maps). Near Kimberley is the Sullivan mine, where large quantities of silver-lead ore is mined and shipped to Trail smelter. This company has a water-power development on Mark creek. At present about 350 horse-power is developed during the summer months. The head it is anticipated, will soon be increased.

There are other valuable mining claims in Mark creek drainage which, when developed, may tend to increase the importance of this little stream.

Discharge Measurements of Mark Creek, near Marysville, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 1	H. B. H. & C. E. R.	1,048	20	41·4	2·66	1·68	110
May 28	D. O'B. G.	1,530	25	57·9	4·08	2·2	236
July 3	H. B. H. (Prov.)	.....	24	55·4	4·02	2·1	223
July 24	D. O.'B. G., H. B. H.	1,929	16	34·1	1·92	1·4	56·4
Sept. 1	H. B. H. (Prov.)	.....	.....	22·2	·77	1·00	17·2
Sept. 29	"	.....	.....	26·2	1·05	1·20	27·4
Oct. 10	D. O. B. G.	1,929	19·5	28·4	0·86	1·125	24·2
Oct. 16	"	1,929	19·5	29·4	0·99	1·22	29·1

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Mark Creek, at Marysville, B.C., for 1914.

Day.	May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·70	112	2·56	354
2	1·85	171	2·76	428
3	2·10	210	3·01	527
4	2·0	184	2·90	483
5	1·9	158	2·56	354
6	1·81	136	2·41	303
7	1·71	114	2·14	221
8	1·75	123	2·05	197
9	2·0	184	2·00	184
10	1·99	181	1·96	174
11	1·98	179	1·94	168
12	2·01	187	1·98	179
13	2·08	205	2·08	205
14	2·24	250	2·41	303
15	2·48	325	2·52	339
16	2·59	364	2·63	379
17	2·6	368	2·69	401
18	2·54	346	2·67	394
19	2·47	322	2·55	350
20	2·38	293	2·33	277
21	2·37	290	2·13	218
22	2·36	286	1·96	174
23	2·37	290	1·86	148
24	2·43	310	1·79	132
25	2·38	293	2·05	197
26	2·45	316	2·23	247
27	2·37	290	2·05	197
28	2·22	244	2·00	184
29	2·08	205	2·00	184
30	2·10	210	2·00	184
31	2·25	253	.....	

Daily Gauge Height and Discharge of Mark Creek, at Marysville, B.C., for 1914—*Concluded*.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·02	189	1·27	38·1	1·07	17·9	1·12	21·8	1·20	29·0	1·22	31·6
2	2·08	206	1·2	29·0	1·07	17·9	1·14	23·6	1·27	38·1	1·17	26·3
3	2·12	215	1·2	29·0	1·07	17·9	1·18	27·2	1·20	29·0	1·20	29·0
4	2·11	213	1·18	27·2	1·07	17·9	1·19	28·1	1·23	32·9	1·26	36·8
5	2·14	221	1·18	27·2	1·04	15·8	1·19	28·1	1·26	36·8	1·23	32·9
6	2·02	189	1·18	27·2	1·04	15·8	1·19	28·1	1·25	35·5	1·19	28·1
7	1·9	158	1·16	25·4	1·08	18·6	1·19	28·1	1·21	30·3	1·12	21·8
8	1·82	139	1·18	27·2	1·10	20·0	1·16	25·4	1·21	30·3	1·56	21·0
9	1·77	128	1·12	21·8	1·08	18·6	1·16	25·4	1·23	32·9	2·10	20·0
10	1·72	116	1·17	26·3	1·08	18·6	1·18	27·2	1·18	27·2	2·25	20·0
11	1·69	110	1·17	26·3	1·08	18·6	1·18	27·2	1·19	28·1	2·45	19·0
12	1·65	102	1·17	26·3	1·08	18·6	1·20	29·0	1·17	26·3	2·50	18·0
13	1·77	127	1·16	25·4	1·06	17·2	1·17	26·3	1·16	25·4	2·55	17·0
14	1·84	144	1·12	21·8	1·06	17·2	1·17	26·3	1·15	24·5	2·60	16·0
15	1·67	106	1·13	22·7	1·09	19·3	1·20	29·0	1·15	24·5	Frozen	15·3
16	1·60	92·0	1·13	22·7	1·12	21·8	1·20	29·0	1·15	24·5	.....	15·0
17	1·53	78·7	1·16	25·4	1·06	17·6	1·15	24·5	1·17	26·3	.....	15·0
18	1·50	73·0	1·17	26·3	1·10	20·0	1·18	27·2	1·17	26·3	.....	15·0
19	1·42	59·4	1·12	21·8	1·19	28·1	1·23	32·9	1·18	27·2	.....	15·0
20	1·45	64·5	1·13	22·7	1·18	27·2	1·24	34·2	1·20	29·0	.....	16·0
21	1·41	57·7	1·11	20·9	1·15	24·5	1·22	31·6	1·20	29·0	.....	16·0
22	1·40	56·0	1·10	20·0	1·10	20·0	1·18	27·2	1·17	26·3	.....	17·0
23	1·40	56·0	1·08	18·6	1·11	20·9	1·16	25·4	1·20	29·0	.....	17·0
24	1·37	51·8	1·08	18·6	1·11	20·9	1·16	25·4	1·20	29·0	.....	18·0
25	1·32	44·8	1·08	18·6	1·14	23·6	1·11	20·9	1·21	30·3	.....	18·0
26	1·35	49·0	1·08	18·6	1·19	28·1	1·16	25·4	1·20	29·0	.....	18·0
27	1·34	47·6	1·08	18·6	1·19	28·1	1·20	29·0	1·18	27·2	.....	18·0
28	1·31	43·4	1·07	17·9	1·19	28·1	1·20	29·0	1·17	26·3	.....	18·0
29	1·30	42·0	1·07	17·9	1·16	25·4	1·20	29·0	1·16	25·4	.....	18·0
30	1·29	40·7	1·07	17·9	1·15	25·4	1·20	29·0	1·21	30·3	.....	18·0
31	1·26	36·8	1·07	17·9	.....	.....	1·20	29·0	.....	.....	.....	18·0

Monthly Discharge of Mark Creek, at Marysville, B.C., for 1914.

Drainage area 90 square miles.

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	368	112	238	2·64	3·04	14,600	B
June	527	132	270	3·0	3·55	10,100	"
July	221	36·8	105	1·17	1·35	6,460	"
August	38·1	17·9	23·4	0·26	0·30	1,440	"
September	20·1	15·8	21·0	0·23	0·26	1,250	"
October	34·2	21·8	27·4	0·30	0·35	1,680	"
November	38·1	24·5	28·9	0·32	0·36	1,720	"
December	36·8	.....	20·1	0·22	0·25	1,240	.....

Mud Creek, near Elko (3044).

Location.—Two and one-half miles above Rock creek mill, near Elko. Cranbrook district.

Records Available.—June to September, 1914.

Climatic Conditions.—Similar to Elko. (See Elk river.)

Gauge.—Three-foot enamel gauge, nailed to an old bridge, about one-half mile above Rock Creek mill. Read four or five times a week by Mr. H. B. Stiven, of Elko.

Channel.—Sluggish. Not very uniform.

Discharge Measurements.—Four measurements were made in 1914.

Co-operation.—Provincial Water Rights Branch and British Columbia Hydrographic Survey co-operated in 1914.

Accuracy.—Not guaranteed.

General.—Mud creek is a small irrigation stream, tributary to Rock creek, near Elko. The discharge of Mud creek, plus that of Rock creek, gives the discharge of Rock creek at the Rock Creek Lumber Company's dam.

DISCHARGE MEASUREMENTS of Mud Creek, near Baynes, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 18	D. O'B. G., R. H. H.	1,048	8·5	10·0	2·27	2·05	22·7
July 12	R. H. H. (Prov.)		8·1	8·9	1·94	1·70	17·3
" 29	D. O'B. G., R. H. H.	1,929	8·1	7·9	1·50	1·40	11·9
Sept. 14	H. B. H. (Prov.)			7·13	1·22	1·20	8·68

DAILY GAUGE HEIGHT AND DISCHARGE of Mud Creek, near Elko, for 1914.

Day.	May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				22·8	1·8	18·4		11·8	1·20	8·7
2			2·1	23·7		17·6	1·4	11·8		8·4
3			2·1	23·7	1·7	16·7	1·35	11·0	1·15	8·0
4			2·1	23·7	1·8	18·4		11·0	1·15	8·0
5				24·2		18·4	1·35	11·0	1·15	8·0
6			2·15	24·6	1·8	18·4		10·6	1·15	8·0
7				24·6		17·6	1·3	10·2		8·0
8			2·15	24·6	1·7	16·7	1·3	10·2	1·15	8·0
9				24·1		17·6		10·2		8·0
10			2·1	23·7	1·8	18·4	1·3	10·2	1·15	8·0
11			2·1	23·7	1·6	15·0		9·8		8·0
12			2·0	21·9	1·65	15·8	1·25	9·4	1·15	8·0
13			1·95	21·0		15·4		9·4	1·15	8·0
14			1·95	21·0	1·6	15·0	1·25	9·4		8·4
15				21·0		14·6	1·25	9·4	1·20	8·7
16			1·95	21·0	1·55	14·2	1·25	9·4		8·7
17			1·95	21·0		14·6		9·4	1·20	8·7
18	2·05	22·8		21·4	1·6	15·0	1·25	9·4		9·0
19	2·1	23·7	2·0	21·9		14·6		9·4	1·25	9·4
20	2·1	23·7	2·0	21·9	1·55	14·2	1·25	9·4	1·25	9·4
21		23·2		15·6		13·8		9·0	1·25	9·4
22	2·05	22·8	1·25	9·4	1·5	13·4	1·2	8·7		9·4
24		22·8		9·0		13·4		8·7	1·25	9·4
24	2·05	22·8	1·2	8·7	1·5	13·4	1·2	8·7		9·4
25		22·8		8·4	1·55	14·2		8·7	1·25	9·4
26	2·05	22·8	1·15	8·0	1·5	13·4	1·2	8·7	1·30	10·2
27		23·7	1·3	10·2		13·0		8·7	1·30	10·2
28	2·15	24·6	1·9	20·4	1·45	12·6	1·2	8·7	1·30	10·2
29		24·1	2·0	21·9		12·2	1·2	8·7		10·2
30	2·1	23·7	1·8	18·4	1·4	11·8		8·7	1·30	10·2
31	2·0	21·9			1·4	11·8		8·7		

MONTHLY DISCHARGE of Mud Creek, near Elko, for 1914.

(Drainage area, 7 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	24·6	8·0	19·5	2·78	3·10	1,160
July	18·4	11·8	15·1	2·15	2·48	928
August	11·8	8·7	9·62	1·37	1·58	590
September	10·2	8·0	8·84	1·26	1·41	526

PHILLIPS CREEK, NEAR ROOSVILLE (3046).

Location.—Fifteen hundred feet above road, near Roo's ranch, Roosville. Cranbrook district.

Records Available.—May to November, 1914.

Climatic Conditions.—Summers, hot and dry. Winters severe, as low as −40° F. during cold spells some seasons. Similar to Elko (see Elk river).

Gauge.—Wooden staff gauge, read by Mr. Fred Roo, of Roosville.

Channel.—Fairly uniform and smooth. Good control.

Discharge Measurements.—Five measurements were made in 1914.

Co-operation.—Provincial Water Rights Branch and British Columbia Hydrographic Survey co-operated during 1914.

Accuracy.—Daily gauge readings and fairly good measurements. Results should be within 15 per cent.

General.—Phillips creek is a small stream about 10 to 15 miles long, flowing from the east into Montana, about 4 miles from the mouth, and thence into Kootenay river. It is used for irrigation, and there is a fall on the creek above Roo's ranch, where a small industrial development might be installed.

DISCHARGE MEASUREMENTS of Phillips Creek, near Roosville, B.C., for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 16	D. O'B. G., R. H. H.	1,048	16·5	23·3	3·36	1·80	78·4
June 17	D. O'B. G., H. B. H.	1,048	14·0	23·65	4·06	1·85	96·1
July 10	R. H. H. (Prov.)	.....	13·0	14·6	2·21	1·40	32·2
" 27	D. O'B. G., R. H. H.	1,929	11·0	13·3	1·35	1·20	18·0
Sept. 10	H. B. H. (Prov.)	.....	.....	11·6	1·00	1·10	12·7

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of Phillips Creek, near Rossville, for 1914.

Day.	April		May		June	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·4	33·0	1·35	115·0
2			1·55	47·5	1·25	204·
3			1·4	33·0	1·	206·0
4			1·4	33·0	1·35	98·5
5			1·55	47·5	1·0	33·0
6			1·55	47·5	1·0	33·0
7			1·5	42·0	1·0	33·0
8			1·55	47·5	1·0	33·0
9			1·4	33·0	1··	44·0
10			1·45	38·5	1·0	33·0
16			1·45	38·5	1··	44·0
12			1·45	38·5	1··	44·0
13			1·7	64·0	1·75	71·0
14			1·75	70·0	1·7	64·0
15			1·9	76·0	1·45	38·5
16			1·9	76·0	1·0	33·0
17			1·0	91·0	1·45	38·5
18			1·0	91·0	1·55	47·5
19			1·45	38·5	1·0	33·0
20			1·0	76·0	1··	44·0
21			1·9	76·0	1··	44·0
22			1·9	76·0	1·0	33·0
23			1·0	91·0	1··	44·0
24			2·0	206·0	1·0	33·0
25			2·0	206·0	1·45	98·5
26			1·0	91·0	1·0	76·0
27	1·3	25·0	1·45	38·5	1··	44·0
28	1·45	29·0	1·9	76·0	1·45	38·5
29	1·45	29·0	1·7	64·0	1·0	33·0
30	1·4	33·0	1·7	64·0	1·0	33·0
31			1·45	38·5		

Daily Gauge Height and Discharge of Phillips Creek, near Roosville, for 1914.

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·6	53·0	1·2	18·0	1·10	12·0	1·15	15·0	1·3	25·0
2	1·6	53·0	1·2	18·0	1·15	15·0	1·15	15·0	1·3	25·0
3	1·55	47·5	1·2	18·0	1·10	12·0	1·15	15·0	1·35	29·0
4	1·55	47·5	1·2	18·0	1·10	12·0	1·2	18·0	1·35	29·0
5	1·6	53·0	1·2	18·0	1·10	12·0	1·2	18·0	1·35	29·0
6	1·55	47·5	1·2	18·0	1·15	15·0	1·2	18·0	1·35	29·0
7	1·55	47·5	1·2	18·0	1·15	15·0	1·15	15·0	1·35	29·0
8	1·5	42·0	1·2	18·0	1·1	12·0	1·15	15·0	1·35	29·0
9	1·5	42·0	1·2	18·0	1·15	15·0	1·15	15·0	1·3	25·0
10	1·5	42·0	1·2	18·0	1·1	12·0	1·15	15·0	1·3	25·0
11	1·4	33·0	1·15	15·0	1·1	12·0	1·2	18·0	1·3	25·0
12	1·4	33·0	1·15	15·0	1·15	15·0	1·2	18·0	1·3	25·0
13	1·45	37·5	1·15	15·0	1·15	15·0	1·2	18·0	1·3	25·0
14	1·4	33·0	1·15	15·0	1·10	12·0	1·2	18·0	1·3	25·0
15	1·4	33·0	1·15	15·0	1·15	15·0	1·2	18·0	1·3	25·0
16	1·4	33·0	1·15	15·0	1·15	15·0	1·25	21·5	1·3	25·0
17	1·4	33·0	1·4	33·0	1·15	15·0	1·3	25·0	1·3	25·0
18	1·35	29·0	1·25	21·5	1·15	15·0	1·3	25·0	1·3	25·0
19	1·35	29·0	1·25	21·5	1·20	18·0	1·3	25·0	1·25	21·5
20	1·35	29·0	1·15	15·0	1·20	18·0	1·3	25·0	1·25	21·5
21	1·3	25·0	1·2	18·0	1·15	15·0	1·3	25·0	1·2	18·0
22	1·3	25·0	1·2	18·0	1·15	15·0	1·25	21·5		18·0
23	1·3	25·0	1·2	18·0	1·15	15·0	1·25	21·5		18·0
24	1·3	25·0	1·15	15·0	1·15	15·0	1·25	21·5		18·0
25	1·3	25·0	1·15	15·0	1·15	15·0	1·25	21·5		18·0
26	1·25	21·5	1·15	15·0	1·15	15·0	1·20	18·0		18·0
27	1·25	21·5	1·15	15·0	1·10	12·0	1·20	18·0		18·0
28	1·25	21·5	1·15	15·0	1·10	12·0	1·20	18·0		18·0
29	1·25	21·5	1·10	12·0	1·10	12·0	1·20	18·0		18·0
30	1·25	21·5	1·10	12·0	1·10	12·0	1·20	18·0		18·0
31	1·25	21·5	1·10	12·0			1·20	18·0		

Monthly Discharge of Phillips Creek, near Roosville, for 1914.

(Drainage area, 23 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	106	33	69·6	3·02	3·48	4,280
June	134	53	76·2	3·31	3·69	4,530
July	53	21·5	33·9	1·47	1·70	2,080
August	33	12·0	17·0	0·74	0·85	1,050
September	18	12·0	14·0	0·61	0·68	833
October	25	15·0	19·0	0·83	0·96	1,170
November	29		23·2	1·01	1·13	1,380

Accuracy "C."

Rock Creek, near Elko (3049).

Location.—One-half mile above Rock mill, near Elko. Cranbrook district.

Records Available.—May to September, 1914.

Climatic Conditions.—Similar to Elko (see Elk river).

Gauge.—Two-foot wooden staff gauge, read four or five times a week by Mr. H. B. Stiven, of Elko.

Channel.—Smooth, with swift water. Good control.

Discharge Measurements.—Five measurements were made in 1914.

Co-operation.—Provincial Water Rights Branch and British Columbia Hydrographic Survey co-operated in 1914.

Accuracy.—Results should be within 15 per cent.

General.—Rock creek is a small stream, about 15 miles long, flowing from the east into Kootenay river, about 10 miles south of Jaffray. The total drainage is about 40 square miles. The station is located above the mouth of Mud creek, and the total discharge of Rock and Mud creeks gives the discharge at Rock Creek Lumber Company's dam. The water is used for irrigation.

Discharge Measurements of Rock Creek, near Baynes, for 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 18	D. O'B. G., R. H. H	1048	18·5	40·6	2·06	1·30	82·8
June 19	D. O'B. G., H. B. H	1048	18·5	37·6	2·28	1·35	86·0
July 12	R. H. H. (Prov.)		18·5	29·3	1·78	0·85	52·1
July 29	D. O'B. G	1929	18·5	23·6	1·35	0·53	31·9
Sept. 14	H. B. H. (Prov.)			20·6	0·87	0·33	18·1

Daily Gauge Height and Discharge of Rock Creek, near Baynes, for 1914.

Day.	May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	31·9	.....	76·1	1·15	73·7	0·5	28·5	0·35	19·2
2	0·55	31·9	1·3	82·9	.....	69·8	0·5	28·5	.....	19·2
3	.....	43·8	1·4	89·7	1·05	65·9	.....	27·4	0·35	19·2
4	0·9	55·7	1·45	93·1	1·0	62·5	.....	26·4	0·35	19·2
5	1·0	62·5	.....	91·4	.....	64·2	0·45	25·2	0·35	19·2
6	1·0	62·5	1·4	89·7	1·05	65·9	.....	23·6	0·35	19·2
7	.....	62·5	.....	84·6	.....	60·8	0·4	22·0	.....	19·2
8	1·0	62·5	1·25	79·5	0·90	55·7	0·45	25·2	0·35	19·2
9	.....	63·3	.....	79·5	.....	55·7	.....	25·2	.....	19·2
10	.....	64·1	1·25	79·5	0·90	55·7	0·45	25·2	0·35	19·2
11	.....	64·9	1·35	79·5	0·85	52·3	.....	25·2	.....	19·2
12	1·05	65·9	1·2	76·1	0·85	52·3	0·45	25·2	0·35	19·2
13	1·15	73·7	1·15	73·7	.....	48·9	.....	23·6	0·30	16·4
14	1·15	73·7	1·15	73·7	0·75	45·5	0·4	22·0	.....	17·8
15	1·25	79·5	.....	76·6	.....	45·5	0·4	22·0	0·35	19·2
16	1·25	79·5	1·25	79·5	0·75	45·5	0·4	22·0	.....	19·2
17	1·3	82·9	1·3	82·9	.....	43·8	.....	22·0	0·35	19·2
18	1·3	82·9	.....	86·3	0·70	42·1	0·4	22·0	.....	19·2
19	1·3	82·9	1·4	89·7	.....	40·4	.....	22·0	0·35	19·2
20	1·35	86·3	1·35	86·3	0·65	38·7	0·4	22·0	0·35	19·2
21	.....	84·6	.....	108·6	.....	38·7	.....	20·6	0·35	19·2
22	1·3	82·9	2·0	131·0	0·65	38·7	0·35	19·2	.....	20·6
23	.....	82·9	.....	129·0	.....	37·0	.....	19·2	0·40	22·0
24	1·3	82·9	1·95	128·0	0·6	35·3	0·35	19·2	.....	22·0
25	.....	82·9	.....	128·0	0·6	35·3	.....	19·2	0·40	22·0
26	1·3	82·9	1·95	128·0	0·6	35·3	0·35	19·2	0·40	22·0
27	.....	81·2	1·9	124·0	.....	33·6	.....	19·2	0·45	25·2
28	1·25	79·5	1·25	79·5	0·55	31·9	0·35	19·2	0·45	25·2
29	.....	81·2	.....	76·6	.....	31·9	0·35	19·2	.....	25·2
30	1·3	82·9	1·15	73·7	0·55	31·9	.....	19·2	0·45	25·2
31	1·1	69·3	.....	.....	0·5	28·5	.....	19·2	.....	.....

Monthly Discharge of Rock Creek, near Baynes, for 1914.

(Drainage area, 15 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	
May	86·3	31·9	71·2	4·75	5·40	4,380	C
June	131·0	73·7	91·9	6·12	6·83	5,470	D
July	73·7	28·5	47·2	3·15	3·63	2,900	C
August	28·5	19·2	22·5	1·50	1·73	1,380	B
September	25·2	16·4	20·3	1·35	1·51	1,210	B

Big Sand Creek, near Jaffray (3042).

Location.—About 300 yards below highway and C.P.R. bridges, 2 miles from Galloway, near Jaffray. Cranbrook district.

Records Available.—May to September, 1914.

Climatic Conditions.—Summers, hot and dry. Winters severe, as low as -40° F. some seasons, with light snowfall. For further information see Elk river. The conditions at Elko are very similar.

Gauge.—Five-foot wooden staff gauge, read daily by Mr. N. Craigie.

Channel.—Uniform and smooth, with swift water. Good control.

Discharge Measurements.—Five well-distributed measurements were made in 1914.

Co-operation.—This station was established by Mr. H. B. Hicks, Provincial Water Rights Branch, and maintained co-operatively by him and the British Columbia Hydrographic Survey.

Accuracy.—Mr. Hicks made a splendid section, late in 1913. The measurements are reliable, daily gauge readings were taken, and the gauge-height-discharge curve is good. The results should be within 5 per cent.

General.—Big Sand creek is an irrigation stream, about 20 miles long, flowing from the northeast into Kootenay river, south of Jaffray. The gauging station is about 8 miles from the mouth, and above the station the drainage area is about 40 square miles. As before stated, the water is used for irrigation.

Discharge Measurements of Big Band Creek, near Jaffray, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May. 19.....	D. O'B. G., R. H. H	1048	38	93·8	5·44	2·3	511
June 19.....	D. O'B. G., H. B. H.....	1048	38	81·5	4·53	2·0	369
July 9.....	R. H. H. (Prov.)	.....	36	51·2	2·64	1·20	135
July 29.....	D. O'B. G., R. H. H.....	1929	35	28·4	1·65	0·65	47·1
Sept. 9.....	H. B. H. (Prov.).....	.....	.....	19·9	1·10	0·35	21·9

Daily Gauge Height and Discharge of Big Sand Creek, near Hanbury, for 1914.

Day.	May.		June.		July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	615	2·1	415	1·5	205	0·58	40·2	0·18	9·0
2	.....	615	2·35	535	1·6	233	0·55	37·5	0·19	9·5
3	2·5	615	2·5	615	1·55	219	0·52	34·8	0·16	8·0
4	2·35	535	2·45	588	1·45	191	0·50	33·0	0·18	9·0
5	1·95	355	2·3	510	1·4	177	0·47	30·6	0·18	9·0
6	1·75	282	2·15	438	1·4	177	0·47	30·6	0·16	8·0
7	1·95	355	1·85	316	1·35	166	0·45	29·0	0·18	9·0
8	2·2	460	1·75	282	1·3	155	0·45	29·0	0·22	11·4
9	2·35	535	1·65	249	1·2	133	0·42	26·6	0·28	15·6
10	2·4	560	1·5	205	1·1	113	0·42	26·6	0·25	13·5
11	2·35	535	1·65	249	1·0	95	0·4	25·0	0·28	15·6
12	2·25	485	1·65	249	1·0	95	0·4	25·0	0·25	13·5
13	2·15	438	1·85	316	0·95	87·5	0·37	22·6	0·25	13·5
14	2·35	535	2·15	438	1·05	103	0·37	22·6	0·20	10·0
15	2·55	642	2·15	438	1·05	103	0·35	21·0	0·22	11·4
16	2·7	730	2·15	438	1·0	95	0·35	21·0	0·30	17·0
17	2·6	670	2·15	438	0·9	80	0·32	18·6	0·41	25·8
18	2·55	642	2·2	460	0·9	80	0·37	22·6	0·61	43·3
19	2·5	615	2·1	415	0·96	89	0·37	22·6	0·88	77·4
20	2·4	560	2·05	395	0·91	81·5	0·37	22·6	1·02	98·6
21	2·4	560	1·85	316	0·83	70·9	0·35	21·0	0·90	80·0
22	2·5	615	1·75	282	0·8	67·0	0·35	21·0	0·88	77·4
23	2·4	560	1·65	249	0·78	64·6	0·35	21·0	0·80	67·0
24	2·35	535	1·4	177	0·75	61·0	0·30	17·0	0·80	67·0
25	2·15	438	1·5	205	0·72	57·4	0·28	15·6	0·76	62·2
26	2·2	460	1·65	249	0·70	55·0	0·25	13·5	0·70	55·0
27	2·15	438	1·65	249	0·67	51·1	0·24	12·8	0·70	55·0
28	2·0	375	1·6	233	0·65	48·5	0·25	13·5	0·65	48·5
29	1·75	282	1·65	249	0·62	44·6	0·22	11·4	0·60	42·0
30	1·75	282	1·65	249	0·61	43·3	0·25	13·5	0·60	42·0
31	2·0	375	.....	.....	0·6	42·0	0·19	9·5	.....	.....

Monthly Discharge of Big Sand Creek, near Hanbury, for 1914.

(Drainage area 40 square miles.)

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	730	282	506	12·7	14·6	31,100
June	615	177	348	8·7	9·71	20,700
July	233	42	106	2·65	3·06	6,520
August	40·2	9·5	22·9	0·57	0·66	1,410
September	98·5	8·0	34·1	0·85	0·95	2,030

Accuracy A.

Little Sand Creek, near Jaffray (3043).

Location.—At small bridge, above Rosen's ranch, near Jaffray. Cranbrook district.

Records Available.—May to September, 1914.

Climatic Conditions.—See Big Sand creek.

Gauge.—Wooden staff gauge, nailed to the bridge, read daily by Andrew Rosen of Jaffray.

Channel.—Uniform. Water unbroken and swift. Control doubtful.

Discharge Measurements.—Five were made in 1914.

Co-operation.—Provincial Water Rights Branch and British Columbia Hydrographic Survey co-operated in 1914.

Accuracy.—Results should be within 15 per cent.

General.—Little Sand creek, a tributary of Big Sand creek, is a small stream used extensively for irrigation.

DISCHARGE MEASUREMENTS of Little Sand Creek, near Jaffray, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Veolcity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1914.							
May 15	D. O. B. G., R. H. H.	1048	24·0	31·7	3·51	1·333	111
June 19	D. O. B. G., H. B. H.	1048	24·0	26·7	3·01	1·000	80·3
July 13	R. H. H. (Prov.)		24·0	26·9	3·05	0·875	82·0
July 29	D. O. B. G., R. H. H.	1929	24·0	14·7	2·04	0·458	30·0
Sept 14	H. B. H. (Prov.)			17·2	2·11	0·562	36·3

DAILY GAUGE HEIGHT AND DISCHARGE of Little Sand Creek, near Jaffray, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge.
	Feet	Sq. ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			1·0	85·0	1·04	90·0
2			0·95	79·0	1·29	120·0
3			1·05	91·0	1·4	133·0
4			0·95	79·0	1·46	141·0
5			0·9	73·2	1·46	141·0
6			0·95	79·0	1·42	136·0
7			1·1	97·0	1·25	115·0
8			0·85	68·2	1·17	105·0
9			1·2	109·0	1·08	95·0
10			1·1	97·0	0·94	77·5
11			1·12	99·0	1·12	99·0
12			1·12	99·0	1·17	105·0
13			1·17	105·0	1·0	85·0
14			1·25	118·0	0·96	80·0
15			1·35	127·0	1·06	92·5
16			1·46	141·0	1·0	85·0
17			1·35	127·0	1·14	102·0
18			1·46	141·0	0·96	80·0
19			1·5	147·0	0·87	69·6
20			1·5	147·0	1·02	87·5
21			1·44	138·0	0·85	68·2
22			1·44	138·0	0·79	61·5
23			1·29	120·0	0·77	59·2
24			1·27	117·0	0·85	68·2
25			1·31	122·0	0·92	75·9
26	0·8	62·4	1·37	129·0	1·0	85·0
27	0·81	60·0	1·2	109·0	1·06	92·5
28	0·85	68·2	1·12	99·0	0·85	68·2
29	0·85	68·2	1·04	90·0	0·79	61·5
30	0·92	75·0	1·12	99·0	0·77	59·2
31			0·96	80·0		

Daily Gauge Height and Discharge of Little Sand Creek, near Jaffray, for 1914—*Concluded.*

Day.	July.		August.		September.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·637	50·3	0·645	46·1	0·312	19·7
2	0·666	48·3	0·416	26·3	0·312	19·7
3	0·812	63·7	0·437	27·8	0·552	37·0
4	0·687	50·3	0·645	46·1	0·604	42·1
5	0·604	42·1	0·572	39·2	0·308	19·5
6	0·791	61·5	0·416	26·3	0·283	18·3
7	0·625	44·1	0·398	24·7	0·301	19·1
8	0·625	44·1	0·398	24·7	0·593	40·9
9	0·625	44·1	0·398	24·7	0·791	61·5
10	0·582	38·1	0·604	42·1	0·687	50·3
11	0·250	34·2	0·583	40·1	0·520	34·2
12	0·500	32·5	0·604	42·1	0·666	48·3
13	0·708	52·5	0·583	40·1	0·687	50·3
14	0·520	34·2	0·554	37·3	0·479	30·8
15	0·509	32·5	0·562	38·1	0·520	34·2
16	0·514	33·3	0·416	26·3	0·479	30·8
17	0·479	30·8	0·395	24·7	0·544	36·1
18	0·489	31·6	0·437	27·8	0·520	34·2
19	0·479	30·8	0·562	38·1	0·479	30·8
20	0·625	44·1	0·510	33·4	0·500	33·2
21	0·625	44·1	0·363	22·4	0·401	25·3
22	0·439	30·8	0·364	22·6	0·416	26·3
23	0·437	27·8	0·333	20·7	0·395	24·7
24	0·437	27·8	0·343	21·2	0·354	21·9
25	0·437	27·8	0·333	20·7	0·416	26·3
26	0·416	26·3	0·333	20·7	0·437	27·8
27	0·604	42·1	0·372	20·2	0·437	27·8
28	0·437	27·8	0·312	19·7	0·408	25·6
29	0·416	26·3	0·312	19·7	0·408	25·6
30	0·458	29·3	0·312	19·7	0·384	23·8
31	0·770	59·2	0·312	19·7	.....	.....

Monthly Discharge of Little Sand Creek, near Jaffray, for 1914.

(Drainage area 33 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	147	68·2	108	3·28	3·78	6,640
June	141	59·2	91·3	2·77	3·09	5,430
July	63·7	26·3	39·1	1·18	1·36	2,400
August	46·1	19·7	29·1	0·88	1·01	1,790
September	61·5	18·3	31·5	0·95	1·06	1,870

Accuracy "C."

St. Mary's River, near Wycliffe (3050).

Location.—At traffic bridge near Wycliffe, 12 miles from the mouth and 7 miles from Cranbrook. Cranbrook district.

Records Available.—April to December, 1914.

Climatic Conditions.—Climatic conditions near Wycliffe are very similar to those at Cranbrook. At Cranbrook, from December 1, 1913, to November

30, 1914, the precipitation was 16 inches. The summers are hot, windy ,and dusty, almost semi-arid. The winters are severe, with occasional cold spells a week or so duration, when the temperature may go as low as -40°F or -50°F. In December, 1914, engineers of the British Columbia Hydrographic Survey were doing field work around Cranbrook when the temperature was as low as -20°F. St. Mary's river freezes up in November or December and remains frozen till March. Frazil ice is prevalent.

Gauge.—Vertical staff gauge, read daily by the Otis Staples Lumber Company at Wycliffe.

Channel.—Straight, uniform, with smooth, swift water. Good control.

Discharge Measurements.—Mr. Hicks, District Engineer, Provincial Water Rights Branch, made several measurements in 1913, and in 1914 four measurements were made.

Accuracy.—Combining Mr. Hick's measurements and the 1914 measurements a very good gauge-height discharge curve has been obtained. The results should be within 10 per cent.

General.—The St. Mary's is a large river rising in the divide between Kootenay lake and Kootenay river in East Kootenay. It flows in an easterly direction, discharging into Kootenay river near Fort Steele, 50 miles above the international boundary line. It is about 50 miles long and drains in the neighbourhood of 1,100 square miles.

The St. Mary's river is at present used for logging purposes. The Otis Staples Lumber Company has a large mill at Wycliffe, and logs are driven from the timber limits near the source of the river to Wycliffe. Ore, particularly silver-lead and zinc, is found in large quantities in various parts of the drainage. The Sullivan mine, at Kimberley, had an output in 1914 of 36,000 tons, from which was obtained 550,000 ounces of silver and 25,000,000 pounds of lead. Power is obtained from Mark creek, a tributary of the St. Mary's.

On St. Mary's river there is a power site immediately above the gauging station near Wycliffe. A head of from 30 to 40 feet may be obtained, and a development of about 2,000 horse power may be installed at a fairly reasonable figure.

Discharge Measurements of St. Mary's River at Wycliffe, for 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section	Mean Velocity	Gauge Height.	Discharge
1914.			Feet	Sq. ft.	Ft. per sec.	Feet	Sec. ft.
June 30.....	D. O. B. C.	1,048	41	1,140	6.82	5.80	7,363
July 23	" H. B. H.	1,929	162	708	3.45	3.60	2,439
Oct. 10	"	1,929	148	451	1.95	1.9	878
Oct. 16.....	"	1,929	148	452	1.94	1.9	877

Daily Gauge Height and Discharge of St. Mary's River near Wycliffe, for 1914.

Day.	April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.ft.
1	1·0	395	3·6	2,460	6·25	8,720
2	1·0	395	4·5	3,910	6·85	11,000
3	1·0	395	5·45	6,210	8·2	17,100
4	1·0	395	5·4	6,070	8·2	17,100
5	1·16	441	4·9	4,790	7·6	14,300
6	1·22	466	4·4	3,710	7·1	12,000
7	1·32	506	4·9	4,790	6·25	8,720
8	1·4	541	3·45	2,280	5·10	5,280
9	1·55	617	3·4	2,220	4·95	4,910
10	1·65	674	3·7	2,590	4·90	4,790
11	1·95	873	4·15	3,260	5·00	5,030
12	2·00	910	4·7	4,340	5·35	5,940
13	2·15	1,030	5·05	5,160	5·65	6,790
14	2·45	1,270	5·15	5,410	6·36	9,060
15	3·05	1,840	6·1	8,200	7·0	11,600
16	3·25	2,060	6·3	8,890	7·2	12,500
17	3·30	2,110	6·4	9,240	7·35	13,100
18	3·40	2,220	6·3	8,890	7·55	14,000
19	3·4	2,220	6·0	7,870	7·6	14,300
20	3·45	2,280	5·9	7,550	7·55	14,000
21	3·6	2,460	5·9	7,550	7·15	12,200
22	3·6	2,460	5·8	7,240	6·25	8,720
23	3·5	2,340	5·7	6,940	5·5	6,350
24	3·5	2,340	5·7	6,940	5·1	5,280
25	3·5	2,340	5·5	6,350	5·1	5,280
26	3·4	2,220	5·4	6,070	5·6	6,640
27	3·4	2,220	5·4	6,070	6·0	7,870
28	3·3	2,110	5·2	5,540	6·25	8,720
29	3·2	2,000	5·2	5,540	6·05	8,040
30	3·1	1,890	5·0	5,030	5·8	7,240
31	.....	.....	5·6	6,640	.....	.....

SESSIONAL PAPER No. 25e

Daily Gauge Height and Discharge of St. Mary's River near Wycliffe, for 1914.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	5·82	7,300	2·8	1,590	1·8	767	1·5	590	2·0	910	2·0	910
2	6·22	8,610	2·8	1,590	1·8	767	1·5	590	2·0	910	2·0	910
3	6·65	10,200	2·7	1,500	1·8	767	1·5	590	2·0	910	2·0	.....
4	7·0	11,600	2·6	1,400	1·8	767	1·5	590	2·0	910	2·0	.....
5	7·0	11,600	2·6	1,400	1·8	767	1·5	590	2·0	910	2·1	.....
6	6·7	10,400	2·5	1,310	1·8	767	1·5	590	2·0	910	2·10	.....
7	6·3	8,890	2·5	1,310	1·8	767	1·5	590	2·0	910	2·2	.....
8	5·9	7,550	2·4	1,230	1·8	767	1·5	590	2·0	910	2·2	.....
9	5·6	6,646	2·4	1,230	1·8	767	1·5	590	2·0	910	2·2	.....
10	5·5	6,356	2·3	1,150	1·8	767	1·6	644	2·0	910	2·2	.....
11	5·35	5,940	2·2	1,070	1·8	767	1·6	644	2·0	910	2·2	.....
12	5·4	6,070	2·2	1,070	1·8	767	1·6	644	2·0	910	2·2	.....
13	5·5	6,350	2·1	990	1·8	767	1·6	644	2·0	910	2·2	.....
14	5·5	6,350	2·1	990	1·8	787	1·7	703	2·0	910	2·2	.....
15	5·4	6,075	2·1	990	1·8	767	1·7	703	2·0	910	2·2	.....
16	5·0	5,030	2·1	990	1·8	767	1·7	703	2·0	910	2·2	.....
17	4·7	4,340	2·1	990	1·8	767	1·8	767	2·0	910	2·2	.....
18	4·5	3,910	2·0	910	1·8	767	1·8	767	2·0	910	2·2	.....
19	4·25	3,430	2·0	910	1·8	767	1·8	767	2·0	910	2·2	.....
20	3·95	2,940	2·0	910	1·8	767	1·8	767	2·0	910	2·2	.....
21	3·75	2,660	2·0	910	1·8	767	1·8	767	2·0	910	2·2	.....
22	3·55	2,490	2·0	910	1·8	767	1·8	767	2·0	910	2·2	.....
23	3·4	2,220	1·9	836	1·8	767	1·8	767	2·0	910	2·2	.....
24	3·25	2,060	1·9	836	1·8	767	1·9	836	2·0	910	2·2	.....
25	3·2	2,000	1·9	836	1·8	767	1·9	836	2·0	910	2·2	.....
26	3·1	1,890	1·9	836	1·8	767	1·9	836	2·0	910	2·2	.....
27	3·1	1,890	1·8	767	1·8	767	1·9	836	2·0	910	2·2	.....
28	3·0	1,780	1·8	767	1·8	767	1·9	836	2·0	910	2·2	.....
29	3·0	1,780	1·8	767	1·8	767	1·9	836	2·0	910	2·2	.....
30	2·9	1,680	1·8	767	1·8	767	1·9	836	2·0	910	2·2	.....
31	2·8	1,590	1·8	767	1·0	.....	1·9	836	.....	.....	2·2	.....

Monthly Discharge of St. Marys River near Wycliffe for 1914.

(Drainage area, 1,100 square miles.)

Month.	Discharge in Second-Feet.			Run-Off.			Accuracy.
	Maximum.	Minimum	Mean	Per square mile.	Depth in inches on Drainage area	Total in acre-feet.	
April	2,460	395	1,470	1·34	1·50	87,500	B
May	9,240	2,220	5,530	5·05	5·82	340,000	B
June	17,100	7,340	9,550	8·68	9·68	568,000	B
July	11,600	1,590	5,420	4·93	5·68	333,000	B
August	1,590	767	1,050	0·95	1·10	64,600	B
September	767	767	767	0·70	0·78	45,600	D
October	836	590	711	0·65	0·75	43,700	D
November	910	910	910	0·83	0·93	54,100	

MISCELLANEOUS METERING STATIONS.

Date.	Stream.	Locality.	Gauge Height.	Discharge.
			Feet.	Sec.-ft.
1913.				
Sept. 20	Washout Creek	Galena	0·72	12·9
1914.				
May 26	Washout Creek	Galena	1·50	45·0
June 21	"	"	1·65	55·8
Aug. 24	"	"	1·02	13·4
Oct. 7	"	"	1·10	12·2
April 17	Shuswap Creek	Athalmer	0·59	11·09
May 23	"	"	1·30	48·02
July 28	"	"	1·15	20·90
Aug. 25	"	"	1·00	16·70
Sept. 21	"	"	1·00	17·15
" 28	"	"	1·00	15·25
May 27	Lewis Creek	Wasa	0·55	17·5
July 16	"	"	0·65	17·5
Aug. 12	"	"	.....	7·08
Sept. 26	"	"	0·40	4·92
May 15	Little Bull	Bull River	1·05	7·83
Aug. 4	"	"	1·30	14·3
Sept. 9	"	"	1·26	12·9
July 7	Moyie River	Kingsgate	2·1	1,140·
Aug. 1	"	"	0·80	333·0
Oct. 15	"	"	1·10	183·0
" 15	"	"	0·80	225·0
" 8	"	"	0·75	213·0
Aug. 14	Sheep Creek	Wasa	11·25	91·8
Sept. 28	"	"	11·00	97·0
Aug. 25	Skookumchuck Creek	.....	.....	114

Date.	Stream.	Tributary to—	Locality.	Gauge Height.	Discharge.
				Feet.	Sec.-ft.
Nov. 27	Duncan River	Howser	Howser	1·80	1,250
" 29	Fry Creek		Kaslo	2·1	278
" 27	Glacier Creek		Howser	4·3	142
" 10	Kootenay River		Taghum	.....	27,300
Dec. 8	"		"	.....	23,400
Nov. 28	Lardeau River		Howser	.....	1,130
April 18	Wilson Creek		Roseberry	1·85	822
May 14	"		"	3·48	2,290
June 15	"		"	3·80	3,320
" 18	"		"	4·00	2,480
July 8	"		"	2·50	2,340
Aug. 17	"		"	0·85	642
Nov. 3	"		"	0·90	759

Date.	Stream.	Locality.	Gauge Height.	Discharge.
			Feet.	Sec.-ft.
1914.				
May 7	Columbia River	Near Athalmer	1·65	235
" 17	"	"	1·43	233
Oct. 24	Field Creek	Near Field	.....	2·92
June 15	Horse Creek	Golden	.....	62·8
July 28	Hospital Creek	"	3·82	17·4
June 12	"	"	5·20	66·1
July 27	"	"	4·75	6·69
Nov. 20	Salmon River	Beaton	1·8	57·0

INDEX.

PAGE.

Accuracy and Reliability of Data, Hydrographic data 13
Adams River, Hydrographic data 270
Anderson River 194
Ashnola river near Keremeos, Hydrographic data 275
Ashcroft and Nicola Districts 7
Akolkolex River, near Wigwam, Hydrographic data 431
Belknap Creek at Belknap Lake, Hydrographic data 55
Belknap Creek below Ann Lake, Hydrographic data 58
Big Qualicum River, Hydrographic data 117
Black Creek, Hydrographic data 204
Boulder Creek, Hydrographic data 61
Brandt Creek, at mouth, Hydrographic data 64
" above Young Creek, Hydrographic data 66
Bridge River, Hydrographic data 168
Barnes Creek, Hydrographic data 327
Boulder Creek, Hydrographic data 61
Bolean Creek, Hydrographic data 207
Bonaparte River, Hydrographic data 330
Boundary Creek, Hydrographic data 278
Barriere River 38
Beaver River, near Six-mile Creek, Hydrographic data 434
Blaeberry River, near Moberly, Hydrographic data 437
Bugaboo Creek, Hydrographic data 440
Bull River, near Mouth, Hydrographic data 494
Big Sand Creek near Joffray 523
Co-operation and Acknowledgements 13
Convenient Equivalents 12
Chief Engineer's Report—Coast Division 3
Coast Division:—
Territory 17
Uses of Water 17
Present Water-Power Developments 17
Possible Water-Power Developments 17
Municipal supply 17
Reclamation 17
Irrigation 18
Location of Stations 18
Precipitation and Temperature 18
Comparison of Stream Measurements 18
Districts:—
Southern 4, 5, 19
Lillooet 5, 20, 24
Vancouver Island 5
Regular Metering Stations 4, 5, 21, 24
Miscellaneous Metering Stations 204
Campbell River, Hydrographic data 120
Capilano Creek, Hydrographic data 69
Cayuse Creek, Hydrographic data 171
Cheakamus River, Hydrographic data 174
Chehalis River, Hydrographic data 72
Chilliwack River, Hydrographic data 75
Chemainus River, Hydrographic data 123
Coquihalla River, Hydrographic data 78
Cowichan River, Hydrographic data 126
Coquitlam River, Hydrographic data 24
Campbell Creek, Hydrographic data 210
Canyon Creek, Hydrographic data 213, 442
Celeste Creek, Hydrographic data 281
Little Clearwater River, Hydrographic data 220
Cherry Creek, Hydrographic data 223, 407
Criss Creek, Hydrographic data 353
Coldwater River, Hydrographic data 236
Crazy Creek, Hydrographic data 284
Canyon Creek, Hydrographic data 213
Cariboo Creek, near Burton City, Hydrographic data 367
Carpenter Creek, near New Denver, Hydrographic data 368
Carpenter Creek, south fork near Sandon, Hydrographic data 372
Cherry Creek near Wasa, Hydrographic data 375
Columbia River, near Castlegar, Hydrographic data 376
Columbia River, at Golden, Hydrographic data 443
Columbia River, near Revelstoke, Hydrographic data 377
Columbia River, near Trail, Hydrographic data 446
Columbia River, drainage basin Cranbrook District, Hydrographic data 48
Clearwater River, Hydrographic data 216, 217
Climatic Conditions 45
Chinook Winds 47
Division of Work 3

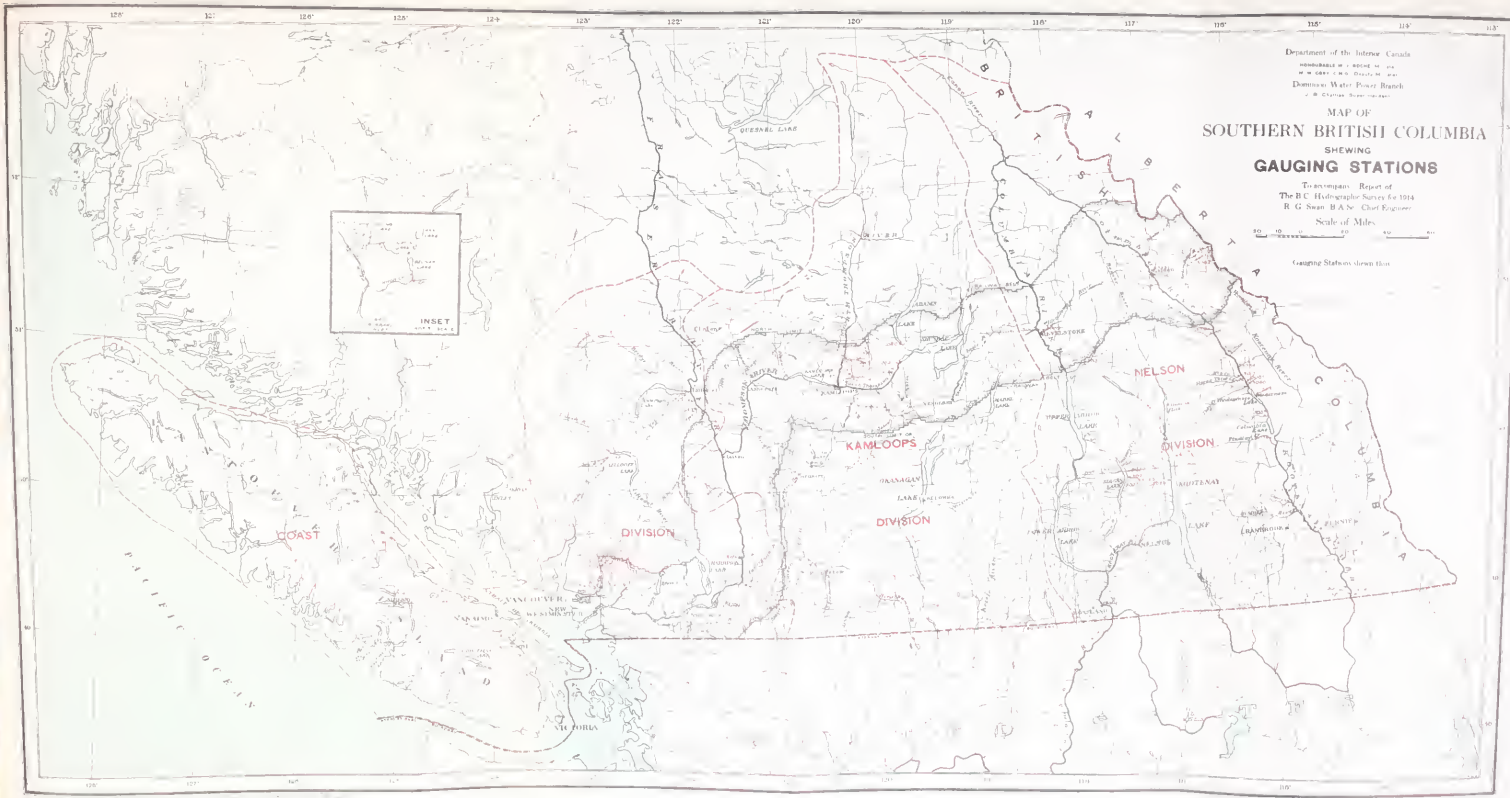
Districts—*Continued.* PAGE.
Definition of Terms ... 12
Developed Water powers—Coast Division ... 24
Deadman River, Hydrographic data ... 339
Districts and Staff—Kamloops Division ... 35
Developed Water powers—Kamloops Division ... 38
Duncan River, Hydrographic data ... 530
Dutch Creek, near Fairmont Springs, Hydrographic data ... 449
Explanation of Tables ... 11
Englishman River, Hydrographic data ... 129
Eagle River, at Malakwa, Hydrographic data ... 287
Essell Creek, Hydrographic data ... 226
Elk River, near Elko, Hydrographic data ... 503
Fountain Creek, Hydrographic data ... 177
Fraser River, Hydrographic data ... 81
Fishtrap Creek, Hydrographic data ... 363
Fraser River, at Lytton, Hydrographic data ... 342
Fortune or Davis Creek, Hydrographic data ... 39
Fry Creek, Hydrographic data ... 530
Field Springs, Nos. 1, 2 and 3, Hydrographic data ... 450
Findlay Creek, near Canal Flats, Hydrographic data ... 454
Four-mile Creek, below Hewitt Mill, Hydrographic data ... 380
Four-mile Creek, above Hewitt intake, Hydrographic data ... 383
Frazil Ice ... 51
Green River, at Nairn Falls, Hydrographic data ... 179
Green River, at Green Lake, Hydrographic data ... 183
Gilley Creek, Hydrographic data ... 24
Goldstream River, Hydrographic data ... 22
Granite Creek, Hydrographic data ... 290
Guichon Creek, Hydrographic data ... 229
Glacier Creek, Hydrographic data ... 46
Goat River, near Erickson, Hydrographic data ... 386
Gold Creek, near Newgate, Hydrographic data ... 506
General Remarks—Nelson Division ... 45
Hixon Creek, above Belknap Creek, Hydrographic data ... 86
Hixon Creek, near mouth, Hydrographic data ... 84
Hat Creek, Hydrographic data ... 344
Heffley Creek (upper) Hydrographic data ... 232
" (lower) Hydrographic data ... 235
Horsethief Creek, near Wilmer, Hydrographic data ... 457
Hospital Creek (Weir) Hydrographic data ... 458
Hydrographic Districts—Nelson Division ... 48
Haslam Creek ... 131
Irrigation Streams—Coast Division ... 25
Ingram Creek, Hydrographic data ... 238
Illecillewaet River, near Revelstoke, Hydrographic data ... 462
" " Glacier, Hydrographic data ... 460
Incomappleux River, near Beaton, Hydrographic data ... 466
Irrigation—Kamloops Division ... 33
Inspections—Kamloops Division ... 36
Jones Creek, Hydrographic data ... 88
Jordan River ... 22
Jamieson Creek, Hydrographic data ... 241
Kamloops Division:—
Chief Engineer's Report ... 3
Territory ... 33
Uses of Water ... 33
Irrigation ... 33
Water Power Development ... 33
" " Possibilities ... 33
Municipal Supply ... 34
Topography ... 34
Precipitation and Climate ... 34
District and Staff ... 35
Kamloops District ... 35
The Ashcroft and Nicola District ... 36
The Okanagan District ... 36
Kamloops Office ... 36
Inspections ... 36
Developed Water Powers ... 38
Barriere River ... 38
Boundary Creek ... 39
Crazy Creek ... 39
Fortune, or Davis Creek ... 39
Kettle River at Cascade ... 39
Kettle River (North Fork) ... 39
Murray Creek ... 40
Nakalliston Creek ... 40
Similkameen River ... 40
Precipitation, Total Monthly ... 40
" Difference from average ... 41
Temperature, Mean Monthly ... 40
" Difference from average ... 41
Koksilah river, Hydrographic Data ... 134
Kettle River at Carson, Hydrographic data ... 301
" (North Fork), Hydrographic data ... 292
" (West Fork), Hydrographic data ... 295
" near Nicholson's Bridge, Hydrographic data ... 298
" at Cascade, Hydrographic data ... 301
Kaslo creek ... 389
Kicking Horse River, near Golden ... 468
" " " " Field ... 472
" " " " No. 2 Tunnel ... 474

SESSIONAL PAPER No. 25e

Kamloops Division—*Concluded.* PAGE

Kooskanax Creek, near Nakusp ... 311
Kootenay River, at Upper Bonnington Falls ... 395
" " near Bonnington Pool, Hydrographic data ... 411
" " " Glade, Hydrographic data ... 417
" " " Nelson, Hydrographic data ... 412
" " " Wardner, Hydrographic data ... 508
Laluwissin Creek, Hydrographic data ... 185
Lillooet River, Hydrographic data ... 187
Little Qualicum River, Hydrographic data ... 137
Lynn Creek, Hydrographic data ... 91
Little Blackwater River, Hydrographic data ... 194
Location of Stations, Coast Division ... 18
Louis Creek, Hydrographic data ... 244
Lardeau Creek, Hydrographic data ... 530
Linklater Creek, Hydrographic data ... 512
Little Sand Creek, near Jaffray ... 524
Little Clearwater River, Hydrographic data ... 220
Mesliloet River, Hydrographic data ... 94
" " Tributaries, Hydrographic data ... 24
McGillivray Creek, Hydrographic data ... 194
Municipal Water Supply, Coast Division ... 17
" " " Kamloops Division ... 34
Murray Creek, Hydrographic data ... 40
Metering Stations, list of Regular, Coast Division ... 4
" " " Miscellaneous, Coast Division ... 5
" " " Regular, Kamloops Division ... 6
" " " Miscellaneous, Kamloops Division ... 8
" " " Regular, Nelson Division ... 9
" " " Miscellaneous, Nelson Division ... 11
Methods of Measuring Stream Flow ... 13
Monte Creek (Diversion to Summit Lake), Hydrographic data ... 247
" (below Diversion to Summit Lake), Hydrographic data ... 250
" (above Bostocks Diversion), Hydrographic data ... 253
Myrtle River, Hydrographic data ... 256
Miscellaneous Measurements in Thompson River Drainage, Hydrographic data ... 363
Moyie Creek, Hydrographic data ... 530
Mark Creek, near Maryville, Hydrographic data ... 513
Mud Creek, near Elko, Hydrographic data ... 516

Nelson Division—
Chief Engineer's Report ... 45
General Remarks ... 45
Climate Conditions ... 45
Chinook Winds ... 47
Snowfall data ... 47
Snowfall Table ... 48
Temperature ... 48
Co-operation ... 48
Hydrographic Districts ... 48
Problem of Transportation ... 49
Winter Measurements ... 50
Personal Equation ... 50
Frazil Ice ... 51
Meter ... 51
Total Monthly Precipitation ... 51
Mean Monthly Temperature ... 52
Difference from Average Precipitation ... 52
" " " Temperature ... 52
Regular Metering Stations, List of ... 9, 367
Miscellaneous Metering Stations, List of ... 11, 530
Nanaimo River, Hydrographic data ... 140
Niskonlith Creek ... 346
Nicolum River, Hydrographic data ... 97
Norton Creek, Hydrographic data ... 99
North Lillooet River, Hydrographic data ... 24
Nahatlatch River (Upper), Hydrographic data ... 347
Nahatlatch River (Lower), Hydrographic data ... 350
Nicola River at Merritt, Hydrographic data ... 352
Nicola River at Mouth, Hydrographic data ... 355
Nakalliston Creek, Hydrographic data ... 40
Nakusp Creek, near Nakusp, Hydrographic data ... 419
North Thomson River, above Clearwater River, Hydrographic data ... 363
North Thomson River, above Jamieson Creek, Hydrographic data ... 363
North Vermilion Creek, near Edgwater, Hydrographic date ... 488
No. 2 Creek, near Forsters Landing, Hydrographic data ... 478
Oyster River, Hydrographic data ... 143
Okanagan River, Hydrographic data ... 308
Okanagan District, Kamloops Division ... 7
Organization ... 4
Personal Equation ... 50
Precipitation, Difference from Average, Nelson Division ... 52
" Total Monthly, Nelson Division ... 51
Problem of Transportation, Nelson Division ... 49
Precipitation and Temperature, Coast Division ... 18
" and Climate, Kamloops Division ... 34
Possible Water Power Developments, Coast Division ... 24
Present " " " " ... 17
Puntledge River, Hydrographic data ... 146
" " Diversion Dam, Hydrographic data ... 149
Paul Creek, Hydrographic data ... 258
Power River, Hydrographic data ... 24


Department of the Interior Canada
Dominion Water Power Branch
MAP OF
SOUTHERN BRITISH COLUMBIA
SHEWING
GAUGING STATIONS
To accompany Report of
The B C Hydrographic Survey for 1914
R G Swan B A Sc Chief Engineer
Scale of Miles
Gauging Stations shewn thus
INSET
QUESNEL LAKE
KAMLOOPS
DIVISION
NELSON
DIVISION
COAST
DIVISION
VANCOUVER
VICTORIA
PACIFIC OCEAN
BRITISH COLUMBIA

Pigeon River, Shining Falls.

DEPARTMENT OF THE INTERIOR—CANADA

Hon. W. J. ROCHE, Minister. W. W. CORY, Deputy Minister.

DOMINION WATER POWER BRANCH,

J. B. CHALLIES, C E., Superintendent.

PROGRESS REPORT

OF THE

MANITOBA HYDROGRAPHIC SURVEY

FOR

THE CALENDAR YEARS 1912 - 13 - 14

BY

M. C. HENDRY, B.A.Sc.

OTTAWA

PRINTED BY J. de L. TACHÉ, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1916

25f—1916]—1½

To Field Marshal, His Royal Highness Prince Arthur William Patrick Albert, Duke of Connaught and of Strathearn, K.G., K.T., K.P., etc., etc., etc., Governor General and Commander in Chief of the Dominion of Canada.

May it Please Your Royal Highness:

The undersigned has the honour to lay before Your Royal Highness the Manitoba Hydrographic Survey Report for the calendar years 1912-13-14.

Respectfully submitted,

W. J. ROCHE,
Minister of the Interior.

Ottawa, May 31, 1915.

DEPARTMENT OF THE INTERIOR,

OTTAWA, May 31, 1915.

The Honourable W. J. ROCHE, M.D.,
Minister of the Interior.

SIR,—I have the honour to submit the Manitoba Hydrographic Survey Report for the calendar years 1912-13-14, and to recommend that it be published as Water Resources Paper No. 4, of the Dominion Water Power Branch.

I have the honour to be, sir,

Your obedient servant,

W. W. CORY,
Deputy Minister of the Interior.

Department of the Interior,

Dominion Water Power Branch,

Ottawa, May 31, 1915.

W. W. Cory, Esq., C.M.G.,
Deputy Minister of the Interior,

Sir,—I have the honour to submit the attached report on the Manitoba Hydrographic Survey for the calendar years 1912-13-14 by M. C. Hendry, B.A.Sc., Chief Engineer.

In view of its important bearing on the industrial development of Manitoba, I would recommend that it be published as Water Resources Paper No. 4, of the Dominion Water Power Branch.

Respectfully submitted,

J. B. CHALLIES,
Superintendent.

WINNIPEG, May 31, 1915.

J. B. CHALLIES, ESQ.,
Superintendent, Dominion Water Power Branch,
Department of the Interior,
Ottawa, Ont.

SIR,—I have the honour to submit herewith the manuscript of the Progress Report of Stream Measurement, Manitoba Hydrographic Survey.

This report covers the hydrographic work carried on by this Survey since its organization in 1912 up to the end of 1914. I would request that it be published as one of the Water Resources Papers of the Dominion Water Power Branch.

In submitting this report, I wish to acknowledge the loyal and efficient assistance of all members of my staff in collecting and arranging the data herein compiled.

I have the honour to be, sir,

Your obedient servant,

M. C. HENDRY,
Chief Engineer.

TABLE OF CONTENTS.

PART I.

	Page.
Introduction	3
Organization and Scope	4
Districts	5
Definitions and Terms	12
Convenient Equivalents	14
Methods of Determining Discharge	14
Slope Method	15
Weir Method	16
Velocity Method	17
Chemical Method	17
Methods of Determining Mean Velocity	18
Float Method	18
Current Meter Method	19
Determination of Mean Velocity by Current Meter	20
Vertical Velocity Method	20
Three Point Method	20
Two Point Method	20
One Point Method	20
Integration Method	22
Winter Measurements	22
Metering Stations	24
Bridge Stations	24
Cable Stations	24
Cable Carrier Stations	25
Wading Stations	25
Boat Stations	25
Preparation of Data	25
Stout Method	26
Bolster Method	26
Explanation of Data	27
Acknowledgments	27
Summary and Recommendations	28

PART II.

HYDROGRAPHIC DATA.

Lake of the Woods Tributaries and Outlets	31
Rainy River	31
Kettle Falls	33
Fort Frances	38
Emo	44
Beaudette	45
Lake of the Woods Outlets	46
Eastern Outlet	46
Western Outlet	59
Mill "A" Headrace	65
Mill "C" Headrace	70
Keewatin Lumber and Mfg. Co's Headrace	73
C. P. R. Culvert, Mink Bay	76
War Eagle Outlet	77
North Tunnel Island	78
Combined Discharge of Outlets	88
Winnipeg River and Tributaries	91
Winnipeg River	91
Minaki	93
Throat Rapids	250
Dalles	250
Whitedog Falls	94
Slave Falls	101
Otter Falls	109
Pinawa Channel	116
Grand du Bonnet Falls	129

PAGE.
English River ... 250
Whiteshell River ... 251
Whitemouth River ... 130
Red River and Tributaries ... 135
Red River ... 135
Emerson ... 136
Below Emerson ... 141
Elm Park Bridge ... 142
Redwood Bridge ... 143
Pembina River ... 144
Roseau River ... 146
Rat River ... 155
Seine River ... 252
Assiniboine River and Tributaries ... 161
Assiniboine River ... 161
Millwood ... 161
Brandon ... 166
Headingly ... 170
St. James ... 174
Shell River ... 178
Birdtail Creek ... 181
Little Saskatchewan River ... 185
Souris River ... 192
Cypress River ... 196
Pipestone Creek ... 197
Tributaries of Lake Winnipegosis ... 198
Red Deer River ... 198
Erwood ... 198
Hudson Bay Junction ... 199
Swan River ... 202
Mossy River ... 207
Fork River ... 213
Valley River ... 214
Ochre River ... 219
Tributaries of Lake Winnipeg from the West ... 225
Saskatchewan River ... 225
Pas ... 225
Head of Grand Rapids ... 231
Fairford River ... 235
Tributaries of Lake Winnipeg from the East ... 237
(1) Brokenhead River ... 237
(2) Manigotagan River ... 242
(3) Berens River ... 246
Nelson River ... 247
Miscellaneous Meterings ... 249

PART III.

Gazetteer of Lakes and Rivers ... 257

LIST OF ILLUSTRATIONS.

	Page.
Pigeon River, Shining Falls	Frontispiece.
Keewatin, M.H.S. Evaporation Station—Meteorological Instrument Shelter	6
Keewatin, M.H.S. Evaporation Station	7
Automatic Gauge House, Kenora—Interior View	7
Lake of the Woods, Western Outlet—North Tunnel Island Metering Station	9
Winnipeg River, Little Du Bonnet Falls	13
Winnipeg River, Whitedog Falls. Meter Section on North Channel	13
Winnipeg River, Second McArthur Falls	21
Winnipeg River, Slave Falls. Metering Section	21
Winnipeg River, Slave Falls. Cable Car Station	32
Roseau River, Dominion City. M.H.S. Gauge	32
Brokenhead River, Sinnot. Bridge, showing Gauge	49
Whitemouth River at Whitemouth. Gauge at Bridge	58
Whitemouth River at Whitemouth. M.H.S. Bench Mark	69
Assiniboine River, Brandon. M.H.S. Bench Mark	69
Assiniboine River, Brandon. Gauge at Bridge	81
Assiniboine River, Headingly. Meter Section at Bridge	92
Souris River, Wawanesa. Meter Section at Bridge	92
Fairford River, Fairford. Meter Section at Bridge, 1912	101
Berens River, First Rapids above Eleventh Falls	115
Berens River, Eleventh Falls	115
Berens River, Twenty-Ninth Falls	126
Pigeon River, Sturgeon Falls	129
Bloodvein River, Fourth Rapids	150
Manigotagan River, Meter Section. Outlet Moose Lake	162
Nelson River, Manitou Rapids. Meter Section, Summer Conditions	183
Nelson River, Manitou Rapids. Meter Section, Winter Conditions	183

MAPS AND PLATES.

	To face page.
Index Map	16
Plate 1.—Winnipeg River Basin	32
" 2.—Winnipeg River, Location of Metering and Gauging Stations	48
" 3.—Red River Basin	144
" 4.—Assiniboine River Basin	160
" 5.—Drainage area tributary to Lake Winnipegosis	208
" 6.—Saskatchewan River in Manitoba	224
" 7.—Saskatchewan River Drainage area	224
" 8.—Rivers tributary to Lake Winnipeg from the East	240

PROGRESS REPORT

OF

THE MANITOBA HYDROGRAPHIC SURVEY FOR 1912-13-14.

PART I

PART I.

PROGRESS REPORT OF THE MANITOBA HYDROGRAPHIC SURVEY FOR THE CALENDAR YEARS 1912-13-14.

INTRODUCTION.

The inception of the work of the Manitoba Hydrographic Survey was a natural consequence of the hydraulic power investigations commenced in Manitoba by the Dominion Water Power Branch in 1911. The institution of these investigations rendered imperative hydrographic studies of the rivers in the province, as prior to 1911 the collection of such data along systematic lines had nowhere been undertaken. Under ideal conditions the gathering of hydrographic data should precede the study of rivers from a power or other standpoint. Under the above circumstances it was necessary that the investigations of the streams for discharge and power should be carried on simultaneously.

The gathering of hydrographic data is of prime importance, not only from a hydraulic power standpoint, but also in connection with other uses of the surface water supply. These various uses may be enumerated as follows:—

1. Domestic, municipal and manufacturing purposes.
2. Irrigation.
3. Water-power.
4. Drainage.
5. Sewage Disposal.
6. Navigation.
7. Flood Prevention.

In the province of Manitoba, information regarding stream flow or surface water supply is or may be required for any one of these uses. Throughout the province, numerous towns and villages are depending upon the rivers for their domestic water supply; this demand will rapidly grow as the population increases, and further information in regard to the amount of water available will be required. In the southwestern part of the province, where the average annual rainfall varies between 14 and 17 inches, and where agriculture is the chief pursuit, the use of water for irrigation purposes is to be expected. Many of the rivers throughout the province present power possibilities, and studies have been made to determine their probable economic value. The true value of these potential water-powers cannot be determined without a thorough knowledge of the water available in the streams, especially under conditions of low discharge. In the northern and southwestern portions of the province the reclamation of large tracts of lands by drainage may profitably be undertaken. As settlement becomes more dense the necessity for the reclamation of these lands will become more pressing; it is essential, therefore, that accurate information concerning the regimen of flow of streams forming the natural outlets for such drainage be obtained.

The use of the streams of the province in connection with sewage disposal will, at no distant date, command attention since the rapid growth of the towns and villages will soon render necessary the formulation of a policy relative to the disposal of their waste in such a manner as will obviate any possible danger to the community as a whole. In order that this question may be handled intelligently, a thorough knowledge of the run-off conditions of the streams is of extreme importance.

Several of the main rivers in the province might be utilized for navigation purposes; in fact, before the advent of the railway in Manitoba, the Red river formed the only means of communication with the outside world. Improvement for navigation purposes is being urged in many quarters, and for this purpose a study of the hydrology of these streams is necessary.

Owing to the fluctuation of stream flow, not only from day to day but from month to month and from year to year, and the effect that such variation may have upon any one of the uses to which the streams may be adapted, it is imperative that the gathering of stream flow data be made to extend over a considerable term of years, so that a true idea of the stream regimen may ultimately be formed.

ORGANIZATION AND SCOPE.

When the Manitoba Hydrographic Survey was organized early in 1912, it was decided that the work should be carried on in as comprehensive a manner as possible, and that as funds became available and the opportunity offered, the work should be extended to embrace the whole of the province of Manitoba. At its inception, however, the district in which stream flow data were particularly required was that tributary to the Winnipeg river as surveys were being carried on to determine the power possibilities of that river. Mr. Douglas L. McLean, under whose direction these power investigations were being carried out, was placed at the head of the survey. Office quarters were secured in Winnipeg, and office equipment, supplies, and the necessary outfit for field work assembled. Several engineers who had been employed on the Winnipeg River work were detailed to the Hydrographic Survey, and the work of stream flow investigation was instituted. Since the organization of the survey the work has been extended from time to time until it now covers all the principal rivers of the province.

Mr. McLean resigned from his position in October, 1913, in order to accept a position on the construction staff of the Greater Winnipeg Water Supply project, and the work was thenceforth energetically carried on until the following June by Mr. S. S. Scovil, Assistant Chief Engineer. Upon the writer taking charge of the work, Mr. Scovil was transferred to Ottawa, being placed in charge of the run-off and storage studies undertaken by the Lake of the Woods Technical Board, in connection with the Lake of the Woods Reference before the International Joint Commission.

In organizing this work, it was recognized that probably the best and most comprehensive methods for gathering hydrographic data were those employed by the Water Resources Division of the United States Geological Survey. Through the courtesy of the officers of that organization, studies were made of their field and office methods, both districts covered by their engineers and at the head office in Washington. The work was then mapped out and has since been carried on along lines closely following the practice of the United States engineers.

The different streams to be studied were investigated and suitable locations selected for the establishment of metering stations, the selection of the stations depending upon the physical features and the need of data in that particular locality. At these metering stations, gauges were also established and the services of some person living in the locality were secured to read the gauge daily. These daily observations are recorded in a book provided for the purpose and examined by the engineer on each of his trips to the station. The readings as entered in the book are transferred to cards by the gauge reader, and are forwarded weekly to the chief engineer. From a study of these readings and the meterings, the daily discharges are arrived at.

On the organization of the Manitoba Hydrographic Survey the work of the Winnipeg River Power Survey was merged with it. Since then all investi-

gations, whether hydrographic, storage, power, or river improvement, have been carried on under the one central control. By this arrangement the work naturally falling within the scope of the survey has been carried on efficiently and systematically. Conservation investigations for power and storage are being dealt with in a comprehensive manner with a view to determining the best use of the available water supply.

In gathering the stream flow data it is believed that the results obtained are sufficiently accurate for all practical purposes; the aim being not so much to concentrate on a few streams and so obtain records of extreme accuracy, but rather to spread the effort over a wide territory and so serve as many purposes as possible without unduly sacrificing the accuracy of results. In this connection it is essential that the records, in order that they may properly cover all possible range in stage of the rivers investigated, should extend over a considerable term of years. On some streams this term should be from five to ten years, while in other cases it should extend over a much longer period, say from ten to twenty years. The length of term will depend largely on the character and relative importance of the stream and the possibility of estimating the discharge by comparison with records of other streams in the vicinity. To quote from an authority on this subject, "the object should be to gauge a certain number of streams at all seasons of the year so as to ascertain their total discharge and its seasonal distribution, also to gauge others at certain stages which have been determined to be critical points in their regimen." It may be stated here that the standpoint taken by the United States Geological Survey is, that owing to the constantly changing flow of the streams, data of reasonable accuracy showing the distribution of flow over several consecutive years, are of more importance than very accurate measurements covering short periods of time.

Care should be exercised in drawing conclusions from the data published herein, owing to the limited period over which most of the records extend, and the fact that these records are often unsupported by any earlier observations.

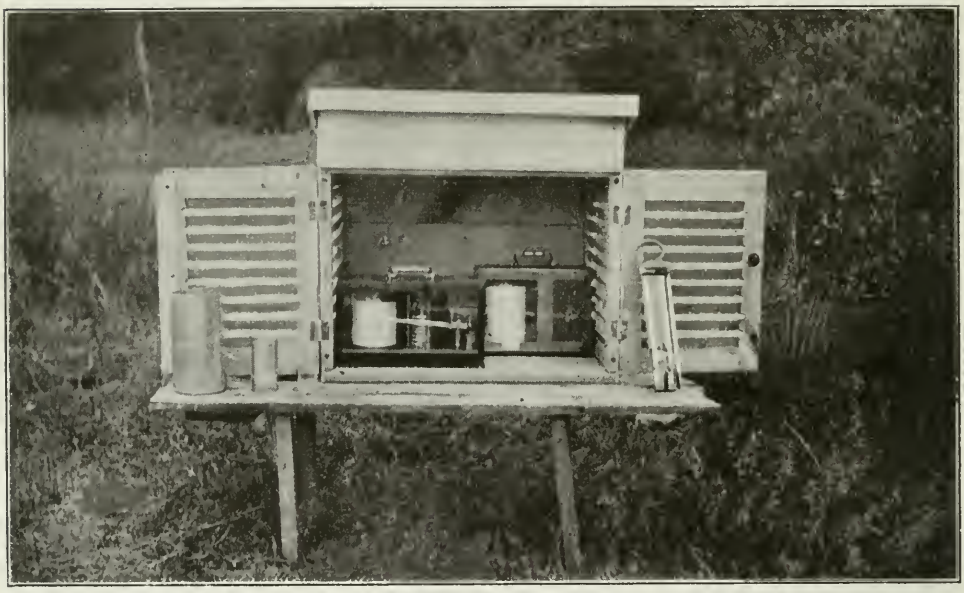
DISTRICTS.

During the first year that the hydrographic work was carried on, some twenty-six regular stations were established at which data were collected throughout the year; forty-one others were located at which miscellaneous readings were secured throughout the summer. From time to time during the past three years, these stations have been revised and others established. In the light of fuller information, it was found desirable to change the location of certain stations so as to increase the value of the data gathered. Owing to transportation difficulties met with in connection with the operation of others, changes have been made which without making for greater accuracy have rendered stations more accessible. In other cases, it has been deemed advisable to discontinue a station entirely owing either to overlapping or to the fact that the information could be obtained indirectly from some other station.

During the first year following organization, attention was concentrated as much as possible on that portion of the country tributary to the district covered by the water-power investigations, and practically all of the permanent stations then established are located in that drainage area. The miscellaneous stations established were spread throughout the province with a view to instituting the work and at the same time ascertaining the desirability of permanent stations in the several localities. Whenever their value has been established, stations have, as far as possible, been located, though owing to the pressure of other branches of the work it has not been possible to carry out this policy to as great an extent as is desired.

In dealing with the work of the survey, the territory covered, due principally to geographic conditions, falls naturally into several main divisions. From time to time the work in these several divisions may be extended, since up to the present time only the principal streams have been examined. The divisions may be enumerated as follows:—

1.—Lake of the Woods tributaries and outlet.
2.—Winnipeg river and tributaries.
3.—Red river and tributaries.
4.—Assiniboine river and tributaries.
5.—The district to the west of lake Winnipegosis, including the Saskatchewan river and its tributaries.
6.—The east shore of lake Winnipeg.
7.—The Nelson river.

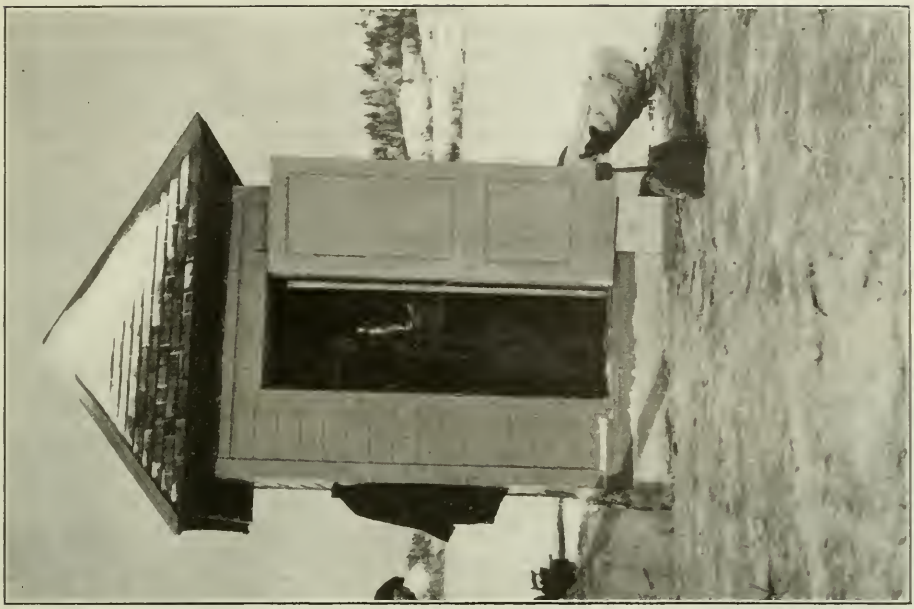


Keewatin, M. H. S. Evaporation Station. Meteorological Instrument Shelter.

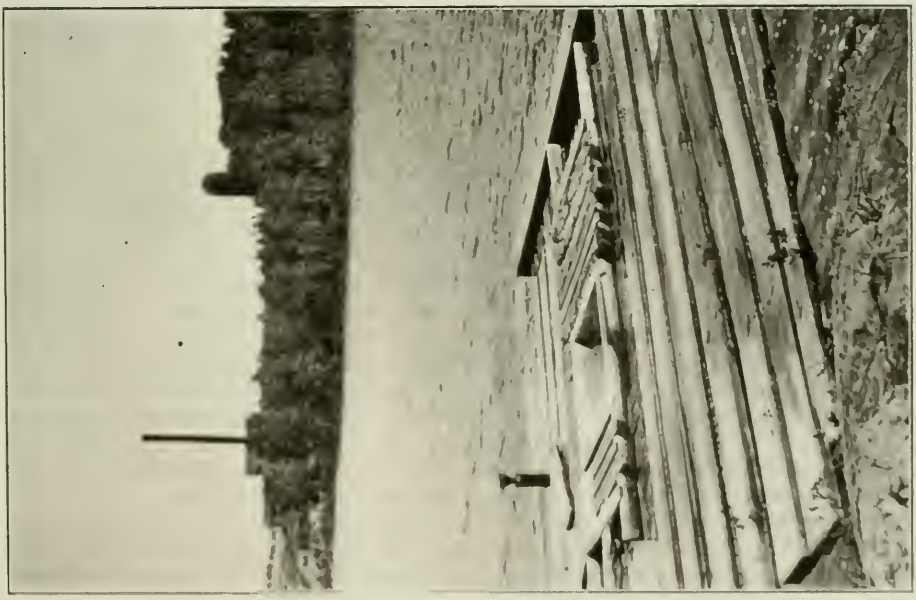
Lake of the Woods Tributaries and Outlet.

The lake of the Woods district comprises all that territory lying above the outlets of the lake, and includes the lake of the Woods, Rainy river, Rainy lake and tributaries and Namakan lake and tributaries. This district forms the chief source of the Winnipeg river, and as it has a very important bearing on the power reach of the river below the outlet, a number of stations were established, the principal ones being at the outlets of the lake of the Woods. Meterings on the Rainy river at International Falls were made in conjunction with the United States Geological Survey, while stations were established and maintained by this Survey at the outlets of Namakan lake. Besides these, some ten or twelve stations were established on the smaller rivers tributary to the lakes.

Owing to the power studies being made on the Winnipeg river, and the need of information relative to regulation, a knowledge of the hydrology of these rivers and lakes was of prime importance. The work instituted in the first year of the survey has therefore been vigorously continued, but with one or two



Automatic Gauge House, Kenora. Interior view.



Keewatin, M. H. S. Evaporation station.

important changes. About the time that the work was instituted a reference was made to the International Joint Commission in connection with the regulation of the level of the lake of the Woods. As there are many interests involved in this regulation, and since it is not only an international but also an interprovincial question, several Provincial and Dominion Governmental Departments have been consulted and required to furnish data. These data are principally along hydrological lines so it was necessary to make some divisions of the work. Under the arrangement made, the Manitoba Hydrographic Survey confined its operations to the gathering of data in the vicinity of the outlets of the lake of the Woods. Above that point all the data are being collected by the other departments referred to. These data which are made available to the consulting engineers of the International Joint Commission are of considerable volume, and necessitate keeping an engineer and an assistant continuously on the ground. Owing to the fact that the waters of the lake of the Woods are discharged into the Winnipeg river, through a number of outlets some of which are controlled by power plants, it has been necessary to establish metering stations at a number of points, and gauges at various other locations. In addition to the work relative to these gauging and metering stations, data of a meteorological nature are also being gathered.

Winnipeg River and Tributaries.

The district referred to as the "Winnipeg river and tributaries" comprises all that territory lying below the lake of the Woods outlets and tributary to the Winnipeg river. The tributaries are not numerous and, with the sole exception of the English river, are of small magnitude. The English river joins the Winnipeg in the vicinity of the interprovincial boundary of Ontario and Manitoba, and drains a large territory directly north of the lake of the Woods district. Lying almost entirely in unsurveyed territory, its drainage area is rather indeterminate, but roughly speaking it forms about one-half of the total tributary drainage area lying above the junction of the two rivers. A station has been established on this river near the mouth, but, owing to the remoteness from settlement, it has been found impossible to secure the services of a gauge reader. On this account it has not been possible to arrive at the daily discharge directly, only scattered meterings being available, but from a consideration of the measurements taken on the Winnipeg river above and below the confluence, the discharge of the English river may be approximately deduced. The smaller tributaries of the Winnipeg have been metered and records of the discharge kept more or less systematically, depending upon their importance.

On the main river, records are available since 1907 and are included in this report. The records from 1907 to 1910 inclusive are based on tail-race gauge readings at Point du Bois, together with discharge measurements made at or in the vicinity of Otter falls by engineers of the city of Winnipeg and of the Winnipeg Electric Street Railway. In October, 1911, a metering station was established by this survey at Slave falls, the measurements being referred to the same gauge at Point du Bois. On the Pinawa channel there are three stations, one at the intake to the channel and the other two, respectively, above and below the power-house of the Winnipeg Electric Railway Company, the last two being established for the purpose of rating the power station.

The two districts just described lie almost entirely within the Laurentian formation; in fact, the Winnipeg river and the lake of the Woods may be said to form the southwestern boundary of that formation. This would account in a great measure for the small number of rivers tributary to the basin from the southwest.

The granites and gneisses of the Laurentian formation underlie the whole region, and the topographical features are typical of it, lakes and rivers abounding

throughout the district. Rock outcroppings are very frequent and the soil covering is shallow, conditions which would tend to rapid run-off, were the lack of storage in the form of ground-water not made up for in a large degree by the numerous lakes. The forest covering of the district varies. In some parts it is sparse owing to the shallow soil, while in other parts dense growths of evergreens, such as spruce, pine, and balsam are to be found, with occasional clumps of birch. Much lumbering has been carried on in the district, and most of the larger stands of timber have been cut. In other parts the forest has been overrun with fire so that the standing timber is now to a large extent of second growth.

Lake of the Woods, Western Outlet. North Tunnel Island metering section.

At present the stations in the district at which run-off data are being gathered are confined almost entirely to the outlets of the lake of the Woods and the Winnipeg river.

Red River District.

What is known as the Red river district is that portion of the Red river valley lying between the international boundary and lake Winnipeg; it also includes the territory drained by its tributaries, with the exception of the Assiniboine. The nature of the area drained by the river within the province varies between the swampy and muskeg country bordering the Laurentian formation to the east and the open prairie found generally to the west of the river. Owing to the nature of the country lying to the east, drainage for land reclamation is to be expected; such reclamation will naturally have an effect upon the range in stage of the river; in fact, this effect has to some extent already occurred owing to drainage schemes in operation to the south of the international boundary in the state of Minnesota. The possibility of such an effect upon the river renders its study advisable. Drainage already in operation or to be anticipated, is not, however, the only reason necessitating the collection of hydrographic data. The importance of the river from a navigation stand-

point has been put forward on numerous occasions; in fact, with the idea of its improvement for that purpose, a careful survey was carried out by this organization. Such improvement would but revive an early use of the river which before the advent of the railway formed the chief artery of communication and transport with the outside world. In order that all phases of the question may be looked into, metering stations have been established at Emerson, near the international boundary, and at Winnipeg, and gauges have been located at several other points. In addition, metering stations have been established on the several tributaries, viz., the Roseau, the Rat, and the Seine.

Assiniboine River District.

The Assiniboine river forms the chief tributary to the Red river within the confines of the province of Manitoba; it drains the country to the west of the Duck and Riding mountains and north of the international boundary. Some of its tributaries have their source within the province of Saskatchewan. The southern and western part of the drainage area may be termed prairie country, with scattered timber bluffs. The northern section of the area has a greater tree covering, the Riding mountain district at the source of one of the tributaries being well timbered and lying within a forest reserve. The tributaries from these two areas are characteristic of the country which they drain. One of the chief tributaries, the Souris, has the small winter flow generally noted for prairie streams. It rises within the province of Saskatchewan, makes a loop down into the state of Minnesota, and then recrosses the international boundary into the province of Manitoba. This stream flows through what may be termed the dry section of Manitoba, the district drained having the lowest annual rainfall of any portion of the province. The Little Saskatchewan, rising in the Riding mountains, is also a tributary of the Assiniboine and is worthy of mention owing to its power possibilities. There are at present three power developments on this river, viz., at Minnedosa, Rapid City, and Brandon.

As the Assiniboine, with its tributaries, drains parts of the province that are very well populated, it is important as a source of domestic water supply or a means of sewage disposal. In addition, the possible use of its waters for irrigation purposes in the southwestern part of the province may be anticipated, while its possible importance as a source of power renders a careful hydrographic study advisable. A number of metering stations have been established, both on the main river and on its more important tributaries; as opportunity offers it is intended to add to these in order that a thorough knowledge of the river may be obtained.

District West of Lake Winnipegosis.

In the district west of lake Winnipegosis there are a large number of streams of different sizes, some of which are not directly tributary to lake Winnipegosis, but add their waters to that lake through several of the smaller lakes tributary to it.

With two or three exceptions, all the rivers of importance in the district have their sources in the Riding, Duck, or Porcupine mountains, and are not of great length, although the flow is much more constant than in the southern part of the province. The northern part of the district adjacent and tributary to the Saskatchewan, while wooded to a greater or less extent, is low lying.

While some of these streams are not of immediate interest from a hydrological standpoint, nevertheless, as the district becomes populated they will become of increasing importance. In some cases the success of the drainage schemes which may be undertaken will depend largely upon their capacity and

possibility of improvement. In addition to this, the towns which are now located or may spring up in the neighbourhood will have to look to them for their domestic water supply. In some cases these rivers are capable of development from a power standpoint. Perhaps the most important in this district in this respect is the Saskatchewan. This river has as its drainage basin practically all that portion of Alberta and about two-thirds of Saskatchewan lying south of the fifty-fourth parallel of latitude. There are two or three points at which this river might be developed for power purposes, while considerable areas lying contiguous to the river between its mouth and the western boundary of Manitoba might profitably be reclaimed by drainage.

A number of metering stations have been established in the district, and also a number of stations where gauge readings only are taken, so that a general knowledge of the hydrography of the district is being obtained; additional stations will be added as necessity arises.

Rivers Entering Lake Winnipeg on the East.

The district covered by the drainage on the east side of lake Winnipeg is for the most part typical of the Laurentian formation; in consequence, practically all of the rivers entering on that side of the lake are interrupted at numerous points in their course by falls and rapids. Throughout the district at various points are to be found stands of timber which may be utilized either for the manufacture of lumber or for pulp and paper purposes. With these facts in view, studies have been made of the power possibilities of the rivers. In order that the conclusions reached may be sound, the possible run-off of the rivers should be accurately determined. Owing to the difficulty in securing competent gauge readers, it has been found difficult to establish regular stations.

However, miscellaneous meterings have been made on these rivers at various times, including the low-flow period which occurs during the winter months, and upon these it has been possible to base the estimates of minimum flow.

On the Berens river it has been possible to secure the services of a gauge reader in the vicinity of Little Grand rapids; a metering station was accordingly established, and it is hoped that records of considerable value will be obtained.

Nelson River.

The Nelson river forms the sole outlet of practically all the drainage areas included in the foregoing six districts. It forms the outlet of lake Winnipeg into which empty the Winnipeg, Red, Saskatchewan, Berens, Pigeon, Bloodvein, and Dauphin rivers, the last named being the outlet of lake Winnipegosis and lake Manitoba. The fall of the Nelson between the outlet of lake Winnipeg and Hudson bay is, in round numbers, 700 feet. A great portion of this natural fall in the river is concentrated in the form of swifts, rapids, and falls. It is to be expected that, with such a vast drainage area tributary to the river, the discharge will be exceptional. It is also a natural inference that, in a drainage area which includes so many lakes forming natural regulation basins, the minimum flow will bear a fairly close relation to the mean flow. Certain of the natural storage basins encountered in this drainage area are of great proportions, among which are the following large lakes: lake Namakan, Rainy lake, and the lake of the Woods on the Winnipeg; Lac Seul on the English; lake Manitoba, Dauphin lake, lake Winnipegosis, and lake Winnipeg. Besides these there are many others of less extent; for instance, in the Winnipeg River basin there are, in addition to those named, 106 lakes which vary from about 3 to 140 square miles in area.

The value from a power-producing standpoint of a river like the Nelson, where numerous falls occur and where, as may reasonably be expected, the minimum flow will approach the mean annual flow, should be enormous, especially where the drainage area is of such great proportions. With this in view and with the advent of the Hudson Bay railway and greatly improved transportation facilities, the development of some of these possible sites may reasonably be expected. It was considered of the utmost importance,, therefore, that the systematic gathering of data relating to the discharge of the Nelson river should be undertaken without delay. Accordingly, during the summer of 1914, an engineer of this survey was detailed to make an investigation of the upper portion of the river and locate a metering station at some point easy of access where the services of a gauge reader could be secured. A station was carefully established in the vicinity of Manitou rapids, and a number of meterings were secured during the summer and early fall. It is intended that as soon as winter conditions become settled another engineer will be sent in to the station to carry on the hydrographic work throughout the winter. In addition, information is being gathered relative to streams tributary to the Nelson in the vicinity of Manitou rapids.

DEFINITIONS AND TERMS.

The volume of water flowing in a stream (called the "run-off" or "discharge" is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as "second-feet," "miner's inches," and "run-off in second-feet per square mile"; and (2) those which represent the actual quantity of water, as "run-off depth in inches" and "acre-feet."

The units used in this report are "second-feet," "second-feet per square mile," "run-off in inches," and "acre-feet" or "mile-feet." The first two belong to the first group and the last three to the second. They may be defined as follows:—

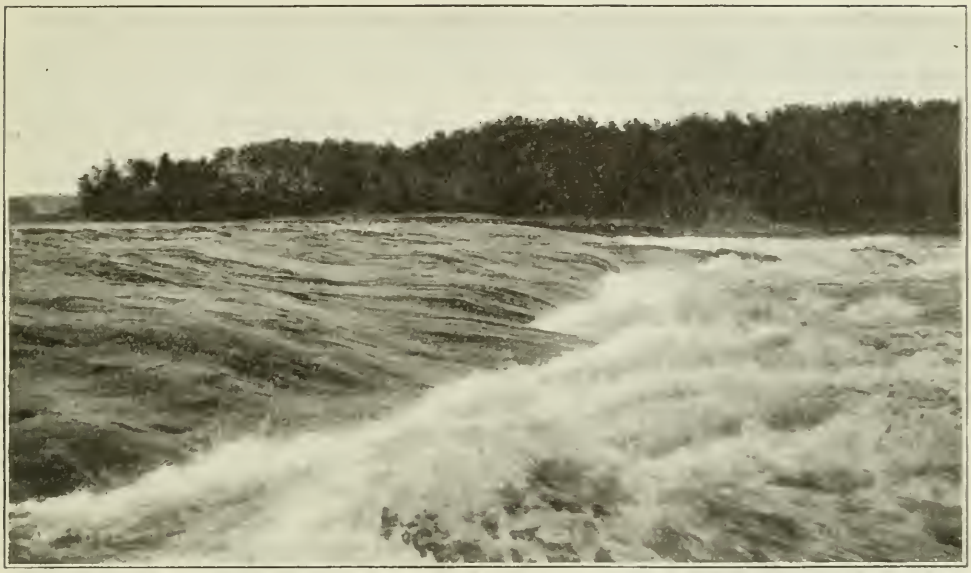
(*a*) "Second-feet" is an abbreviation for cubic feet per second (c.f.s.) and is the quantity of water flowing per second in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of factors given in the following table of equivalents.

(*b*) "Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

(*c*) "Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed over the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

(*d*) "Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity of water required to cover an acre to the depth of 1 foot. It is the common unit of measurement of quantity, and is generally used in connection with storage.

(*e*) "Mile-foot" is equivalent to 27,878,400 cubic feet, and is the quantity of water required to cover one square mile to a depth of 1 foot, and is equal to 640 acre-feet. While not a common unit of measurement of quantity it is sometimes made use of in connection with large storage projects to express the quantity of water stored.



Winnipeg River. Little Du Bonnet Falls.

Winnipeg River, Whitedog Falls. Meter section on North Channel.

Convenient Equivalents.

1 second-foot equals 35·71 British Columbia miner's inches, or one British Columbia miner's inch equals 1·68 cubic foot per minute.
1 second-foot equals 6·23 British imperial gallons per second; equals 538,272 gallons for one day.
1 second-foot equals 7·48 United States gallons per second; equals 646,317 gallons for one day.
1 second-foot for one year covers 1 square mile 1·131 foot or 13·572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet; equals 724 acre-feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one 28-day month covers 1 square mile 1·041 inch deep.
1 second-foot for one 29-day month covers 1 square mile 1·079 inch deep.
1 second-foot for one 30-day month covers 1 square mile 1·116 inch deep.
1 second-foot for one 31-day month covers 1 square mile 1·153 inch deep.
1 second-foot for one day equals 1·983 acre-foot.
1 second-foot for one 28-day month equals 55·54 acre-feet.
1 second-foot for one 29-day month equals 57·52 acre-feet.
1 second-foot for one 30-day month equals 59·50 acre-feet.
1 second-foot for one 31-day month equals 61·49 acre-feet.
100 British imperial gallons per minute equals 0·268 second-foot.
100 United States gallons per minute equals 0·223 second-foot.
1,000,000 British imperial gallons per day equals 1·86 second-foot.
1,000,000 United States gallons per day equals 1·55 second-foot.
1,000,000 British imperial gallons equals 3·68 acre-feet.
1,000,000 United States gallons equals 3·07 acre-feet.
1,000,000 cubic feet equals 22·95 acre-feet.
1 acre-foot equals 43,560 cubic feet.
1 acre-foot equals 271,472 British imperial gallons.
1 acre-foot equals 325,850 United States gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0·0737 second-foot per year.
1 acre equals 43,560 square feet.
1 cubic foot equals 6·23 British imperial gallons.
1 cubic foot equals 7·48 United States gallons.
1 cubic foot of water weighs 62·5 pounds.
1 foot per second equals 0·682 mile per hour.
1 horse-power equals 550-foot pounds per second.
1 horse-power equals 746 watts or ·746 kilowatts.
1 horse-power equals 1 second-foot of water falling 8·80 feet.

To calculate water-power quickly:

Second-feet × fall in feet ÷ 11 = net horse-power on water wheel, realizing 80 per cent of theoretical power.

METHODS OF DETERMINING DISCHARGE.

Three separate methods are commonly followed in the determination of discharge of streams, and these methods involve the use of certain formulæ based on physical data more or less easily ascertained. The three methods referred to are:—

1. The slope method.
2. The weir method.
3. The mean velocity method.

The Slope Method.

In the slope method of determining the discharge, the fact that the slope of the bed of the stream, and consequently the surface slope bears some definite relation to the discharge is made use of. A number of empirical fomulæ have been deduced from time to time in an effort to express this relationship, and among these in most common use are the Chezy, the Kutter, and the Bazin formulæ.

What is known as the Chezy formula was deduced by a French engineer of that name about the year 1775, and takes the form of:—

$V = C\sqrt{rs}$ in which V is the velocity, C a coefficient depending upon the slope, the roughness of the channel and the wetted perimeter; r is the hydraulic radius, being the cross-sectional area divided by the wetted perimeter, and s the slope, being the head or fall in the section divided by the length of the section. This formula: $V = C\sqrt{rs}$ may be considered the fundamental slope formula. Various modifications of it have been deduced from time to time depending upon values of C obtained from formulæ based upon experiments and observations. The Kutter and Bazin formulæ belong to this class, and the former is perhaps the better known, taking the form of: $V = C\sqrt{rs}$ where C is obtained from the equation:

$$C = \frac{41{\cdot}6 + \frac{{\cdot}00281}{S} + \frac{1{\cdot}811}{n}}{1 + \left\{41{\cdot}6 + \frac{{\cdot}00281}{S}\right\}\frac{n}{\sqrt{r}}}$$

Where r and S have the same significance as in the Chezy formula, the factor "n" is known as the coefficient of roughness.

The Bazin formula, often considered to be one of the best for the determination of flow in open channels, takes the form: $V = C\sqrt{rs}$ where

$$C = \frac{157.6}{1 + \frac{c}{\sqrt{r}}}$$

the coefficient "c" depending upon the roughness of the channel; values being determined for different classes of material by experiment.

Humphreys and Abbott made determinations of C from which they also derived a formula. As the first-named formula depended on experiments carried on in small channels of various natures, and the latter upon observations made on the Mississippi river, the governing conditions were of a widely different nature; it is therefore to be expected that neither of the formulæ could be considered as generally applicable. The diversity of the results obtained from the use of these two formulæ was the subject of investigation by Kutter and Ganguillet and undoubtedly influenced the final determination of Kutter's formula.

Tables have been prepared giving values for the coefficient "n" in Kutter's formula and "c" in the Bazin formula, and are to be found in practically every handbook. It is, however, very difficult to choose the correct value for these coefficients, and it is therefore advisable that whenever possible the value of "n" and "c" in the two formulæ be computed from a measured discharge.

In the Manitoba work, the results of which are herewith published, it is seldom necessary to make use of the slope method of determining the discharge; in fact, about the only application of the method is in the determination of flood discharges, or, in conjunction with meterings on rivers where the gauge height does not always bear a constant relation to the discharge. For the Kutter formula it is, however, possible in each of these cases, to arrive at a value for the

factor "n" since from a determination of the hydraulic radius at the time of metering, the slope and the mean velocity, the value "c" may be found from the equation: $V = C\sqrt{rs}$; then having found the value of "C" this may be equated to Kutter's formula and the value of "n" derived, or may be found in the tables prepared for this purpose in any engineering handbook. A value for the coefficient "c" in the Bazin formula may be found in the same way.

Weir Method.

The weir method of determining discharge may be made use of in connection with widely varying discharges. Very often estimates of flow both under conditions of flood and of extremely low water may be arrived at by this method. Where funds are available, and the value of the records warrants the expense of installation, a permanent weir undoubtedly provides the best method of determining discharge. When the stream flow to be measured is of a comparatively small volume (a few second-feet), and the discharge is to be determined from time to time, a temporary weir may be utilized in conjunction with a gauge in the natural river channel.

This temporary weir would consist of a standard sharp-crested weir fastened for convenience to a wooden plank, the method of using it being as follows: A point in the stream below the gauge is selected and, after reading the gauge height, a temporary dam of earth and sods is thrown across the stream, in which dam the weir is placed; care being taken to place the crest absolutely level. Sods and earth are tamped about the weir to prevent leakage. The site of this small temporary dam should be so selected that the depth of water above will be at least twice the head on the weir, while the pond created should have a total width of several times the length of the crest. On the downstream side care must be taken to permit free access of air below the napp when the weir is discharging.

When the weir is installed, readings with the level are taken upon the crest, a gauge is placed 8 or 10 feet upstream from the dam and is set to the same datum as the weir crest. Readings of the water level on this gauge will then indicate the head on the crest of the weir.

In computing discharges by this method, a modification of the Francis formula may be made use of, these modifications being in the nature of corrections for end contraction and elimination of velocity of approach, the formula taking the form of: $Q = 3{\cdot}33\ (L - {\cdot}2H)\ H^{\frac{3}{2}}$, in which:

Q = discharge in second-feet.
L = length of crest in feet.
H = head in feet.

As mentioned before, where the value of the records warrants it and accurate continuous discharges are required, a permanent weir may be built; this, however, is seldom necessary as dams, if suitably situated and constructed, may be utilized. The main features governing the use of such structures as a means of determining the discharge are those relating to the characteristics of the dam itself, and also the consideration of the possible diversion of varying quantities of water around or through the dam. The physical requirements, in order that good records may be obtained, are as follows:—

1.—Crest all at the same elevation or divided into sections of the same elevation.
2.—Sufficient height to eliminate backwater effect from below.
3.—Absence of leaks.
4.—Crest of such type that the coefficient of discharge may be readily arrived at.
5.—Absence of flash boards or careful records of the use of same.

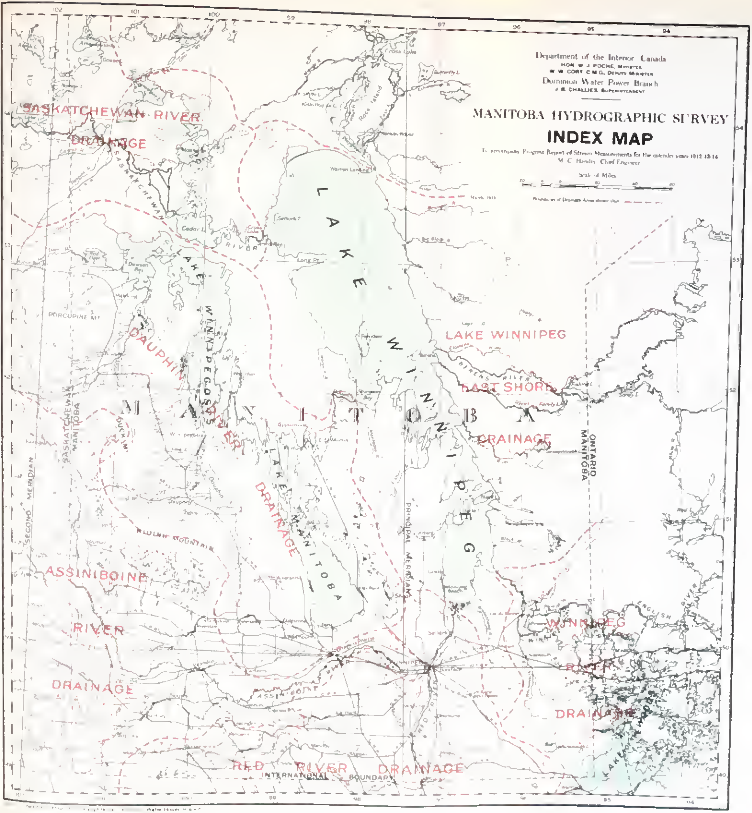
use of
ay be
f con-
harge,
onnec-
, etc.,
verted

e pro-
t, and
ection
of the
meter,

y: (*a*)
these
elocity
order
ng the
in the
e both
ughout
from
ght to
ng the
ries of
vel or
stage
ountry
fall, so
extent
nge of

deter-
bench-
nently
same
Very
ver, or
Where
station
cross-
d, and
ng this
stream

n, and
d. In
elocity
to the



Department of the Interior Canada
Dominion Water Power Branch
MANITOBA HYDROGRAPHIC SURVEY
INDEX MAP
Scale of Miles
SASKATCHEWAN RIVER
DRAINAGE
LAKE WINNIPEG
LAKE WINNIPEG
EAST SHORE
DRAINAGE
LAKE WINNIPEGOSIS
LAKE MANITOBA
DRAINAGE
MANITOBA
ONTARIO
MANITOBA
SASKATCHEWAN
MANITOBA
SECOND MERIDIAN
PRINCIPAL MERIDIAN
ASSINIBOINE
RIVER
DRAINAGE
WINNIPEG
RIVER
DRAINAGE
RED RIVER DRAINAGE
INTERNATIONAL BOUNDARY
PORCUPINE MT
RIDING MOUNTAIN
DAUPHIN

There are many things that may be said both for and against the use of dams as a means of determining discharge, which, generally speaking, may be summarized as follows: The use of a weir or dam has every advantage of continuity of records through the period of ice formation and flood discharge, while, on the other hand, it has the disadvantages of the uncertainty in connection with the proper coefficient to be used and the effect of debris, logs, etc., gathering on the crest, and the possibly varying amounts of water diverted for other uses.

Velocity Method.

The quantity of water flowing past a given point is derived from the product of two factors: (*a*) the mean velocity of the water past the point, and (*b*) the area of the cross-section of the river at that point. The area of the section depends upon the contour of the bed of the stream and the fluctuation of the water surface, the mean velocity being a function of the wetted perimeter, the roughness of the stream bed, and the slope of the water surface.

There are two principal methods of determining the mean velocity: (*a*) by current-meter, and (*b*) by float measurement. The requirements of these two methods are essentially the same, the method being to observe the velocity of the stream at a number of points throughout the cross-section. In order that good results may be obtained, care should be exercised in selecting the metering section. The section selected should be situated at a point in the stream where the banks are nearly parallel for a considerable distance both above and below the section. Also, the cross-section of the stream throughout this distance should be as nearly uniform as possible, the bottom free from projections, holes, large boulders, etc., and the banks of sufficient height to obviate the possibility of overflow under flood conditions. In selecting the site, due regard should be paid to its relation or proximity to tributaries of the stream, or to lakes, in order that sudden changes in the surface level or stage may be eliminated, the object being to secure a location where the stage or gauge height will truly indicate the discharge. In this northern country the stations are preferably located adjacent to the crest of a rapid or fall, so that backwater effects from tributaries lower down may be to a large extent eliminated, and open-water conditions may obtain under a greater range of temperature.

The equipment of a metering station usually consists of a gauge for determining the fluctuation of the water surface referred to a permanent bench-mark, in order that any change in datum may be checked, and a permanently referenced initial point of measurement of the cross-section so that the same points at which the velocities are determined may always be found. Very often these points are located by stretching a tagged line across the river, or where a bridge is made use of, the points are marked upon the structure. Where the stream is swift or deep and no bridge is available, a cable or boat station may be established. The velocity at different points throughout the cross-section of the river is ascertained by either of the two methods mentioned, and the mean velocity over the whole section is then determined. Applying this mean velocity to the cross-sectional area gives the discharge of the stream at that point.

Chemical Method.

The most recent method of determining discharge in a stream, and possibly the most accurate, is what is known as the chemical method. In many cases, especially in turbulent mountain streams, determination of velocity and discharge by the float or current-meter method is impossible, owing to the

difficulty in securing a station where the stream bed is uniform and the velocity sufficiently low. On the other hand, an application of the weir method would very often involve considerable expense on account of the necessity of rugged construction. In such cases the chemical method is particularly applicable.

Another purpose to which this method can be favourably applied is the rating of power stations. Owing to the advance in the art of water-wheel design and construction, the high degree of efficiency obtained and the premium placed upon such efficiency by purchasers, it is necessary that very careful determination be made. For wheels of large capacity the volume of water involved is great, and hence there is a possibility of errors of considerable magnitude creeping in, if the ordinary methods of determining discharge are used. With a view to eliminating these errors and securing the degree of accuracy required, there has recently been evolved what is known as the "chemical method" of measuring discharge. This method may be outlined as follows: Knowing approximately the volume of water to be measured, a definite quantity of chemical solution of known strength is added at a given rate to the stream or intake above the point of measurement. Owing to the turbulent nature of the stream or the churning action of the turbine wheels, this solution is thoroughly mixed throughout the whole volume of the water to be measured. In the case of a stream, samples of the water are taken some distance below the point of application of the solution, and in the case of power plants, in the tail-race. A chemical analysis of this water will reveal the amount of added chemical held in solution. Knowing the volume of the sample and the amount of solution added per unit of time, the determination of the volume of water flowing per unit of time involves only a simple calculation, for it may be readily seen that if:

Q = discharge of turbine or river.
q = " of salt solution.
N^o = concentration of salt solution.
N_1 = " of water before addition of salt solution.
N_2 = " of water in tail-race or river at sampling station.

Then: $$Q = \frac{N^o \times q}{N_2 - N_1}$$

This method of measurement has been quite recently brought forward, and the opinion is ventured that its use, especially in the case of power plant rating, will be generally adopted.

METHODS OF DETERMINING MEAN VELOCITY.

It has been mentioned before that the mean velocity in a channel may be determined by the use of either floats or a current meter. Each of these methods may be employed in several different ways depending upon the local conditions.

Float Method.

Where floats are used for the determination of mean velocity they are mainly of three types, known as:—

1. Surface.
2. Sub-surface.
3. Tube or rod floats.

When surface floats are used to determine the velocity, the results obtained indicate the velocity of the stream at the surface only, and in order that this may be reduced to mean velocity it is necessary to apply some factor. A very good type of surface float consists of a tightly corked bottle, in the top of which is

placed a small flag, sufficient weight being placed in the bottom, either sand or gravel, to cause it to float low down in order to avoid wind interference. Where measurements are being taken with a view to determining flood discharge, floating debris or cakes of ice may often be made use of to determine the surface velocity.

Subsurface and tube or rod floats are intended to give the mean velocity directly, the subsurface float being designed to float at any depth, a marker or flag on the surface being attached to the float to indicate the velocity. By placing the float at the proper depth the mean velocity is obtained by applying a slight correction to the observed velocity to offset the effect of the line connecting the float and flag. A tube float gives perhaps the best results, especially when the channel conditions are good; it consists of a tube or rod about $2\frac{1}{2}$ inches in diameter and weighted at the lower end, the weight being large enough to cause the rod to float at the exact depth required. Although designed to measure the mean velocity directly, a factor less than unity must be applied to the observed velocity owing to the impossibility of floating the rod or tube low enough to register the effect of the slow moving water in contact with the bottom of the channel.

In measuring velocity by means of floats, a stretch of river from 100 to 200 feet in length is selected where the banks are parallel and the cross-section over the reach is as uniform as possible. The floats are placed at different points across the stream in order that they may indicate the velocity of the different stream lines; the time to traverse the measured reach is then taken and this, divided into the length of the reach in feet, gives the mean velocity in feet per second. From the number of obervations made across the section the mean velocity for the stream is obtained. Applying this mean velocity to the mean cross-sectional area of the stream determined from sections taken at various points throughout the run, the mean discharge is obtained.

Current-meter Methods.

The determination of velocity by current-meter is known as the indirect method. There are numerous current-meters of various types, but the two types in general use are represented by the Price and Haskell meters, the essential difference between the two being that in the former meter the rotating wheel is made up of a series of cups, while with the latter it takes the form of a screw propeller. The Price meter is the one used by this survey.

The principle upon which current-meters operate is as follows: The water impinging on the cups of the wheel or vanes of the screw causes them to rotate. By means of a contact and connections to a telephone receiver the operator is enabled to count the number of revolutions of the wheel or vanes. The number of revolutions in a given time bears a direct relation to the velocity of the stream at that point. This relation between the velocity of the moving water and the revolution of the wheel is determined for each meter by experiment. To rate the meter it is drawn through the water for a given distance at different speeds, the number of revolutions for each speed and the time being noted; from this data a rating table is prepared which gives the velocity in feet per second for any given number of revolutions in a given time.

In making measurements by means of the current-meter, the general method followed is: (1) After selecting a section on the stream where the banks are nearly parallel and straight for some distance above and below the section, and the channel well defined, a number of stations known as measuring points are laid off along a line perpendicular to the direction of flow, these points being usually fixed at regular intervals, the number varying with the size or width of the stream. (2) At each of these points soundings are taken and the cross-

sectional area of the stream developed. The cross-section of the stream is theoretically divided into strips by vertical lines passing through the measuring points, and at each of these latter points the velocity is observed at various depths with a current-meter. By multiplying the area of each strip by the mean of the velocities at the two adjacent measuring points, the discharge of the strip is determined. The sum of the discharges of all these subdivisions gives the total discharge of the stream, and this, divided by the total cross-sectional area, gives the mean velocity of the stream at the metering section.

Determination of Mean Velocity by Current-meter.

There are several methods of determining the mean velocity for each one of the strips or sections into which the cross-section is divided, these being as follows:—

1.—By vertical velocity curves.
2.— " the three-point method.
3.— " the two-point method.
4.— " the single-point method.
5.— " the integration method.

Vertical Velocity Curve Method.

In the vertical velocity curve method, a series of determinations of the velocity are made in each vertical at regular intervals; these intervals may be as close as half a foot apart, though generally each interval is equal to 0·1 the depth at that point. The meter is lowered so that the current is recorded at each one of the intervals, and from these records a vertical velocity curve is plotted, with depths as ordinates and velocities as abscissæ. This curve shows graphically the magnitude and variation in the velocity at each point in the stream from surface to bottom. From the curve so plotted the mean velocity is obtained by dividing the area between the curve and its vertical axis, by the depth.

Three-point Method.

In the three-point method, the meter is held about half a foot below the surface, the same distance above the bottom and at mid-depth, the mean velocity being determined by dividing the sum of the top and bottom and four times the mid-depth velocity by six. Very often this method is modified by holding the meter at 0·2, 0·6, and 0·8 of the depth, but generally both this and the vertical velocity curve method are discarded in favour of what is known as the two-point method.

Two-point Method.

In the two-point method the velocities are observed at 0·2 and 0·8 of the depth, for it has been found from experiment that the mean velocity corresponds very closely to the mean of the observed velocities at these two points. It has also been found that not only does this method give results which closely approximate to the true mean, but the method may be applied with equal success when observing velocities for discharge under ice cover.

One-point Method.

Numerous experiments have been carried out with a view to determining the vertical velocity curve, and from this it has been found that the mean velocity nearly always occurs between 0·5 and 0·7 of the depth; on this account

Winnipeg River. Second McArthur Falls.

Winnipeg River, Slave Falls. Metering section.

when observing for mean velocity by the one-point method the practice generally followed is to observe the velocities at 0·6 of the depth, as under widely varying conditions it has been found the results obtained from this method very closely approximate to the true mean velocity. Or again, under flood conditions or when the depth of the stream is great, it is sometimes found impossible to place the meter at the desired position in the vertical. When such is the case or when, owing to floating debris or ice, damage to or loss of the meter might occur if it could not be quickly withdrawn, the velocity is measured about one foot below the surface and a suitable coefficient applied so as to obtain the true mean velocity. This coefficient varies between 0·85 and 0·95; where the velocities are high the coefficient approaches unity depending upon conditions of channel, slope and stage.

Integration Method.

To determine the mean velocity by the integration method, the meter is moved through the water at a slow uniform speed from top to bottom and return, the number of revolutions and the time taken for the operation being observed. This method, however, is not used in connection with Price meters, as it has been found that the vertical motion of the meter has an influence upon the speed of the wheel so that true results are not obtained.

WINTER MEASUREMENTS.

Determination of discharge under winter conditions is perhaps one of the most difficult features of stream measurement. The laws governing the flow of water in open channels have been fairly well determined, but under winter conditions the problem presented involves the consideration of a number of governing features of more or less indeterminate character. The relation of discharge to gauge height in winter is frequently totally different from the relationship existing in summer and, further, whereas the latter relationship is usually well defined, the former has to be modified according to the features peculiar to that season. Primarily, the estimates of daily discharge depend upon meterings taken at frequent intervals, as in the summer, and upon observed gauge heights. The winter meterings are taken in somewhat similar manner. The most desirable is the vertical curve method. An examination of velocities determined in this way points to the fact that the mean velocity in the vertical nearly corresponds to the mean of the velocities as determined at 0·2 and 0·8 of the depths as measured from the under surface of the ice, so that this method is generally followed. It should be made clear in referring to winter conditions that the presence of ice is involved either as an ice cover or otherwise.

To determine the discharge where an ice sheet is present, holes are cut in the ice at intervals of from 5 to 10 feet, large enough to allow the free introduction of the meter and the measurements are then taken in the same manner as under open-water conditions, except that the depths are computed from the under side of the ice sheet. In addition, the gauge height of the surface of the water, to which the soundings are also referred and the thickness of the ice sheet at the various points across the section are noted. The horizontal distance between these points should preferably be the same as under open-water conditions, although owing to the amount of labour involved in opening up the holes this is not always possible. The meter is either suspended by a cable in the ordinary manner or fastened to the suspension rods; the latter method is generally used where the water is shallow. For depths over 5 feet the cable is found to be most convenient. In metering under ice conditions, care must be taken to prevent the meter from freezing. In order to obviate this as much as possible, the meter should be kept immersed and the transfer from one hole to another made

as quickly as possible, since a small amount of water congealing on the rotor or near the bearing may very materially change the meter's rating. Should the meter become frozen, it may be thawed out by immersing in the water or carefully warming and wiping before a small fire. Where the rivers to be metered are large, and considerable time is necessary for the operation, it is often found advantageous to construct a small shelter of poles and canvas in order to protect the meter and the operator. As far as possible, winter measurements should be taken on the same section as those under summer conditions. If this is not found possible, or conditions prevent accurate measurements at the old station, a new station may be selected, but if such is done, care should be taken to refer the auxiliary gauge installed to the datum of the summer station, and sufficient soundings should be taken at the new station to develop the cross-sectional area.

The location for winter stations where ice cover is involved should be well below any stretch of open water where the formation of frazil or anchor ice might occur, and clog the section. It is preferable to locate the section above a rapid or fall if possible; even though the formation of an ice sheet occurs, the presence of such fall or rapid below the section will tend to eliminate any backwater effect due to the clogging of the channel below the station, and hence the gauge readings will indicate more closely the actual discharge from time to time.

The gauge at the station should be read daily and the thickness of the ice and the depth of the under surface of the ice below the water surface also noted. A record of the daily temperature is neeessary. The gauge readers of this survey have been provided with a thermometer, a device in the form of a modified scaler's rule for reading the thickness of the ice, and where necessary, with an ice chisel. On the forms provided, the gauge reading, thickness of ice, depth of ice below water surface, and temperature are recorded; these records are kept in a book, and post cards of corresponding form are provided on which the records are forwarded to the office each week.

In this northern climate the temperature has a very direct effect upon the discharge of the streams. The lowering of temperature may have the effect of reducing the ground water supply and so directly affect the flow, or what is of more importance, it may influence the variation in gauge height in such a way that the relation between gauge height and discharge will not hold true from day to day. The ways in which this influence may be brought about are as follows: Where the stream has open-water sections due to the presence of rapids, small falls, or swifts, a drop in temperature will cause the formation of frazil or needle ice; this ice may be formed in such quantities that practically the whole body of water is full of ice particles, which on arrival at some restricted section of the river, for instance, where an ice sheet occurs, may block the channel and materially reduce the flow. Should such a condition occur below the gauging station, the blocking of the channel will have the effect of backing up the water at the gauge. As such effect on the gauge height might occur over a wide range of conditions, it may readily be seen that estimates of discharge based on such records are not entirely reliable. The estimating of winter discharge, therefore, where there is a possibility of backwater effects, or where ice sheet occurs, is one which calls for considerable care and consideration of the governing features. A great deal of study is being given to this particular problem, not only by the different organizations here in Canada, but by engineers of the Water Resources Division of the United States Geological Survey. It is hoped, therefore, that the laws governing discharge under these conditions may eventually become better understood, and a great deal of labour involved in the computing of the discharges eliminated.

METERING STATIONS.

The selection and establishment of metering stations is the first step in the collection of river discharge data. On the careful selection of a suitable site at which measurements may be made depends to a very large extent the value of the data gathered. The primary requisites for a suitable metering station are permanency of section, approach to and delivery from the section such that stream lines will always be at right angles to the section, and permanent banks of such height that the river will be confined to its channel under all conditions of discharge. Another feature that should be considered in connection with the selection of a site is, that it should be so located that records taken at the point will indicate the complete run-off above that point. Where diversion of water from the stream by canals, pipelines, etc., occurs, the station should be located above these points. It is often necessary to locate a number of stations throughout the length of the stream in order that the full discharge may be recorded. In this country, where in many districts the population is sparse, the availability of an observer will often materially influence the location of the station. Close proximity to the place of residence of the gauge reader is, as a rule, very necessary to the obtaining of good records.

There are five general types of stations located by this survey; these are:—

1. —Bridge stations.
2. —Cable stations.
3. —Cable carrier stations.
4. —Wading stations.
5. —Boat stations.

Bridge Stations.

A gauging station located at a bridge is perhaps the most desirable, other conditions being favourable. By locating a station in such a position the hydrographer is afforded good facilities for making his measurements, the width of the bridge and stability of his position rendering him free to devote his whole attention to the actual metering. However, it is often found necessary to select some other location, as at times under high-water conditions the whole flow of the stream does not pass between the abutments. Again, the presence of the piers in the stream, especially where the velocities are high, introduces factors which prevent the obtaining of good results. In using a bridge for a station, the different points in the section are marked off on the bridge, and soundings taken at these points.

Cable Stations.

Where a bridge is not available in a favourable location and the stream to be observed is large, recourse is had to the establishment of a cable station. This consists of a steel cable stretched over wooden towers which rest on each bank; a small car, capable of carrying two men, is suspended from the cable. A light steel cable supported by the towers and tagged at intervals to locate the verticals in the cross-section is also stretched across the river. Where the velocities are high, a stay line for the meter is used; this is usually a ¼-inch guy wire, stretched across the stream 40 to 50 feet above the section, the meter being kept in the desired vertical by means of a stay line attached to the meter and rove through a small pulley which may be moved to any position along the stay wire. With this equipment the hydrographer is able to make observations at different points on the cross-section, change of location being obtained by moving the car along the cable.

Cable Carrier Station.

At various points throughout the province there are streams of too great a depth for measurements by wading, and without suitably located bridges. In such cases what are termed "cable carrier stations" are established. The installation may be described as follows: A galvanized iron pulley is attached to a tree or post on each side of the river and directly opposite the ends of the section, and through these a light steel cable is rove. The meter is suspended from a device which can be made to travel along this cable by manipulating it from either shore. To observe the velocity in the stream at any point the meter is first moved to the desired vertical and then lowered to the desired point by means of the usual suspension cable. The soundings are made by replacing the meter with the sounding weight, and operating it in the same way. For streams up to 100 feet in width this method of obtaining measurements has proved very satisfactory.

Wading Stations.

Where wading stations are established, a tagged line is stretched across the stream at the sections, the tags indicating the various verticals. The observer, while standing in the stream, obtains the velocities at the different points in the section, care being taken to stand to one side and below the meter in order that eddies caused may not influence the reading.

Boat Stations.

Bridges are not always available or suitably located for use as metering stations, nor is it always feasible to erect a cable or cable carrier station owing to excessive width of section, low banks, or possible interference by passing boats. What is termed a "boat station" is then made use of.

Several stations of this description are in use by this survey. At a boat station the method adopted is to stretch a stay line or rope across the river about two or three feet above the water surface and just above the section. A tagged line, upon which the intervals for the section are indicated, is also stretched across the river and directly on the section. The measurements are made in the usual way from a boat which is held at the desired location on the section by means of the stay line.

PREPARATION OF DATA.

The compilation of the data gathered calls for considerable time and study, for the gathering of the data such as metering and gauge heights is but one phase in the process of arriving at the final estimates of daily discharge and total run-off of a stream. The first step to be taken in estimating the daily discharge for each station is the construction of a discharge curve. From the results of the meterings, points are plotted to co-ordinates, the ordinates being the gauge heights observed at the time of metering, and the abscissæ the corresponding discharge in cubic feet per second. Through these plotted points a smooth curve is drawn, this is known as the "discharge curve." "Mean velocity" and "area" curves are also constructed for the station. The points on the curves have as ordinates the gauge heights observed, and as abscissæ the corresponding mean velocity and cross-sectional area of the stream, respectively. From a study of the "mean velocity" and "area" curves, points not defined on the discharge curve may be closely approximated.

Where the stream bottom at any gauging station is permanent, or changes very slowly, and measurements well distributed over the range in gauge height experienced at the station have been secured, a well-defined curve may be obtained. Where, however, these conditions are not found, and the discharge curve is, in consequence, not well defined, it may be necessary to obtain meterings at very close intervals in order that a fair estimate of the discharge from day to day may be made. In order that the discharge for the days intervening between those upon which actual measurements are made, may be obtained, one of two accepted methods of correcting the discharge curve to give the true discharge is used. These two methods are known as the Stout and Bolster methods.

Stout Method.

In the Stout method, an approximate rating curve and table are prepared from the discharge measurements and observed gauge heights, and the corrected gauge heights are used in conjunction with it. To correct the gauge heights, a curve is plotted with the difference between the actual gauge heights at the time of the various measurements and the gauge heights as given on the approximate curve, as ordinates, and the days of the month upon which the measurements were made, as abscissæ. Through the points an irregular curve is drawn and, from this, the correction to be applied to the gauge height for the days intervening between those of actual measurements can be obtained. The corrected discharges are then easily derived.

Bolster Method.

In the Bolster method the discharge measurements for the entire year are plotted, as for a discharge curve. The points plotted are then considered consecutively, and usually two or more curves are so defined. Where conditions change rapidly, there is practically a new curve for each day. To obtain the daily discharges a standard rating curve is used. For days on which there are discharge measurements, the curve passes through the plotted points. To define the position of the curve for intervening days, the consecutive points are joined and the line divided into parts of equal length, corresponding to the number of intervening days. By passing the standard curve through the points so defined, the discharge for the corresponding day is determined by applying the gauge height observed for that day.

With the discharge curve defined, the next step is the construction of a rating table; this will depend upon certain laws relating to the flow of water in open channels, which are as follows:—

1. The discharge will remain constant when the conditions at or near the station, known as the station control, are constant.
2. The discharge at the station will always be the same for each stage provided always that the slope of the stream remains constant at such stage.
3. The discharge is a function of and, under normal conditions increases with the stage.

In preparing the rating table the discharge for each difference in gauge height of one-tenth or one-half tenth of a foot, depending on the size of the stream, is taken from the curve, and these differences are so adjusted that they either remain constant or increase by regular amounts. These are then entered upon a rating sheet. After the discharge curve is constructed and the rating table compiled, the daily gauge heights are listed on separate sheets, and from the rating table the discharge corresponding to the gauge height is set down for each day. In passing, it should be noted that the gauge heights as

recorded by the gauge reader are taken as the mean daily gauge height for the station; this is not always true, however, for there may easily occur fluctuations in the stage of the stream during each day. The results, however, are in most cases close enough for all practical purposes. Where the variation from the true mean is considerable and much depends upon the accuracy of results, the gauge readings are taken more than once a day or some type of recording gauge is installed. The table of discharges compiled from the gauge heights, therefore, is taken to represent the mean daily discharge at the station.

EXPLANATION OF DATA.

In this report the following data have been included for every regular station:—

1. Description of station.
2. Table of discharge measurements.
3. Table of daily gauge heights and discharges.
4. Table of monthly and yearly estimated discharges.

In the case of stations which are not regularly maintained, their location is described, the facts as to the drainage basin to which they belong are given, and the miscellaneous readings which have been taken at that station are listed. The description of all stations includes general information such as location of the gauge, equipment, location of initial point on the section, bench-marks, etc.; in short, a description such as would enable interested persons to locate the station with the least possible difficulty. A short history of the operation of the station covering any changes in the location of the gauge, section, or equipment made during the time of its operation is also given. The discharge table gives the results of the discharge measurements made from time to time by the hydrographers, since the installation of the station. It includes the date of the measurements, the name of the hydrographer, the gauge height at the time of measurement, the area of the section, the mean velocity and the discharge in second-feet. The daily gauge height and discharge table gives the daily height of the water surface at the gauge as observed by the gauge reader. These observations are generally made once a day but in some cases, where the records are of particular value, the readings are taken twice a day, and the mean of the two is given in the gauge height table. The daily mean discharge, as given in the table, is arrived at by applying the gauge height observed to the rating table for the station, and this figure is taken as being the rate or mean daily discharge in cubic feet per second. In the table of monthly and yearly discharges the following are given both for each month and for the year or period covered by the records; the *maximum* and *minimum* daily discharge, the *mean* discharge in cubic feet per second, the *run-off* in cubic feet per second per square mile the *run-off* depth in inches on drainage area, and the *total run-off* in acre-feet.

ACKNOWLEDGEMENTS.

Acknowledgement is made to the officers of the United States Geological Survey for assistance and advice received from time to time in connection with various points that have arisen in the operation of stations and in the matter of apparatus and equipment and also to the officers of the Winnipeg Street railway and the city of Winnipeg for assistance offered and records placed at the disposal of the survey. Mention should also be made of the hearty co-operation of the officials of the Lake of the Woods Milling Company, the Kenora Municipal Plant, and the engineering staff of the Hydro-Electric Power Commission of the province of Ontario, in gathering data relative to the Lake of the Woods outlets.

SUMMARY AND RECOMMENDATIONS.

The records contained in the report are the result of investigations carried on by the survey since its inception in 1912. Some stations have for various reasons been discontinued, while others have been established, the net result being a marked increase in the number of stations operated and, when the streams where miscellaneous readings are secured are considered, it will be seen that the southern part of the province is now well covered.

In the northern part of the province the work is being extended as opportunity offers and occasion arises, though, as far as possible, the need of stream flow data should be anticipated.

It is recommended that in view of the necessity of anticipating the requirement of data, that the work be extended to cover as much of the northern part of the province as possible. This extension will necessarily depend to a very great extent upon the accessibility of the various rivers and the possibility of securing continuous records. The work instituted on the Nelson should be vigorously carried on and an attempt made to secure a station that will permit of an all-year-round rating. In addition, slope gauges should be established, and if possible a suitable site for an automatic gauge selected and the same installed for the purpose of securing a rating of the river. The storage possibilities of Lac Seul should be looked into and an automatic gauge installed at some point on that lake, so that records of its variation in stage may be secured.

The necessity of some investigation into the underground water resources of the province is a question that is becoming pressing. The year 1914 was one of exceptionally low flow, and where the communities and individuals were dependent upon surface water for a domestic supply, hardship was experienced. A careful survey of the ground-water supply should make valuable and reliable information on the subject available to the general public, and as it is so closely allied to the gathering of data regarding the surface supply, it is suggested that it be carried out by this survey as soon as the necessary funds and assistance can be made available.

PROGRESS REPORT

OF

THE MANITOBA HYDROGRAPHIC SURVEY FOR 1912-13-14

PART II

HYDROGRAPHIC DATA

PART II

LAKE OF THE WOODS TRIBUTARIES AND OUTLETS.

GENERAL.

The lake of the Woods is drained into lake Winnipeg by the Winnipeg river, of which it forms one of the chief sources. It lies partly in Manitoba, partly in Ontario, and a considerable portion is in the United States. The area of the lake, including Shoal lake, is 1,500 square miles, and the drainage area tributary to it is 26,400 square miles. Naturally a lake with such an area and having a large tributary drainage area may have a very marked effect upon the run-off of the river draining it.

The power possibilities of the Winnipeg river are considerable, and these may be very materially increased by means of the proper utilization of the lake of the Woods as a storage or regulating basin. Of the total area tributary to the lake, 20,740 square miles is drained by Rainy river, which enters the lake at the southeast end.

Owing to the very direct influence the lake of the Woods and its tributaries may have upon the power output of the Winnipeg river, a careful study of the hydrology of the basin was undertaken; this included a study of the Rainy river and its tributaries and of the outlets of the lake of the Woods at Kenora and Keewatin.

RAINY RIVER.

Rainy river is the chief tributary of lake of the Woods. It drains Rainy lake and the territory above into the lake of the Woods, and forms the international boundary between the two lakes. It has a length of about 75 miles, and the basin drained by it is 20,740 square miles in extent; of this area, 14,400 square miles lies above Fort Frances, which is just below the outlet of Rainy lake, and 7,060 square miles is above the outlet of Namakan lake.

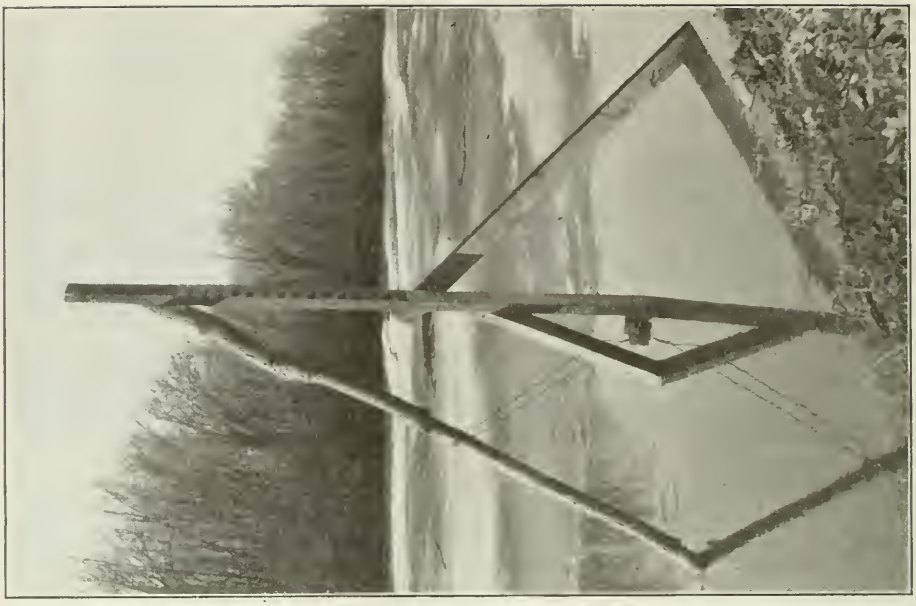
Namakan lake and Rainy lake are used as storage basins in connection with the Minnesota and Ontario Power Company's development at International Falls, which is just below the outlet of Rainy lake.

The country drained above Fort Frances is typical of the Laurentian formation. It abounds in small lakes, swamps, and muskegs, with rock outcrops everywhere. The country is well timbered, good stands of spruce and pine timber being found throughout the district. A considerable portion of the area has been cut over, and the product used for the manufacture of lumber, pulp and paper.

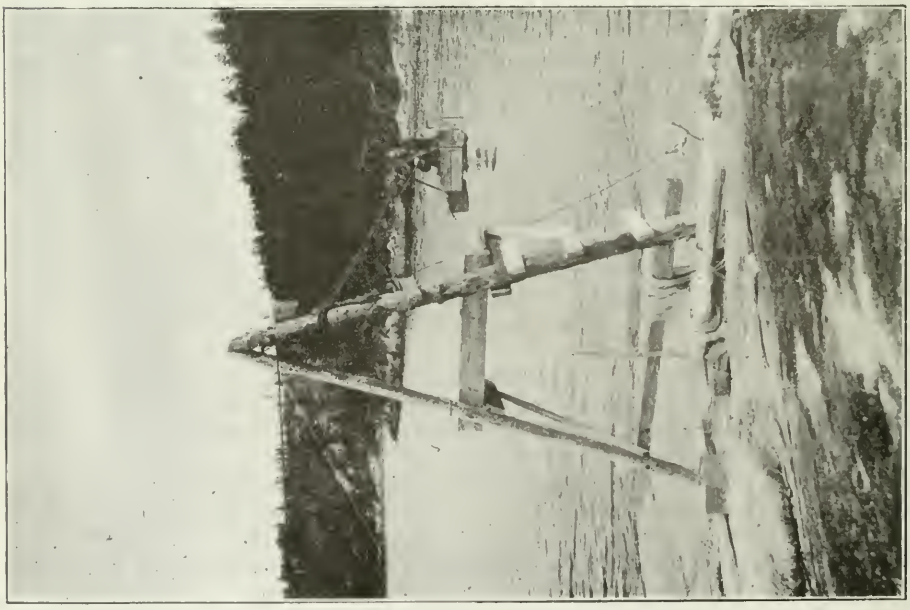
Below Fort Frances and bordering the river the land is flat and swampy, though when drained the land offers good opportunities for farming. The banks vary from a few feet in height to 20 or 30 feet, and are generally of clay, though rock outcrops occur at certain points.

The river is navigable from just below International Falls to the lake of the Woods, and is used during the summer months. In addition, the lumbermen drive their logs down it to the mills.

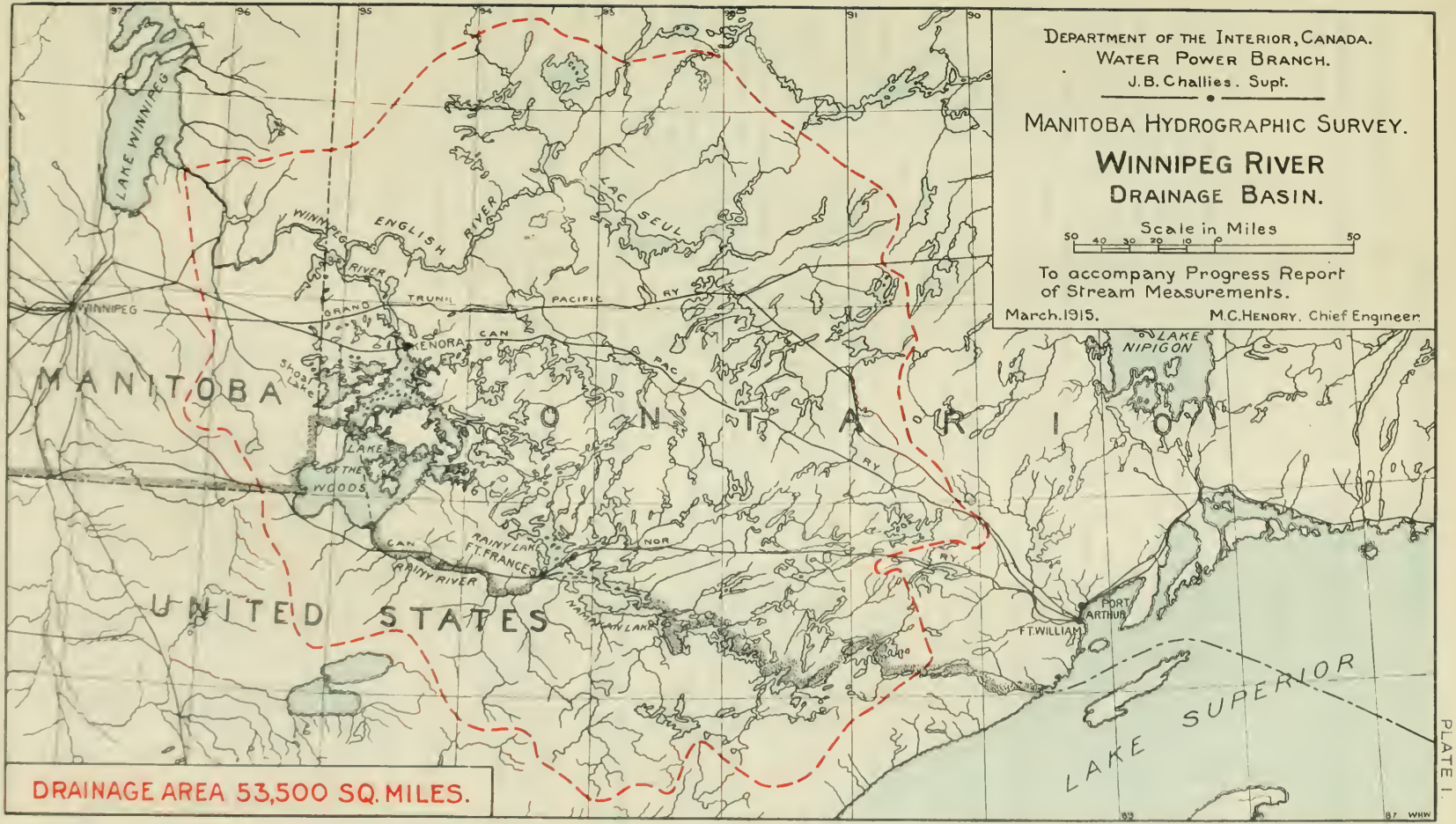
Metering stations have been established on this river by the Manitoba Hydrographic Survey above Kettle falls, below International Falls, in conjunction with the United States Geological Survey, and at Beaudette and Emo. The station below International Falls is, however, the most important on the river, and the records at this point cover the longest period, though the actua-



Roseau River, Dominion City. M. H. S. Gauge.



Winnipeg River, Slave Falls. Cable Car Station.


DEPARTMENT OF THE INTERIOR, CANADA.
WATER POWER BRANCH.
J.B. Challies. Supt.
MANITOBA HYDROGRAPHIC SURVEY.
WINNIPEG RIVER
DRAINAGE BASIN.
Scale in Miles
50 40 30 20 10 0 50
To accompany Progress Report of Stream Measurements.
March. 1915.
M.C. HENORY. Chief Engineer
LAKE WINNIPEG
WINNIPEG RIVER
ENGLISH RIVER
LAC SEUL
WINNIPEG
GRAND TRUNK PACIFIC RY
KENORA
CAN PAC RY
LAKE OF THE WOODS
MANITOBA
ONTARIO
LAKE NIPIGON
RAINY LAKE
FT. FRANCES
RAINY RIVER
NOR RY
NAMAKAN LAKE
UNITED STATES
PORT ARTHUR
FT. WILLIAM
LAKE SUPERIOR
DRAINAGE AREA 53,500 SQ. MILES.
PLATE I.

operation of the stations by the Manitoba Hydrographic Survey only covers a short period.

Kettle Falls, Canadian Channel.

History.—The station was established on August 8, 1912, by Alexander Pirie, and was operated by the Manitoba Hydrographic Survey until 1913, when it was taken over by the Dominion Department of Public Works.

Location of Section.—The section on the Canadian channel is located at the foot of the first narrows, about 100 feet above the falls. The initial point is a hole drilled in the rock on Canadian island at the foot of the first narrows, and is marked "I. P. Elevation 503·5," it is referenced by a 15-inch spruce tree blazed on the side facing the river and marked "I. P. 48 feet southwest."

Records Available.—Records are available for the period August 8, 1912, to June 13, 1913, when the station was taken over by the Dominion Department of Public Works.

Drainage Area.—The drainage area above Kettle falls has an area of 7,060 square miles, and includes in its drainage area a large number of small lakes, the largest of which is Namakan.

Gauge.—The gauge is a 9-foot vertical staff located 100 feet above the metering section on the Canadian mainland, and is bolted to the rock; it is referred to the D.P.W. datum at Fort Frances.

Channel.—The channel has a permanent rock bed and is straight for about 1,500 feet above the section and about 300 feet below, the banks are high and rocky and not liable to overflow. It forms one of the outlets from Namakan lake the other being known as the International channel, Kettle falls.

Discharge Measurements.—Eleven discharge measurements were taken by the Manitoba Hydrographic Survey during the years 1912 and 1913, over a range in gauge height of about 6 feet. Sufficient meterings were obtained to define a discharge curve over the range in stage given above, and from this curve the daily discharges were estimated.

Accuracy.—The discharge measurements define the curve very well between the limits in elevation 497·6 and 500·6; beyond these limits the curve is not well defined.

It is necessary to obtain the discharge in both the International and Canadian channels in order that the actual discharge from Namakan lake may be ascertained. Owing to the presence of Kettle falls a short distance below the section the backwater effect under winter conditions was negligible.

Discharge Measurements of Canadian Channel, Kettle River at Kettle Falls, 1912–13.

Date	Hydrographer	Meter No.	Width.	Area of Section	Mean Velocity	Gauge Height	Discharge
1912			Feet	Sq. ft.	Ft. per sec.	Feet	Sec. ft.
Aug. 8	S. S. Scoval	1371	119·5	1,273	1·127	500·04	1,[illegible]
Sept. 6	Alex. Pirie	1197	115·0	1,207	0·902	500·04	1,088
" 9	W. Richardson	1371	118·0	1,181	0·797	500·06	942
" 29	Alex. Pirie	1187	111·5	1,198	0·752	499·71	901
" 30	"	1187	111·5	1,191	0·709	499·64	844
Nov. 2	R. H. Nelson	1196	108	1,100	0·496	499·64	546
" 4	"	1196	108	1,184	0·517	498·69	561
1913							
Jan. 9	Alex. Pirie	1162	102	975	0·[illegible]	498·[illegible]	[illegible]
" 9	"	1162	102	973	0·[illegible]	498·[illegible]	[illegible]
Mar. 15	"	1186	102	946	0·[illegible]	497·[illegible]	[illegible]
May 31	"	1197	182·5	17·19	[illegible]·78	[illegible]	[illegible]

Daily Gauge Height and Discharge of Kettle River, Canadian Channel, at Kettle Falls for 1912–13.

[Drainage Area, 7,100 square miles.]

Day.	July, 1912.		August, 1912.		Sept., 1912.		Oct., 1912.		Nov., 1912.		Dec., 1912.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					499·96	1,005	499·62	810	499·06	575	498·53	409
2					499·92	975	499·53	760	499·01	559	498·53	409
3					499·86	947	499·51	760	498·98	549	498·53	409
4					499·86	947	499·55	760	498·97	546	494·53	409
5					500·05	1,035	499·56	785	498·93	533	498·53	409
6					500·03	1,035	499·57	785	498·91	527	498·53	409
7					500·03	1,035	499·58	785	498·88	517	498·52	406
8			500·67[1]	1,480	500·03	1,035	499·55	760	498·85	507	498·48	395
9			500·67	1,480	500·13	1,095	499·53	760	498·85	507	498·43	381
10			500·67	1,480	500·13	1,095	499 51	760	498·83	501	498·43	381
11			500·66	1,480	500·13	1,095	499·50	737	498·82	498	498·43	381
12			500·56	1,402	500·13	1,095	499·49	737	498·82	498	498·43	381
13			500·66	1,480	500·11	1,095	499·48	737	498·81	494	498·23	328
14			500·49	1,330	500·04	1,035	499·48	737	498·78	485	498·23	328
15			500·47	1,330	500·03	1,035	499·43	715	498·76	479	498·23	328
16			500·41	1,295	500·01	1,035	499·41	715	498·81	494	498·13	306
17			500·40	1,260	499·95	975	499·40	695	498·78	485·	498·13	306
18			500·38	1,260	499·92	975	499·35	675	498·73	469	498·13	306
19			500·34	1,225	499·85	920	499·28	655	498·75	475	498·33	353
20			500·31	1,225	499·85	920	499·27	651	498·78	485	498·33	353
21			500·29	1,192	499·81	920	499·25	643	498·73	469	498·33	353
22			500·23	1,160	499·79	892	499·23	635	498·71	463	498·33	353
23			500·18	1,127	499·73	865	499·20	624	498·69	457	498·23	328
24			500·17	1,127	499·75	865	499·19	621	498·67	451	498·23	328
25			500·14	1,095	499·75	865	499·16	610	498·65	445	498·23	328
26			500·08	1,065	499·73	865	499·13	600	498·63	439	498·23	328
27			500·06	1,065	499·68	837	499·11	593	498·69	457	498·23	328
28			500·08	1,065	499·68	837	499·05	572	498·73	469	498·23	328
29			500·06	1,065	499·71	865	499·03	565	498·63	439	498·23	328
30			500·04	1,035	499·64	810	499·05	572	498·69	457	498·23	328
31			500·02	1,035			499·10	590			498·23	328

	Jan., 1913.		Feb., 1913.		Mar., 1913.		April, 1913.		May, 1913.		June, 1913.	
1	498·23	328	497·93	266	497·63	217	497·56	207	499·98	1,005	503·63	4,375
2	498·23	328	497·93	266	497·63	217	497·56	207	500·08	1,065	503·83	4,575
3	498·13	306	497·93	266	497·63	217	497·58	210	500·18	1,127	504·01	4,775
4	498·13	306	497·93	266	497·63	217	497·58	210	500·28	1,192	504·11	4,875
5	498·13	306	497·93	266	497·63	217	497·59	211	500·38	1,260	504·27	5,025
6	498·13	306	497·93	266	497 63	217	497·59	211	500·38	1,260	504·35	5,075
7	498·13	306	497·83	248	497·63	217	497·59	211	500·53	1,365	504·43	5,175
8	498·13	306	497·83	248	497·63	217	497·59	211	500·68	1,480	504·45	5,175
9	498·13	306	497·83	248	497·63	217	497·60	213	500·75	1,520	504·49	5,225
10	498·13	306	497·83	248	497·53	203	497·60	213	500·83	1,605	504·55	5,275
11	498·13	306	497·83	248	497·53	203	497·60	213	500·93	1,690	504·55	5,275
12	498·13	306	497·83	248	497·57	208	497·61	214	501·13	1,875	504·55	5,275
13	498·13	306	497·83	248	497·58	210	497·65	220	501·05	1,780	504·55	5,275
14	498·13	306	497·83	248	497·60	213	497·81	245	501·13	1,875		
15	498·13	306	497·83	248	497·61	214	497·91	262	501·33	2,075		
16	498·13	306	497·83	248	497·61	214	498·05	290	501·43	2,175		
17	498·13	306	497·73	232	497·60	213	498·18	317	501·55	2,275		
18	498·13	306	497·73	232	497·60	213	498·33	353	501·63	2,375		
19	498·13	306	497·73	232	497·60	213	498·43	381	501·73	2,475		
20	498·03	286	497·73	232	497·59	211	498·61	433	501·78	2,525		
21	498·03	286	497·73	232	497·59	211	498·73	469	501·93	2,675		
22	498·03	286	497·73	232	497·59	211	498·83	501	502·03	2,775		
23	498·03	286	497·73	232	497·60	213	498·98	549	502·15	2,875		
24	498·03	286	497·73	232	497·61	214	499·08	583	502·23	2,975		
25	498·03	286	497·73	232	497·62	216	499·23	635	502·33	3,075		
26	498·03	286	497·63	217	497·61	214	499·38	695	502·48	3,125		
27	498·03	286	497·63	217	497·61	214	499·48	738	502·58	3,225		
28	497·93	266	497·63	217	497·61	214	499·63	810	502·71	3,475		
29	497·93	266			497·60	213	499·75	865	502·83	3,575		
30	497·93	266			497·58	210	499·83	920	503·11	3,875		
31	497·93	266			497·56	207			503·38	4,125		

Gauge heights marked thus [1] interpolated.

Kettle Falls, International Channel.

History.—The meter section on the International channel at Kettle falls was established on August 8, 1912, by Alexander Pirie.

Location.—The meter section is located 300 feet above Kettle falls on the Canadian and International channel. The initial point is a hole drilled in the rock at the head of the first narrows above the falls on the American shore elevation 506·68 D.P.W. datum. It is referenced by a 14-inch spruce tree blazed and marked, "I. P. S. 7 feet south."

Records Available.—From August 8, 1912, to June 13, 1913, daily gauge heights have been recorded and the daily discharges have been computed for that period.

Drainage Area.—The drainage area above Kettle falls is 7,060 square miles.

Gauge.—The gauge which was located in connection with the meter section on the Canadian channel was used for rating both stations.

Channel.—The channel is permanent, the river flowing over solid rock bed. Above the section it is straight for approximately 1,500 feet, and continues in the same direction for about 300 feet below.

Discharge Measurements.—Ten discharge measurements were taken by the Manitoba Hydrographic Survey during 1912 and 1913, covering a range in gauge height of approximately 6 feet.

Accuracy.—The discharge curve for the station is well defined for a range of 3 feet between elevation 497·6 and 500·6, D.P.W. datum; beyond these limits it is not so well defined.

Owing to the presence of Kettle falls a short distance below the section, no serious backwater effects are noted under winter conditions. Under these circumstances the discharge measurements may be considered as fairly accurate.

Discharge Measurements of International Channel, Kettle River at Kettle Falls, 1912–13.

Date	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 8	S. S. Scovil	1,374	213	4,351	0·769	500·67	3,345
Sept. 6	A. Pirie	1,197	213	4,353	0·680	500·05	2,960
" 9	W. Richardson	1,374	213	4,318	0,643	500·10	2,775
" 30	A. Pirie	1,187	213	4,311	0·587	499·65	2,548
Nov. 4	R. H. Nelson	1,196	213	4,156	0·481	498·98	1,999
" 2	do	1,196	213	4,193	0·485	498·99	2,047
1913.							
Jan. 10	A. Pirie	1,462	208	3,981	0·35	498·13	1,342
" 10	do	1,462	208	3,981	0·32	498·12	1,298
Mar. 17	do	1,186	210	3,888	0·281	497·69	1,105
May 31	do	1,197	223	5,243	1·22	503·41	6,378

Daily Gauge Height and Discharge of Kettle River at International Channel, Kettle Falls for 1912–13.

[Drainage area 7,100 square miles.]

Day.	July, 1912.		Aug., 1912.		Sept., 1912.		Oct., 1912.		Nov., 1912.		Dec., 1912.	
	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					499·96	2,785	499·62	2,445	499·06	1,959	498·53	1,580
2					499·92	2,735	499·53	2,355	499·01	1,920	498·53	1,580
3					499·86	2,685	499·51	2,355	498·98	1,897	498·53	1,580
4					499·86	2,685	499·55	2,355	498·97	1,890	498·53	1,580
5					500·05	2,835	499·56	2,400	498·93	1,860	498·53	1,580
6					500·03	2,835	499·57	2,400	498·91	1,845	498·53	1,580
7					500·03	2,835	499·58	2,400	498·88	1,822	498·52	1,573
8			500·67	3,517	500·03	2,835	499·55	2,355	498·85	1,800	498·48	1,547
9			500·67	3,517	500·13	2,940	499·53	2,355	498·85	1,800	498·43	1,515
10			500·67	3,517	500·13	2,940	499·51	2,355	498·83	1,785	498·43	1,515
11			500·66	3,517	500·13	2,940	499·50	2,310	498·82	1,778	498·43	1,515
12			500·56	3,412	500·13	2,940	499·49	2,310	498·82	1,778	498·43	1,515
13			500·66	3,517	500·11	2,940	499·48	2,310	498·81	1,771	498·23	1,390
14			500·49	3,307	500·04	2,835	499·48	2,310	498·78	1,750	498·23	1,390
15			500·47	3,307	500·03	2,835	499·43	2,265	498·76	1,736	498·23	1,390
16			500·41	3,255	500·01	2,835	499·41	2,265	498·81	1,771	498·13	1,330
17			500·40	3,202	499·95	2,735	499·40	2,222	498·78	1,750	498·13	1,330
18			500·38	3,202	499·92	2,735	499·35	2,180	498·73	1,715	498·13	1,330
19			500·34	3,150	499·85	2,635	499·28	2,137	498·75	1,729	498·33	1,450
20			500·31	3,150	499·85	2,635	499·27	2,129	498·78	1,750	498·33	1,450
21			500·29	3,097	499·81	2,635	499·25	2,112	498·73	1,715	498·33	1,450
22			500·23	3,045	499·79	2,587	499·23	2,095	498·71	1,701	498·33	1,450
23			500·18	2,992	499·73	2,540	499·20	2,071	498·69	1,687	498·23	1,390
24			500·17	2,992	499·75	2,540	499·19	2,063	498·67	1,673	498·23	1,390
25			500·14	2,940	499·75	2,540	499·16	2,039	498·65	1,659	498·23	1,390
26			500·08	2,887	499·73	2,540	499·13	2,015	498·63	1,645	498·23	1,390
27			500·06	2,887	499·68	2,492	499·11	1,999	498·69	1,687	498·23	1,390
28			500·08	2,887	499·68	2,492	499·05	1,951	498·73	1,715	498·23	1,390
29			500·06	2,887	499·71	2,540	499·03	1,935	498·63	1,645	498·23	1,390
30			500·04	2,835	499·64	2,445	499·05	1,951	498·69	1,687	498·23	1,390
31			500·02	2,835			499·10	1,991			498·23	1,390

	Jan., 1913.		Feb., 1913.		March, 1913.		April, 1913.		May, 1913.		June, 1913	
1	498·23	1,390	497·93	1,220	497·63	1,080	497·56	1,052	499·98	2,785	503·63	6,615
2	498·23	1,390	497·93	1,220	497·63	1,080	497·56	1,052	500·08	2,887	503·83	6,825
3	498·13	1,330	497·93	1,220	497·63	1,080	497·58	1,060	500·18	2,992	504·01	7,035
4	498·13	1,330	497·93	1,220	497·63	1,080	497·58	1,060	500·28	3,097	504·11	7,140
5	498·13	1,330	497·93	1,220	497·63	1,080	497·59	1,064	500·38	3,202	504·27	7,297
6	498·13	1,330	497·93	1,220	497·63	1,080	497·59	1,064	500·38	3,202	504·35	7,350
7	498·13	1,330	497·83	1,170	497·63	1,080	497·59	1,064	500·53	3,360	504·43	7,455
8	498·13	1,330	497·83	1,170	497·63	1,080	497·59	1,064	500·68	3,517	504·45	7,455
9	498·13	1,330	497·83	1,170	497·63	1,080	497·60	1,068	500·75	3,570	504·49	7,507
10	498·13	1,330	497·83	1,170	497·53	1,040	497·60	1,068	500·83	3,675	504·55	7,560
11	498·13	1,330	497·83	1,170	497·53	1,040	497·60	1,068	500·93	3,780	504·55	7,560
12	498·13	1,330	497·83	1,170	497·57	1,056	497·61	1,072	501·13	3,990	504·55	7,560
13	498·13	1,330	497·83	1,170	497·58	1,060	497·65	1,089	501·05	3,885	504·55	7,560
14	498·13	1,330	497·83	1,170	497·60	1,068	497·81	1,161	501·13	3,990		
15	498·13	1,330	497·83	1,170	497·61	1,072	497·91	1,210	501·33	4,200		
16	498·13	1,330	497·83	1,170	497·61	1,072	498·05	1,286	501·43	4,305		
17	498·13	1,330	497·73	1,125	497·60	1,068	498·18	1,360	501·55	4,410		
18	498·13	1,330	497·73	1,125	497·60	1,068	498·33	1,450	501·63	4,515		
19	498·13	1,330	497·73	1,125	497·60	1,068	498·43	1,515	501·73	4,620		
20	498·03	1,275	497·73	1,125	497·59	1,064	498·61	1,632	501·78	4,672		
21	498·03	1,275	497·73	1,125	497·59	1,064	498·73	1,715	501·93	4,830		
22	498·03	1,275	497·73	1,125	497·59	1,064	498·83	1,785	502·03	4,935		
23	498·03	1,275	497·73	1,125	497·60	1,068	498·98	1,897	502·15	5,040		
24	498·03	1,275	497·73	1,125	497·61	1,072	499·08	1,975	502·23	5,143		
25	498·03	1,275	497·73	1,125	497·62	1,076	499·23	2,095	502·33	5,250		
26	498·03	1,275	497·63	1,080	497·61	1,072	499·38	2,222	502·48	5,407		
27	498·03	1,275	497·63	1,080	497·61	1,072	499·48	2,310	502·58	5,512		
28	497·93	1,220	497·63	1,080	497·61	1,072	499·63	2,445	502·71	5,670		
29	497·93	1,220			497·60	1,068	499·75	2,540	502·83	5,775		
30	497·93	1,220			497·58	1,060	499·83	2,635	503·11	6,090		
31	497·93	1,220			497·56	1,052			503·38	6,352		

Note.—Gauge heights marked thus (*) interpolated

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Combined Channels, Kettle River, at Kettle Falls for 1912–13.

[Drainage area, 7,100 square miles.]

Day.	July, 1912.		Aug., 1912.		Sept., 1912.		Oct., 1912.		Nov., 1912.		Dec., 1912.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	....	.....	499·96	3,790	499·62	3,255	499·06	2,534	498·53	1,989
2	....	....	....	.....	499·92	3,710	499·53	3,115	499·01	2,479	498·53	1,989
3	....	....	....	.....	499·86	3,632	499·51	3,115	498·98	2,446	498·53	1,989
4	....	....	....	.....	499·86	3,632	499·55	3,115	498·97	2,436	498·53	1,989
5	....	....	....	.....	500·05	3,870	499·56	3,185	498·93	2,393	498·53	1,989
6	....	....	....	.....	500·03	3,870	499·57	3,185	498·91	2,372	498·53	1,989
7	....	....	....	.....	500·03	3,870	499·58	3,185	498·88	2,339	498·52	1,979
8	....	....	500·67	4,997	500·03	3,870	499·55	3,115	498·85	2,307	498·48	1,942
9	....	....	500·67	4,997	500·13	4,035	499·53	3,115	498·85	2,307	498·43	1,896
10	....	....	500·67	4,997	500·13	4,035	499·51	3,115	498·83	2,286	498·43	1,896
11	....	....	500·66	4,997	500·13	4,035	499·50	3,047	498·82	2,276	498·43	1,896
12	....	....	500·56	4,814	500·13	4,035	499·49	3,047	498·82	2,276	498·43	1,896
13	....	....	500·66	4,997	500·11	4,035	499·48	3,047	498·81	2,265	498·23	1,718
14	....	....	500·49	4,637	500·04	3,870	499·48	3,047	498·78	2,235	498·23	1,718
15	....	....	500·47	4,637	500·03	3,870	499·43[1]	2,980	498·76	2,215	498·23	1,718
16	....	....	500·41	4,550	500·01	3,870	499·41[1]	2,980	498·81	2,265	498·13	1,636
17	....	....	500·40	4,462	499·95	3,710	499·40[1]	2,917	498·78	2,235	498·13	1,636
18	....	....	500·38	4,462	499·92	3,710	499·35[1]	2,855	498·73	2,184	498·13	1,636
19	....	....	500·34	4,375	499·85	3,555	499·28[1]	2,792	498·75	2,204	498·33	1,803
20	....	....	500·31	4,375	499·85	3,555	499·27[1]	2,780	498·78	2,235	498·33	1,803
21	....	....	500·29	4,289	499·81	3,555	499·25[1]	2,755	498·73	2,184	498·33	1,803
22	....	....	500·23	4,205	499·79	3,479	499·23[1]	2,730	498·71	2,164	498·33	1,803
23	....	....	500·18	4,119	499·73	3,405	499·20[1]	2,695	498·69	2,144	498·23	1,718
24	....	....	500·17	4,119	499·75	3,405	499·19[1]	2,684	498·67	2,124	498·23	1,718
25	....	....	500·14	4,035	499·75	3,405	499·16[1]	2,649	498·65	2,104	498·23	1,718
26	....	....	500·08	3,952	499·73	3,405	499·13[1]	2,615	498·63	2,084	498·23	1,718
27	....	....	500·06	3,952	499·68	3,329	499·11[1]	2,592	498·69	2,144	498·23	1,718
28	....	....	500·08	3,952	499·68	3,329	499·05[1]	2,523	498·73	2,184	498·23	1,718
29	....	....	500·06	3,952	499·71	3,405	499·03	2,500	498·63	2,084	498·23	1,718
30	....	....	500·04	3,870	499·64	3,255	499·05	2,523	498·69	2,144	498·23	1,718
31	....	....	500·02	3,870	.....	...	499·10	2,581	.....	.....	498·23	1,718

	Jan., 1913.		Feb., 1913.		March, 1913.		April, 1913.		May, 1913.		June, 1913.	
1	498·23	1,718	497·93	1,486	497·63	1,297	497·56	1,259	499·98	3,790	503·63	10,990
2	498·23	1,718	497·93	1,486	497·63	1,297	497·56	1,259	500·08	3,952	503·83	11,400
3	498·13	1,636	497·93	1,486	497·63	1,297	497·58	1,270	500·18	4,119	504·01	11,810
4	498·13	1,636	497·93	1,486	497·63	1,297	497·58	1,270	500·28	4,289	504·11	12,015
5	498·13	1,636	497·93	1,486	497·63	1,297	497·59	1,275	500·38	4,462	504·27	12,322
6	498·13	1,636	497·93	1,486	497·63	1,297	497·59	1,275	500·38	4,462	504·35	12,425
7	498·13	1,636	497·83	1,418	497·63	1,297	497·59	1,275	500·53	4,725	504·43	12,68
8	498·13	1,636	497·83	1,418	497·63	1,297	497·59	1,275	500·68	4,997	504·45	12 [illegible]
9	498·13	1,636	497·83	1,418	497·63	1,297	497·60	1,281	500·75	5,090	504·49	12,742
10	498·13	1,636	497·83	1,418	497·53	1,243	497·60	1,281	500·83	5,280	504·55	12,875
11	498·13	1,636	497·83	1,418	497·53	1,243	497·60	1,281	500·93	5,470	504·55	12,875
12	498·13	1,636	497·83	1,418	497·57	1,261	497·61	1,286	501·13	5,865	504·55	12,875
13	498·13	1,636	497·83	1,418	497·58[1]	1,270	497·65	1,309	501·05	5,665	504·55	12,875
14	498·13	1,636	497·83	1,418	497·60[1]	1,281	497·81	1,406	501·13	5,865		
15	498·13	1,636	497·83	1,418	497·61	1,286	497·91	1,472	501·33	6,275		
16	498·13	1,636	497·83	1,418	497·61	1,286	498·05	1,576	501·43	6,480		
17	498·13	1,636	497·73	1,357	497·60	1,281	498·18	1,677	501·55	6,685		
18	498·13	1,636	497·73	1,357	497·60	1,281	498·33	1,803	501·63	6,800		
19	498·13	1,636	497·73	1,357	497·60	1,281	498·43	1,896	501·74	7,096		
20	498·03	1,561	497·73	1,357	497·59	1,275	498·61	2,065	501·78	7,197		
21	498·03	1,561	497·73	1,357	497·59	1,275	498·73	2,184	501·96	7,50[illegible]		
22	498·03	1,561	497·73	1,357	497·59	1,275	498·83	2,286	502·09	7,71[illegible]		
23	498·03	1,561	497·73	1,357	497·60	1,281	498·98	2,440	502·15	7,91[illegible]		
24	498·03	1,561	497·73	1,357	497·61	1,286	499·08	2,558	502·23	8,118		
25	498·03	1,561	497·73	1,357	497·62	1,292	499·23	2,740	502·3[illegible]	8,32[illegible]		
26	498·03	1,561	497·63	1,297	497·61	1,286	499·38	2,941	502·18	8,0[illegible]		
27	498·03	1,561	497·63	1,297	497·61	1,286	499·48	3,048	502·38	8,3[illegible]		
28	497·93	1,486	497·63	1,297	497·61	1,286	499·63	3,255	502·74	9,11		
29	497·93	1,486			497·60	1,281	499·78	3,445	502·83	9,3[illegible]		
30	497·93	1,486			497·58	1,270	499·83	3,555	502·11	8,9[illegible]		
31	497·93	1,486			497·56	1,259			502·38	8,11		

Note.—Gauge height marked thus [1] interpolated.

Monthly Discharge of Kettle River at Kettle Falls, for 1912–13.

[Drainage area, 7,100 square miles.]

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
August	4,997	3,870	4,400	0·620	0·715	270,500
September	4,035	3,255	3,685	0·519	0·580	219,300
October	3,255	2,500	2,900	0·408	0·470	178,300
November	2,534	2,084	2,255	0·317	0·354	134,200
December	1,989	1,636	1,810	0·255	0·294	111,300
The period	4,997	1,636	3,019	0·424	2·413	913,600
1913.						
January	1,718	1,486	1,600	0·225	0·259	98,400
February	1,486	1,297	1,400	0·197	0·205	77,800
March	1,297	1,243	1,280	0·180	0·207	78,700
April	3,555	1,259	1,895	0·267	0·298	112,800
May	10,477	3,790	6,595	0·928	1·068	405,500
The period	10,477	1,243	2,554	0·359	2·037	773,200

Note.—This table gives the total combined discharge, run-off, etc., of the Canadian and International Channels of the Kettle River at Kettle Falls.

Rainy River at Fort Frances.

History.—The station was established by the United States Geological Survey in 1909. On August 13, 1911, the maintenance of the station was taken over by the Dominion Department of Public Works, though the United States Geological Survey still co-operated in the securing of discharge measurements. During the years 1912 and 1913, a similar co-operation was carried on by the Manitoba Hydrographic Survey.

Location of Section.—The section is located 80 feet below the steamboat wharf at International Falls, and is about 1,800 feet below the dam of the Minnesota and Ontario Power Company. The initial point of the section is marked by an iron bolt which is imbedded in a rock outcrop just below the steamboat wharf on the American side of the river.

Records Available.—Gauging records from March 1, 1907, to August 12, 1911, have been secured by the Minnesota and Ontario Power Company and the United States Geological Survey. Subsequent to the latter date, continuous records have been secured by the United States Geological Survey and the Dominion Department of Public Works. From March 1, 1907, to August 12, 1911, the estimated daily discharges are based on the gauge records referred to a computed discharge curve. Subsequent to August 12, 1911, the discharges, published herein, have been furnished by the Dominion Department of Public Works, and are based on records of turbine gate and sluice openings in the plant of the Minnesota and Ontario Power Company.

Drainage Area.—The drainage area which is tributary to the Rainy river above International Falls is, according to determinations of the United States Geological Survey, 14,600 square miles. A later determination, made from the best maps available by the Dominion Water Power Branch, gives this area as being 14,400 square miles.

Gauge.—A vertical staff gauge is fastened to a pile at the southwest corner of the steamboat landing, about 80 feet above the section; the zero of this gauge is referred to the Ontario D.P.W. datum.

Channel.—There is only one channel in the river at this point, the bed of the stream is of sandy clay and reasonably permanent, the average depth across the section at normal stage being about 9 feet. There is a slight curve both above and below the section.

Discharge Measurements.—Meterings are made from a boat at all stages of the river, the discharge curve being based upon meterings made by the United States Geological Survey, the Dominion Department of Public Works, and the Manitoba Hydrographic Survey. These cover a range in gauge height of about 6 feet.

Storage.—Records of discharge following the summer of 1909 do not represent natural run-off, as Rainy lake, and later Namakan lake were both used as regulation basins, and therefore the supply and levels of these two lakes have to be considered on arriving at natural run-off.

Accuracy.—Previous to August, 1911, the estimated discharges are based primarily on gauging records to which corrections have been applied for backwater due to the Little and Big Fork rivers in the open season, and for backwater due to ice effects in winter months. At certain intervals, therefore, in the above period the records are only approximate. Since August, 1911, the estimated discharges are of high accuracy.

DAILY GAUGE HEIGHT AND DISCHARGE of Rainy River at Fort Frances for 1911.

[Drainage area, 14,400 square miles.]

Day	August.		September		October.		November		December	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				6,480		5,18[illegible]		4,970		5,6[illegible]
2				6,515		4,11[illegible]		4,85[illegible]		5,615
3				6,586		5,25[illegible]		4,890		4,815
4				5,835		5,505		4,900		[illegible]
5				6,076		5,500		4,22[illegible]		[illegible]
6				6,415		5,56[illegible]		4,20[illegible]		[illegible]
7				6,180		5,22[illegible]		4,770		[illegible]
8				[illegible]		4,175		4,785		[illegible]
9				[illegible]		4,16[illegible]		5,012		[illegible]
10				5,70[illegible]		4,080		4,987		[illegible]
11				[illegible]		5,170		[illegible]		[illegible]
12				5,98[illegible]		5,480		4,915		[illegible]
13				[illegible]		5,400		4,250		[illegible]
14		4,820		[illegible]		[illegible]		[illegible]		[illegible]
15		6,750		[illegible]		4,180		[illegible]		[illegible]
16		6,730		[illegible]		[illegible]		[illegible]		[illegible]
17		6,170		[illegible]		[illegible]		[illegible]		[illegible]
18		6,385		[illegible]		[illegible]		[illegible]		[illegible]
19		6,650		[illegible]		[illegible]		[illegible]		[illegible]
20		5,194		[illegible]		[illegible]		[illegible]		[illegible]
21		4,847		[illegible]		[illegible]		[illegible]		[illegible]
22		6,510		[illegible]		[illegible]		[illegible]		[illegible]
23		6,585		[illegible]		[illegible]		[illegible]		[illegible]
24		6,711		[illegible]		[illegible]		[illegible]		[illegible]
25		6,910		[illegible]		[illegible]		[illegible]		[illegible]
26		6,740		5,150		[illegible]		[illegible]		[illegible]
27		5,201		[illegible]		[illegible]		[illegible]		[illegible]
28		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
29		[illegible]		[illegible]		4,110		[illegible]		[illegible]
30		6,910		[illegible]		[illegible]		[illegible]		[illegible]
31		[illegible]				4,840				[illegible]

Daily Gauge Height and Discharge of Rainy River at Fort Frances, for 1912.

[Drainage Area, 14,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft.
1		4,490		5,085		4,856		3,953		5,880		6,315
2		5,695		5,440		4,888		5,022		5,885		5,440
3		5,665		5,845		4,197		5,028		5,915		5,325
4		5,695		4,620		4,102		4,997		6,190		6,437
5		5,640		3,995		5,101		5,002		5,250		6,382
6		5,815		5,105		5,037		4,984		4,795		6,410
7		4,450		5,090		5,090		3,725		6,185		6,305
8		3,995		5,050		5,102		3,616		6,570		6,159
9		5,725		4,985		5,063		5,049		6,610		5,971
10		5,720		4,870		4,205		5,068		6,692		5,889
11		5,725		4,105		4,108		5,096		6,734		6,267
12		5,940		3,990		5,105		5,119		5,435		6,239
13		6,220		5,030		5,060		5,052		4,800		6,283
14		3,700		5,035		5,025		4,031		6,690		6,312
15		5,030		5,000		5,046		4,409		6,695		6,255
16		5,855		5,009		4,960		5,100		6,690		5,570
17		5,930		5,017		3,828		5,060		6,350		5,730
18		5,900		4,119		3,890		5,045		6,355		6,042
19		5,915		3,976		4,812		5,055		4,855		6,093
20		5,915		5,035		5,045		5,048		5,200		6,180
21		4,700		5,044		5,096		4,130		6,730		6,261
22		4,320		5,057		5,095		3,950		6,743		6,415
23		5,915		5,063		5,004		5,045		6,720		5,823
24		5,920		5,014		3,560		5,055		6,770		5,693
25		5,875		4,169		4,429		5,385		6,577		6,190
26		5,760		4,080		5,070		5,800		4,892		5,835
27		5,495		5,068		5,022		5,900		5,175		5,969
28		4,255		5,066		5,057		4,597		6,680		5,853
29		3,935		5,056		5,090		4,348		6,495		5,555
30		5,080				4,910		5,865		6,350		5,267
31		5,080				4,012				5,814		

Day.	July.		August.		September.		October.		November.		December.	
1		6,078		10,091		6,448		7,279		7,087		5,801
2		5,660		10,072		5,892		7,202		7,122		6,433
3		5,880		10,077		6,470		7,039		6,184		6,725
4		5,472		9,462		8,408		7,089		6,095		7,001
5		5,402		8,953		8,490		7,078		7,199		6,968
6		5,905		9,825		8,363		6,199		7,146		6,655
7		5,394		9,837		7,997		6,543		7,160		6,149
8		5,835		9,714		7,254		7,060		7,073		5,828
9		6,932		9,333		7,266		7,060		6,791		5,860
10		7,043		9,332		8,057		7,039		6,175		6,913
11		8,074		8,442		7,962		7,045		5,998		6,973
12		8,285		8,299		7,799		7,100		6,568		6,972
13		8,218		8,208		7,831				6,923		6,962
14		7,576		8,246		7,880		6,664		7,020		6,675
15		7,494		7,965		7,260		7,083		6,955		5,412
16		8,613		7,048		7,234		7,044		7,041		5,532
17		8,835		7,528		7,812		7,047		5,261		7,267
18		8,148		7,720		7,579		6,852		6,511		6,987
19		6,981		7,530		6,996		6,987		6,999		6,850
20		7,604		8,416		6,923		6,594		7,015		6,989
21		8,633		8,194		6,588		5,824		7,089		6,762
22		8,405		6,865		5,910		7,076		7,033		5,900
23		8,936		6,728		6,663		7,111		7,051		4,650
24		9,012		6,932		6,930		7,070		6,174		6,581
25		8,940		5,885		7,315		7,056		5,978		5,011
26		9,061		6,166		8,892		7,078		7,002		4,591
27		8,105		6,614		8,223		6,135		7,054		5,995
28		8,572		6,839		7,179		5,927		7,047		6,549
29		9,946		7,055		6,980		6,968		6,687		5,762
30		9,569		7,152		7,024		7,076		6,422		5,137
31		10,087		7,177				7,112				6,751

Daily Gauge Height and Discharge of Rainy River at Fort Frances, for 1913.

[Drainage Area, 14,490 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge	Gauge Height	Dis-charge.
	Feet	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft
1	....	6,805	....	6,841	....	6,850	....	6,846	....	6,826	....	5,535
2	....	6,795	....	5,647	....	5,602	....	6,246	....	6,831	....	6,216
3	....	6,827	....	6,385	....	5,675	....	5,870	....	6,814	....	6,960
4	....	6,978	....	6,864	....	6,749	....	6,187	....	5,978	....	6,852
5	....	5,989	....	6,887	....	6,751	....	6,634	....	6,331	....	6,868
6	....	5,216	....	6,895	....	6,900	....	4,406	....	6,827	....	6,904
7	....	6,858	....	6,853	....	6,905	....	5,438	....	6,827	....	6,820
8	....	6,796	....	6,900	....	6,919	....	6,621	....	6,814	....	6,273
9	....	6,892	....	5,738	....	5,840	....	6,801	....	6,881	....	6,343
10	....	6,920	....	5,849	....	5,725	....	6,865	....	6,820	....	6,795
11	....	6,921	....	6,879	....	6,750	....	6,792	....	5,938	....	6,870
12	....	5,778	....	6,884	....	6,780	....	6,783	....	6,172	....	6,911
13	....	6,124	....	6,878	....	6,716	....	5,883	....	6,761	....	6,902
14	....	6,911	....	6,872	....	6,798	....	5,419	....	6,788	....	7,052
15	....	6,932	....	6,853	....	6,739	....	6,715	....	6,730	....	6,729
16	....	6,941	....	5,618	....	5,464	....	6,837	....	6,765	....	6,398
17	....	6,909	....	5,477	....	5,653	....	6,801	....	6,820	....	7,492
18	....	6,947	....	6,865	....	6,730	....	6,716	....	5,994	....	7,410
19	....	6,015	....	6,877	....	6,747	....	6,751	....	6,163	....	7,336
20	....	5,073	....	6,853	....	6,682	....	5,324	....	6,772	....	7,473
21	....	6,956	....	6,894	....	6,752	....	6,254	....	6,796	....	7,468
22	....	6,945	....	6,844	....	6,715	....	6,368	....	6,777	....	6,689
23	....	6,909	....	5,631	....	5,598	....	6,706	....	6,760	....	7,324
24	....	6,937	....	6,054	....	4,921	....	6,758	....	6,785	....	7,814
25	....	6,955	....	6,864	....	6,840	....	6,726	....	6,162	....	7,840
26	....	5,896	....	6,847	....	6,813	....	6,746	....	6,088	....	7,856
27	....	6,273	....	6,830	....	6,811	....	5,873	....	6,749	....	8,798
28	....	6,856	....	6,830	....	6,775	....	6,180	....	6,550	....	8,832
29	....	6,928	....		....	6,800	....	6,696	....	6,889	....	9,673
30	....	6,977	....		....	5,946	....	6,913	....	6,896	....	9,863
31	....	6,981			....	5,990			....	6,906		

Day.	July.		August.		September.		October		November.		December	
1	....	11,023	....	9,490	....	5,251	....	6,126		5,965		[illegible]
2	....	11,058	....	8,829	....	6,328		6,892		5,406		[illegible]
3		11,004		9,223		6,935		6,980		5,445		6,987
4		11,606		9,048		7,019		6,970		6,110		6,540
5		11,438		9,134		6,703		6,456		6,055		[illegible]
6		11,503		9,139		6,997		6,040		5,994		6,542
7		10,343		9,176		5,885		8,565		6,080		[illegible]
8		10,106		10,414		7,262		6,435		6,075		5,877
9		9,633		10,022		6,821		6,633		5,493		[illegible]
10		10,820		9,503		7,016		6,920		5,759		[illegible]
11		13,475		8,758		7,014		6,940		6,105		6,864
12		13,510		9,108		6,964		6,207		6,100		[illegible]
13		12,246		9,076		7,010		7,389		6,135		[illegible]
14		13,539		9,207		6,238		7,170		5,889		6,222
15		11,493		9,261		6,455		6,932		6,222		[illegible]
16		13,715		8,968		[illegible]		6,257		[illegible]		[illegible]
17		14,576		8,758		7,094		6,360		[illegible]		[illegible]
18		14,243		8,651		7,000		6,150		[illegible]		[illegible]
19		15,290		9,019		6,985		6,018		[illegible]		[illegible]
20		14,019		8,914		6,975		5,545		[illegible]		[illegible]
21		13,187		9,136		6,545		6,080		[illegible]		[illegible]
22		13,221		9,118		[illegible]		6,140		[illegible]		[illegible]
23		13,254		8,888		7,060		[illegible]		[illegible]		[illegible]
24		13,331		[illegible]		7,026		6,100		6,408		[illegible]
25		13,225		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
26		14,262		[illegible]		6,994		[illegible]		[illegible]		[illegible]
27		12,809		6,965		6,945		5,650		[illegible]		[illegible]
28		12,841		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
29		13,292		6,967		[illegible]		[illegible]		[illegible]		[illegible]
30		13,739		6,665		7,030		6,026		[illegible]		[illegible]
31		9,794		[illegible]				[illegible]				[illegible]

Daily Gauge Height and Discharge of Rainy River at Fort Frances, for 1914.

[Drainage area 14,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		6,070		6,439		6,164		6,898		6,868		7,874
2		6,097		6,586		6,418		6,998		6,784		8,834
3		6,933		6,949		6,980		6,912		5,988		8,976
4		6,251		7,000		6,896		6,892		6,396		9,043
5		5,492		7,020		6,956		6,050		6,598		8,749
6		6,935		6,938		6,942		6,320		6,798		8,792
7		6,877		6,976		6,922		6,936		6,840		6,646
8		6,870		6,468		5,775		6,916		6,788		7,753
9		6,785		6,482		6,394		6,918		6,752		9,054
10		6,856		6,970		7,064		6,928		5,997		9,421
11		6,218		6,978		7,006		6,910		6,214		8,906
12		6,536		7,078		7,030		6,077		6,802		8,415
13		6,961		7,050		6,986		6,244		6,814		8,860
14		6,953		6,944		7,016		6,902		6,842		6,673
15		6,957		6,312		5,589		6,895		6,846		7,203
16		6,980		6,436		6,384		6,894		6,818		8,686
17		7,021		7,280		6,950		6,932		6,269		8,953
18		6,245		6,744		7,002		6,852		6,272		9,126
19		6,455		6,978		7,022		5,878		6,804		9,070
20		6,920		7,042		7,006		6,280		6,818		9,050
21		6,950		8,023		7,016		6,990		6,864		6,968
22		6,921		5,967		6,180		6,834		6,832		7,644
23		6,959		6,410		6,392		6,868		6,856		8,745
24		6,957		6,974		6,958		6,878		6,102		8,916
25		6,326		6,988		6,850		6,876		6,620		9,466
26		7,140		7,018		6,944		6,052		7,398		9,504
27		7,036		6,998		6,928		6,252		7,432		9,104
28		6,958		7,020		6,928		6,862		7,940		6,606
29		7,004				6,056		6,796		8,630		8,198
30		6,936				6,270		6,856		8,954		8,670
31		6,685				6,880				6,963		

Day.	July.		August.		September.		October.		November.		December	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		7,778		10,703		10,419		10,520		7,601		11,040
2		8,316		8,331		10,580		10,510		8,935		10,929
3		8,966		9,081		10,540		10,005		10,839		11,069
4		8,416		10,984		10,528		7,019		10,778		10,853
5		6,184		10,854		10,528		8,651		10,821		10,399
6		7,216		10,937		7,630		10,353		10,781		7,458
7		10,058		10,772		8,270		10,570		10,788		8,272
8		9,829		10,895		9,216		10,154		8,271		10,661
9		10,346		8,816		10,599		10,482		9,150		11,171
10		10,669		9,021		10,640		10,540		10,788		10,711
11		10,739		10,907		10,590		7,641		10,810		10,740
12		7,815		10,948		10,570		8,833		10,880		10,938
13		10,756		10,902		7,713		10,508		10,566		7,225
14		11,023		10,855		8,889		9,996		9,946		8,684
15		10,953		10,877		10,690		9,269		7,783		9,308
16		10,933		7,730		10,522		9,660		8,959		10,218
17		11,376		8,618		10,529		9,680		10,285		9,290
18		11,819		10,654		10,513		7,456		10,762		9,925
19		9,503		10,716		10,500		8,371		11,134		9,991
20		10,472		10,599		8,045		10,533		10,744		6,911
21		12,061		10,578		8,848		10,462		11,145		7,834
22		12,441		10,549		10,512		10,671		8,192		9,124
23		12,775		8,549		10,542		10,991		9,199		9,313
24		12,541		8,871		10,505		11,397		11,059		9,666
25		12,445		10,607		10,515		7,007		10,911		3,448
26		10,773		10,699		10,414		8,977		10,891		1,224
27		11,503		10,628		8,187		10,648		10,003		3,710
28		12,262		10,658		8,673		10,848		9,416		8,318
29		12,522		10,628		10,520		11,808		8,317		9,950
30		11,247		7,735		10,385		11,891		8,171		10,410
31		10,687		8,725				10,739				10,017

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Rainy River at Fort Frances, for 1915.

[Drainage area 14,400 square miles.]

Day.	January.		February.	
	Gauge Height	Discharge	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet	Sec.-ft
1		10,092		7,153
2		10,320		8,292
3		6,610		8,175
4		9,030		8,291
5		10,460		8,083
6		10,052		8,281
7		10,057		6,792
8		10,277		7,193
9		10,360		8,245
10		6,981		8,247
11		8,635		8,360
12		10,352		8,178
13		10,330		7,746
14		10,137		
15		8,595		
16		9,565		
17		9,183		
18		8,220		
19		9,555		
20		9,545		
21		9,508		
22		9,451		
23		8,882		
24		7,938		
25		8,714		
26		9,425		
27		8,807		
28		8,534		
29		9,090		
30		9,201		
31		7,529		

Monthly Discharges of Rainy River at Fort Frances.

Month.	Discharge in Second-Feet.				Run-off	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Billions of cub. ft.
1911.						
September	6,880	4,730	5,990	0·416	0·464	15·52
October	5,890	4,320	5,210	0·362	0·418	13·95
November	6,070	4,020	5,410	0·376	0·419	14·03
December	.....	.....	5,900	0·410	0·473	15·80
The Period	6,880	4,020	5,377	0·391	1·774	59·30
1912						
January	6,220	3,700	5,330	0·370	0·427	14·27
February	5,840	3,980	4,830	0·336	0·349	11·68
March	5,100	3,560	4,740	0·329	0·380	12·70
April	5,900	3,620	4,850	0·337	0·376	12·57
May	6,770	4,800	6,090	0·423	0·488	16·31
June	6,420	5,240	6,020	0·418	0·467	15·60
July	10,100	5,150	7,680	0·534	0·616	20·57
August	10,100	5,880	8,120	0·564	0·651	21·73
September	8,890	5,890	7,360	0·512	0·570	19·08
October	7,280	5,820	6,880	0·478	0·552	18·41
November	7,200	5,260	6,730	0·468	0·522	17·45
December	7,267	4,591	6,280	0·436	0·504	16·82
The Year	10,100	3,560	6,243	0·434	5·90	197·19
1913.						
January	6,978	5,073	6,620	0·460	0·530	17·73
February	6,900	5,477	6,561	0·456	0·474	15·87
March	6,919	4,921	6,420	0·446	0·514	17·20
April	6,913	4,406	6,405	0·445	0·497	16·60
May	6,906	5,938	6,620	0·460	0·531	17·73
June	9,863	5,535	7,274	0·506	0·564	18·85
July	15,290	9,633	12,597	0·876	1·010	33·71
August	10,414	5,660	8,544	0·594	0·685	22·89
September	7,262	5,251	6,770	0·470	0·525	17·55
October	8,565	5,474	6,318	0·439	0·506	16·91
November	7,175	5,242	6,129	0·426	0·475	15·89
December	6,988	4,608	6,309	0·438	0·506	16·90
The Year	15,290	4,406	7,214	0·501	6·82	227·83
1914.						
January	7,140	5,492	6,718	0·467	0·538	17·98
February	8,023	5,967	6,823	0·474	0·493	16·50
March	7,064	5,589	6,707	0·466	0·538	17·96
April	6,998	5,878	6,694	0·465	0·519	17·35
May	8,954	5,988	6,866	0·477	0·550	18·39
June	9,504	6,606	8,464	0·588	0·656	22·11
July	12,775	6,184	10,464	0·727	0·839	28·02
August	10,984	7,730	10,044	0·698	0·805	26·90
September	10,600	4,270	9,749	0·677	0·756	25·28
October	10,991	7,019	9,787	0·680	0·784	26·21
November	11,145	7,783	9·927	0·690	0·770	25 72
December	11,171	1,224	8,994	0·625	0·721	24·09
The Year	12,775	1,224	8,436	0·586	7·97	266·51

[1]Estimated.

Rainy River at Emo.

History.—The station on the Rainy river at Emo was established on October 2, 1912, by Alexander Pirie, and was in operation by the Manitoba Hydrographic Survey until March, 1913, when it was taken over by the Dominion Department of Public Works.

Location of Section.—On the Rainy river at Emo, Ont., the section is at the foot of the road leading from the C.N.R. station to the river in that town. The initial point is marked by a hub driven at the foot of a 2-foot stump which is on the left hand side of the road about one-half way down the river bank.

Records Available.—Four discharge measurements have been taken at this point, and these have not been sufficient to define a discharge curve for the station. Records of gauge heights taken at this point for the years 1906 to 1912 during the open-water season have been secured.

Gauge.—A 6-foot vertical staff gauge was nailed to the fourth pile from the shore on the downstream side of the old dock below Emo hotel, and 600 feet below the initial point of the metering section. The zero of the gauge is referred to Ontario Department of Public Works datum.

Channel.—The river is confined to one channel at this point and has an approximate depth under normal conditions of about 12 feet; the bottom is of clay and fairly permanent. The channel is straight for 1,500 feet above the section and 1,000 feet below, the banks are high and wooded, and are not liable to overflow.

Discharge Measurements.—Four discharge measurements have been taken of the river at this point and cover a range in stage of 1·2 feet.

DISCHARGE MEASUREMENTS of Rainy River at Emo, Ont., for 1912–13.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 3	A. Pirie	1,187	731	5,962	1·75	457·93	10,419
Nov. 7	R. H. Nelson	1,197	717	4,603	1·408	456·57	6,482
1913.							
Jan. 14	A. Pirie	1,469	722	5,009	1·29	456·66	[1]6,455
Mar. 21	"	1,187	690	4,808	1·43	458·53	6,876

[1]Measurement taken under ice conditions.

RAINY RIVER AT BEAUDETTE.

History.—The meter section at this point on the Rainy river was established by G. W. Worden on August 19, 1912, and was continued in operation by the Manitoba Hydrographic Survey till March, 1913, when the Dominion Department of Public Works took it over.

Location of Section.—On the Rainy river on the downstream side of the C.N.R. bridge below the mouth of the Beaudette river. The initial point of the section is at the northeast corner of the C.N.R. bridge, and is marked at the intersection of the steel work with the top of the board walk.

Records Available.—Daily gauge heights were secured during the open-water period from August 19 to November 27, 1912, and gauge heights at various times during the winter period up till February 10, 1913.

Drainage Area.—The drainage area tributary to the Rainy river above this point is approximately 15,000 square miles.

Gauge.—A vertical staff gauge fastened to the upstream or west side of the centre pier of the C.N.R. bridge. Zero of gauge is referred to Ontario Department of Public Works datum.

Channel.—The river at the section is divided into six channels by piers of the C.N.R. bridge. The bottom is composed of sandy loam and clay, and is fairly permanent. Above the section the channel is straight for about 200 feet, and below there is a slight curve to the west. The banks are high and wooded and are not liable to overflow at the section.

Discharge Measurements.—Three discharge measurements have been taken at this point.

Accuracy.—This station is primarily dependent on the level of the lake of the Woods, and therefore no discharge rating curve referred to one gauging point can be secured.

Discharge Measurements of Rainy River at Beaudette Bridge, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 3	W. Richardson	1,374	1,010	16,003	0·676	59·53	10,824
" 21	W. G. Worden	1,187	1,014	16,378	0·506	59·68	8,287
Sept. 3	Alex. Pirie	1,197	1,000	15,925	0·340	59·50	5,415

LAKE OF THE WOODS OUTLETS.

The outflow from the lake of the Woods into the Winnipeg river below the lake is through several natural and artificial channels. The flow through all these outlets is controlled by the operation of hydraulic plants or the manipulation of dams placed upon them. The outlets from the lake in order from the east are: eastern outlet, completely controlled by the Municipal Power Plant of Kenora; the western outlet, upon which has been built the Norman dam, the head-race of mill "C',' Lake of the Woods Milling Co. and artificial outlet; the head-race of mill "A," belonging to the same company, and also an artificial channel; and last, the artificial head-race of the Keewatin Lumber and Manufacturing Company's plant discharging into Mink bay, which in turn drains into Darlington bay, an arm of the Winnipeg river.

Below the outlets the Winnipeg river is split up into a number of branches, the tail-races of mills "A" and "C," the outlet of Darlington bay, and the western outlet form the West Branch, and river below the eastern outlet forms the East Branch of the Winnipeg river. These unite below Old Fort island to form the main river.

The manipulation and operation of the dams and plants at the various outlets renders it difficult to ascertain the discharge from the lake of the Woods. In order that correct estimates may be made it has been necessary to establish and operate a number of metering stations and maintain gauges at various points in the district. The location of the metering stations are as follows:—

1. Eastern outlet, above the Kenora power-house.
2. Western outlet, Norman traffic bridge.
3. Head-race, mill "C."
4. Head-race, mill "A."
5. Head-race, Keewatin Lumber and Manufacturing Company.
6. C.P.R. culvert, outlet of Mink bay.
7. North Tunnel Island station.

In addition to the records obtained at these regular stations, observations of the discharge at different controlling sections below the outlets have been made from time to time.

East Branch Winnipeg River, Kenora Power-House.

History.—The discharge of the East Branch or eastern outlet, lake of the Woods, depends upon the operation of the Kenora Municipal Power Plant. To determine the discharge under these circumstances it was necessary to rate the power plant. At first an attempt was made to determine the discharge directly, and to this end a station was established by Mr. S. S. Scovil, June 27, 1912, about half-mile below the power-house, near Old Fort island; this proved unsatisfactory so a station was established by Alexander Pirie, October 8, 1913, about 150 feet above the power-house, in the eastern outlet. This section was used to rate the power station.

Location of Section.—The metering station is about 150 feet above the Kenora power-house on the eastern outlet of the lake of the Woods. The initial point is located on the bank, and is marked by an iron bolt set in the rock.

Records Available.—Daily gauge height readings are available for the head- and tail-race of the plant from August 21, 1907, and daily estimates of discharge based upon the load of the plant are available for a like period.

Drainage Area.—As in the case of the other outlets of the lake of the Woods the drainage area above for the individual outlets is not significant.

Gauge.—Tail-race and head-race gauges were established at the power plant in 1907, and are the ones used in the records until 1912, when on June 24 and 27, head- and tail-race gauges were respectively established by Mr. Scovil, the former being on the upstream side of the timber platform in the head-race and the latter 200 feet below the power-house. Both were referred to W.P.S. datum.

Channel.—The channel is permanent, being in solid rock and boulders, is fairly uniform and free from cross eddies. It is straight for 50 feet above the section and 100 feet below, and fairly uniform. All the water passes through the power-house except for a small part escaping in the log chute.

Discharge Measurements.—Sufficient measurements were made to rate the station under the range in loads and heads occurring, and a rating curve of load-discharges constructed for various heads. A boat station is used for the measurements.

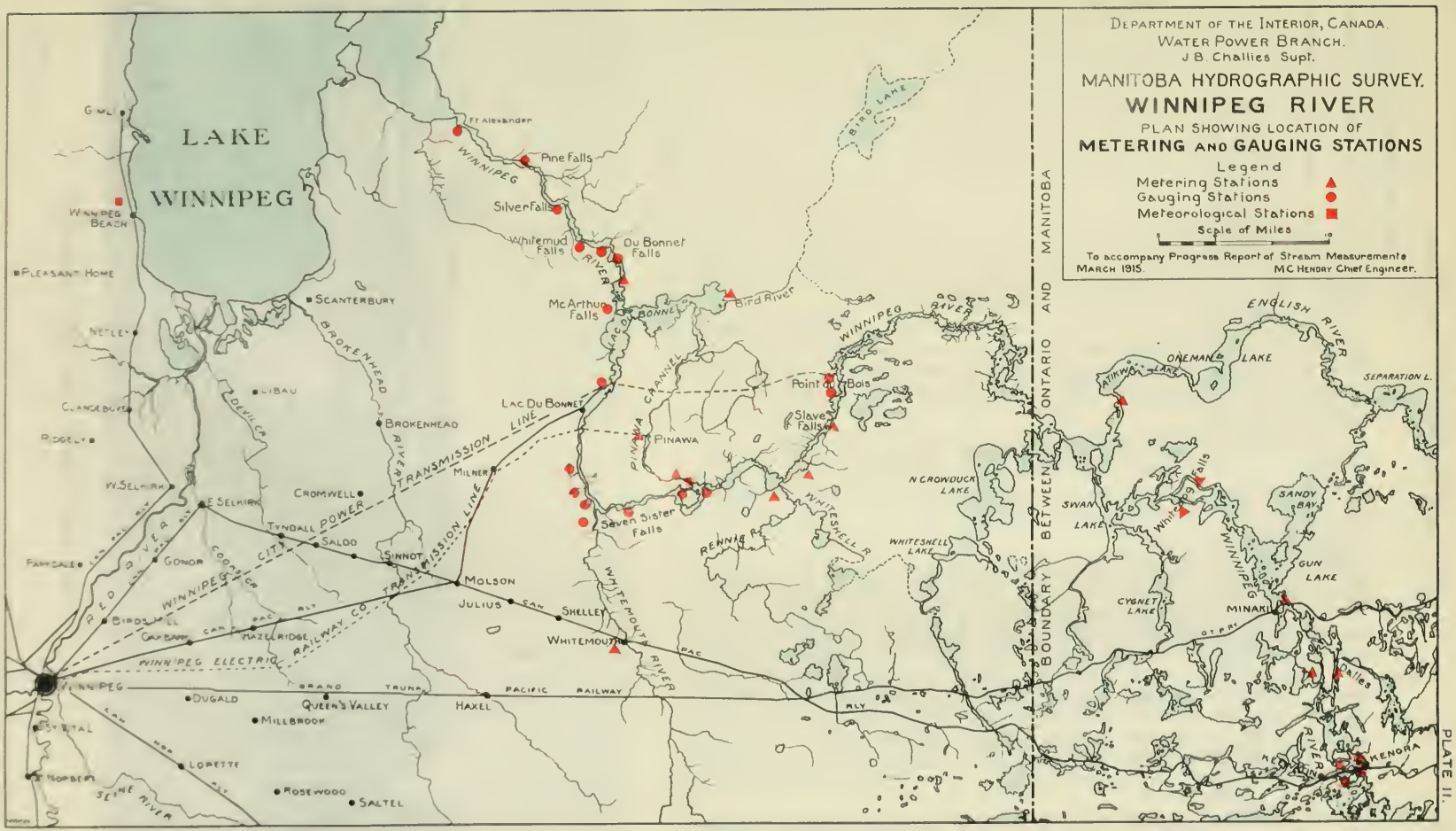
Accuracy.—Except for conditions due to small loads the rating may be considered good.

DISCHARGE MEASUREMENTS of East Branch Winnipeg River at Kenora Power House, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1912.						Tailrace.	
June 27	S. S. Scovil	1,374	142	818	1·30	36·18	1,095
July 18	"	1,374	143	856	1·27	36·25	1,090
" 31	W. H. Richardson	1,374	149	832	1·25	36·23	1,043
Aug. 13	W. G. Worden.	1,187	141	828	1·29	36·20	1,068
" 31	"	1,187	141	770	1·28	36·26	985
Sept. 27	W. H. Richardson	1,462	138	723	0·97	35·61	704
Oct. 1	"	1,462	136	700	0·76	35·55	530
" 2	"	1,462	136	690	0·81	35·49	562
" 3	"	1,462	136	696	0·78	35·49	541
" 7	"	1,462	150	838	1·15	36·24	967
" 8	A. Pirie	1,462	163	910	1·18	35·57	1,070
" 9	"	1,462	163	914	1·21	36·35	1,109
" 13	"	1,462	153	811	0·54	35·42	443
" 14	"	1,462	163	929	1·05	36·26	982
" 14	"	1,462	163	925	1·07	36·27	997
" 14	"	1,462	163	934	1·05	36·29	989
" 15	"	1,462	163	946	1·07	36·35	1,029
" 15	"	1,462	163	943	1·09	36·35	1,035
" 15	"	1,462	163	943	1·11	36·36	1,048
						Forebay.	
" 15	"	1,462	89	1,393	0·78	59·45	1,095
" 17	"	1,462	89	1,392	0·75	59·41	1,042
" 17	"	1,462	89	1,392	0·77	59·41	1,081
" 17	"	1,462	89	1,393	0·75	59·42	1,049
" 17	"	1,462	89	1,393	0·74	59·42	1,041
" 17	"	1,462	89	1,393	0·83	59·41	1,176
" 19	"	1,462	89	1,392	0·74	59·39	1,038
						Tailrace.	
Nov 22	G. J. Lamb	1,187	164	1,025	1·11	36·47	1,137
" 22	"	1,187	164	1,025	1·10	36·49	1,127
" 28	"	1,187	166	998	1·11	36·49	1,108
1913.						Forebay.	
Feb. 24	G. J. Lamb	1,375	79	1,244	0·84	59·00	1,048
" 24	"	1,375	79	1,244	1·07	58·98	1,331
" 25	"	1,375	79	1,244	1·05	58·98	1,311
" 25	"	1,375	79	1,244	1·00	58·98	1,241
" 25	"	1,375	79	1,244	1·03	58·98	1,282
" 25	"	1,375	79	1,244	1·05	58·98	1,306
" 26	"	1,375	79	1,244	1·12	58·99	1,394
Mar 2	"	1,375	79	1,244	0·57	59·00	711
" 2	"	1,375	79	1,244	0·62	58·97	777
" 3	"	1,375	79	1,244	1·12	59·05	1,394
" 3	"	1,375	79	1,244	1·18	59·05	1,464
" 3	"	1,375	79	1,244	1·21	59·05	1,506
" 7	"	1,375	79	1,244	1·01	59·02	1,258
" 7	"	1,375	79	1,244	1·05	59·02	1,312
" 7	"	1,375	79	1,244	0·99	59·01	1,236

DISCHARGE MEASUREMENTS of East Branch Winnipeg River at Kenora Power House, 1912–14—*Continued.*

Date	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet. Forebay.	Sec.-ft.
1913.							
March 7	G. J. Lamb	1,375	79	1,244	1·01	59·06	1,254
" 7	"	1,375	79	1,244	1·00	59·05	1,242
" 7	"	1,375	79	1,244	0·96	59·05	1,200
" 7	"	1,375	79	1,244	1·01	59·06	1,256
" 7	"	1,375	79	1,251	1·00	59·08	1,250
" 8	"	1,375	79	1,244	0·97	59·07	1,205
" 8	"	1,375	79	1,244	1·00	59·05	1,239
" 8	"	1,375	79	1,244	0·99	59·06	1,224
" 8	"	1,375	79	1,244	1·00	59·04	1,249
" 8	"	1,375	79	1,244	1·02	59·03	1,266
" 8	"	1,375	79	1,244	1·01	59·03	1,263
" 9	"	1,375	79	1,251	0·65	59·12	816
" 9	"	1,375	79	1,251	0·62	59·12	771
" 9	"	1,375	79	1,251	0·62	59·13	777
" 9	"	1,375	79	1,251	0·61	59·14	765
" 9	"	1,375	79	1,251	0·57	59·15	719
" 9	"	1,375	79	1,251	0·60	59·14	749
" 9	"	1,375	79	1,251	0·49	59·13	613
" 10	"	1,375	79	1,244	1·17	59·07	1,454
" 10	"	1,375	79	1,251	1·23	59·08	1,538
" 10	"	1,375	79	1,244	1·18	59·07	1,469
" 15	"	1,375	79	1,244	1·16	59·07	1,442
" 15	"	1,375	79	1,244	1·24	59·07	1,541
" 15	"	1,375	79	1,244	1·16	59·06	1,439
" 19	"	1,375	79	1,244	1·05	59·05	1,304
" 19	"	1,375	79	1,244	1·02	59·05	1,270
" 19	"	1,375	79	1,244	1·03	59·05	1,280
" 19	"	1,375	79	1,244	0·97	59·06	1,203
" 20	"	1,375	79	1,251	1·01	59·11	1,266
" 20	"	1,375	79	1,251	1·05	59·11	1,318
" 20	"	1,375	79	1,251	1·05	59·11	1,318
" 20	"	1,375	79	1,251	1·01	59·11	1,270
April 4	"	1,375	79	1,259	0·55	59·17	694
" 4	"	1,375	79	1,259	0·58	59·18	729
" 4	"	1,375	79	1,259	0·60	59·19	755
" 4	"	1,375	79	1,259	0·56	59·19	713
" 4	"	1,375	79	1,259	0·51	59·19	644
" 4	"	1,375	79	1,259	0·55	59·17	687
" 4	"	1,375	79	1,259	0·56	59·18	703
" 4	"	1,375	79	1,259	0·52	59·17	657
" 5	"	1,375	79	1,259	0·58	59·19	672
" 5	"	1,375	79	1,259	0·53	59·19	667
" 5	"	1,375	79	1,259	0·57	59·19	711
" 5	"	1,375	79	1,259	0·55	59·19	691
" 5	"	1,375	79	1,259	0·49	59·20	619
" 5	"	1,375	79	1,259	0·53	59·20	668
" 5	"	1,375	79	1,259	0·45	59·20	563
" 5	"	1,375	79	1,259	0·57	59·20	720
" 5	"	1,375	79	1,259	0·49	59·20	620
" 5	"	1,375	79	1,259	0·56	59·18	709
" 24	"	1,375	79	1,290	1·07	59·63	1,377
" 24	"	1,375	79	1,290	0·96	59·63	1,259
Sept. 9	"	1,374	79	1,284	0·49	59·48	626
" 9	"	1,374	79	1,284	0·47	59·51	605
" 10	"	1,371	79	1,252	0·48	59·16	598
" 10	"	1,374	79	1,252	0·47	59·14	590
" 10	"	1,374	79	1,252	0·51	59·12	635
" 10	"	1,374	79	1,252	0·46	59·13	579
" 10	"	1,374	79	1,252	0·46	59·14	580
" 10	"	1,374	79	1,252	0·45	59·13	568
" 11	"	1,371	79	1,252	0·52	59·13	646
" 11	"	1,374	79	1,252	0·49	59·12	612
" 11	"	1,374	79	1,252	0·49	59·10	608
" 11	"	1,374	79	1,252	0·49	59·13	609
" 12	"	1,371	79	1,242	0·51	59·01	630
" 12	"	1,374	79	1,244	0·50	59·01	625
" 12	"	1,374	79	1,244	0·43	59·01	536
Dec. 13	S. C. O'Grady	1,186	79	1,228	0·79	58·82	964
" 13	"	1,186	79	1,228	0·74	58·82	914
" 14	"	1,186	79	1,228	0·52	58·83	620
" 14	"	1,186	79	1,228	0·50	58·83	629
1914.							
Mar. 6	S. C. O'Grady	1,196	79	1,237	1·11	58·66	1,372
" 6	"	1,196	79	1,238	1·08	58·65	1,329
" 6	"	1,196	79	1,237	1·07	58·64	1,317
" 6	"	1,196	79	1,238	1·04	58·64	1,287
" 17	"	1,196	79	1,237	1·00	58·60	1,249
" 24	"	1,196	79	1,229	1·06	58·52	1,306
" 24	"	1,196	79	1,230	1·07	58·52	1,324
" 24	"	1,196	79	1,230	0·98	58·52	1,215
April 1	"	1,196	79	1,239	0·62	58·60	764
" 1	"	1,196	79	1,230	0·67	58·60	821


DEPARTMENT OF THE INTERIOR, CANADA.
WATER POWER BRANCH.
J.B. Challies Supt.
MANITOBA HYDROGRAPHIC SURVEY.
WINNIPEG RIVER
PLAN SHOWING LOCATION OF
METERING AND GAUGING STATIONS
Legend
Metering Stations
Gauging Stations
Meteorological Stations
Scale of Miles
To accompany Progress Report of Stream Measurements
MARCH 1915.
M.C. HENDRY Chief Engineer.
LAKE WINNIPEG
BOUNDARY BETWEEN MANITOBA AND ONTARIO
GIMLI
WINNIPEG BEACH
PLEASANT HOME
NETLEY
CLANDEBOYE
RIDGELY
W. SELKIRK
E. SELKIRK
FAIRDALE
GONOR
BIRDS HILL
DUGALD
MILLBROOK
ST. VITAL
LORETTE
ROSEWOOD
SALTEL
SCANTERBURY
LIBAU
BROKENHEAD
CROMWELL
TYNDALL
SALDO
SINNOT
MOLSON
JULIUS
SHELLEY
WHITEMOUTH
HAZELRIDGE
QUEEN'S VALLEY
HAXEL
Ft. Alexander
Pine Falls
Silver Falls
Whitemud Falls
Du Bonnet Falls
McArthur Falls
Bird River
BIRD LAKE
Lac Du Bonnet
PINAWA
Point du Bois
Slave Falls
Seven Sister Falls
MILNER
N. CROWDUCK LAKE
WHITESHELL LAKE
ENGLISH RIVER
ONEMAN LAKE
SEPARATION L.
SWAN LAKE
SANDY BAY
GUN LAKE
CYGNET LAKE
MINAKI
KENORA
PLATE II.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1907.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height	Discharge	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					59·52	554	60·42	567	60·60	586	60·61	567
2					59·52	567	60·47	567	60·50	597	60·55	659
3					59·42	554	60·42	567	60·72	567	60·53	606
4					59·52	554	60·47	567	60·69	567	60·53	620
5					59·57	554	60·47	567	60·62	583	60·56	607
6					59·62	554	60·42	567	60·66	571	60·61	604
7					59·72	554	60·27	567	60·89	589	60·59	623
8					59·72	554	60·72	567	60·80	579	60·53	567
9					59·62	554	60·27	581	60·52	598	60·53	604
10					59·81	554	60·42	581	60·45	581	60·53	596
11					59·77	550	60·32	581	60·55	587	60·50	648
12					59·67	554	60·52	567	60·90	588	60·53	648
13					59·82	554	60·82	567	60·22	600	60·52	635
14					59·82	554	60·57	567		600	60·53	674
15					60·02	541	60·62	567	60·62	581	60·53	554
16					59·87	554	60·63	567	60·64	597	60·53	620
17					59·92	541	60·32	581	60·70	567	60·53	674
18					60·02	541	60·57	567	60·57	581	60·55	626
19					59·82	554	60·57	567	60·75	580	60·54	648
20					60·02	554	60·60	567	60·73	600	60·50	620
21			59·32	541	60·17	541	60·89	567	60·59	594	60·53	649
22			59·42	541	60·20	554	60·60	567	60·64	607	60·58	560
23			59·47	541	59·32	541	60·70	567	60·73	590	60·44	708
24			59·32	529	59·87	554	60·68	567	60·72	567	60·45	689
25			59·37	554	60·22	554	60·53	567	60·61	590		617
26			59·32	554	60·17	567	61·12	558	60·51	594	60·43	627
27			59·52	541	60·22	567	60·37	581	60·51	594	60·41	719
28			59·42	554	60·42	567	60·74	567	60·61	594	60·34	709
29			59·52	554	60·32	567	60·57	567	60·62	592	59·44	562
30			59·52	554	60·37	567	60·74	572	60·61	605	59·45	699
31			59·62	541			60·73	567			59·37	696

Note.—Gauge heights refer to forebay gauge.

Brokenhead River, Sinnot. Bridge, showing gauge.

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1908.

[Drainage Area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Dis. charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.	Gauge Height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.ft.
1	60·42	598	60·06	762	59·78	567	59·22	581	59·37	595	59·82	610
2	60·42	628	60·06	740	59·77	592	59·22	581	59·47	581	59·82	626
3	60·42	615	60·06	740	59·73	598	59·22	581	59·52	595	59·82	626
4	60·42	620	60·06	762	59·75	586	59·22	581	59·52	581	59·92	626
5	60·42	561	60·06	760	59·72	588	59·22	581	59·52	581	59·92	626
6	60·42	665	60·05	760	59·71	575	59·22	581	59·52	581	60·02	626
7	60·42	668	60·02	761	59·70	572	59·22	581	59·56	581	60·02	644
8	60·32	645	60·04	744	59·69	567	59·22	581	59·57	581	59·72	644
9	60·32	647	60·03	723	59·70	567	59·17	581	59·57	581	59·72	644
10	60·28	667	59·96	740	59·70	570	59·17	581	59·59	581	59·92	644
11	60·22	738	59·96	740	59·70	574	59·17	581	59·52	581	60·12	644
12	60·28	554	59·97	740	59·60	567	59·17	581	59·42	595	60·02	644
13	60·23	734	59·96	741	50·61	567	59·12	581	59·52	595	60·02	644
14	60·24	724	59·92	739	59·59	577	59·12	581	59·52	595	59·72	644
15	60·17	581	59·90	741	59·59	567	59·12	581	59·52	595	59·92	644
16	60·14	587	59·92	723	59·59	579	59·12	581	59·52	595	59·92	644
17	60·14	581	59·90	723	59·59	572	59·12	581	59·52	595	60·02	644
18	60·13	597	59·89	741	59·59	567	59·22	581	59·52	595	59·92	644
19	60·13	567	59·85	740	59·59	567	59·12	595	59·52	610	60·02	644
20	60·27	570	59·93	742	59·59	567	59·12	595	59·32	611	59·92	644
21	60·22	581	59·93	742	59·52	567	59·12	595	59·52	610	59·92	644
22	60·22	585	59·92	742	59·42	567	59·12	595	59·82	595	59·92	644
23	60·20	590	59·92	723	59·32	581	59·12	595	59·72	610	59·92	644
24	60·17	584	59·85	740	59·27	581	59·12	595	59·82	595	59·92	644
25	60·13	594	59·84	763	.....	617	59·12	595	59·72	610	60·02	644
26	60·12	567	59·83	767	59·27	581	59·22	595	59·72	610	60·12	644
27	60·14	592	59·83	768	59·27	581	59·28	595	59·72	610	60·02	644
28	60·12	589	59·83	768	59·32	581	59·32	595	59·62	626	60·02	644
29	60·10	594	59·77	782	59·27	581	59·41	595	59·72	626	59·72	662
30	60·10	673	.....	.....	59·22	581	59·49	581	59·82	610	59·72	662
31	60·07	590	.....	.....	59·22	581	.....	.....	59·82	626	.....	.....

	July.		August.		September.		October.		November.		December.	
1	59·92	644	59·44	664	59·07	690	58·90	581	58·72	613	58·32	604
2	60·02	644	59·67	644	59·22	667	59·24	581	58·60	641	58·34	619
3	60·02	644	59·71	644	59·20	650	58·75	624	58·47	634	58·22	628
4	60·07	655	59·67	657	59·24	668	58·77	598	58·50	636	58·30	640
5	59·94	654	59·42	653	59·07	632	58·92	586	58·67	633	57·92	682
6	59·77	644	59·32	647	59·20	623	58·91	595	58·42	634	57·82	604
7	59·87	644	59·42	648	59·32	611	58·67	595	58·54	647	57·57	691
8	59·97	644	59·43	661	59·14	619	58·90	601	58·52	607	57·57	700
9	59·82	644	59·37	644	59·34	618	58·82	635	58·44	616	51·57	697
10	59·77	644	59·41	649	59·12	614	58·47	643	58·47	642	57·57	695
11	59·79	644	59·32	653	59·07	632	58·72	629	58·52	641	57·57	695
12	59·74	644	59·25	644	59·04	597	58·92	634	58·32	640	57·57	692
13	59·73	644	59·20	653	.....	[1]600	58·80	641	58·32	647	57·57	610
14	59·64	644	59·32	652	59·07	619	58·80	636	58·47	644	57·57	690
15	59·64	644	59·32	680	59·24	613	58·72	648	58·32	613	57·37	689
16	59·72	644	59·32	644	59·13	623	59·62	654	58·42	631	57·57	694
17	59·62	644	59·24	648	59·12	621	58·32	674	58·42	640	57·57	694
18	59·54	644	59·37	649	58·84	620	58·62	599	58·42	626	57·57	702
19	59·75	644	59·12	645	59·14	653	58·72	606	58·42	626	57·57	697
20	59·87	644	59·27	650	59·05	615	58·87	634	58·47	626	57·57	678
21	59·62	644	59·23	658	.....	[1]600	58·77	615	58·42	610	57·57	693
22	59·62	644	59·07	653	59·14	581	58·75	627	58·44	582	57·57	674
23	59·67	644	59·05	644	58·95	595	58·62	631	58·32	614	57·57	668
24	59·72	644	59·04	647	58·77	596	58·57	645	58·17	616	57·57	657
25	59·73	661	59·12	660	58·75	607	58·42	627	58·22	619	57·57	655
26	59·85	644	59·22	681	58·74	620	59·12	630	58·22	620	57·57	660
27	59·64	644	59·24	663	58·93	595	58·70	632	58·42	620	57·57	643
28	59·66	644	59·04	665	58·77	595	58·60	629	58·44	622	57·57	662
29	59·65	644	59·02	666	58·90	608	58·60	633	58·41	591	57·57	656
30	59·57	644	59·32	649	58·72	600	58·52	638	58·32	620	57·57	660
31	59·67	645	59·42	675	.....	.....	58·62	642	.....	.....	57·57	683

Note.—Gauge heights refer to forebay gauge. Discharges marked thus [1] estimated.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1909.

[Drainage Area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Sec.-ft	Sec.-ft.
1	.....	[1]700	57·57	762	.....	889	57·07	775	56·67	1,226	57·62	750
2	.....	[1]700	57·57	701	.....	868	57·06	921	56·70	728	57·62	740
3	.....	[1]700	57·57	689	.....	865	57·12	907	56·72	975	57·72	751
4	.....	[1]700	57·57	689	.....	850	57·42	657	56·73	1,175	57·52	786
5	.....	[1]700	57·57	737	.....	900	57·12	982	56·80	1,058	57·52	763
6	.....	[1]700	57·57	754	57·32	842	57·02	1,129	56·67	1,094	57·82	535
7	57·57	769	57·57	701	57·32	711	57·02	1,001	56·84	804	57·69	735
8	57·57	759	57·57	819	57·32	881	56·99	1,146	57·27	745	57·70	731
9	57·57	799	57·57	793	57·32	848	57·02	1,131	56·30	697	57·64	774
10	57·57	754	57·57	848	57·32	724	57·32	927	56·93	965	57·60	752
11	57·57	699	57·57	848	57·32	703	57·32	712	56·90	1,170	57·67	756
12	57·57	801	57·57	875	57·12	815	56·92	1,071	56·91	1,130	57·73	743
13	57·57	807	57·57	915	57·12	836	56·82	1,223	57·04	1,040	57·72	534
14	57·57	798	57·57	812	57·12	677	56·82	1,216	57·13	1,087	57·64	734
15	57·57	793	57·57	933	57·12	898	56·90	1,204	57·22	1,070	57·74	745
16	57·57	789	57·57	898	57·12	974	56·84	1,165	57·58	664	57·63	750
17	57·57	729	57·57	911	57·12	947	56·97	1,145	57·32	784	57·62	755
18	57·57	738	57·57	903	56·92	908	57·32	691	57·37	1,029	57·70	759
19	57·57	735	57·57	867	56·92	887	56·87	950	57·42	966	57·82	692
20	57·57	693	57·57	888	56·92	857	56·82	1,128	57·50	1,049	58·02	529
21	57·57	714	57·57	697	56·92	660	56·83	1,145	57·52	1,037	57·96	721
22	57·57	700	57·57	876	56·92	799	56·72	1,229	57·57	1,026	58·21	694
23	57·57	698	57·57	868	56·92	807	56·77	1,213	57·82	670	58·03	731
24	57·57	695	57·57	961	56·92	819	56·74	1,197	57·82	561	57·92	731
25	57·57	710	.....	957	56·92	822	57·22	618	57·57	737	57·82	724
26	57·57	685	.....	937	56·92	823	56·72	981	57·62	735	57·87	731
27	57·57	696	.....	949	.....	808	56·72	1,266	57·57	747	58·02	529
28	57·57	734	.....	747	.....	648	56·70	1,150	57·62	750	57·92	731
29	57·57	747	.....	.....	56·82	746	56·70	1,203	57·62	755	58·09	721
30	57·57	781	.....	.....	56·82	696	56·62	1,217	57·82	565	57·84	718
31	57·57	756	.....	.....	57·04	781	.....	.....	57·62	743	.....	.....

	July.		August.		September.		October.		November.		December.	
1	58·17	530	58·32	526	58·62	556	58·22	1,019	58·57	755	58·52	1,178
2	57·82	732	58·32	537	58·62	595	58·30	1,006	58·60	1,084	58·52	1,192
3	57·94	729	58·12	714	58·32	703	58·42	652	58·60	1,210	58·53	1,194
4	58·24	517	58·22	733	58·52	639	58·42	703	58·60	1,174	58·59	1,044
5	58·02	739	58·11	733	58·62	537	58·42	991	58·55	1,159	58·77	743
6	57·94	736	58·15	582	58·27	558	58·30	1,022	58·62	1,136	58·74	1,100
7	58·07	731	58·12	745	58·62	518	58·28	1,027	58·72	659	58·72	1,250
8	58·22	734	58·32	530	58·22	587	58·52	876	58·58	862	58·52	1,265
9	58·36	850	58·22	709	58·34	710	58·05	1,056	58·92	1,056	58·62	1,285
10	58·92	868	58·22	714	58·02	717	58·22	652	58·69	1,109	58·52	1,290
11	58·29	531	58·32	542	58·32	664	57·80	812	58·60	1,160	58·72	1,140
12	58·22	521	58·22	683	58·42	549	57·79	1,069	58·50	1,158	..	786
13	58·02	730	58·47	599	58·32	606	58·02	1,079	58·52	1,009	58·72	1,076
14	.....	746	58·42	559	58·35	622	58·10	1,079	57·92	692	58·80	1,170
15	.....	753	58·42	529	58·14	728	58·10	1,063	58·52	1,132	58·90	1,222
16	57·94	750	58·22	703	59·15	723	58·21	1,099	58·59	1,130	58·82	1,213
17	58·02	754	58·32	714	58·32	722	58·42	669	58·60	1,182	58·89	1,205
18	58·24	529	58·27	697	58·50	713	58·42	764	58·72	1,161	58·80	1,052
19	58·22	718	58·14	634	58·60	536	58·42	1,094	58·70	1,155	..	854
20	58·02	730	58·44	526	58·52	688	58·42	1,120	58·57	1,055	58·92	1,093
21	58·02	729	58·82	559	58·32	715	58·22	1,127	58·67	739	58·92	1,193
22	58·12	539	58·52	519	58·12	731	58·34	1,132	58·49	1,024	58·92	1,168
23	58·21	551	58·62	572	58·22	832	58·52	1,135	58·52	1,158	58·99	1,207
24	58·12	735	58·32	573	58·24	1,002	59·02	853	58·52	1,145	58·95	1,197
25	58·40	518	58·54	560	58·30	1,030	58·64	869	58·52	1,215	59·12	845
26	58·13	712	58·52	555	58·64	627	58·22	1,109	58·32	1,259	59·13	770
27	58·12	719	58·74	558	58·62	763	58·32	1,142	58·52	1,203	58·97	1,059
28	58·24	709	58·43	575	58·12	1,044	58·72	1,106	58·72	730	58·97	1,217
29	58·24	551	58·43	527	58·10	1,029	58·72	1,100	58·64	1,032	59·02	1,222
30	58·32	551	58·62	556	58·24	1,027	58·42	1,144	58·59	1,132	58·94	1,214
31	58·27	563	58·52	554	.....	.....	58·72	046	.....	.....	59·02	1,207

Note.—Gauge heights refer to forebay gauge. Discharges marked thus [1] estimated.

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1910.

(Drainage area, 26,400 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	59·12	1,088	59·17	1,116	59·12	1,129	59·65	1,127	60·00	800	59·22	917
2	59·12	876	59·20	1,116	59·12	1,060	59·62	1,090	59·92	1,075	59·20	978
3	59·02	1,146	59·22	1,120	59·32	734	59·81	744	60·02	1,291	59·42	894
4	59·12	1,240	59·20	1,137	59·32	731	59·67	1,045	60·02	1,278	59·52	912
5	59·12	1,241	59·19	1,034	59·32	715	59·72	1,232	59·97	1,262	59·62	663
6	59·10	1,217	59·32	805	59·47	727	59·72	1,267	59·92	1,254	59·32	864
7	59·20	792	59·19	1,001	59·34	725	59·73	1,248	60·06	1,209	59·32	865
8	59·09	1,116	59·32	990	59·34	716	59·72	1,276	60·22	810	59·32	864
9	....	884	59·14	1,150	59·32	739	59·72	1,151	59·86	1,026	59·30	858
10	59·12	1,090	59·12	1,161	59·33	916	59·82	767	59·72	1,325	59·25	860
11	59·14	1,166	59·12	1,142	59·13	1,076	59·52	1,049	59·69	1,401	59·32	884
12	59·12	1,198	59·12	905	59·12	1,036	59·79	1,225	59·70	1,405	59·48	610
13	59·12	1,200	59·32	788	59·34	746	59·75	1,240	59·74	1,381	59·34	911
14	59·20	1,179	59·13	1,027	59·33	893	59·72	1,229	60·02	1,173	59·32	1,094
15	59·22	948	59·14	1,155	59·37	838	59·72	1,306	59·98	816	59·34	1,125
16	59·25	816	59·32	919	59·12	1,062	59·87	1,194	59·82	1,112	59·25	1,106
17	59·12	1,005	59·12	1,183	59·20	1,070	59·45	827	59·52	1,371	59·22	1,093
18	59·12	1,163	59·12	1,161	59·22	1,032	59·62	1,089	59·77	852	59·32	995
19	59·12	1,145	59·12	1,024	59·22	967	59·92	1,311	59·82	1,354	59·32	736
20	59·12	1,168	59·42	812	59·37	699	59·92	1,258	59·52	1,184	59·32	874
21	59·12	1,159	59·12	1,073	59·32	888	60·17	1,281	59·72	1,562	59·32	1,098
22	59·22	1,067	59·12	1,175	59·27	893	59·64	1,285	59·84	803	59·32	1,006
23	59·30	800	59·12	1,171	59·52	643	59·44	1,195	59·62	1,105	59·22	1,083
24	59·13	1,018	59·12	1,160	59·52	778	60·04	741	59·53	840	59·32	1,057
25	59·12	1,135	59·12	1,158	59·32	1,001	60·06	1,010	59·53	1,128	59·22	930
26	59·12	1,136	59·32	944	59·32	1,068	60·04	1,253	59·54	1,284	59·22	738
27	59·12	1,103	59·32	823	59·52	695	59·84	1,287	59·75	1,266	59·22	859
28	59·14	1,123	59·12	1,029	59·52	840	60·03	1,287	59·73	1,147	59·12	997
29	59·13	1,022	.....	.....	59·42	1,119	60·01	1,293	59·62	804	59·22	985
30	59·32	787	.....	.....	59·52	1,086	60·01	1,209	59·52	908	59·22	1,034
31	59·22	1,035	.....	.....	59·62	1,062	.....	.....	59·42	1,020	.....	.....

Day.	July.		August.		September.		October.		November.		December.	
1	59·22	701	58·15	805	57·72	604	57·22	1,035	56·79	1,240	.....	1,300[1]
2	58·88	862	58·30	987	57·72	593	57·42	660	56·62	1,087	56·62	1,324
3	58·92	745	58·12	1,010	.....	595	57·32	840	57·02	925	56·62	1,285
4	58·72	852	57·94	1,010	57·82	539	57·45	1,125	57·12	713	56·72	907
5	58·99	1,035	58·05	1,010	57·81	596	57·52	1,168	56·62	1,221	56·62	1,255
6	58·74	1,117	58·05	970	57·80	613	57·17	1,092	56·92	747	56·62	1,387
7	58·79	1,109	58·37	652	57·55	846	57·22	1,133	56·62	1,164	56·62	1,312
8	58·72	1,091	58·03	834	57·32	892	57·12	1,000	56·80	1,271	56·58	1,374
9	58·67	925	57·84	1,022	57·47	846	57·32	683	56·70	1,294	56·55	1,370
10	58·82	718	58·00	1,020	57·82	769	57·20	924	56·64	1,277	56·62	1,376
11	58·62	836	58·11	808	57·42	535	56·92	1,196	56·69	1,277	56·72	969
12	58·62	1,048	58·21	654	57·52	884	56·80	1,208	56·65	1,157	56·57	1,202
13	58·61	1,044	57·94	588	57·44	731	57·02	1,211	56·82	798	56·62	1,347
14	58·72	1,060	58·12	529	57·52	609	57·02	1,203	56·54	1,176	56·54	1,328
15	58·64	1,013	58·22	547	57·52	760	57·17	1,052	56·64	1,324	56·52	1,330
16	58·52	864	58·12	529	57·47	768	57·17	678	56·72	1,293	56·52	1,356
17	58·63	672	58·10	593	57·12	780	57·00	986	56·70	1,330	56·53	1,230
18	58·64	787	58·05	591	57·52	559	56·95	1,154	56·72	1,316	56·72	820
19	.....	688	58·07	705	57·22	939	56·32	1,188	56·72	1,242	56·52	1,245
20	.....	604	58·05	815	57·19	1,062	56·92	1,246	56·80	802	56·52	1,332
21	58·42	740	58·11	549	57·07	1,104	.....	1,161	56·62	1,184	56·50	1,329
22	58·32	748	57·74	855	57·29	1,121	.....	1,186	56·72	1,279	56·52	1,330
23	58·52	734	57·82	833	57·22	1,126	.....	785	56·72	1,330	56·43	1,338
24	58·52	534	57·54	733	57·22	1,163	.....	1,149	56·71	1,294	56·42	1,359
25	58·37	720	57·62	757	57·22	691	57·10	1,205	56·72	1,320	56·53	989
26	58·22	731	57·82	737	57·12	652	56·92	1,254	56·62	1,348	56·53	919
27	58·22	729	57·52	743	57·32	1,042	56·72	1,202	56·81	806	56·50	1,188
28	58·22	732	57·82	548	57·32	1,131	56·71	1,259	56·70	1,211	56·41	1,352
29	58·18	727	57·72	848	57·35	1,100	57·20	1,172	56·70	1,250	56·35	1,286
30	58·18	733	57·37	686	57·32	1,121	57·02	713	56·64	1,358	56·33	1,375
31	58·32	533	57·80	584	.....	.....	56·85	989	.....	.....	56·39	1,361

Note.—Gauge heights refer to forebay gauge. Discharges marked thus [1] estimated.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1911.

(Drainage area, 26,400 square miles.)

Day.	January.		February.		March.		April.		May.		June	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet .	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	56·54	948	56·19	1,343	56·15	1,255	55·54	838	55·51	847	55·59	1,052
2	56·34	1,252	56·19	1,342	56·15	1,259	55·54	803	55·42	1,261	55·39	1,407
3	56·34	1,353	56·19	1,377	56·15	1,270	55·54	828	55·51	1,259	55·56	1,283
4	56·34	1,349	56·19	1,196	56·15	1,284	55·34	1,184	55·53	1,252	.....	795
5	56·34	1,353	56·22	862	56·17	822	55·34	1,338	55·62	1,254	55·75	867
6	56·34	1,346	56·19	1,247	56·16	806	55·34	1,328	55·63	1,200	55·86	1,251
7	56·34	1,363	56·19	1,399	56·15	1.049	55·34	1,434	55·80	735	55·74	1,249
8	56·59	872	56·19	1,378	56·16	1,198	55·34	1,294	55·61	891	55·72	1,272
9	56·24	1,172	56·16	1,366	56·16	1,237	55·36	768	55·38	1,216	55·76	1,252
10	56·24	1,355	56·16	1,366	56·17	858	55·34	1,055	55·44	1,217	55·80	1,138
11	56·24	1,346	56·16	1,371	56·04	771	55·32	1,366	56·04	1,221	.....	697
12	56·24	1,358	56·19	863	56·05	730	55·32	1,295	55·50	1,256	.....	652
13	56·24	1,208	56·14	1,247	56·04	734	55·34	1,301	55·69	1,270	.....	1,009
14	56·24	1,357	56·19	1,360	56·04	1,265	55·34	1,284	.....	793	55·85	1,227
15	56·44	956	56·19	1,334	56·04	1,267	55·34	1,302	.....	878	55·99	1,250
16	56·24	1,264	56·20	1,259	56·04	1,272	55·54	803	.....	1,247	55·88	1,251
17	56·24	1,340	56·18	1,317	56·04	1,267	55·34	926	.....	1,171	55·92	1,260
18	56·19	1,345	56·19	1,070	56·04	1,264	55·35	1,253	.....	1,119	56·14	724
19	56·19	1,354	56·20	841	56·04	765	55·35	1,271	.....	1,171	56·18	819
20	56·19	1,333	56·17	1,165	56·04	899	55·54	1,282	.....	1,224	56·01	1,206
21	56·19	1,340	56·18	1,261	55·54	1,264	55·54	1,274	.....	773	56·07	897
22	56·31	948	56·17	1,246	55·54	1,286	55·55	1,274	.....	845	56·04	640
23	56·19	1,141	56·14	1,294	55·54	1,288	55·65	796	.....	1,218	55·77	1,029
24	56·19	1,311	56·15	1,272	55·52	1,157	55·56	935	.....	800	56·01	1,254
25	56·19	1,294	56·15	1,281	55·52	1,269	55·60	1,244	.....	1,024	56·15	750
26	56·19	1,314	56·19	947	55·59	795	55·61	1,222	.	803	56·10	921
27	56·19	1,110	56·14	1,317	55·52	1,114	55·59	1,209	55·85	1,066	55·51	1,267
28	56·19	1,294	56·14	1,277	55·52	1,274	55·62	1,248	56·15	738	55·97	946
29	56·20	926	.....	.....	55·52	1,267	55·60	1,272	55·56	951	56·16	627
30	56·20	1,037	.....	.....	55·54	811	55·46	795	55·64	1,257	55·88	781
31	56·19	1,326	.....	.....	55·54	801	..	. ..	55·65	1,248	.....	...

	July.		August.		September.		October		November.		December	
1	56·08	659	55·43	666	55·21	1,062	55·43	776	54·96	1,481	55·42	1,160
2	56·15	599	55·61	661	55·17	906	55·29	961	55·22	1,489	55·33	1,322
3	56·01	701	55·61	663	55·53	675	55·27	1,344	55·62	1,455	. . .	804
4	55·96	1,223	55·64	660	55·44	728	54·97	1,295	55·41	1,489	55·39	1,173
5	55·96	676	55·64	655	54·85	1,112	54·52	1,315	55·59	822	55·40	1,339
6	55·99	669	55·74	630	55·03	911	55·37	1,326	54·99	1,134	55·38	1,390
7	55·88	920	55·56	668	55·15	1,061	55·34	1,351	55·21	1,477	55·38	1,400
8	56·02	867	55·61	652	55·25	1,078	55·89	748	55·00	1,495	55·43	1,273
9	56·31	585	55·51	655	55·36	1,051	55·54	881	55·34	1,446	55·36	1,385
10	56·41	883	55·56	690	55·42	676	55·49	1,309	55·49	1,426	55·57	788
11	55·95	1,239	55·56	661	54·94	897	55·44	1,343	54·90	1,527	55·66	1,016
12	55·90	848	55·71	669	55·19	1,032	55·39	1,166	55·17	982	55·42	1,291
13	55·90	1,194	55·57	623	55·14	1,033	55·39	1,281		1,200	55·42	1,153
14	55·81	1,131	55·61	673	55·29	1,074	55·39	1,298	55·20	1,459	55·44	1,376
15	55·55	925	55·52	675	55·36	1,071	55·56	778	55·26	1,461	55·54	1,411
16	55·81	610	55·55	686	55·34	870	55·37	899	55·24	1,485	55·42	1,465
17	55·72	686	55·52	731	55·37	692	55·31	1,360	55·38	1,016	55·50	907
18	55·63	1,005	55·61	785	55·32	926	55·51	1,358	55·28	1,296	55·59	1,094
19	55·68	998	55·45	1,136	55·26	1,078	55·24	1,312	55·47	920	55·49	1,406
20	55·69	1,035	55·55	639	55·27	1,310	55·22	1,382	55·26	1,335	55·44	1,405
21	55·53	848	55·61	1,057	55·52	1,290	55·37	1,345	55·26	1,363	55·44	1,379
22	55·63	1,314	56·19	905	55·07	1,340	55·59	779	55·25	1,385	55·49	1,370
23	55·50	634	55·31	1,111	54·44	1,401	55·11	1,112	55·26	1,327	55·40	1,396
24	55·41	672	55·43	1,100	55·10	775	55·19	1,401	55·14	1,336	55·09	875
25	55·51	640	55·39	1,086	55·16	940	55·24	1,461	55·25	1,256	55·04	827
26	55·75	630	55·42	940	55·45	1,329	55·29	1,426	55·52	883	55·49	1,179
27	55·82	634	55·18	663	54·80	1,377	55·29	1,429	55·39	1,081	55·49	1,424
28	55·66	634	55·06	1,029	55·16	989	55·09	1,351	55·28	1,398	55·42	1,390
29	55·64	670	55·29	1,060	55·15	1,373	55·31	868	55·41	1,443	55·49	1,414
30	55·50	625	55·59	1,179	55·36	1,365	55·27	1,080	55·20	1,419	55·41	1,400
31	55·49	663	55·33	839			55·01	1,447			55·74	608

NOTE.—Gauge heights refer to footbridge gauge. Discharges marked thus (*) estimated.

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1912.

[Drainage area 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	55·63	956	55·66	1,372	55·73	1,547	55·90	1,300	56·38	1,425	57·33	1,276
2	55·58	1,302	55·69	1,325	55·83	1,532	55·85	1,469	55·33	1,421	57·33	758
3	55·58	1,436	55·70	1,473	55·83	1,047	55·84	1,501	56·35	1,381	57·35	688
4	55·53	1,408	55·85	946	55·73	1,354	55·85	1,494	56·59	766	57·35	1,072
5	55·63	1,243	55·73	1,284	55·73	1,496	55·85	1,492	56·39	1,404	57·35	1,252
6	55·63	1,073	55·72	1,366	55·83	1,449	55·73	1,510	56·52	1,072	57·15	1,267
7	55·68	985	55·77	1,432	55·73	1,527	56·00	1,311	56·50	1,320	57·40	1,138
8	55·48	1,347	55·76	1,454	55·83	1,500	55·83	1,325	56·48	1,369	57·45	691
9	55·53	1,565	55·68	1,458	55·83	1,539	55·89	1,496	56·73	1,313	57·51	672
10	55·53	1,526	55·71	1,427	55·93	1,011	55·88	1,399	56·68	1,323	57·63	721
11	55·53	1,522	55·85	929	55·93	1,201	55·81	1,451	56·70	1,358	57·22	911
12	55·53	1,497	55·83	1,121	55·83	1,492	55·83	1,460	56·83	777	57·45	873
13	55·58	1,470	55·75	1,390	55·73	1,484	55·87	1,512	56·76	1,035	57·43	1,217
14	55·63	1,011	55·76	1,342	55·73	1,491	56·00	852	56·89	1,316	57·42	1,294
15	55·63	1,141	55·81	1,433	55·73	1,507	55·95	1,220	56·73	1,355	57·24	1,313
16	55·55	1,473	55·75	1,496	55·75	1,440	56·01	1,416	56·94	1,278	57·24	1,313
17	55·60	1,416	55·63	1,548	55·87	974	56·01	1,446	56·94	1,366	57·04	1,086
18	55·58	1,465	55·93	1,028	55·75	1,340	56·04	1,365	56·73	1,397	57·43	1,280
19	55·62	1,422	55·83	1,330	55·75	1,535	56·07	1,388	57·03	790	57·33	1,272
20	55·63	1,326	55·73	1,583	55·75	1,539	56·05	1,423	56·96	1,090	57·26	1,283
21	55·77	928	55·83	1,621	55·74	1,492	56·15	821	56·93	1,358	57·33	1,256
22	55·75	1,197	55·83	1,445	55·80	1,443	56·15	1,059	56·94	1,378	57·43	1,205
23	55·67	1,387	55·73	1,738	55·93	1,238	56·07	1,408	56·98	1,365	57·53	685
24	75·61	1,393	55·73	1,532	55·94	1,001	56·12	1,386	57·05	1,337	57·53	975
25	55·58	1,326	55·93	1,026	55·80	1,356	56·07	1,385	57·14	1,340	57·32	1,234
26	55·59	1,413	55·83	1,384	55·83	1,516	56·15	1,447	57·18	776	57·39	1,256
27	55·60	1,394	55·73	1,555	55·80	1,164	56·23	1,459	57·15	753	57·44	1,206
28	55·79	976	55·63	1,601	55·83	1,486	56·41	816	56·76	1,315	57·45	1,198
29	55·75	1,112	55·73	1,541	55·78	1,495	56·36	1,124	56·23	1,005	57·43	1,157
30	55·65	1,362	.....	.....	55·77	1,202	56·34	1,417	56·33	1,300	57·53	634
31	55·69	1,306	.....	.....	56·05	819	.....	.....	56·36	1,304	.....	.....

	July.		August		September.		October.		November.		December.	
1	57·68	555	57·82	1,222	58·43	596	59·22	635	59·23	1,245	59·31	714
2	57·73	896	57·80	1,228	58·23	1,009	59·23	714	59·35	1,242	59·24	1,001
3	57·48	1,149	57·79	1,247	58·26	1,234	59·21	631	59·54	667	59·22	1,297
4	57·42	1,083	57·99	686	58·24	1,153	59·25	659	59·35	944	59·24	1,278
5	57·53	1,091	57·99	1,014	58·25	934	59·23	1,157	59·41	1,239	59·18	1,285
6	57·63	1,160	58·00	1,241	58·48	637	59·03	621	59·51	1,244	59·23	1,311
7	57·63	671	58·06	1,229	58·43	638	59·43	967	59·45	1,230	59·23	1,316
8	57·58	745	58·02	731	58·15	595	59·32	1,230	59·23	1,216	59·25	908
9	57·73	635	58·02	1,228	58·23	636	59·01	1,229	59·41	1,201	59·25	1,055
10	57·40	1,141	58·03	1,161	58·33	713	59·13	1,234	59·43	652	59·22	1,322
11	57·72	1,192	58·13	658	58·53	825	59·33	1,186	59·21	968	59·23	1,308
12	57·61	1,186	58·22	1,010	58·48	821	59·33	1,213	59·33	1,237	59·22	1,316
13	57·55	1,207	58·15	1,233	58·65	830	59·39	653	59·33	1,230	59·21	1,291
14	57·93	660	57·95	1,242	58·65	857	59·33	994	59·38	1,242	59·15	1,256
15	57·73	862	58·13	1,234	58·43	610	59·36	1,211	59·53	1,218	59·23	889
16	58·10	1,191	58·13	1,235	58·53	881	59·54	1,197	59·33	1,237	59·22	1,108
17	57·63	1,049	58·15	1,243	58·53	836	59·41	1,194	59·43	682	59·13	1,269
18	57·64	1,202	58·15	676	58·69	640	59·53	1,206	59·57	907	59·13	1,302
19	57·93	1,149	58·11	1,038	58·73	635	59·33	1,208	59·34	1,243	59·13	1,306
20	57·73	1,175	58·12	1,169	58·64	644	59·52	661	59·33	943	59·13	1,311
21	57·64	670	58·22	1,247	58·75	631	59·31	848	59·23	1,158	59·13	1,321
22	57·80	905	58·03	1,252	58·63	599	59·33	676	59·33	1,188	59·23	912
23	57·74	1,152	58·13	1,245	58·63	641	59·61	1,207	59·15	1,298	59·23	1,150
24	57·81	1,191	58·12	1,245	58·33	655	59·61	1,198	59·35	722	59·23	1,223
25	57·63	1,177	58·15	870	58·29	630	59·35	1,175	59·35	965	59·23	873
26	57·92	1,092	58·04	1,024	58·63	643	59·23	1,194	59·18	1,300	59·23	1,128
27	57·84	1,157	58·23	776	59·02	585	59·42	642	59·10	1,300	59·28	1,257
28	57·92	632	58·11	1,054	58·99	638	59·25	891	59·70	1,250	59·14	1,279
29	57·88	930	58·23	1,245	59·31	577	59·93	1,228	59·20	1,420	59·13	858
30	57·74	1,099	58·33	1,032	59·09	630	59·31	1,286	59·28	1,255	59·13	1,117
31	.....	1,000[1]	58·27	861	.....	.....	59·33	1,230	.....	.....	59·13	1,274

Note.—Gauge heights refer to forebay gauge. Discharges marked thus (1) estimated.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1913.

[Drainage area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	59·26	1,233	58·98	1,388	59·04	931	59·11	1,251	59·64	1,275	59·61	815
2	59·16	1,264	59·23	1,347	59·05	928	59·09	1,096	59·65	1,262	59·73	929
3	59·11	1,309	59·09	1,275	59·08	1,158	59·13	684	59·68	1,266	59·53	1,354
4	59·16	1,389	58·96	1,382	58·98	1,360	59·18	689	59·91	638	59·79	1,301
5	59·19	914	58·97	1,303	58·02	1,346	59·19	694	59·78	950	59·68	1,361
6	59·16	1,215	58·98	1,394	59·05	1,319	59·20	657	59·73	1,220	59·29	1,332
7	59·11	1,517	58·98	1,358	59·02	1,276	59·18	769	59·77	1,258	59·60	1,369
8	59·04	1,506	58·99	1,364	59·08	1,187	59·23	1,060	59·57	1,234	59·74	817
9	59·13	1,592	58·99	1,021	59·13	942	59·18	1,218	59·70	1,250	59·85	963
10	59·13	1,484	58·91	1,162	59·13	1,038	59·18	845	59·79	1,250	59·89	1,349
11	59·12	1,505	58·96	1,309	59·02	1,308	59·24	680	59·98	787	59·86	1,363
12	59·16	1,066	58·96	1,391	59·03	1,309	59·29	664	59·76	996	59·75	884
13	59·15	1,236	58·98	1,366	59·05	1,256	59·29	628	59·58	1,299	59·68	789
14	59·11	1,486	58·93	1,368	58·96	1,297	59·35	645	59·74	1,317	59·74	778
15	59·14	1,361	58·93	1,372	59·00	1,303	59·33	640	59·70	1,328	59·70	747
16	58·99	1,465	59·00	961	59·08	935	59·38	936	59·77	1,339	59·65	780
17	59·08	1,517	58·99	1,158	59·09	1,134	59·47	1,086	59·67	1,347	59·49	1,153
18	59·05	1,537	58·97	1,345	59·03	1,312	59·43	1,146	59·68	810	59·59	1,352
19	59·10	1,072	58·98	1,347	59·05	1,306	59·45	1,155	59·73	738	59·53	1,352
20	59·10	1,373	58·98	1,340	59·10	1,293	59·54	652	59·71	792	59·48	1,331
21	59·00	1,559	58·97	1,343	59·10	1,300	59·61	874	59·53	1,150	59·45	1,331
22	59·05	1,607	58·94	1,364	59·13	1,354	59·59	1,117	59·71	1,338	59·54	785
23	59·06	1,583	58·99	948	59·10	885	59·56	1,168	59·78	1,356	59·69	1,104
24	58·99	1,483	59·03	1,158	59·10	1,051	59·64	1,172	59·52	823	59·61	1,227
25	59·05	1,430	58·99	1,358	59·09	1,382	59·66	1,172	60·27	763	59·55	1,316
26	59·08	1,015	58·98	1,380	59·09	1,265	59·63	1,207	59·83	772	59·33	1,342
27	59·07	1,148	58·99	1,211	59·10	1,312	59·69	676	59·83	789	59·18	1,400
28	58·98	1,378	59·02	935	59·09	1,310	59·69	812	59·65	1,090	59·44	1,348
29	58·99	1,279	.....	.....	59·14	1,300	59·68	1,205	59·65	1,323	59·45	782
30	59·08	1,298	.....	.....	59·14	740	59·68	1,193	59·59	1,373	59·67	737
31	59·98	1,373	.....	.....	59·14	911	.....	.....	59·72	1,323	.....	.....

	July.		August.		September.		October.		November.		December.	
1	59·72	724	59·69	855	59·41	675	58·59	1,307	58·87	1,347	58·75	1,237
2	59·52	936	59·67	884	59·20	690	58·62	1,312	58·64	717	58·73	1,382
3	59·57	1,376	59·55	671	59·14	700	58·68	1,302	58·73	1,132	58·78	1,407
4	59·27	1,354	59·57	867	59·35	706	58·52	1,337	58·85	1,317	58·80	1,392
5	59·17	820	59·41	714	59·35	704	58·27	737	58·95	1,312	58·74	1,377
6	59·39	704	59·52	703	59·17	696	58·57	1,067	58·74	1,332	58·75	1,417
7	59·44	742	59·74	701	59·08	662	58·91	1,307	58·53	1,372	58·51	827
8	59·40	1,214	59·66	690	59·09	693	58·52	1,352	58·58	1,377	58·80	1,277
9	59·05	1,296	59·51	720	59·43	698	58·58	1,337	58·71	737	58·76	1,392
10	59·41	1,271	59·48	685	59·24	704	58·85	1,242	58·66	1,137	58·72	1,412
11	59·60	1,241	59·68	724	59·14	718	58·83	1,312	58·92	1,357	58·72	1,407
12	59·50	1,238	59·52	705	59·00	728	58·74	692	58·71	1,337	58·71	1,407
13	59·54	732	59·58	697	58·99	729	58·88	1,147	58·80	1,372	58·71	1,272
14	59·51	1,014	59·49	702	59·20	675	58·81	1,342	58·72	1,352	58·82	712
15	59·66	1,216	59·40	712	59·05	699	58·71	1,352	58·80	1,372	58·77	837
16	59·62	1,224	59·44	717	58·93	728	58·71	1,352	59·02	697	58·84	807
17	59·60	1,224	59·39	700	58·98	734	58·92	1,292	58·71	1,392	58·78	1,132
18	59·62	1,246	59·38	700	59·11	721	58·73	1,357	58·82	1,352	58·72	1,357
19	59·55	931	59·54	708	59·18	814	58·64	722	58·82	1,387	58·73	947
20	59·65	637	59·47	698	58·37	1,211	58·54	1,162	58·62	1,372	58·75	1,017
21	59·80	667	59·46	691	58·31	787	58·71	1,397	58·82	1,057	58·78	932
22	59·75	669	59·39	709	58·67	1,160	58·92	1,347	58·88	1,332	58·70	992
23	59·58	665	59·44	701	58·70	1,300	58·74	1,377	58·97	722	58·70	1,332
24	59·66	869	59·46	681	58·66	1,340	58·72	1,347	58·75	1,227	58·70	1,482
25	59·83	861	59·51	693	58·67	1,326	58·72	1,377	58·70	1,302	58·71	1,072
26	59·70	901	59·31	695	58·75	1,321	58·73	747	58·73	1,392	58·70	1,352
27	59·60	651	59·43	708	58·79	1,314	58·76	1,152	58·79	1,397	58·68	1,457
28	59·75	860	59·27	696	58·91	710	58·30	1,417	58·71	1,377	58·73	1,002
29	59·68	937	59·27	702	58·53	1,121	58·67	1,377	58·79	1,402	58·72	1,202
30	59·71	920	59·38	702	58·70	1,242	58·78	1,380	58·80	742	58·71	1,442
1	59·67	831	59·27	667			58·82	1,357			58·67	1,497

Note.—Gauge heights refer to forebay gauge.

Daily Gauge Height and Discharge of East Branch Winnipeg River at Kenora Power House for 1914.

(Drainage area, 26,400 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	58·64	1,432	58·78	947	58·76	942	58·61	712	58·88	673	59·67	869
2	58·66	1,422	58·74	887	58·76	1,207	58·61	742	58·92	663	59·72	919
3	58·64	1,397	58·74	962	58·78	1,147	58·64	777	58·92	653	59·68	924
4	58·60	937	58·77	987	58·75	1,117	58·62	807	58·93	648	59·56	887
5	58·72	927	58·74	1,032	58·60	1,132	58·62	737	58·96	673	59·74	944
6	58·70	882	58·75	1,007	58·62	1,102	58·63	792	59·02	843	59·71	909
7	58·73	842	58·75	1,062	58·63	1,142	58·53	857	59·03	848	59·73	639
8	58·68	1,227	58·80	957	58·66	812	58·57	832	59·12	808	59·71	879
9	58·68	1,397	58·76	1,047	58·62	1,232	58·61	767	59·15	853	59·87	896
10	58·70	1,382	58·74	1,077	58·58	1,257	58·61	702	59·05	648	59·98	904
11	58·72	1,082	58·76	1,102	58·63	1,262	58·62	772	59·10	920	59·88	931
12	58·70	1,332	58·74	1,087	58·59	1,232	58·51	737	59·17	965	59·94	896
13	58·68	1,517	58·76	1,072	58·63	1,182	58·56	752	59·16	960	59·94	981
14	58·68	1,387	58·76	1,047	58·64	1,137	58·55	727	59·14	945	60·02	684
15	58·68	1,317	58·73	962	58·70	702	58·52	892	59·27	695	59·91	886
16	58·68	1,047	58·75	997	58·62	832	58·53	922	59·24	920	60·02	879
17	58·71	912	58·74	1,002	58·55	1,182	58·50	937	59·40	635	60·09	882
18	58·73	817	58·76	957	58·56	1,132	58·50	972	59·37	660	59·74	894
19	58·72	797	58·76	1,012	58·58	892	58·64	687	59·30	875	59·94	901
20	58·67	897	58·76	1,037	58·53	1,127	58·64	937	59·34	860	60·16	892
21	58·73	947	58·77	1,017	58·53	1,137	58·67	857	59·33	895	59·88	676
22	58·68	972	58·75	1,002	58·61	802	58·71	687	59·36	900	60·03	944
23	58·67	947	58·75	1,052	58·55	1,087	58·71	692	59·40	925	60·10	1,067
24	58·60	1,007	58·80	997	58·54	1,077	58·74	687	59·54	635	59·90	1,016
25	58·73	927	58·74	937	58·47	982	58·78	687	59·58	650	59·73	1,009
26	58·70	967	58·75	892	58·57	882	58·82	642	59·52	905	59·78	1,027
27	58·72	967	58·78	882	58·56	867	58·78	687	59·54	900	59·63	1,002
28	58·69	967	58·78	1,182	58·60	817	58·71	712	59·57	870	59·84	687
29	58·76	997	.....	.....	58·60	712	58·80	692	59·54	880	59·87	736
30	58·76	1,027	.....	.....	58·59	722	58·84	682	59·65	910	50·87	741
31	58·80	1,027	.....	.....	58·60	712	.....	.....	59·66	665	.....	.....

	July.		August.		September.		October.		November.		December.	
1	59·75	721	59·71	769	58·98	992	59·18	874	59·26	656	59·38	965
2	59·95	732	59·58	701	58·94	712	59·25	875	59·50	876	59·44	1,006
3	59·90	741	59·78	767	58·68	712	59·14	913	59·44	936	59·42	1,010
4	59·81	782	59·58	966	58·98	702	59·14	633	59·30	945	59·42	979
5	59·84	819	59·54	985	58·88	992	59·02	1,092	59·28	939	59·44	981
6	59·98	784	59·31	995	58·80	667	59·08	1,297	59·41	951	59·48	714
7	59·59	771	59·46	758	58·85	942	58·98	1,297	59·12	960	59·42	900
8	59·83	959	59·50	759	58·88	1,182	59·02	1,317	59·48	711	59·34	1,013
9	59·84	744	59·46	693	59·03	982	59·08	1,307	59·45	751	59·37	1,019
10	59·68	979	59·10	747	59·01	1,092	58·92	1,362	59·37	989	59·41	1,129
11	59·72	819	59·30	760	59·00	722	59·24	700	59·27	962	59·42	1,033
12	59·87	684	59·34	761	59·10	892	59·02	647	59·32	975	59·40	1,016
13	59·73	731	59·23	765	59·26	656	59·19	1,004	59·32	960	59·48	787
14	59·85	739	59·13	758	58·94	1,182	59·36	1,336	59·25	967	59·42	1,105
15	59·98	749	59·13	758	59·11	992	59·28	1,265	59·50	756	59·45	1,124
16	60·07	761	59·12	707	59·13	1,153	59·34	1,271	59·32	943	59·46	1,240
17	59·61	771	59·12	767	59·03	942	59·16	1,283	59·31	1,020	59·47	1,094
18	59·88	1,026	59·11	787	59·18	1,164	59·49	687	59·28	1,049	59·44	1,069
19	59·87	694	59·06	992	59·25	865	59·34	966	59·31	1,040	59·43	1,075
20	59·87	919	59·07	1,247	59·20	640	59·32	1,271	59·36	1,040	59·49	826
21	59·91	761	59·02	1,257	59·18	904	59·26	1,035	59·30	989	59·43	1,223
22	59·77	766	59·07	1,012	58·92	1,117	59·30	1,261	59·41	751	59·44	1,131
23	59·86	959	58·72	722	59·14	878	59·08	727	59·47	952	59·43	1,241
24	59·82	757	58·92	1,262	58·90	1,100	59·36	656	59·42	970	59·43	1,154
25	59·85	744	58·82	1,342	59·12	892	59·32	621	59·41	1,108	59·48	889
26	59·87	694	58·88	1,092	59·14	813	59·03	682	59·36	954	59·46	929
27	59·72	744	58·98	1,242	59·14	658	59·48	717	59·34	1,001	59·52	823
28	59·85	759	59·07	1,222	59·10	887	59·23	695	59·38	962	59·41	1,128
29	58·88	771	59·14	727	59·02	897	59·32	1,026	59·47	680	59·43	1,205
30	59·75	786	59·02	677	59·13	907	59·37	1,041	59·41	915	59·44	1,231
31	59·63	768	59·07	727	.....	.....	59·42	877	.....	.....	59·44	1,100

Note—Gauge heights refer to forebay gauge.

SESSIONAL PAPER No. 25f

Monthly Discharge of East Branch Winnipeg River at Kenora Power House for the year 1907–14.

(Drainage area, 26,400 square miles.)

Month.	Discharge in Second-Feet.		
	Maximum.	Minimum.	Mean.
1907			
September	567	541	554
October	581	558	569
November	607	567	588
December	719	554	633
The period	719	541	586
1908.			
January	738	554	616
February	782	723	750
March	617	567	577
April	595	581	586
May	626	581	598
June	662	610	641
July	661	644	645
August	681	644	655
September	690	581	619
October	674	581	624
November	647	582	625
December	702	604	668
The year	782	567	634
1909.			
January	807	685	735
February	961	689	834
March	974	648	816
April	1,266	618	1,040
May	1,226	561	896
June	786	529	712
July	868	517	671
August	745	519	607
September	1,030	518	715
October	1,144	646	968
November	1,259	659	1,060
December	1,290	743	1,120
The year	1,290	517	848
1910.			
January	1,241	787	1,070
February	1,183	805	1,050
March	1,129	643	893
April	1,311	741	1,150
May	1,562	800	1,140
June	1,125	610	928
July	1,117	533	820
August	1,022	529	760
September	1,163	535	826
October	1,259	660	1,060
November	1,358	713	1,170
December	1,387	820	1,250
The year	1,562	529	1,010
1911.			
January	1,363	872	1,230
February	1,399	841	1,240
March	1,288	730	1,080
April	1,431	768	1,140
May	1,270	735	1,070
June	1,283	627	1,010
July	1,311	585	820
August	1,179	623	800
September	1,401	675	1,040
October	1,461	748	1,200
November	1,527	822	1,310
December	1,514	788	1,240
The year	1,527	585	1,100
1912.			
January	1,565	928	1,[illegible]
February	1,708	929	1,[illegible]
March	1,547	819	1,260
April	1,512	816	1,340
May	1,425	753	1,220
June	1,313	634	1,070
July	1,207	555	1,000
August	1,252	658	1,080
September	1,284	577	732
October	1,286	621	1,040
November	1,430	652	1,120
December	1,322	714	1,170
The year	1,708	555	1,150

Whitemouth River at Whitemouth. Gauge at bridge.

Monthly Discharge of East Branch Winnipeg River at Kenora Power House for the year 1907–14—*Continued.*

Month.	Discharge in Second-Feet.		
	Maximum.	Minimum.	Mean.
1913.			
January	1,607	914	1,360
February	1,394	935	1,270
March	1,382	740	1,190
April	1,251	628	926
May	1,373	638	1,110
June	1,400	737	1,120
July	1,376	637	967
August	884	667	716
September	1,349	662	877
October	1,417	692	1,240
November	1,402	697	1,230
December	1,497	712	1,220
The year	1,607	628	1,100
1914.			
January	1,432	797	1,090
February	1,182	882	1,010
March	1,262	702	1,020
April	972	642	770
May	965	635	802
June	1,067	639	883
July	1,026	684	749
August	1,342	677	894
September	1,182	640	908
October	1,362	621	991
November	1,108	656	924
December	1,241	714	1,040
The year	1,432	621	923

Western Outlet Norman Traffic Bridge.

History.—Station was established on June 5, 1912, by S. S. Scovil.

Location of Section.—The section is located on the downstream side of the Norman traffic bridge which spans the western outlet of the lake of the Woods about two miles west of Kenora on the highway leading from Kenora to Keewatin. The initial point is marked on the wooden handrail at the west end of the bridge, the meterings being taken from the deck.

Records Available.—Estimates of daily discharge are available for this station from May 1, 1913, and are based upon gauge readings taken at the D.P.W. forebay gauge, Norman dam, from May 1 to August 25, 1913, and from August 26, 1913 on, the gauge heights are those recorded by the Manitoba Hydrographic Survey gauge above the Norman dam.

Drainage Area.—The drainage area above this section is 26,400 square miles, but owing to the fact that there are several other outlets of the lake of the Woods, this drainage area should not be used in computing run-off.

Gauge.—When the station was first established a reference point was marked on the northeast corner of the west pier of the bridge, to which water levels at the time of metering were referred. This was later replaced by a vertical staff gauge which was referred to W.P.S. datum.

Owing to the fact that the discharge past this section depends entirely upon the operation of the Norman dam, the discharge measurements have been referred to the gauge height at that point, and daily discharges are also referred to the same gauge. Two gauges were established above the Norman dam, the first being that of the Ontario D.P.W. which was used until August 25, 1913. On August 26, 1913, a vertical staff gauge was established by the Manitoba Hydrographic Survey, which was referred to the W.P.S. datum.

Channel.—There is but one channel for all stages of the river, the average depth over the section being approximately 40 feet under normal conditions. The bed of the river is loose rock and boulders but is not subject to appreciable change. The velocity at the section is fairly high, and some eddies are formed due to the section being located at the apex of a curve.

Discharge Measurements.—Some 180 discharge measurements have been made at this station, but owing to the fact that the water at this point is practically at lake level the range in stage has not been great, amounting to 2.2 feet.

Accuracy.—The Norman dam, which is located about 4,000 feet below the station, forms the control, and the discharge is therefore dependent upon the manipulation of the dam; considerable range in discharge may occur for the same gauge height recorded at the section.

Discharge Measurements of Winnipeg River at Western Outlet, Norman Traffic Bridge, Kenora, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.	Remarks
1912.			Feet.	Sec.-ft.	Ft. per sec	Feet.	Sec.-ft.	No. of Logs out of Dam.
June 5	S. S. Scovil	1,374	193	4,740	0·57	.....	2,694	.....
July 15	"	1,374	193	4,820	0·64	.....	3,070	.....
" 30	W. Richardson	1,374	193	4,831	0·56	57·75	2,715	.....
Aug. 13	S. S. Scovil	1,187	205	4,946	0·77	58·09	3,823	.....
" 30	W. H. Worden	1,187	205	4,853	0·80	.....	3,863	.....
Sept. 27	W. Richardson	1,462	205	4,992	0·83	.....	4,154	.....
" 30	"	1,462	205	5,001	0·79	.....	3,995	.....
Oct. 4	"	1,462	205	5,090	1·38	58·94	7,010	20
" 11	Alex. Pirie	1,462	209	5,045	1·39	59·07	7,027	20
" 12	"	1,462	206	5,038	1·28	59·10	6,476	20
" 16	"	1,462	206	5,082	1·35	.....	6,874	20
" 18	"	1,462	211	5,077	1·67	59·08	8,495	30
Nov. 20	G. J. Lamb	1,187	213	4,992	1·68	.....	8,386	28
" 27	"	1,187	213	4,968	1·68	.....	8,346	28
1913.								
Feb. 12	G. J. Lamb	1,375	212	4,986	1·57	58·66	7,821	29
" 19	"	1,375	212	5,028	0·85	.....	4,259	29
Mar. 10	"	1,375	212	4,951	0·89	.....	4,443	1
" 11	"	1,375	212	4,930	0·83	.....	4,103	1
April 1	"	1,375	212	4,951	0·88	59·04	4,331	1
" 9	"	1,375	212	4,951	0·88	.....	4,374	1
" 16	"	1,375	212	4,993	0·92	59·23	4,587	1
" 17	"	1,375	212	5,014	0·98	59·28	4,895	1
May 21	"	1,375	212	4,910	3·58	57·28	17,588	107
June 26	"	1,375	205	4,856	3·27	57·11	15,903	107
July 2	G. Emery	1,375	207	4,900	3·45	57·29	16,919	107
" 11	"	1,375	212	5,013	1·84	58·82	9,250	50
Aug. 1	"	1,375	205	4,979	2·82	58·35	14,034	70
" 6	"	1,375	205	4,919	2·73	58·21	13,409	70
" 8	"	1,375	205	4,979	2·71	58·29	13,510	70
" 26	C. O. Allen	1,435	205	4,898	2·45	58·00	11,991	70
" 26	"	1,435	205	4,898	2·76	58·00	13,518	70
" 27	"	1,435	205	4,939	2·70	58·12	13,334	70
" 27	"	1,435	205	4,939	2·70	58·12	13,334	70
" 28	"	1,435	205	4,898	2·66	57·96	13,028	70
" 28	"	1,435	205	4,898	2·71	57·96	13,273	70
" 29	"	1,435	205	4,898	2·63	57·98	12,881	70
" 29	"	1,435	205	4,898	2·75	57·98	13,469	70
" 30	"	1,435	205	4,918	2·66	58·06	13,082	70
" 30	"	1,435	205	4,918	2·68	58·06	13,181	70
Sept. 1	"	1,435	205	4,918	2·66	58·06	13,082	70
" 1	"	1,435	205	4,918	2·69	58·06	13,230	70
" 3	"	1,435	205	4,878	2·55	57·92	12,438	70
" 3	"	1,435	205	4,878	2·57	57·92	12,535	70
" 5	"	1,435	205	4,878	2·58	57·92	12,584	70
" 5	"	1,435	205	4,878	2·58	57·92	12,584	70
" 9	"	1,435	205	4,939	2·66	58·11	13,136	70
" 9	"	1,435	206	4,939	2·65	58·11	13,087	70
" 20	G. Emery	1,760	205	4,737	2·46	57·32	11,677	70
" 21	"	1,760	205	4,737	2·47	57·42	11,825	70
" 22	"	1,760	205	4,818	2·32	57·87	11,167	49
" 23	"	1,760	205	4,842	1·75	58·29	8,526	29
" 23	"	1,760	205	4,857	1·72	58·29	8,342	29
" 24	"	1,760	205	4,818	1·49	58·25	7,200	23
" 25	"	1,760	205	4,838	1·57	58·27	7,615	23
" 25	"	1,760	205	5,033	1·55	58·27	7,780	23
" 26	"	1,760	205	4,860	1·54	58·26	7,503	23
" 26	"	1,760	205	4,839	1·56	58·26	7,584	23
" 27	"	1,760	205	4,859	1·30	58·54	6,327	13
" 27	"	1,760	205	4,875	1·19	58·54	5,812	13
" 28	"	1,760	205	4,875	1·20	58·52	5,826	13
" 28	"	1,760	205	4,859	1·20	58·52	5,834	13
" 29	"	1,760	205	4,821	1·21	58·37	5,915	4
" 29	"	1,760	205	4,821	1·19	58·37	5,743	4
" 30	"	1,760	205	4,860	1·18	58·50	5,758	.....
" 30	"	1,760	205	4,860	1·11	58·50	5,384	.....
Oct. 1	"	1,760	205	4,838	1·15	58·42	5,565	.....
" 1	"	1,760	205	4,838	1·13	58·42	5,470	.....
" 2	"	1,760	205	4,860	1·12	58·51	5,463	.....
" 2	"	1,760	205	4,860	1·17	58·51	5,692	.....
" 3	"	1,760	205	4,860	1·16	58·46	5,638	.....
" 3	"	1,760	205	4,838	1·20	58·46	5,806	.....
" 4	"	1,760	205	4,821	1·14	58·33	5,477	.....
" 5	"	1,760	205	4,740	1·17	58·03	5,559	.....
" 6	"	1,760	205	4,838	1·19	58·44	5,759	.....

SESSIONAL PAPER No. 25f

Discharge Measurements of Winnipeg River at Western outlet Norman Traffic Bridge, Kenora—*Continued.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height	Discharge.	Remarks
1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	No. of Logs out of Dam.
Oct. 23	E. J. Budge	1,186	205	4,897	1·19	58·69	5,841	
" 25	"	1,186	205	4,852	1·14	58·58	5,540	
" 28	"	1,186	205	4,775	1·10	58·77	5,235	
" 30	"	1,186	205	4,877	1·13	58·62	5,530	
Nov. 1	"	1,186	205	4,897	1·12	58·73	5,515	
" 4	"	1,186	205	4,897	1·13	58·74	5,540	
" 6	E. J. Budge	1,186	205	4,877	1·13	58·63	5,503	
" 10	"	1,186	205	4,857	1·13	58·52	5,492	
" 12	"	1,186	205	4,857	1·11	58·52	5,388	
" 14	"	1,186	205	4,877	1·16	58·62	5,651	
" 17	"	1,186	205	4,878	1·11	58·63	5,438	
" 19	"	1,186	205	4,877	1·13	58·66	5,515	
" 21	"	1,186	205	4,857	1·16	58·57	5,612	
" 24	"	1,186	205	4,877	1·18	58·53	5,725	
" 26	S. C. O'Grady	1,186	205	4,857	1·09	58·53	5,303	
" 27	"	1,186	205	4,877	1·09	58·67	5,335	
" 28	"	1,186	205	4,857	1·14	58·57	5,527	
" 29	"	1,186	205	4,877	1·13	58·65	5,522	
Dec. 2	E. J. Budge	1,186	205	4,877	1·08	58·69	5,239	
" 5	"	1,186	205	4,857	1·13	58·63	5,467	
" 29	"	1,186	205	4,946	1·08	58·59	5,355	
" 29	"	1,186	205	4,946	1·11	58·59	5,458	
1914								
Jan. 6	M. S. Madden	1,186	205	4,946	1·13	58·59	5,554	
" 13	S. C. O'Grady	1,186	205	4,923	1·05	58·54	5,154	
" 19	M. S. Madden	1,196	205	4,926	1·07	58·52	5,272	
" 28	S. C. O'Grady	1,196	205	4,927	1·11	58·54	5,458	
" 28	"	1,196	205	4,927	1·08	58·54	5,297	
Feb. 4	"	1,196	205	4,945	1·10	58·60	5,461	
" 4	"	1,196	206	4,945	1·09	58·60	5,390	
" 9	"	1,196	205	4,946	1·10	58·59	5,421	
" 9	"	1,196	206	4,946	1·09	58·59	5,385	
" 17	"	1,196	205	4,946	1·13	58·59	5,582	
" 17	"	1,196	205	4,945	1·07	58·59	5,280	
" 24	"	1,196	205	4,926	1·40	58·39	6,860	35
" 24	"	1,196	205	4,926	1·45	58·39	7,172	35
" 26	"	1,196	205	4,926	1·70	58·26	8,350	35
" 26	"	1,196	205	4,926	1·67	58·26	8,207	35
Mar. 3	"	1,196	205	4,904	1·68	58·20	8,273	
" 3	"	1,196	205	4,904	1·62	58·20	7,962	
" 5	T. J. Moore	1,196	206	4,906	1·60	58·20	7,824	
" 20	S. C. O'Grady	1,196	205	4,885	1·62	58·20	7,930	
" 20	"	1,196	205	4,885	1·66	58·20	8,097	
" 24	"	1,196	205	4,885	1·59	58·18	7,774	
" 27	T. J. Moore	1,196	205	4,884	1·63	58·14	7,954	
" 27	"	1,196	205	4,884	1·56	58·14	7,610	
" 31	"	1,196	205	4,886	1·57	58·13	7,652	
" 31	"	1,196	205	4,885	1·60	58·13	7,837	
April 1	S. C. O'Grady	1,196	206	4,885	1·61	58·13	7,893	
" 2	"	1,196	205	4,885	1·63	58·14	7,945	
" 9	T. J. Moore	1,196	205	4,885	1·63	58·13	7,980	
" 9	"	1,196	205	4,885	1·59	58·13	7,762	
" 15	S. C. O'Grady	1,196	205	4,885	1·66	58·10	8,111	
" 15	"	1,196	205	4,885	1·52	58·10	7,407	
" 17	T. J. Moore	1,196	205	4,885	1·54	58·11	7,527	
" 17	"	1,196	205	4,885	1·42	58·11	6,949	
" 22	S. C. O'Grady	1,196	206	4,905	1·57	58·16	7,678	
" 22	"	1,196	205	4,905	1·64	58·16	8,074	
" 25	T. J. Moore	1,196	205	4,926	1·71	58·19	8,437	
" 25	"	1,196	205	4,926	1·69	58·19	8,304	
" 27	"	1,196	205	4,926	1·65	58·36	8,119	
" 27	"	1,196	205	4,926	1·68	58·36	8,282	
" 29	S. C. O'Grady	1,196	205	4,946	1·68	58·37	8,321	
" 29	"	1,196	206	4,946	1·73	58·37	8,573	
May 1	"	1,196	205	4,946	1·67	58·38	8,272	
" 1	"	1,196	205	4,946	1·75	58·38	8,618	
" 9	T. J. Moore	1,196	205	5,007	1·78	58·63	8,929	
" 9	S. C. O'Grady	1,196	205	5,007	1·75	58·63	8,754	
" 15	T. J. Moore	1,196	205	4,987	1·76	58·73	8,775	
" 15	"	1,196	205	5,028	1·76	58·73	8,874	
" 15	"	1,196	205	5,028	1·78	58·73	8,936	
" 19	"	1,196	205	5,028	1·63	58·77	9,208	
" 23	"	1,196	205	5,048	2·39	58·54	12,112	54
" 23	"	1,196	205	5,048	2·37	58·54	11,963	
" 27	C. Galloway	1,196	205	5,048	2·60	58·45	13,113	72
" 27	"	1,196	206	5,048	2·68	58·45	13,526	

DISCHARGE MEASUREMENTS of Winnipeg River at Western outlet Norman Traffic Bridge, Kenora—*Concluded.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge	Remarks.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	Number Logs out of Dam.
June 5	T. J. Moore	1,196	205	5,088	2·99	58·29	15,217	
" 5	"	1,196	205	5,088	2·94	58·29	14,991	
" 12	"	1,196	205	5,129	3·07	58·33	15,749	
" 12	"	1,196	205	5,129	3·03	58·33	15,545	
" 19	"	1,196	205	5,109	3·33	58·17	17,045	79
" 19	"	1,196	205	5,109	3·32	58·17	16,993	
" 26	"	1,196	205	5,088	3·62	57·55	18,447	89
" 26	"	1,196	205	4,088	3·58	57·55	18,236	
" 30	"	1,196	205	5,068	3·64	57·60	18,436	
" 30	"	1,196	205	5,068	3·67	57·60	18,602	
July 10	C. Galloway	1,196	205	5,068	3·58	57·50	18,155	
" 10	"	1,196	205	5,068	3·60	57·50	18,287	
" 24	S. C. O'Grady	1,196	212	5,081	3·35	57·50	16,952	
" 27	C. Galloway	1,196	212	5,041	3·51	57·42	17,686	
" 27	"	1,196	212	5,041	3·49	57·42	17,064	
Aug. 8	S. C. O'Grady	1,196	205	4,997	3·33	57·25	16,396	
" 8	"	1,196	205	4,997	3·30	57·25	16,507	
" 15	"	1,196	205	4,946	3·39	57·20	16,720	
" 15	"	1,196	205	4,946	3·39	57·20	16,731	
" 21	"	1,196	205	4,926	3·33	56·97	16,399	
" 21	"	1,196	205	4,926	3·27	56·97	16,110	
Sept. 12	"	1,196	205	4,997	2·24	58·62	11,151	44
" 22	"	1,196	205	4,946	2·12	58·32	10,468	
" 29	"	1,196	201	4,966	2·14	58·40	10,622	
Oct. 3	C. Galloway	1,196	205	4,967	2·23	58·35	11,125	
" 3	"	1,196	205	4,967	2·19	58·35	10,905	
Nov. 9	S. C. O'Grady	1,196	212	5,112	1·51	59·15	7,713	10
" 11	"	1,196	212	5,050	1·46	59·10	7,395	
" 27	"	1,196	212	5,080	1·42	59·00	7,203	
Dec. 12	"	1,196	212	5,091	1·48	59·09	7,517	
" 29	C. Galloway	1,196	212	5,104	1·45	59·14	7,375	
" 29	"	1,196	212	5,104	1·44	59·14	7,339	

NOTE.—All gauge heights read on forebay gauge at Norman Dam. All gauge heights prior to Aug. 26 are readings of D.P.W. gauge at forebay of Norman Dam. Datum of gauge 1,000.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Winnipeg River at Western outlet Norman Traffic Bridge, Kenora, for 1913.

[Drainage area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									58·54	13,300	57·34	17,500
2									58·49	13,400	57·39	17,500
3									58·54	13,600	57·34	17,423
4									58·64	13,800	57·44	17,500
5									58·54	13,800	57·44	17,709
6									58·54	13,800	57·29	17,600
7									58·54	13,800	57·34	17,600
8									58·49	13,800	57·39	17,600
9									58·49	13,900	57·44	17,600
10									58·59	14,200	57·49	17,367
11									58·59	14,200	57·49	17,694
12									58·49	14,500	57·39	17,848
13									58·09	15,200	57·34	17,826
14									57·69	16,000	57·34	17,628
15									57·49	16,900	57·34	17,532
16									57·39	17,200	57·34	17,532
17									57·39	17,200	57·34	17,435
18									57·39	17,200	57·34	17,501
19									57·44	17,200	57·34	17,545
20									57·39	17,300	57·24	16,900
21									57·34	17,400	57·29	16,900
22									57·39	17,700	57·29	17,300
23									57·44	17,700	57·29	17,300
24									57·39	17,700	57·29	17,300
25									57·49	17,800	57·29	17,300
26									57·49	17,800	57·14	16,000
27									57·39	17,700	57·09	16,000
28									57·44	17,700	57·24	16,800
29									57·49	17,700	57·29	17,400
30									57·39	17,900	57·29	17,400
31									57·49	18,000		

	July.		August.		September.		October.		November.		December	
1	57·14	16,100	58·29	13,600	58·06	13,243	58·42	5,520	58·73	5,565	58·67	5,540
2	57·29	16,800	58·29	13,600	57·99[1]	13,000	58·51	5,515	58·75[1]	5,575	58·69	5,525
3	57·34	17,000	58·19	13,500	57·92	12,609	58·46	5,530	58·57	5,520	58·71	5,550
4	57·29	16,000	58·19	13,500	57·92[1]	13,000	58·33	5,460	58·74	5,550	58·73	5,565
5	57·19	15,800	58·09	13,500	57·92	12,721	58·03	4,950	58·79	5,595	58·63	5,535
6	57·29	16,500	58·19	13,500	57·94[1]	12,840	58·44	5,475	58·63	5,540	58·58	5,535
7	57·19	16,500	58·49	13,500	57·96[1]	12,870	58·46[1]	5,540	58·56[1]	5,500	58·55	5,450
8	57·79	16,500	58·29	13,500	57·99[1]	12,800	58·48	5,475	58·56	5,500	58·65	5,495
9	57·99	15,900	58·29	13,300	58·11	13,197	58·42	5,500	58·52[1]	5,510	58·64	5,540
10	58·19	12,200	58·19	13,300	58·04[1]	12,850	58·75	5,550	58·52	5,515	58·62	5,535
11	58·69	10,400	58·29	13,300	57·97[1]	12,800	58·68	5,540	58·75	5,565	58·64	5,535
12	58·74	10,300	58·24	13,300	57·90[1]	12,640	58·54	5,530	58·52	5,525	58·61	5,530
13	58·79	10,300	58·19	13,300	57·83[1]	12,570	58·73	5,535	58·57	5,540	58·62	5,535
14	58·79	10,300	58·19	13,300	57·76[1]	13,040	58·69	5,550	58·62	5,530	58·63	5,520
15	58·84	10,300	57·99	13,300	57·70[1]	12,650	58·56	5,525	58·65	5,530	58·61	5,530
16	58·84	10,300	58·19	13,300	57·63[1]	12,500	58·60	5,525	58·75	5,580	58·63	5,535
17	58·89	10,300	58·19	13,200	57·55[1]	12,550	58·71	5,565	58·63	5,540	58·64	5,530
18	58·84	10,200	58·09	13,200	57·48[1]	12,800	58·61	5,535	58·49	5,510	58·61	5,535
19	58·89	10,100	58·24	13,300	57·40[1]	12,900	58·48	5,500	58·66	5,550	58·64	5,530
20	58·99	10,100	58·09	13,300	57·32	11,751	58·40	5,485	58·67	5,548	58·59	5,530
21	59·09	10,100	58·09	13,300	57·42[1]	11,800	58·59	5,530	58·57	5,525	58·60	5,540
22	59·04	10,100	58·14	13,300	57·87	11,105	58·73	5,565	58·56	5,525	58·60	5,530
23	58·89	12,000	57·99	13,300	58·29	8,071	58·69	5,540	58·75[1]	5,570	58·59	5,525
24	58·49	13,000	57·99	13,300	58·25	7,900	58·55	5,510	58·53	5,505	58·60	5,530
25	58·29	13,000	57·99	13,300	58·27	7,697	58·58	5,515	58·46	5,525	58·59	5,530
26	57·44	13,000	58·00	13,000	58·26	7,534	58·53	5,510	58·53	5,525	58·58	5,525
27	57·39	13,000	58·12	13,300	58·54	6,069	58·75	5,565	58·67	5,550	58·59	5,525
28	57·39	13,000	57·96	13,100	58·52	5,830	58·77	5,225	58·57	5,525	58·61	5,540
29	57·39	13,000	57·98	13,100	58·37	5,829	58·52	5,525	58·65	5,540	58·60	5,565
30	57·39	13,000	58·06	13,200	58·50	5,567	58·62	5,540	58·65[1]	5,540	58·56	5,530
31	57·39	13,000	58·06[1]	13,200			58·73	5,550			58·60	5,524

Note.—Gauge heights marked thus (1) interpolated.
Gauge heights read on forebay gauge at Norman dam.
Gauge heights prior to August 26 are readings of D P W gauge at forebay of Norman dam.

Daily Gauge Height and Discharge of Winnipeg River at Norman Traffic Bridge, Kenora, for 1914.

[Drainage area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	58·59	5,525	58·55	5,400	58·20	7,815	58·13	7,830	58·38	8,444	58·18	14,800
2	58·57	5,525	58·50	5,400	58·24	7,855	58·14	7,860	58·42	8,500	58·21	14,925
3	58·54	5,530	58·55	5,400	58·20	7,815	58·13	7,830	58·44	8,530	58·23	14,800
4	58·56	5,535	58·60	5,400	58·18	7,790	58·13	7,830	58·47	8,575	58·27	14,850
5	58·59	5,535	58·58	5,400	58·20	7,815	58·15	7,885	58·50	8,630	58·29	15,100
6	58·59	5,525	58·59	5,425	58·21	7,825	58·14	7,860	58·54	8,700	58·23	15,025
7	58·57	5,530	58·59	5,400	58·23	7,850	58·13	7,830	58·57	8,780	58·22	15,175
8	58·58	5,525	58·62	5,425	58·09	7,700	58·13	7,830	58·59	8,790	58·22	15,200
9	58·58	5,530	58·59	5,425	58·24	7,855	58·13	7,830	58·63	8,839	58·24	15,400
10	58·57	5,530	58·58	5,400	58·25	7,870	58·13	7,830	58·63	8,839	58·34	15,600
11	58·58	5,540	58·59	5,400	58·28	7,900	58·15	7,885	58·61	8,775	58·34	15,575
12	58·56	5,530	58·57	5,400	58·28	7,900	58·10	7,760	58·60	8,770	58·33	15,650
13	58·54	5,510	58·59	5,400	58·23	7,850	58·12	7,810	58·60	8,770	58·36	15,675
14	58·57	5,525	58·59	5,400	58·28	7,900	58·10	7,760	58·66	8,875	58·39	15,700
15	58·50	5,530	58·58	5,425	58·23	7,850	58·10	7,760	58·73	8,904	58·31	15,650
16	58·51	5,525	58·58	5,425	58·28	7,900	58·10	7,760	58·77	9,070	58·26	15,725
17	58·54	5,530	58·59	5,400	58·25	7,870	58·11	7,785	58·80	9,120	58·16	15,825
18	58·57	5,535	58·58	5,400	58·21	7,825	58·17	7,935	58·77	9,208	58·11	16,025
19	58·52	5,530	58·58	5,400	58·18	7,790	58·18	7,960	58·77	12,155	58·17	16,825
20	58·53	5,525	58·57	5,400	58·20	7,815	58·20	8,010	58·80	12,555	58·19	17,000
21	58·60	5,530	58·54	5,800	58·18	7,790	58·17	7,935	58·66	12,555	58·20	16,650
22	58·59	5,530	58·45	5,800	58·18	7,790	58·16	7,910	58·50	12,555	58·20	17,300
23	58·57	5,530	58·42	6,400	58·18	7,790	58·16	7,910	58·54	12,555	58·15	18,200
24	58·60	5,535	58·39	7,000	58·18	7,790	58·17	7,935	58·59	12,900	57·90	18,575
25	58·59	5,530	58·30	7,700	58·18	7,790	58·19	7,985	58·59	12,900	57·66	18,275
26	58·57	5,530	58·26	8,275	58·17	7,780	58·26	8,165	58·57	12,900	57·55	18,350
27	58·53	5,530	58·27	8,275	58·14	7,750	58·36	8,420	58·45	12,900	57·58	18,050
28	58·54	5,525	58·23	8,275	58·14	7,750	58·37	8,445	58·28	13,500	57·60	18,525
29	58·55	5,535	.....	.....	58·14	7,750	58·37	8,445	58·23	14,900	57·60	18,525
30	58·59	5,535	.....	.....	58·13	7,740	58·36	8,420	58·20	15,000	57·60	18,525
31	58·60	5,535	.....	.....	58·13	7,750	.....	.....	58·13	15,000	.....	.....

	July.		August.		September.		October.		November.		December.	
1	57·60	18,560	57·38	17,400	58·24	10,270	58·40	10,814	58·87	7,350	59·00	7,390
2	57·60	18,560	57·38	17,400	58·28	10,520	58·39	10,784	58·85	7,462	58·99	7,379
3	57·53	18,150	57·36	17,325	58·30	10,370	58·35	10,675	58·85	7,412	58·97	7,358
4	57·48	17,850	57·32	17,150	58·35	10,470	58·31	10,557	58·85	7,337	58·93	7,316
5	57·42	17,500	57·30	17,050	58·41	10,720	58·30	10,522	58·87	7,350	58·97	7,358
6	57·40	17,400	57·30	17,050	58·46	10,955	58·31	10,557	58·86	7,444	59·00	7,390
7	57·39	17,350	57·29	17,025	58·51	10,980	58·32	10,558	58·82	7,293	59·00	7,390
8	57·43	17,550	57·25	16,850	58·54	10,980	58·47	10,947	58·87	7,450	58·96	7,348
9	57·46	17,750	57·25	16,850	58·59	11,290	58·64	11,406	59·15	7,690	58·97	7,358
10	57·50	17,975	57·24	16,825	58·62	11,265	58·82	11,587	59·13	7,597	59·00	7,390
11	57·50	17,975	57·21	16,700	58·65	11,240	58·90	12,100	59·10	7,520	59·00	7,390
12	57·50	17,975	57·20	16,675	58·62	11,315	58·93	12,157	59·07	7,546	59·09	7,492
13	57·53	18,150	57·20	16,675	58·53	11,080	58·95	10,987	59·05	7,530	59·00	7,390
14	57·59	18,450	57·20	16,675	58·45	10,770	59·00	8,647	59·12	7,538	59·00	7,390
15	57·61	18,575	57·20	16,675	58·39	10,795	59·05	7,477	59·17	7,583	59·00	7,390
16	57·60	18,560	57·20	16,675	58·32	10,720	59·05	7,530	59·13	7,547	59·00	7,390
17	57·58	18,475	57·23	16,800	58·28	10,545	58·88	7,361	58·95	7,455	59·05	7,447
18	57·57	18,400	57·03	16,150	58·29	10,570	58·98	7,518	58·87	7,400	59·01	7,401
19	57·57	18,400	57·01	16,100	58·29	10,570	58·93	7,438	59·10	7,570	58·95	7,337
20	57·58	18,475	57·01	16,100	58·31	10,570	58·98	7,470	59·00	7,515	59·17	7,590
21	57·57	18,400	56·97	15,860	58·31	10,545	58·93	7,423	58·95	7,405	59·10	7,504
22	57·54	18,225	56·94	15,640	58·32	10,470	58·92	7,437	59·05	7,555	59·10	7,504
23	57·52	18,100	56·91	15,420	58·34	10,545	58·83	7,280	59·03	7,564	59·10	7,504
24	57·50	17,975	56·87	15,200	58·35	10,495	59·00	7,518	59·00	7,515	59·00	7,396
25	57·50	17,975	56·86	13,800	58·37	10,795	58·80	7,302	59·00	7,515	59·10	7,504
26	57·46	17,750	57·25	11,990	58·38	10,795	58·83	7,291	59·00	7,490	59·10	7,504
27	57·42	17,500	57·86	10,560	58·40	10,820	58·92	7,486	59·00	7,515	59·10	7,504
28	57·39	17,350	58·27	10,545	58·40	10,795	58·98	7,434	59·00	7,515	59·11	7,516
29	57·39	17,350	58·64	11,290	58·40	10,795	58·97	7,459	59·00	7,515	59·14	7,553
30	57·38	17,300	58·23	10,270	58·40	10,795	58·99	7,508	59·00	7,515	59·10	7,504
31	57·38	17,300	58·23	10,270	.....	.....	59·01	7,515	.....	.....	59·10	7,504

Note.—Gauge heights read on forebay gauge at Norman dam.

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Winnipeg River at Western Outlet Norman Traffic Bridge, Kenora, for the year 1913–14.

Month.	Discharge in Second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Total in acre feet.
May	18,000	13,300	16,000	983,800
June	17,848	16,000	17,400	1,035,400
July	17,000	10,100	13,000	799,300
August	13,600	13,000	13,300	817,800
September	13,243	5,567	11,100	660,500
October	5,565	4,950	5,500	338,200
November	5,595	5,500	5,550	327,300
December	5,565	5,450	5,500	338,200
The period	18,000	4,950	10,900	5,300,500
1914				
January	5,540	5,510	5,530	340,000
February	8,275	5,400	5,900	327,700
March	7,900	7,700	7,800	479,600
April	8,445	7,760	7,950	473,100
May	15,000	8,444	10,700	657,900
June	18,575	14,800	16,400	975,900
July	18,575	17,300	18,000	1,106,800
August	17,400	10,270	15,400	946,900
September	11,315	10,270	10,800	642,600
October	12,157	7,280	9,000	553,400
November	7,690	7,293	7,500	446,300
December	7,590	7,316	7,450	458,100
The year	18,575	5,510	10,200	7,408,300

MILL "A" HEAD-RACE, KEEWATIN.

History.—The station in the head-race, mill "A," was established by Mr. S. S. Scovil, December 23, 1912. This channel has formed one of the outlets of the lake of the Woods since the mill was built in 1887. A gauge in the tail-race was operated from May, 1896, until June, 1912, when it was discontinued.

Location of Section.—The section as first located in the head-race of mill "A" was on the downstream side of the foot-bridge across the channel. Later it was changed to a position just above the intake racks of the power-house in the head-race, mill "A," Lake of the Woods Milling Company, Keewatin, Ont.

Records Available.—Intermittent gauge readings in the tail-race from 1896–1912, and from 1913 daily discharge records based upon meterings, head and tail gauge readings and loads on the mill are available.

Drainage Area.—Total drainage area of all Lake of the Woods outlets is 26,400 square miles.

Gauge.—No gauge has been established, water levels are obtained by measuring down from a point of known elevation which is situated on the top of the head wall of the channel, near its intersection with the river retaining wall.

Channel.—The entrance to the racks is uniform and the section is well situated to avoid eddies of entrance, the stream line being generally perpendicular to the section.

Discharge Measurements.—A number of meterings have been made to determine the discharge for different gate openings and head, so that the daily discharge may be arrived at. They are made from the rack structure.

Accuracy.—The records are reliable owing to the conditions controlling the discharge, *i.e.*, gate opening, head, etc., being easily observed.

DISCHARGE MEASUREMENTS of Headrace, Mill "A," Lake of the Woods Milling Company, 1912–13.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Dec. 23	S. S. Scovil	1469	36	433	1·90	99·45	820
1913.							
Feb. 14	G. J. Lamb	1375	36	412	1·87	99·14	769
" 20	"	1375	36	420	1·81	99·27	760
Mar. 11	"	1375	36	420	1·83	99·25	769
" 12	"	1375	36	420	1·65	99·24	693
" 15	"	1375	36	420	1·79	99·31	749
" 21	"	1375	36	420	1·82	99·28	765
" 28	"	1375	36	426	1·75	99·43	747
April 9	"	1375	36	423	0·57	99·40	241
" 10	"	1375	36	426	0·57	99·43	242
" 10	"	1375	36	426	0·51	99·44	219
" 12	"	1375	36	426	0·48	99·50	206
" 12	"	1375	36	426	0·53	99·50	226
May 21	"	1375	36	444	1·99	99·93	885
June 26	"	1375	36	430	2·03	99·50	873
July 15	G. Emery	1375	36	440	1·76	99·80	774
Aug. 7	C. O. Allen	1375	36	444	1·63	99·98	724
Sept. 2	"	1435	36	426	1·86	99·40	792
" 2	"	1435	36	426	1·83	99·40	780
" 2	"	1435	36	426	1·78	99·40	757
" 2	"	1435	36	426	1·86	99·40	791
" 2	"	1434	36	423	1·81	99·38	763
" 2	"	1435	36	423	1·84	99·38	778
" 2	"	1435	36	423	1·82	99·37	767
" 4	"	1435	36	430	1·80	99·53	774
" 4	"	1435	36	430	1·73	99·50	743
" 4	"	1435	36	426	1·82	99·48	774
" 4	"	1435	36	426	1·90	99·48	811
" 4	"	1435	36	426	1·85	99·45	789
" 4	"	1435	36	426	1·84	99·45	784
" 4	"	1435	36	426	1·84	99·45	784
" 4	"	1435	36	426	1·84	99·45	785
" 6	"	1435	36	180	1·30	99·40	234
" 6	G. Emery	1435	36	180	1·29	99·37	232
" 6	"	1435	36	180	1·32	99·37	238
Dec. 3	E. J. Budge	1186	36	404	1·77	99·10	713
" 4	"	1186	36	407	1·85	99·16	754

SESSIONAL PAPER No. 25f

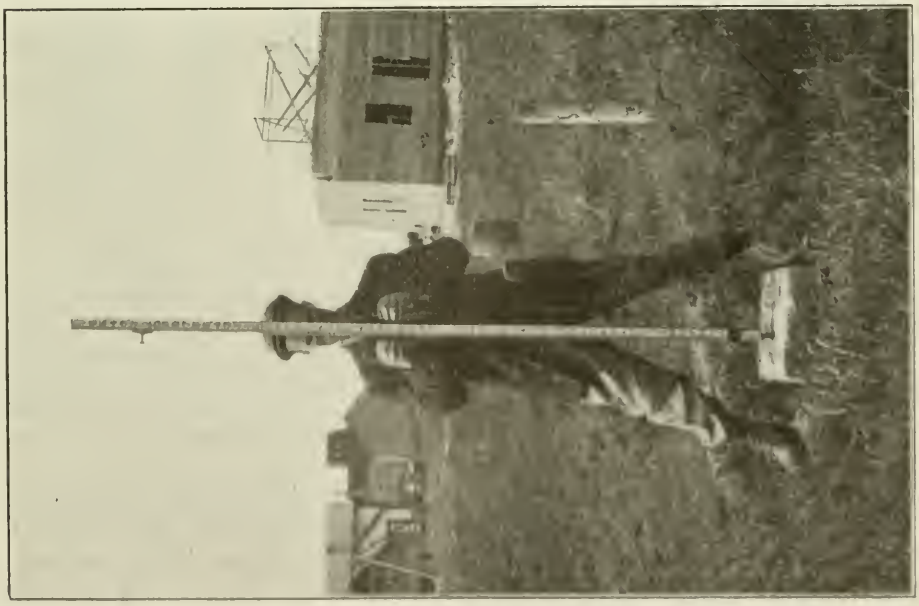
Discharge Measurements of Headrace, Mill "A," Flume No. 1, Lake of the Woods Milling Company, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge	Remarks.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
Dec. 10	S. C. O'Grady	1186	15	173	1·43	−3·98	248	Hydro-electric power-house.
" 10	"	1186	15	173	1·35	−3·98	234	
" 23	E. J. Budge.....	1186	15	171	1·59	−4·10	273	
" 23	"	1186	15	171	1·62	−4·10	277	
" 26	S. C. O'Grady....	1186	15	173	1·36	−3·99	235	
" 26	"	1186	15	173	1·33	−3·99	229	
" 27	"	1186	15	171	1·45	−4·06	248	
" 27	"	1186	15	171	1·35	−4·06	231	
" 31	E. J. Budge.....	1186	15	171	1·72	−4·10	295	
" 31	"	1186	15	171	1·76	−4·10	302	
1914.								
								Hydro-electric power-house.
Jan. 2	M. S. Madden.....	1186	15	173	0·95	−3·98	164	No. 2 generator off.
" 2	"	1186	15	173	0·93	−3·98	161	No. 2 generator off.
" 5	"	1186	15	173	1·47	−3·97	252	
" 5	"	1186	15	173	1·61	−3·96	278	
" 9	"	1186	15	171	1·62	−4·06	277	
" 9	"	1186	15	171	1·69	−4·06	290	
" 23	"	1186	15	170	1·29	−3·80	220	
" 23	S. C. O'Grady.....	1187	15	170	1·43	−3·80	241	
" 24	"	1196	15	169	1·20	−3·74	202	
" 24	"	1196	15	169	1·10	−3·70	178	
" 24	"	1196	15	177	1·04	−3·70	182	
" 24	"	1196	15	177	1·20	−3·70	211	
" 30	M. S. Madden. ...	1196	15	173	1·69	−4·00	292	
" 30	"	1196	15	173	1·83	−4·00	316	
" 30	"	1196	15	171	1·52	−4·08	260	
" 30	"	1196	15	172	1·58	−4·08	270	
" 30	"	1196	15	171	1·51	−4·08	258	
" 30	"	1196	15	171	1·53	−4·07	262	
" 30	"	1196	15	171	1·54	−4·06	264	
" 30	"	1196	15	171	1·43	−4·06	244	
Feb. 6	"	1196	15	173	0·88	−3·96	153	
" 6	"	1196	15	173	0·91	−3·96	158	
" 6	"	1196	15	173	1·20	−3·96	207	
" 6	"	1196	15	173	1·16	−3·96	200	
" 6	"	1196	15	173	1·18	−4·01	204	
" 7	"	1196	15	173	1·34	−4·00	231	
" 7	"	1196	15	173	1·34	−4·00	232	
" 7	"	1196	15	173	1·28	−4·00	222	
" 7	"	1196	15	173	1·26	−4·02	219	
" 7	"	1196	15	173	1·27	−4·02	220	
" 7	" ...	1196	15	173	1·11	−4·02	192	
" 7	"	1196	15	173	1·21	−4·02	210	
" 7	"	1196	15	173	1·15	−4·02	199	
" 7	"	1196	15	173	1·28	−4·02	221	Hydro-electric power house.
" 13	S. C. O'Grady....	1196	15	173	0·89	−3·98	154	No. 2 generator off; pump on.
" 13	"	1196	15	173	0·98	−3·98	169	No. 2 generator off
" 13	" ...	1196	15	173	1·07	−3·98	186	"
" 13	M. S. Madden.....	1196	15	173	1·03	−4·00	178	"
" 13	"	1196	15	173	1·02	−4·00	176	"
" 13	"	1196	15	173	1·00	−4·00	173	"
" 13	"	1196	15	173	0·94	−4·00	162	"
" 13	"	1196	15	173	1·09	−4·00	188	"
" 13	"	1196	15	173	1·06	−4·02	184	"
" 14	S. C. O'Grady....	1196	15	173	1·03	−3·98	179	"
" 14	"	1196	15	173	1·00	−3·98	173	"
" 14	"	1196	15	173	1·03	−3·98	179	"
" 14	" ...	1196	15	173	1·04	−3·98	181	"
" 14	" ...	1196	15	173	0·91	−3·98	158	"
" 14	" ...	1196	15	173	0·96	−3·98	166	"
" 20	" ...	1196	15	173	0·70	−3·98	122	" pump on
" 20	" ...	1196	15	173	0·62	−3·98	108	" "
" 20	" ...	1196	15	173	0·60	−3·98	105	" "
" 20	" ...	1196	15	173	0·63	−3·98	109	" "
" 21	" ...	1196	15	173	0·68	−3·95	117	"
" 21	" ...	1196	15	173	0·69	−3·98	119	"
" 21	" ...	1196	15	173	0·60	−3·98	104	"
" 21	"	1196	15	173	0·68	−3·97	119	"
April 3	" ...	1196	15	171·5	0·59	−4·03	102	"
" 3	" ...	1196	15	171·5	0·64	−4·03	110	"
" 3	" ...	1196	15	171·5	0·58	−4·03	100	"
" 3	"	1196	15	171·5	0·60	−4·03	102	"
" 7	" ...	1196	15	171·5	0·66	−4·06	112	"
" 7	"	1196	15	171·5	0·55	−4·06	96	"
" 7	"	1196	15	171·5	0·66	−4·06	114	"
" 7	"	1196	15	171·5	0·59	−4·06	101	"
" 7	C. C. Galloway	1196	15	168·5	1·48	−4·30	248	

DISCHARGE MEASUREMENTS of Head-race, Mill "A," Flume No. 1, Lake of the Woods Milling Company—*Concluded.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity	Gauge Height.	Discharge	Remarks.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
April 7	C. C. Galloway...	1196	15	168·5	1·43	−4·30	242	Hydro-elcetric power house.
" 8	S. C. O'Grady....	1196	15	171·5	0·69	−4·07	119	No. 2 generator off; pump on.
" 8	"	1196	15	171·5	0·67	−4·06	116	" "
" 8	"	1196	15	171·5	0·67	−4·06	115	" "
" 8	"	1196	15	171·5	0·72	−4·06	123	" "
" 9	"	1196	15	174·5	0·61	−3·88	107	" "
" 9	"	1196	15	174·5	0·62	−3·88	109	" "
" 9	"	1196	15	174·5	0·62	−3·88	109	" "
" 9	"	1196	15	174·5	0·61	−3·88	107	" "
" 10	"	1196	15	174·5	0·61	−3·92	106	" "
" 10	"	1196	15	174·5	0·60	−3·92	105	" "
" 10	C. C. Galloway ...	1196	15	173·2	1·31	−3·98	226	Pump on.
" 10	"	1196	15	173·0	1·39	−3·98	241	"
" 11	S. C. O'Grady....	1196	15	174·5	0·54	−3·90	95	No. 2 generator off.
" 11	"	1196	15	174·5	0·58	−3·90	101	"
" 11	T. J. Moore.....	1196	15	174·5	0·57	−3·90	99	"
" 11	"	1196	15	174·5	0·58	−3·90	102	"
" 11	"	1196	15	174·5	0·56	−3·90	99	"
" 11	"	1196	15	174·5	0·58	−3·90	103	"
" 11	"	1196	15	174·5	0·57	−3·90	99	"
" 15	S. C. O'Grady....	1196	15	171·4	0·62	−4·12	107	"
" 15	"	1196	15	171·4	0·60	−4·12	102	"
" 15	"	1196	15	171·4	0·60	−4·12	104	"
" 15	"	1196	15	171·4	0·63	−4·12	108	"
" 16	"	1196	15	171·5	0·51	−4·12	88	"
June 9	C. C. Galloway...	1196	15	192·4	1·18	−2·70	228	"
" 9	" ...	1196	15	192·4	1·19	−2·70	230	
July 14	" ...	1196	15	189·6	1·37	−2·85	259	
" 14	" ...	1196	15	189·6	1·30	−2·85	246	
" 20	" ...	1196	15	190·7	0·50	−2·75	97	No. 2 generator off.
" 20	" ...	1196	15	190·7	0·59	−2·75	112	"
" 20	" ...	1196	15	190·7	0·62	−2·75	118	"
" 20	" ...	1196	15	190·7	0·62	−2·75	118	"
" 20	" ...	1196	15	190·7	0·66	−2·75	126	"
" 20	" ...	1196	15	194·0	1·35	−2·60	263	
" 20	" ...	1196	15	194·0	1·30	−2·60	252	
" 21	T. J. Moore.....	1119	15	192·7	0·60	−2·65	115	No. 2 generator off; pump on.
" 21	"	1196	15	192·7	0·63	−2·65	121	No. 2 generator off.
" 21	"	1196	15	192·7	0·62	−2·65	119	"
" 21	"	1196	15	192·7	0·63	−2·65	122	"
" 21	"	1196	15	192·7	0·62	−2·65	119	"
" 22	"	1196	15	189·6	0·60	−2·90	116	"
" 22	"	1196	15	189·6	0·60	−2·90	115	"
" 29	"	1196	15	189·5	0·64	−2·90	121	"
" 29	"	1196	15	189·5	0·61	−2·90	117	"
" 29	"	1196	15	189·5	0·60	−2·90	115	"
Aug. 14	C. C. Galloway....	1196	15	176·9	1·59	−3·74	281	"
" 14	"	1196	15	176·9	1·54	−3·74	273	"
Sept. 18	" ...	1196	15	179·0	1·26	−3·59	225	"
" 18	" ...	1196	15	179·0	1·26	−3·59	225	"
" 30	" ...	1196	15	176·2	1·34	−3·56	236	"

Assiniboine, Brandon. M. H. S. Bench-mark.



Whitemouth River at Whitemouth. M. H. S. Bench-mark.

DISCHARGE MEASUREMENTS of Head-race, Mill "A," Flume No. 2,(Mill drive), Lake of the Woods Milling Company, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Dec. 10	S. C. O'Grady	1186	38	568	1·15	−3·98	653
" 10	"	1186	38	568	1·15	−3·98	654
" 18	E. J. Budge	1186	38	568	1·11	−4·00	639
" 18	"	1186	38	568	1·12	−4·00	638
" 23	"	1186	38	565	1·16	−4·08	655
" 23	"	1186	38	563	1·21	−4·08	680
" 26	S. C. O'Grady	1186	38	577	1·10	−3·99	628
" 27	"	1186	38	563	1·11	−4·05	625
" 26	"	1186	38	567	1·10	−3·99	628
" 27	M. S. Madden	1186	38	567	1·10	−3·98	622
1914.							
Jan. 2	M. S. Madden	1186	38	569	1·10	−3·98	622
" 5	"	1196	38	567	1·09	−3·97	620
" 8	"	1186	38	560	1·07	−4·16	601
" 8	"	1186	38	560	1·07	−4·16	601
" 26	"	1196	38	560	1·06	−4·12	578
Feb. 6	"	1196	38	567	1·03	−3·95	584
" 6	"	1196	38	571	1·10	−3·90	627
" 19	"	1196	38	563	1·16	−4·13	657
" 19	"	1196	38	563	1·16	−4·13	659
" 21	"	1196	38	563	1·14	−4·12	641
" 21	"	1196	38	563	1·16	−4·12	655
" 21	"	1196	38	563	1·20	−4·12	675
April 4	C. C. Galloway	1196	38	561	1·06	−4·20	592
" 7	"	1196	38	536	1·24	−4·30	691
" 7	"	1196	38	536	1·23	−4·30	687
" 7	"	1196	38	536	1·24	−4·30	691
" 7	"	1196	38	536	1·21	−4·30	672
June 9	"	1196	38	615	1·10	−2·70	735
" 9	"	1196	38	614	1·17	−2·70	722
" 11	"	1196	38	610	1·19	−2·82	726
" 11	"	1196	38	610	1·16	−2·83	712
" 15	"	1196	38	611	1·19	−2·81	727
" 15	"	1196	38	611	1·22	−2·82	745
" 20	T. J. Moore	1196	38	619	1·12	−2·60	694
" 20	C. C. Galloway	1196	38	619	1·14	−2·60	711
July 14	"	1196	38	609	1·02	−2·85	622
" 14	"	1196	38	609	0·98	−2·85	598
Aug. 14	"	1196	38	577	1·18	−3·72	680
" 14	"	1196	38	577	1·23	−3·74	707
" 14	"	1196	38	577	1·23	−3·74	708
Sept. 18	"	1196	38	582	1·13	−3·58	658
" 18	"	1196	38	582	1·18	−3·58	689
" 30	"	1196	38	583	1·09	−3·56	635

MILL "C" HEAD-RACE, KEEWATIN.

History.—The station was established on July 17, 1912, by Mr. S. S. Scovil, when the first metering was taken by this survey.

Location of Section.—The section is located about 5 feet upstream from the racks in the head-race of mill "C," Lake of the Woods Milling Company, leading from Portage bay, an arm of lake of the Woods at Keewatin, Ont. The initial point is marked on the east bank of the channel above the racks.

Records Available.—The records of discharge are based upon meterings and gauge heights in the head- and tail-race and also depend upon the load on the mill. The daily discharges through the mill are available for 1912–13–14.

Drainage Area.—This channel forms one of the outlets of the lake of the Woods, and in consequence the drainage area above has no particular significance. It is, however, 26,400 square miles.

Gauge.—The gauge is a vertical staff gauge placed on the east side of the channel, about 10 feet upstream from the racks, and reads direct to elevations.

The zero of the gauge is referred to W.P.S. datum, the reference bench-mark being a point on the top of the flume.

Channel.—The channel is rectangular, cut in solid rock, and has a normal depth of 12 feet. It is straight for about 15 feet above the section.

Discharge Measurements.—The meterings are made from a small bridge spanning the channel, and have been taken periodically from July 17, 1912, the range in stage covered being about 2½ feet.

Accuracy.—The station gives good records, but the daily discharge depends upon the gate openings on the turbines so that, after rating the station to these, the records are reliable.

DISCHARGE MEASUREMENTS of Head-race Mill "C," Lake of the Woods Milling Co., 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
July 17	S. S. Scovil	1,374	42	455	1·95	97·77	888
" 30	"	1,374	42	461	2·10	97·92	967
Aug. 14	"	1,187	42	475	2·04	98·24	969
" 28	W. G. Worden	1,187	42	476	2·14	98·28	1,015
Oct. 4	W. Richardson	1,142	42	525	1·80	99·46	946
Sept. 26	"	1,462	42	504	1·86	99·10	938
Oct. 11	A. Pirie	1,462	42	533	2·01	99·58	1,069
" 12	W. Richardson	1,462	42	530	1·95	99·56	1,035
" 16	"	1,462	42	527	1·88	99·74	993
" 18	"	1,462	42	532	2·09	99·60	1,112
Nov. 26	G. J. Lamb	1,187	42	514	1·49	99·38	766
" 26	"	1,187	42	514	1·54	99·38	791
" 16	"	1,187	42	512	1·82	99·50	931
1913.							
Feb. 7	G. J. Lamb	1,375	42	513	1·39	99·30	715
" 14	"	1,375	42	506	1·39	99·14	706
" 20	"	1,375	42	513	0·27	99·27	138
Mar. 11	"	1,375	42	512	1·35	99·25	693
" 12	"	1,375	42	512	1·36	99·25	698
" 15	"	1,375	42	512	1·30	99·30	666
" 21	"	1,375	42	512	1·31	99·28	672
" 28	"	1,375	42	519	0·34	99·43	174
April 8	"	1,375	42	523	1·34	99·48	703
" 10	"	1,375	42	519	1·36	99·44	704
June.. 25	"	1,375	42	531	1·34	99·75	710
July 2	G. Emery	1,375	42	527	1·38	99·65	730
Aug. 7	"	1,375	42	538	1·29	99·98	696
Sept. 6	C. O. Allen	1,435	42	515	1·44	99·31	739
" 6	"	1,435	42	515	1·40	99·32	722
" 6	"	1,435	42	515	1·40	99·31	719
Dec. 3	E. J. Budge	1,186	42	502	1·18	99·02	593
" 4	"	1,186	42	505	1·28	99·08	646
" 9	S. C. O'Grady	1,186	42	502	1·34	98·99	670
" 11	E. J. Budge	1,186	42	501	1·41	98·96	708
" 11	S. C. O'Grady	1,186	42	490	1·38	98·98	677
" 22	E. J. Budge	1,186	42	499	1·33	98·92	667
" 22	"	1,186	42	499	1·35	98·92	675
" 27	S. C. O'Grady	1,186	42	496	1·50	98·89	744
" 27	"	1,186	42	496	1·51	98·89	749
" 31	E. J. Budge	1,186	42	505	1·37	98·87	694
" 31	"	1,186	42	505	1·44	98·88	732
1914.							
Jan. 3	M. S. Madden	1,186	42	496	1·40	98·87	694
" 3	"	1,186	42	495	1·43	98·87	702
" 8	"	1,186	42	494	1·31	98·85	647
" 8	"	1,186	42	495	1·31	98·87	648
" 9	"	1,186	42	495	1·37	98·88	679
" 9	"	1,186	42	495	1·35	98·88	667
" 21	S. C. O'Grady	1,196	42	493	1·32	98·90	650
" 24	"	1,196	42	493	1·46	98·90	721
" 23	M. S. Madden	1,196	42	499	1·38	98·92	689
" 26	"	1,196	42	490	1·38	98·82	679
Feb. 3	"	1,196	42	499	1·43	98·93	716
" 3	"	1,196	42	499	1·35	98·92	675
" 3	"	1,196	42	499	1·38	98·92	688
" 11	"	1,196	42	498	1·72	98·92	861
" 14	"	1,196	42	498	1·74	98·94	868

DISCHARGE MEASUREMENTS of Head-race Mill " C," Lake of the Woods Milling Co., 1912–14—*Continued.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 4	T. J. Moore	1,196	42	495	1·27	98·85	630
" 4	"	1,196	42	495	1·26	98·85	625
" 5	"	1,196	42	495	1·23	98·85	607
" 5	"	1,196	42	495	1·25	98·85	617
April 20	S. C. O'Grady	1,196	42	494	1·32	98·90	653
" 20	"	1,196	42	494	1·36	98·90	671
" 21	"	1,196	42	494	1·33	98·85	658
" 21	"	1,196	42	494	1·36	98·85	671
" 21	"	1,196	42	494	1·34	98·85	661
" 28	C. Galloway	1,196	42	496	1·30	98·90	645
" 28	"	1,196	42	497	1·32	98·91	655
May 1	"	1,196	42	498	1·25	99·00	623
" 22	T. J. Moore	1,196	42	501	1·22	99·60	629
" 22	"	1,196	42	501	1·27	99·60	637
June 4	"	1,196	42	534	1·28	99·85	685
" 4	"	1,196	42	534	1·29	99·88	688
" 9	"	1,196	42	545	1·26	100·08	674
" 9	"	1,196	42	546	1·28	100·08	697
" 11	"	1,196	42	547	1·20	100·13	696
" 11	"	1,196	42	547	1·28	100·13	695
" 15	C. Galloway	1,196	42	545	1·30	100·15	710
" 15	"	1,196	42	558	1·34	100·20	745
" 24	"	1,196	42	545	1·30	100·10	707
" 24	"	1,196	42	.....	1·29	100·09	706
" 24	T. J. Moore	1,196	42	538	1·31	100·00	707
" 24	"	1,196	42	538	1·32	100·00	711
July 14	C. Galloway	1,196	42	543	1·30	100·04	709
" 14	"	1,196	42	543	1·27	100·03	689
" 17	S. C. O'Grady	1,196	42	536	1·44	99·87	771
Aug. 14	C. Galloway	1,196	42	517	1·47	99·40	760
" 14	"	1,196	42	517	1·50	99·40	775
" 19	"	1,196	42	511	1·51	99·28	771
" 19	"	1,196	42	511	1·43	99·28	732
Sept. 17	"	1,196	42	512	1·50	99·29	766
" 17	"	1,196	42	512	1·49	99·29	762
" 30	"	1,196	42	516	1·35	99·39	692
Nov. 4	"	1,196	42	516	1·28	99·35	662
" 4	"	1,196	42	516	1·25	99·35	644

DISCHARGE MEASUREMENTS of Tail-race Mill " C," Lake of the Woods Milling Co., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq.-ft.	Ft. per sec.	Feet.	Sec.-ft.
Feb. 22	S. C. O'Grady	1,196	46·5	111	2·32	−15·04	258·00
" 22	"	1,196	46·5	111	2·35	−15·04	260·00
" 22	"	1,196	46·5	116	2·65	−14·90	308·00
" 22	"	1,196	46·5	116	2·55	−14·90	297·00
Mar. 1	"	1,196	46·5	129	0·84	−14·50	108·00
" 1	"	1,196	46·5	130	0·80	−14·60	104·00
" 1	"	1,196	46·5	136	1·04	−14·50	141·00
" 1	"	1,196	46·5	136	1·02	−14·50	138·66
" 1	"	1,196	46·5	140	2·85	−14·50	397·3
" 1	"	1,196	46·5	139	2·85	−14·50	396·3

NOTE : Mill not running.

Keewatin Lumber and Manufacturing Company's Head-race, Keewatin, Ont.

History.—This channel forms one of the outlets of the Lake of the Woods. It was created and used in connection with the above company's mill, the discharge being controlled by the headgates. After the mill was burned in 1905 these fell into disrepair and leakage occurred; to ascertain this a station was established on December 13, 1913, by S. C. O'Grady, and has since been operated.

Location of Section. —The metering section is on the upstream side of the bridge crossing the channel 300 feet above the power-house and east of the head-gates at the K. L. & M. Co.'s head-race. The initial point is a notch cut in the plank floor at the south end of the bridge and marked 0+00.

Records Available.—The daily discharge records are available at this point since the establishment of the station in December, 1913.

Gauge.—There is no gauge at this point, but the meterings are referred to the lake gauge at the Keewatin bridge, where daily records are available.

Channel.—The channel is fairly permanent, composed of clay and rock. It is straight for 150 feet above and 100 feet below the section. The current is not swift, and depends upon the leakage at the gates.

Discharge Measurements.—Discharge measurements are taken frequently to check the leakage through the headgates, and as this control is fairly permanent the discharge depends largely upon the lake stage. No curve has been plotted for the station, but the daily estimated discharge is based upon the meterings. The measurements are made from the bridge.

Accuracy.—The accuracy may be considered good.

Discharge Measurements of Winnipeg River at K. L. & M. Co. Head-race, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 21	G. J. Lamb	1,375	15	44	2·39	−·79	106[1]
" 22	"	1,375	15	44	2·46	−·80	109[1]
April 9	"	1,375	29	135	0·89	−·00	121[2]
" 10	"	1,375	29	140	0·90	−·04	129[2]
1914.							
Feb. 19	M. S. Madden	1,196	30	151	0·71	−8·00	107
Mar. 25	S. C. O'Grady	1,196	30	150	0·62	−8·00	94
" 25	"	1,196	30	150	0·60	−8·00	91
April 16	"	1,196	30	150	0·64	−8·00	96
" 16	"	1,196	30	150	0·62	−8·00	93
July 11	"	1,196	31	205	1·19	−5·60	243
" 11	"	1,196	31	205	1·22	−5·60	249
Aug. 7	N. Galloway	1,196	32	196	1·19	−5·90	233
" 7	"	1,196	32	196	1·18	−5·90	231
Sept. 17	"	1,196	31	177	1·05	−6·50	186
" 17	"	1,196	31	177	1·05	−6·50	186
" 30	"	1,196	31	171	1·21	−6·40	207
Nov. 4	"	1,196	31	176	1·05	−6·55	185
" 4	"	1,196	31	176	1·06	−6·55	187
Dec. 8	"	1,196	30	188	1·03	−6·40	192
" 8	"	1,196	30	188	0·97	−6·40	181

[1] Keewatin 1 mile west.
[2] Keewatin school.

Daily Gauge Height and Discharge of Head-race, K. L. & M. Co., at 2nd Bridge for 1913.

Day.	May		June	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft	Feet.	Sec.-ft.
1	99·85	110	99·90	110
2	99·85	110	99·90	110
3	99·95	110	99·80	110
4	100·10	110	100·00	110
5	100·00	110	99·90	110
6	100·00	110	99·50	110
7	100·00	110	99·80	110
8	99·80	110	99·90	110
9	99·95	110	100·00	110
10	100·00	110	100·06	110
11	100·20	110	100·08	105
12	100·00	110	99·98	105
13	99·90	110	99·89	105
14	100·00	110	99·90	105
15	99·90	110	99·88	105
16	100·00	110	99·90	105
17	99·85	110	99·72	105
18	99·90	110	99·81	105
19	99·95	110	99·69	105
20	99·95	110	99·69	105
21	99·85	110	99·70	105
22	99·95	110	99·78	105
23	100·00	110	99·98	105
24	99·80	110	99·85	105
25	100·00	110	99·77	105
26	100·05	110	99·58	105
27	99·90	110	99·43	105
28	99·90	110	99·70	105
29	99·95	110	99·81	105
30	99·80	110	99·84	105
31	100·00	110	.....	.....

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	99·54	105	99·89	110	99·55	110	98·94	110	99·16	110	99·06	110
2	99·62	105	99·87	110	99·45	110	98·90	110	99·20	110	99·02	110
3	99·78	105	99·77	110	99·40	110	99·00	110	98·92	110	99·10	110
4	99·49	105	99·79	110	99·45	110	98·79	110	99·10	110	99·18	110
5	99·38	105	99·63	110	99·40	110	98·44	110	99·26	110	99·03	110
6	99·62	105	99·71	110	99·32	105	98·82	110	99·03	110	99·03	110
7	99·62	105	99·97	110	99·35	105	99·07	110	98·88	110	98·78	110
8	99·63	105	99·83	110	99·30	105	98·81	110	98·88	110	98·80	110
9	99·23	105	99·71	110	99·64	105	98·88	110	98·90[1]	110	99·06	110
10	99·63	105	99·67	110	99·33	105	99·08	110	98·91	110	99·02	110
11	99·87	105	99·87	110	99·30	105	99·04	110	99·18	110	99·03	110
12	99·69	105	99·81	110	99·19	105	99·00	110	98·99	110	99·01	110
13	99·72	105	99·74	110	99·15	105	99·03	110	99·06	110	99·03	110
14	99·74	105	99·70	110	99·47	105	99·10	110	99·00	110	99·05	110
15	99·88	105	99·65	110	99·20	105	99·00	110	99·01	110	99·02	110
16	99·88	105	99·63	110	99·10	105	99·00	110	99·23	110	99·04	110
17	99·83	105	99·60	110	99·12	105	99·17	110	99·05	110	99·01	110
18	99·83	105	99·69	110	99·30	105	99·03	110	98·90	110	99·02	110
19	99·79	105	99·86	110	99·37	105	98·86	110	99·10	110	99·00	110
20	99·99	105	99·73	110	98·60	100	98·83	110	99·07	110	99·00	110
21	100·00	105	99·78	110	98·52	100	99·02	110	98·96	110	99·04	110
22	99·92	105	99·72	110	98·98	100	99·15	110	98·99	110	99·02	110
23	99·99	105	99·75	110	99·00	100	99·03	110	99·19	110	98·99	110
24	99·91	105	99·73	110	98·71	100	98·99	110	99·02	110	99·01	110
25	100·04	105	99·85	110	99·90	105	99·02	110	98·99	110	99·00	110
26	99·76	105	99·48	110	99·98	105	99·00	110	98·97	110	98·99	110
27	99·78	105	99·63	110	99·02	105	99·18	110	99·09	110	99·98	110
28	99·99	105	99·46	110	99·08	105	98·58	110	99·00	110	99·04	110
29	99·88	105	99·45	110	98·85	100	98·96	110	99·04	110	99·03	110
30	99·88	105	99·53	110	98·99	100	99·04	110	99·05	110	99·00	110
31	99·84	105	99·48	110	.....	.....	99·12	110	.....	.....	98·99	110

Note.—All gauge heights marked thus [1] interpolated. Gauge heights are readings on lake gauge at Keewatin bridge. Daily discharges are estimated from actual meterings.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Head-race, K. L. & M. Co., at 2nd Bridge for 1914.

Day.	January.		February.		March.		April.		May.		June	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.
1	98·98	110	99·03	120	99·01	100	98·87	95	99·11	95	99·95	240
2	98·98	110	99·01	120	99·03	100	98·85	95	99·15	95	100·00	245
3	98·99	110	99·01	120	98·98	100	98·88	95	99·18	95	99·93	237
4	99·02	110	99·01	120	98·98	100	98·87	95	99·22	95	99·83	225
5	99·01	110	99·02	120	98·94	100	98·90	95	99·23	95	100·00	245
6	98·98	110	99·05	120	98·93	100	98·90	95	99·29	95	99·92	237
7	98·99	110	99·02	120	98·95	100	98·84	95	99·30	95	99·98	243
8	98·98	110	99·06	120	98·99	100	98·84	95	99·40	95	99·99	243
9	98·99	110	99·05	120	98·99	100	98·87	95	99·45	110	100·10	258
10	98·99	110	99·00	120	98·90	100	98·80	95	99·41[1]	110	100·20	270
11	99·04	110	99·01	120	98·93	100	98·83	95	99·38	110	100·15	265
12	98·99	110	99·02	120	98·93	100	98·79	95	99·45	110	100·20	270
13	98·91	110	99·02	120	98·95	100	98·85	95	99·43	110	100·20	270
14	98·98	110	99·02	120	98·90	100	98·82	95	99·43	110	100·22	270
15	98·99	110	99·05	120	98·98	100	98·80	95	99·50	110	100·20	270
16	98·97	110	99·04	120	98·90	100	98·77	95	99·53	120	100·25	277
17	98·99	110	99·00	120	98·88	95	98·80	95	99·63	120	100·32	287
18	99·01	110	99·01	120	98·85	95	98·82	95	99·63	120	100·02	246
19	98·99	110	99·01	120	98·86	95	98·91	95	99·50	120	100·18	268
20	98·97	110	99·02	120	98·88	95	98·92	95	99·62	120	100·40	295
21	98·99	110	99·01	120	98·85	95	98·90	95	99·63	120	100·10	258
22	98·99	110	99·01	120	98·87	95	98·88	95	99·65	120	100·30	285
23	99·00	110	99·03	120	98·88	95	98·93	95	99·66	120	100·32	287
24	99·01	110	99·02	120	98·85	95	98·95	95	99·79	120	100·10	258
25	99·00	110	99·00	120	98·80	95	98·95	95	99·85	130	100·01	245
26	99·00	110	99·00	120	98·85	95	99·08	95	99·81	130	100·05	252
27	98·99	110	99·01	120	98·87	95	99·03	95	99·80	130	99·92	237
28	98·98	110	98·99	120	98·87	95	98·95	95	99·80	130	100·10	258
29	99·01	110	.....	.....	98·87[1]	95	98·95	95	99·80	130	100·10	258
30	99·01	110	.....	.....	98·87	95	98·95[1]	95	99·91	130	100·10	258
31	99·02	110	.....	.....	98·86	95	.....	.....	99·93[1]	130	.....	.....

	July.		August.		September.		October.		November.		December.	
1	100·00	265	99·85	240	99·29	175	99·44	200	99·52	210	99·62	185
2	100·12	285	99·85	240	99·32	175	99·43	200	99·79	265	99·68	200
3	100·15	295	99·96	260	98·91	120	99·40	195	99·69	245	99·65	190
4	100·15	295	99·82	235	99·20	160	99·35	185	99·46	200	99·62	185
5	100·01	265	99·84	240	99·13	155	99·32	180	99·52	210	99·68	200
6	100·18	300	99·55	195	99·09	150	99·35	185	99·76	255	99·70	200
7	99·80	235	99·68	215	99·14	155	99·28	175	99·41	195	99·69	200
8	100·06	275	99·63	210	99·15	155	99·30	180	99·74	255	99·62	185
9	100·08	280	99·69	215	99·28	175	99·35	185	99·80	265	99·68	200
10	99·91	250	99·35	160	99·25	170	99·27	175	99·61	230	99·70	200
11	100·00	265	99·53	190	99·21	160	99·40	195	99·52	210	99·70	200
12	100·20	305	99·58	200	99·36	185	99·34	185	99·59	230	99·72	200
13	100·00	265	99·44	170	99·55	215	99·46	200	99·60	230	99·69	200
14	100·02	270	99·39	170	99·30	175	99·69	215	99·52	210	99·69	200
15	100·22	310	99·50	185	99·35	185	99·45	200	99·50	210	99·70	200
16	100·30	320	99·46	175	99·31	175	99·60	230	99·51	210	99·72	200
17	99·82	235	99·41	170	99·34	185	99·47	205	99·60	230	99·72	200
18	100·15	295	99·35	160	99·44	200	99·72	250	99·58	230	99·72	200
19	100·18	300	99·34	160	99·49	205	99·59	225	99·57	220	99·73	205
20	100·18	300	99·31	155	99·48	205	99·58	225	99·65	235	99·70	200
21	100·10	280	99·30	155	99·36	185	99·55	220	99·49	210	99·75	210
22	99·98	260	99·30	155	99·20	160	99·61	230	99·67	235	99·72	200
23	100·04	270	99·06	125	99·39	190	99·33	180	99·72	245	99·75	210
24	100·01	265	99·19	145	99·23	170	99·68	245	99·65	235	99·70	200
25	100·01	265	99·14	130	99·42	190	99·45	200	99·68	245	99·72	200
26	100·10	280	99·20	145	99·35	185	99·36	185	99·60	230	99·70	200
27	99·98	265	99·28	155	99·43	200	99·75	255	99·65	235	99·73	205
28	100·00	265	99·38	155	99·40	190	99·48	205	99·65	235	99·73	205
29	100·08	280	99·35	160	99·32	175	99·57	225	99·69	245	99·69	200
30	100·00	265	99·30	155	99·40	190	99·67	240	99·65	235	99·70	200
31	99·83	235	99·30	155	.....	.....	99·65	240	.....	.....	99·69	200

Note.—All gauge heights marked thus (1) interpolated. Gauge heights are readings on lake gauge at Keewatin bridge. Daily discharges up to April 30 are estimated from actual meterings.

MONTHLY DISCHARGE of Head-race, K. L. & M. Co., at 2nd Bridge, Keewatin 1913–14.

Month.	Discharge in Second-Feet.		
	Maximum.	Minimum.	Mean.
1913.			
May	110	110	110
June	110	105	107
July	105	105	105
August	110	110	110
September	110	100	105
October	110	110	110
November	110	110	110
December	110	110	110
The period	110	100	108

NOTE.—Daily discharges are estimated from actual meterings.

1914.			
January	110	110	110
February	120	120	120
March	100	95	98
April	95	95	95
May	130	95	114
June	295	225	258
July	320	235	276
August	260	125	180
September	215	120	177
October	255	175	208
November	265	195	230
December	210	185	200
The year	320	91	172

NOTE.—Daily discharges to end of May, 1914, are estimated from actual measurements.

C.P.R. CULVERT AT MINK BAY.

History.—This channel is a tunnel excavated in solid rock under the C.P.R. embankment, and connects Mink bay and Darlington bay, the latter being an arm of the Winnipeg river. The station was established on July 29, 1912, by S. S. Scovil, and has since been continuously maintained.

Location of Section.—The section is about 25 feet above the entrance to the tunnel, which is about 2,000 feet west of the old K. L. & M. mill on Mink bay, and forms the outlet for that bay into Darlington bay. The initial point is a stake driven in the bank at the west side of the channel, 25 feet above the mouth of the tunnel.

Records Available.—Meterings have been made at close intervals from July 29, 1912, but no gauge heights are available, so no discharge curve has been constructed.

Drainage Area.—Not significant, as most of the water flowing past this station is leakage through the K. L. & M. Co.'s head gates from lake of the Woods.

Gauge.—No gauge has been installed, water levels at the time of meterings being obtained by measuring down from a point of rock which is referred to W.P.S. datum.

Channel.—The channel is a rock cut, and is constant in section above and below point of metering.

Discharge Measurements.—The meterings are taken from a plank bridged across the channel, by Price meter.

Accuracy.—The results obtained are good, as the governing conditions are constant. No attempt has been made to obtain the daily discharges from daily gauge heights.

DISCHARGE MEASUREMENTS of Winnipeg River at 1st Tunnel C.P.R. Culvert, Keewatin, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 29	S. S. Scovil	.....	13	30	1·62	.....	48
1913.							
April 7	G. J. Lamb	1,375	15	43	2·53	−0·80	109
" 7	"	1,375	15	43	2·25	−0·80	97
" 8	"	1,375	15	40	2·43	−0·90	98
" 10	"	1,375	15	42	2·43	−0·90	101
May 20	"	1,375	15	40	2·30	−0·70	104
June 26	"	1,375	15	51	2·10	−0·50	107
Sept. 8	C. O. Allen	1,435	16	48	2·50	−0·82	121
" 8	"	1,435	16	48	2·52	−0·82	122
" 10	"	1,435	16	49	2·61	−0·82	127
" 10	"	1,435	16	49	2·55	−0·82	124
" 12	"	1,435	16	47	2·51	−0·90	118
" 12	"	1,435	16	47	2·57	−0·90	121
Dec. 23	E. J. Budge	1,186	16	49	2·25	−0·94	109
1914.							
Feb. 19	M. S. Madden	1,196	16	46	2·65	−0·94	122
" 19	"	1,196	16	46	2·63	−0·94	121
Mar. 25	S. C. O'Grady	1,196	17	46	2·04	−1·33	93
" 25	"	1,196	17	44	2·21	−1·33	96
April 24	"	1,196	16	41	2·44	−2·15	101
" 24	"	1,196	16	41	2·39	−2·15	99
July 11	"	1,196	22	71	4·12	−0·65	292
" 11	"	1,196	22	71	4·20	−0·65	297
Aug. 7	N. Galloway	1,196	16	61	4·20	−0·90	255
" 7	"	1,196	16	61	4·00	−0·90	243
Nov. 13	"	1,196	17	54	3·32	−1·46	181
" 13	"	1,196	17	54	3·25	−1·46	178
Dec. 8	"	1,196	17	56	3·30	−1·47	184

WAR EAGLE OUTLET.

History.—The station was established by Mr. S. S. Scovil on July 29, 1912.

Location of Section.—The station is situated at downstream end of the culvert under the C.P.R. embankment on the outlet of War Eagle lake, about one-quarter mile below the lake and near Darlington bay, into which it empties. The initial point is marked on the rock forming the right side of the channel at the mouth of the tunnel.

Records Available.—A number of meterings have been made during the period 1912-13, but no gauge records have been kept.

Drainage Area.—The area tributary is about 59 square miles.

Gauge.—No gauge has been established, but the elevation of the water surface is obtained by measuring down from a fixed point marked on the rock near the section.

Channel.—The channel is straight for 20 feet above the section and 60 feet below. The section is fairly uniform, being an artificial rock-cut.

Discharge Measurements.—The meterings are made from a plank bridged from side to side of the channel.

Accuracy.—As only a few discharge measurements have been made covering a very narrow range in stage, no estimate has been made of daily discharge.

Discharge Measurements of Winnipeg River at War Eagle Lake Outlet, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 29	S. S. Scovil	.....	43	44	0·47	.....	21[1]
1913.							
April 7	G. J. Lamb	1,375	3·7	26	3·84	.....	98
May 20	"	1,375	8·1	11	3·93	.....	10
Sept. 8	R. Emery	1,435	8·4	8·4	3·78	−0·46	6·6
" 8	C. O. Allen	1,435	8·4	8·4	3·75	−0·46	6·3
" 10	R. Emery	1,435	8·4	8·4	3·75	−0·42	6·3
" 10	"	1,435	8·4	8·4	3·74	−0·42	6·2
" 12	"	1,435	8·4	8·4	3·73	−0·43	6·2
" 12	"	1,435	8·4	8·4	3·76	−0·43	6·4
1914.							
Jan. 10	M. S. Madden	1,186	8·5	7	0·14	−0·30	2

[1]Float measurement.

North Tunnel Island.

History.—The station at North Tunnel island was established on June 28, 1912, by S. S. Scovil.

Location of Section.—The meter section is on the west branch of the Winnipeg river on the north side of Tunnel island about 1 mile below the Keewatin river bridge. The initial point of the section is chiselled in the rock on the south bank of the river, and is painted "I. P. W.P.S. El. 1039·88."

Records Available.—Frequent discharge measurements have been made since the establishment of the station, and daily discharges have been estimated for this section from the year 1907 to date.

Drainage Area.—The drainage area lying above this section is 26,400 square miles, but all of the water coming from this basin does not pass this section, as part of it goes through the east branch of the Winnipeg, the east and the west branch, joining a short distance below the section.

Gauge.—A vertical staff gauge, reading to tenths, was first located on a pile bent at the south end of the Keewatin River bridge, and to which all measurements at the station were referred. The zero of the gauge is referred to W.P.S. datum.

A vertical staff gauge read during metering is located on the north shore about 30 feet above the meter section, and is bolted to the rock. It is referred to W.P.S. datum.

Channel.—The river at this point is confined to a single channel at all stages, the bed of the stream is solid rock or boulders and of a very permanent nature, the banks are high and rocky, and the river is confined to its channel at all stages, and is straight for 100 feet above and below the station, the cross-section being approximately uniform throughout.

Discharge Measurements.—Numerous discharge measurements have been taken at this station and cover a range in stage of 6·3 feet. Owing to the fact that part of the water flowing past this section enters the river through the Lake of the Woods Milling Company's plants which discharge into Darlington bay, and part of the water is discharged through the Norman dam on the western outlet of the lake of the Woods, the conditions governing discharge at this point vary from time to time, and considerable difficulty is experienced in arriving

at the daily discharge by means of a discharge curve, the ponding effect in Darlington bay being very noticeable. The measurements are made from a boat.

Accuracy.—Owing to the presence of the mills and the operation of the Norman dam, the accuracy of the records are considerably affected.

DISCHARGE MEASUREMENTS of W. Branch Winnipeg River at North Tunnel Island, 1912.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Fet. per sec.	Feet.	Sec.-ft.
June 28	S. S. Scovil	1,374	156	4,115	1·05	32·62	4,340
July 17	"	1,374	155	4,080	0·94	32·60	3,851
" 27	"	1,374	155	4,054	0·97	32·72	3,952
" 28	"	1,374	155	4,017	0·83	32·58	3,330
" 30	"	1,374	155	4,033	1·02	32·72	4,126
Aug. 14	W. G. Worden	1,187	158	4,149	1·12	32·97	4,647
" 29	"	1,187	159	4,171	1·13	33·04	4,714
Sept 26	W. Richardson	1,462	159	4,190	1·22	33·43	5,131
Oct. 5	"	1,462	160	4,346	1·79	34·42	7,798
" 11	A. Pirie	1,462	161	4,480	1·81	35·18	8,510
" 12	"	1,462	161	4,480	1·84	35·23	8,230
" 16	"	1,462	163	4,508	1·99	35·38	8,993
" 18	"	1,462	163	4,558	2·20	35·74	10,048
Nov. 20	G. J. Lamb	1,187	164	4,563	1·90	35·82	8,670
" 25	"	1,187	164	4,588	2·14	35·86	9,819
" 26	"	1,187	164	4,588	2·08	35·95	9,544

DISCHARGE MEASUREMENTS of W. Branch, Winnipeg River at North Tunnel Island, 1913.

Date.	Hydrographer.	Meter. No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge	Gauge at Meter Section
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.	Feet
Feb. 21	G. J. Lamb	1,375	163	4,253	1·33	34·01	5,654	
" 23	"	1,375	163	4,232	1·19	33·76	5,033	
Mar. 12	"	1,375	163	4,240	1·39	33·91	5,909	
" 20	"	1,375	163	4,256	1·43	33·96	6,107	
" 21	"	1,375	163	4,256	1·40	33·99	5,978	
" 22	"	1,375	163	4,256	1·41	33·98	6,052	
" 22	"	1,375	163	4,256	1·41	33·98	6,030	
" 27	"	1,375	162	4,224	1·32	33·73	5,562	
" 27	"	1,375	163	4,224	1·33	33·73	5,615	
" 28	"	1,375	163	4,224	1·35	33·73	5,731	
" 28	"	1,375	163	4,224	1·30	33·71	5,476	
" 31	"	1,375	163	4,177	1·24	33·44	5,197	
April 8	"	1,375	162	4,190	1·36	33·57	5,714	
" 12	"	1,375	161	4,206	1·39	33·64	5,835	
" 14	"	1,375	160	4,171	1·25	33·41	5,194	
" 16	"	1,375	162	4,206	1·42	33·67	5,963	
June 24	"	1,375	182	5,250	3·56	39·85	18,701	
" 28	"	1,375	182	5,267	3·49	39 96	18,420	
July 11	R. Emery	1,375	173	4,930	2·46	38·02	12,115	
" 14	"	1,375	170	4,797	2·54	37·39	12,215	
" 15	"	1,375	179	4,798	2·48	37 50	11,880	
Aug 1	"	1,375	174	4,986	3·01	38·40	15,024	
" 5	"	1,375	174	4,982	2·80	38 33	13,947	
" 6	"	1,375	174	4,983	2·85	38 34	14,216	
" 21	G. J. Lamb	1,375	173	4,915	2·85	38 13	14,039	
" 26	"	1,375	172	4,915	2·86	38·03	14,068	37 81
" 26	"	1,375	172	4,899	2·86	37·02	14,009	37 80
" 26	"	1,375	172	4,899	2·82	37 02	13,817	37 80
" 27	"	1,375	172	4,91	2·96	37·06	14,530	37 82
" 27	"	1,375	172	4,916	2·89	37 06	14,174	37 82
" 28	"	1,375	172	4,916	2·83	37·08	13,916	37 84
" 28	"	1,375	172	4,916	2·77	37 08	13,606	37 85
" 28	"	1,375	173	4,916	2 78	37 08	13,652	37 85

Discharge Measurements of W. Branch, Winnipeg River at North Tunnel Island, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.	Gauge at Meter Section.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	Feet.
Aug. 28	G. J. Lamb	1,375	173	4,916	2·79	38·08	13,729	37·84
" 29	"	1,375	172	4,898	2·86	38·02	13,991	37·81
" 29	"	1,375	171	4,898	2·90	38·02	14,176	37·81
" 29	"	1,375	172	4,898	2·86	38·02	14,003	37·81
" 29	"	1,375	172	4,898	2·84	38·02	13,907	37·81
" 29	"	1,375	172	4,898	2·75	38·02	13,423	37·81
" 29	"	1,375	172	4,898	2·82	38·02	13,787	37·81
" 30	"	1,375	172	4,898	2·90	38·04	14,180	37·81
" 30	"	1,375	172	4,898	2·88	38·03	14,087	37·83
" 31	"	1,375	172	4,881	2·72	37·89	13,234	37·70
" 31	"	1,375	172	4,881	2·76	37·87	13,501	37·65
Sept. 1	"	1,375	172	4,881	2·83	37·89	13,820	37·70
" 1	"	1,375	172	4,881	2·85	37·93	13,956	37·72
" 2	"	1,375	172	4,881	2·79	37·90	13,644	37·72
" 2	"	1,375	172	4,881	2·81	37·90	13,736	37·71
" 3	"	1,375	172	4,881	2·74	37·90	13,382	37·69
" 3	"	1,375	172	4,881	2·77	37·90	13,501	37·69
" 4	"	1,375	172	4,850	2·87	37·91	13,901	37·73
" 5	"	1,375	172	4,850	2·78	37·90	13,488	37·68
" 5	"	1,375	172	4,850	2·82	37·90	13,719	37·70
" 5	"	1,375	172	4,850	2·77	37·90	13,416	37·70
" 6	"	1,375	172	4,850	2·72	37·90	13,208	37·70
" 6	"	1,375	172	4,850	2·76	37·90	13,376	37·70
" 7	"	1,375	172	4,833	2·76	37·77	13,300	37·58
" 7	"	1,375	172	4,833	2·71	37·75	13,066	37·57
" 8	"	1,375	172	4,816	2·73	37·77	13,125	37·55
" 8	"	1,375	172	4,833	2·64	37·77	12,766	37·57
" 21	"	1,375	171	4,799	2·38	37·60	11,427	37·43
" 21	"	1,375	171	4,782	2·39	37·49	11,411	37·35
" 22	"	1,375	171	4,782	2·65	37·66	12,637	37·33
" 22	"	1,375	171	4,782	2·50	37·53	11,917	37·37
" 23	"	1,375	166	4,725	2·21	37·07	10,414	36·98
" 23	"	1,375	166	4,709	2·09	37·07	9,838	36·95
" 24	"	1,776	166	4,660	1·98	36·69	9,215	36·58
" 24	"	1,375	165	4,660	2·00	36·70	9,302	36·60
" 25	"	1,776	165	4,627	2·00	36·50	9,249	36·42
" 25	"	1,776	165	4,627	2·00	36·50	9,249	36·41
" 26	"	1,776	165	4,631	1·98	36·41	9,173	36·31
" 26	"	1,776	165	4,631	2·00	36·41	9,294	36·31
" 27	"	1,776	165	4,586	1·98	36·19	9,054	36·13
" 27	"	1,776	165	4,582	1·86	36·19	8,465	36·11
" 28	"	1,776	163	4,480	1·45	35·60	6,494	35·52
" 28	"	1,776	163	4,526	1·46	35·53	6,603	35·50
" 29	"	1,776	162	4,432	1·62	35·29	7,188	35·22
" 29	"	1,776	162	4,432	1·60	35·31	7,408	35·24
" 30	"	1,776	162	4,396	1·67	35·36	7,337	35·28
Oct. 1	"	1,776	162	4,432	1·60	35·28	7,101	35·20
" 2	E. J. Budge	1,776	162	4,416	1·70	35·28	7,511	35·12
" 2	"	1,776	162	4,416	1·58	35·28	6,984	35·10
" 3	"	1,776	162	4,400	1·61	35·11	7,100	35·05
" 3	"	1,776	162	4,400	1·68	35·11	7,404	35·05
" 4	"	1,776	162	4,400	1·59	35·08	7,014	35·02
" 4	"	1,776	162	4,400	1·63	35·08	7,173	35·01
" 5	"	1,776	162	4,367	1·41	34·92	6,171	34·77
" 5	"	1,776	161	4,346	1·45	34·76	6,316	34·72
" 6	"	1,776	161	4,335	1·60	34·78	6,937	34·65
" 7	"	1,776	161	4,367	1·58	34·88	6,916	34·83
" 8	"	1,776	161	4,367	1·62	34·89	7,091	34·81
" 9	"	1,776	161	4,367	1·61	34·84	7,016	34·80
" 10	"	1,776	161	4,368	1·67	34·78	7,300	34·85
" 11	"	1,776	161	4,367	1·61	34·86	7,029	34·85
" 13	"	1,776	161	4,303	1·60	34·58	6,880	34·47
" 14	"	1,776	161	4,335	1·61	34·80	7,013	34·65
" 15	"	1,776	161	4,351	1·60	34·78	6,972	34·71
" 18	"	1,186	161	4,351	1·64	34·79	7,140	34·71
" 21	"	1,186	161	4,303	1·61	34·52	6,941	34·40
" 22	"	1,186	161	4,319	1·58	34·61	6,803	34·52
" 24	"	1,186	161	4,335	1·62	34·72	7,006	34·64
" 27	"	1,186	161	4,272	1·55	34·50	6,603	34·36
" 29	"	1,186	161	4,335	1·66	34·68	7,176	34·61
" 31	"	1,186	161	4,335	1·65	34·68	7,126	34·65
Nov. 5	"	1,186	160	4,319	1·63	34·63	7,026	34·55
" 8	"	1,186	161	4,335	1·50	34·66	6,771	34·67
" 11	"	1,186	161	4,319	1·61	34·62	6,962	34·51
" 13	"	1,186	161	4,335	1·60	34·63	6,933	34·60
" 15	"	1,186	161	4,335	1·56	34·68	6,769	34·61
" 18	"	1,186	161	4,319	1·57	34·63	6,765	34·53
" 20	"	1,186	161	4,334	1·67	34·63	7,242	34·61
" 22	"	1,186	161	4,335	1·65	34·70	7,151	34·65
" 25	"	1,186	160	4,319	1·64	34·61	7,069	34·51

SESSIONAL PAPER No. 25f

Discharge Measurements of West Branch, Winnipeg River at North Tunnel Island, 1913—*Continued.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.	Gauge at Meter Section.
1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
Dec. 1	M. S. Madden	1,186	160	4,323	1·63	34·46	7,064	34·44
" 6	E. J. Budge	1,186	160	4,315	1·55	34·55	6,668	34·64
" 12	S. C. O'Grady	1,186	161	4,335	1·58	34·68	6,868	34·60
" 20	"	1,186	161	4,365	1·65	34·57	7,218	34·45
" 24	E. J. Budge	1,186	160	4,372	1·60	34·57	7,008	34·50
" 30	M. S. Madden	1,186	161	4,365	1·67	34·54	7,286	34·49
" 30	E. J. Budge	1,186	161	4,365	1·63	34·54	7,124	34·49

Assiniboine River, Brandon. Gauge at Bridge.

Discharge Measurements of West Branch, Winnipeg River at North Tunnel Island, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.	Gauge at Meter Section.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
Jan. 7	M. S. Madden	1,186	161	4,351	1·55	34·49	6,731	34·41
" 7	"	1,186	161	4,351	1·62	34·49	7,028	34·42
" 17	"	1,196-7	160	4,365	1·61	34·56	7,018	34·52
" 21	S. C. O'Grady	1,196-7	161	4,352	1·65	34·50	7,077	34·44
" 22	"	1,196-7	161	4,337	1·52	34·32	6,582	34·25
" 22	"	1,196-7	161	4,337	1·52	34·32	6,586	34·25
" 27	M. S. Madden	1,196-7	160	4,351	1·55	34·47	6,733	34·39
" 27	"	1,196-7	160	4,352	1·53	34·47	6,653	34·39
" 31	"	1,196-7	161	4,365	1·61	34·55	7,049	34·49
Feb. 2	"	1,196-7	160	4,321	1·60	34·35	6,827	34·22
" 11	S. C. O'Grady	1,196-7	160	4,307	1·52	34·53	6,658	34·49
" 12	"	1,196-7	160	4,307	1·52	34·52	6,660	34·49
" 16	M. S. Madden	1,196-7	160	4,321	1·52	34·38	6,572	34·25
" 18	"	1,196-7	160	4,305	1·52	34·52	6,822	34·50
" 18	"	1,196-7	160	4,365	1·52	34·53	6,642	34·50
" 23	"	1,196-7	160	4,400	1·74	34·84	7,665	34·66
" 23	"	1,196-7	160	4,415	1·79	34·92	7,899	34·74
" 25	"	1,196-7	160	4,404	2·00	35·48	8,979	35·32
" 25	"	1,196-7	160	4,404	2·04	35·49	9,153	35·33

DISCHARGE MEASUREMENTS of West Branch, Winnipeg River at North Tunnel Island, 1914—*Continued.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.	Gauge at Meter Section.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
Mar. 2	S. C. O'Grady	1,196-7	162	4,529	2·07	35·58	9,406	35·45
" 2	"	1,196-7	162	4,543	2·06	35·68	9,386	35·55
" 4	T. J. Moore	1,196-7	162	4,576	2·04	35·80	9,313	35·80
" 4	"	1,196-7	162	4,576	2·05	35·80	9,399	35·80
" 6	S. C. O'Grady	1,196-7	162	4,576	2·06	35·84	9,441	35·80
" 18	"	1,196-7	162	4,592	2·06	36·00	9,436	35·84
" 18	"	1,196-7	162	4,592	2·02	36·00	9,277	35·84
" 23	"	1,196-7	162	4,544	1·96	35·76	8,896	35·59
" 23	"	1,196-7	162	4,560	2·00	35·76	9,160	35·65
" 28	T. J. Moore	1,196-7	162	4,576	2·02	35·92	9,256	35·79
" 28	"	1,196-7	162	4,576	2·06	35·92	9,428	35·79
" 30	"	1,196-7	162	4,529	1·98	35·67	8,977	35·50
" 30	"	1,196-7	162	4,529	1·96	35·67	8,885	35·55
April 1	"	1,196	162	4,560	2·00	35·81	9,147	35·67
" 1	"	1,196	162	4,560	2·07	35·81	9,459	35·67
" 3	S. C. O'Grady	1,196	162	4,560	2·04	35·87	9,314	35·70
" 3	"	1,196	162	4,560	2·04	35·87	9,323	35·70
" 6	"	1,196	162	4,529	1·86	35·70	8,520	35·51
" 6	"	1,196	162	4,513	1·86	35·70	8,380	35·42
" 8	"	1,196	162	4,560	2·04	35·82	9,270	35·71
" 8	"	1,196	162	4,560	2·03	35·82	9,137	35·71
" 11	T. J. Moore	1,196	162	4,527	1·85	35·64	8,359	35·50
" 14	S. C. O'Grady	1,196	162	4,529	1·99	35·63	9,047	35·50
" 16	"	1,196	162	4,544	1·87	35·70	8,512	35·59
" 16	"	1,196	162	4,544	1·83	35·70	8,330	35·59
" 18	"	1,196	162	4,529	1·90	35·68	8,635	35·55
" 20	T. J. Moore	1,196	162	4,544	2·06	35·73	9,343	35·58
" 20	"	1,196	162	4,544	2·02	35·73	9,220	35·62
" 22	S. C. O'Grady	1,196	162	4,576	2·12	35·90	9,694	35·80
" 22	"	1,196	162	4,576	2·15	35·90	9,823	35·80
" 23	"	1,196	162	4,560	2·00	35·81	9,117	35·70
" 23	"	1,196	162	4,560	2·02	35·81	9,235	35·70
" 24	"	1,196	162	4,544	2·05	35·77	9,336	35·65
" 24	"	1,196	162	4,544	2·00	35·77	9,103	35·65
" 27	"	1,196	162	4,529	1·80	35·61	8,133	35·50
" 27	"	1,196	162	4,529	1·85	35·61	8,353	35·52
" 29	T. J. Moore	1,196	162	4,592	2·18	35·95	10,001	35·85
" 29	"	1,196	162	4,592	2·11	35·95	9,689	35·85
" 30	"	1,196	162	4,592	2·15	35·97	9,879	35·87
" 30	"	1,196	162	4,592	2·11	35·97	9,682	35·87
May 1	"	1,196	162	4,592	2·13	36·00	9,762	35·87
" 1	"	1,196	162	4,592	2·14	36·00	9,819	35·87
" 2	"	1,196	162	4,592	2·14	36·02	9,851	35·90
" 2	"	1,196	162	4,592	2·08	36·02	9,552	35·90
" 8	"	1,462	162	4,656	2·19	36·42	10,184	36·30
" 8	"	1,462	162	4,656	2·19	36·40	10,217	36·29
" 11	"	1,462	162	4,624	1·87	36·22	8,662	36·07
" 11	"	1,462	162	4,624	2·09	36·22	9,638	36·13
" 12	C. C. Galloway	1,462	162	4,656	2·14	36·40	9,946	36·32
" 12	"	1,462	162	4,656	2·23	36·40	10,342	36·32
" 14	T. J. Moore	1,196	162	4,671	2·23	36·55	10,166	36·40
" 14	"	1,196	162	4,671	2·22	36·55	10,391	36·42
" 15	"	1,196	162	4,671	2·28	36·52	10,670	36·40
" 16	"	1,196	162	4,671	2·28	36·52	10,650	36·40
" 16	"	1,196	162	4,671	2·13	36·45	9,979	36·32
" 18	"	1,196	162	4,640	2·34	36·32	10,880	36·20
" 18	"	1,196	162	4,640	2·22	36·36	10,406	36·24
" 21	"	1,196	162	4,719	2·72	36·95	12,123	36·76
" 22	"	1,196	162	4,782	2·53	37·32	12,086	37·14
" 22	"	1,196	162	4,782	2·73	37·32	13,055	37·15
" 26	C. C. Galloway	1,462	162	4,830	2·77	37·60	13,352	37·42
" 26	"	1,462	162	4,830	2·67	37·60	13,326	37·42
" 28	"	1,462	169	4,926	3·15	38·14	15,527	37·93
" 28	"	1,462	169	4,926	3·14	38·14	15,459	37·94
" 30	S. C. O'Grady	1,196	174	5,022	3·21	38·70	16,111	38·42
" 30	"	1,196	174	5,022	3·23	38·70	16,227	38·42
June 2	C. C. Galloway	1,462	174	5,041	3·16	38·75	15,945	38·53
" 2	"	1,462	174	5,041	3·18	38·75	16,066	38·53
" 4	"	1,462	174	5,081	3·22	38·95	16,379	38·81
" 4	"	1,462	174	5,081	3·21	38·95	16,338	38·81
" 10	T. J. Moore	1,196	174	5,161	3·40	39·50	17,665	39·22
" 10	"	1,196	174	5,161	3·35	39·50	17,284	39·28
" 16	"	1,196	179	5,166	3·30	39·50	17,071	39·26
" 16	"	1,196	179	5,166	3·30	39·50	17,181	39·27
" 18	C. C. Galloway	1,196	179	5,182	3·28	39·57	17,025	39·26
" 18	"	1,196	179	5,182	3·18	39·57	16,499	39·28
" 22	T. J. Moore	1,196	179	5,217	3·45	39·58	17,994	39·40
" 22	"	1,196	179	5,217	3·35	39·58	17,504	39·47
" 25	"	1,196	181	5,273	3·66	40·20	19,288	39·82

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of West Branch, Winnipeg River at North Tunnel Island for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.	Gauge at Meter Section.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
June 25	"	1,196	181	5,273	3·64	40·20	19,186	39·82
" 27	"	1,196	181	5,273	3·56	40·18	18,764	39·82
" 27	"	1,196	181	5,273	3·60	40·18	18,999	39·82
July 9	S. C. O'Grady	1,196	179	5,365	3·42	40·14	18,356	39·80
" 9	"	1,196	179	5,365	3·59	40·14	19,270	39·80
" 21	C. C. Galloway	1,196	181	4,992	3·85	40·22	19,208	39·85
" 21	"	1,196	181	4,992	3·78	40·22	18,905	39·85
" 30	"	1,196	181	5,223	3·68	40·15	19,240	39·85
" 30	"	1,196	181	5,223	3·78	40·15	19,714	39·85
Aug. 3	"	1,196	180	5,231	3·67	39·88	19,192	39·61
" 3	"	1,196	180	5,231	3·60	39·88	18,883	39·63
" 5	T. J. Moore	1,196	181	5,264	3·73	40·00	19,644	39·75
" 13	S. C. O'Grady	1,196	177	5,280	3·42	39·73	17,960	39·43
" 13	"	1,196	177	5,280	3·42	39·73	18,069	39·43
" 18	"	1,196	177	5,199	3·57	39·59	18,569	39·38
" 18	"	1,196	177	5,199	3·73	39·59	19,372	39·38
" 22	C. C. Galloway	1,196	177	5,199	3·48	39·70	18,078	39·42
Sept. 15	S. C. O'Grady	1,196	171	4,827	2·67	37·41	12,870	37·24
" 15	"	1,196	171	4,827	2·62	37·41	12,644	37·24
" 22	"	1,196	171	4,834	2·56	37·47	12,385	37·30
" 24	"	1,196	171	4,843	2·60	37·49	12,545	37·33
" 24	"	1,196	171	4,843	2·52	37·49	12,217	37·33
" 29	"	1,196	172	4,817	2·58	37·32	12,437	37·18
Oct. 3	C. C. Galloway	1,196	172	4,819	2·60	37·42	12,530	37·22
Nov. 3	S. C. O'Grady	1,196	163	4,529	1·94	35·62	8,797	35·51
" 11	"	1,196	163	4,554	1·97	35·71	8,970	35·65
" 16	"	1,196	163	4,530	1·93	35·58	8,648	35·52
" 16	"	1,196	163	4,530	1·80	35·58	8,151	35·52
" 19	"	1,196	163	4,554	1·98	35·73	9,009	35·65
" 19	"	1,196	163	4,554	1·98	35·73	9,032	35·65
" 23	C. C. Galloway	1,196	163	4,493	1·89	35·55	8,517	35·36
" 23	"	1,196	163	4,506	1·96	35·55	8,830	35·36
" 27	"	1,196	163	4,553	1·83	35·79	8,324	35·65
" 27	S. C. O'Grady	1,196	163	4,553	1·91	35·76	8,701	35·65
" 30	C. C. Galloway	1,196	163	4,582	2·00	35·79	9,040	35·46
Dec. 4	"	1,196	163	4,561	2·02	35·83	9,203	35·69
" 9	S. C. O'Grady	1,718	163	4,521	1·84	35·55	8,295	35·42
" 9	"	1,718	163	4,521	1·89	35·55	8,530	35·42
" 14	"	1,718	163	4,514	1·98	35·51	8,946	35·42
" 16	"	1,718	163	4,530	1·95	35·62	8,847	35·50
" 16	"	1,718	163	4,530	1·97	35·62	8,921	35·50
" 19	"	1,718	163	4,537	1·94	35·64	8,778	35·50
" 22	"	1,718	163	4,563	1·97	35·60	8,979	35·53
" 22	"	1,718	163	4,563	1·95	35·60	8,891	35·53
" 24	C. C. Galloway	1,718	163	4,571	1·95	35·61	8,919	35·57
" 24	"	1,178	163	4,571	1·94	35·61	8,851	35·57
" 28	"	1,718	163	4,531	1·93	35·51	8,759	35·37
" 28	"	1,718	163	4,531	1·94	35·51	8,807	35·37
" 31	"	1,718	163	4,563	1·94	35·64	8,854	35·56
" 31	"	1,718	163	4,563	1·95	35·64	8,922	35·56

Daily Gauge Height and Discharge of West Branch, Winnipeg River at North Tunnel Island for 1912.

Drainage area, 26,400 square miles.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	73·80	4,290	73·70	4,160	74·10	4,720	74·10	4,720	74·30	5,030	74·40	5,190
2	73·80	4,290	73·70	4,160	74·10	4,720	74·10	4,720	74·40	5,190	74·10	4,720
3	73·80	4·290	73·75	4,225	78·10	4,720	74·15	4,795	74·40	5,190	73·80	4,290
4	73·80	4,290	73·75	4,225	74·10	4,720	74·15	4,795	74·40	5,190	74·20	4,870
5	73·80	4,290	73·80	4,290	74·00	4,570	74·15	4,795	74·50	5,350	74·30	5,030
6	73·80	4,290	73·80	4,290	74·00	4,570	74·15	4,795	74·50	5,350	74·20	4,870
7	73·80	4,290	73·80	4,290	74·00	4,570	74·15	4,795	74·50	5,350	73·90	4,430
8	73·80	4,290	73·80	4,290	74·00	4,570	74·15	4,795	74·55	5,435	73·90	4,430
9	73·80	4,290	73·80	4,290	74·00	4,570	74·15	4,795	74·60	5,520	73·80	4,290
10	73·80	4,290	73·80	4,290	74·10	4,720	74·15	4,795	74·60	5,520	73·60	4,040
11	73·80	4,290	73·80	4,290	74·10	4,720	74·20	4,870	74·60	5,520	73·50	3,920
12	73·80	4,290	73·85	4,360	74·10	4,720	74·20	4,870	74·65	5,605	73·60	4,040
13	73·80	4,290	73·85	4,360	74·05	4,645	74·20	4,870	74·65	5,605	73·80	4,290
14	73·80	4,290	73·85	4,360	74·05	4,645	74·20	4,870	74·70	5,690	73·80	4,290
15	73·80	4,290	73·85	4,360	74·05	4,645	74·20	4,870	74·70	5,690	73·80	4,290
16	73·70	4,160	73·85	4,360	74·05	4,645	74·20	4,870	74·70	5,690	73·80	4,290
17	73·70	4,160	73·90	4,430	74·05	4·645	74·25	4,950	74·50	5,350	73·90	4,430
18	73·75	4,225	73·90	4,430	74·05	4,645	74·25	4,950	74·50	5,350	73·90	4,430
19	73·75	4,225	73·95	4,500	74·05	4·645	74·25	4,950	74·40	5,190	74·00	4,570
20	73·75	4,225	73·95	4,500	74·05	4,645	74·25	4,950	74·40	5,190	74·00	4,570
21	73·75	4,225	73·95	4,500	74·05	4,645	74·30	5,030	74·40	5,190	74·00	4,570
22	73·75	4,225	73·95	4,500	74·05	4,645	74·30	5,030	74·40	5,190	73·85	4,360
23	73·75	4,225	73·95	4,500	74·05	4,645	74·30	5,030	74·45	5,270	73·80	4,290
24	73·75	4,225	74·00	4,570	74·05	4·645	74·35	5,110	74·40	5,190	73·60	4,040
25	73·75	4,225	74·00	4,570	74·05	4,645	74·35	5,110	74·30	5,030	73·60	4,040
26	73·80	4,290	74·00	4,570	74·05	4,645	74·35	5,110	74·30	5,030	73·60	4,040
27	73·80	4,290	74·10	4,720	74·05	4,645	74·40	5,190	74·30	5,030	73·65	4,100
28	73·80	4,290	74·10	4,720	74·05	4,645	74·40	5,190	74·30	5,030	73·60	4,040
29	73·70	4,160	74·10	4,720	74·05	4,645	74·40	5,190	74·30	5,030	73·60	4,040
30	73·70	4,160	.....	.....	74·05	4,645	74·40	5,190	74·30	5,030	73·60	4,040
31	73·75	4,225	.....	.....	74·05	4,645	.....	.....	74·20	4,870	.....	.....

	July.		August.		September.		October.		November.		December.	
1	73·50	3,920	73·60	4,040	73·70	4,160	74·40	5,190	76·95	10,430	76·90	10,320
2	73·15	3,540	73·55	3,980	73·80	4,290	74·40	5,190	77·00	10,540	76·70	9,880
3	73·40	3,810	73·60	4,040	74·00	4,570	74·45	5,270	76·75	9,990	76·80	10,100
4	73·40	3,810	73·60	4,040	74·00	4,570	75·00	6,240	76·85	10,210	76·80	10,100
5	73·45	3,865	73·65	4,100	74·20	4,870	75·35	6,945	76·95	10,430	76·80	10,100
6	73·45	3,865	73·70	4,160	74·00	4,570	75·30	6,840	76·95	10,430	76·80	10,100
7	73·50	3,920	73·75	4,225	74·05	4,645	75·70	7,680	76·90	10,320	76·80	10,100
8	73·50	3,920	73·80	4,290	73·85	4,360	75·85	8,010	76·20	8,780	76·90	10,320
9	73·50	3,920	73·80	4,290	73·95	4,500	75·85	8,010	76·10	8,560	76·90	10,320
10	73·50	3,920	73·85	4,360	74·00	4,570	76·00	8,340	75·80	7,900	76·95	10,430
11	73·40	3,810	73·85	4,360	74·05	4,645	76·10	8,560	75·70	7,680	77·00	10,540
12	73·50	3,920	73·80	4,290	74·05	4,645	76·10	8,560	75·95	8,230	77·00	10,540
13	73·40	3,810	73·80	4,290	74·10	4,720	75·95	8,230	76·50	9,440	77·00	10,540
14	73·50	3,920	73·85	4,360	74·10	4,720	76·05	8,450	76·70	9,880	77·00	10,540
15	73·30	3,700	73·90	4,430	74·10	4,720	76·15	8,670	76·75	9,990	77·00	10,540
16	73·50	3,920	73·90	4,430	74·08	4,570	76·30	9,000	76·70	9,880	77·00	10,540
17	73·50	3,920	73·90	4,430	74·05	4,645	76·55	9,550	76·65	9,770	77·00	10,540
18	73·50	3,920	73·90	4,430	.....	4,645	.....	9,880	76·70	9,880	77·00	10,540
19	73·35	3,755	73·65	4,100	74·00	4,570	76·80	10,100	76·75	9,990	77·00	10,540
20	73·30	3,700	73·90	4,430	74·05	4,645	76·60	9,660	76·80	10,100	77·00	10,540
21	73·35	3,755	73·95	4,500	74·10	4,720	76·65	9,770	76·80	10,100	77·00	10,540
22	73·30	3,700	73·95	4,500	74·00	4,570	76·80	10,100	76·85	10,210	76·90	10,320
23	73·35	3,755	74·00	4,570	74·10	4,720	77·00	10,540	76·90	10,320	76·80	10,100
24	73·50	3,920	74·05	4,645	74·20	4,870	76·95	10,430	76·80	10,100	76·90	10,320
25	73·50	3,920	73·85	4,360	74·30	5,030	76·95	10,430	76·85	10,210	76·90	10,320
26	73·55	3,980	73·80	4,290	74·35	5,110	76·80	10,100	76·90	10,320	76·95	10,430
27	73·60	4,040	73·95	4,500	74·35	5,110	76·65	9,770	77·00	10,540	76·95	10,430
28	73·60	4,040	73·95	4,500	74·40	5,190	76·70	9,880	77·10	10,760	76·95	10,430
29	73·60	4,040	74·00	4,570	74·20	4,870	76·75	9,990	77·00	10,540	76·85	10,210
30	73·55	3,980	74·05	4,645	74·30	5,030	76·85	10,210	77·00	10,540	76·90	10,320
31	73·55	3,980	74·00	4,570	.....	.....	76·95	10,430	.....	.....	76·90	10,320

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of West Branch, Winnipeg River at North Tunnel Island for 1913.

Drainage area, 26,400 square miles.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	10,320	35·94	10,320	33·96	6,050	33·61	5,435	38·09	15,050	39·80	18,790
2	.....	10,320	.....	10,200	.....	6,050	33·66	5,520	38·15	15,160	39·79	18,790
3	.....	10,430	.....	10,200	.....	6,050	33·64	5,520	38·23	15,270	39·95	19,120
4	36·01	10,430	.....	10,100	.....	6,050	33·58	5,350	38·14	15,160	40·02	19,230
5	.....	10,430	.....	10,100	.....	5,960	33·58	5,350	38·10	15,050	40·08	19,340
6	.....	10,320	.....	10,000	.....	5,960	33·46	5,190	38·30	15,490	40·11	19,450
7	.....	10,320	.....	10,000	.....	5,960	33·54	5,350	38·42	15,710	40·08	19,340
8	.....	10,210	35·76	9,880	33·91	5,960	33·56	5,350	38·42	15,710	39·95	19,120
9	.....	10,210	.....	9,730	.....	5,960	33·66	5,520	38·45	15,820	39·88	18,900
10	.....	10,100	.....	9,580	33·56	5,350	33·70	5,605	38·50	15,930	40·02	19,230
11	35·86	10,100	.....	9,430	33·86	5,870	33·68	5,520	38·31	15,490	40·08	19,340
12	.....	10,100	.....	9,230	33·91	5,960	33·66	5,520	38·28	15,380	40·15	19,560
13	.....	10,100	.....	9,080	33·94	6,050	33·55	5,270	38·60	16,260	40·14	19,560
14	.....	10,100	.....	8,930	33·96	6,050	33·51	5,270	39·00	17,030	40·05	19,340
15	.....	10,100	35·28	8,780	33·96	6,050	33·61	5,435	39·42	17,910	39·84	18,900
16	.....	10,100	.....	8,400	33·76	5,690	33·67	5,520	39·56	18,240	39·83	18,790
17	.....	10,100	.....	8,100	33·58	5,350	33·79	5,780	39·60	18,350	39·96	19,120
18	35·86	10,100	.....	7,700	33·84	5,870	33·91	5,960	39·55	18,240	39·99	19,230
19	.....	10,100	.....	7,400	33·88	5,870	33·97	6,050	39·58	18,240	40·01	19,230
20	.....	10,100	.....	7,000	33·96	6,050	33·81	5,780	39·65	18,460	40·01	19,230
21	.....	10,100	.....	6,700	33·98	6,050	33·80	5,780	39·70	18,570	39·97	19,120
22	.....	10,100	.....	6,300	33·98	6,050	34·94	8,120	39·79	18,790	39·88	18,900
23	.....	10,210	.....	6,000	33·76	5,690	35·70	9,770	40·12	19,450	39·72	18,570
24	.....	10,210	33·76	5,690	33·59	5,435	36·51	11,530	39·76	18,680	39·84	18,700
25	35·91	10,210	.....	5,780	33·76	5,690	37·14	12,960	39·66	18,460	39·94	18,820
26	.....	10,210	.....	5,870	33·74	5,690	37·46	13,620	39·68	18,460	39·95	18,700
27	.....	10,210	.....	5,870	33·74	5,690	37·41	13,510	39·78	18,680	39·93	18,450
28	.....	10,210	.....	5,960	33·73	5,605	37·52	13,730	39·80	18,790	39·94	18,420
29	.....	10,210	.....	.....	33·70	5,605	37·85	14,500	39·85	18,900	39·82	18,100
30	.....	10,210	.....	.....	33·58	5,350	38·00	14,830	39·90	19,010	39·78	18,100
31	.....	10,210	.....	.....	33·48	5,190	.....	.....	39·94	19,120	.....	.....

	July.		August.		September.		October.		November.		December.	
1	39·73	17,950	38·46	15,020	37·91	13,880	35·28	7,100	34·70	7,100	34·38	7,050
2	39·64	17,850	38·49	14,850	37·90	13,690	35·18	7,250	34·45	6,600	34·59	7,300
3	39·83	18,100	38·31	14,250	37·90	13,440	35·12	7,250	34·37	6,480	34·65	7,450
4	39·84	18,250	38·28	14,000	37·91	13,500	35·07	7,100	34·57	6,900	34·68	7,450
5	39·80	17,750	38·38	13,950	37·89	13,540	34·83	6,240	34·63	7,020	34·70	7,100
6	39·60	17,000	38·37	14,220	37·90	13,290	34·64	6,930	34·63	7,060	34·69	6,670
7	39·50	16,400	38·41	14,280	37·80	13,180	34·84	6,910	34·67	7,050	34·43	6,000
8	39·31	15,750	38·47	14,480	37·76	12,950	34·87	7,090	34·70	6,770	34·41	6,050
9	38·80	14,300	38·45	14,430	37·87	13,150	34·86	7,010	34·48	6,350	34·57	6,400
10	38·13	12,600	38·24	13,980	37·90	13,170	34·89	7,300	34·40	6,200	34·63	6,550
11	38·00	12,100	38·24	13,980	37·93	13,270	34·86	7,030	34·58	6,960	34·67	6,650
12	37·87	12,100	38·35	14,250	37·90	13,200	34·64	6,900	34·65	7,000	34·68	6,870
13	37·59	11,920	38·36	14,300	37·90	13,230	34·51	6,880	34·68	6,930	34·68	6,850
14	37·40	12,210	38·34	14,250	37·82	13,050	34·71	7,010	34·70	6,850	34·40	6,400
15	37·48	11,880	38·43	14,500	37·81	13,000	34·77	6,970	34·70	6,770	34·35	6,350
16	37·50	11,970	38·45	14,550	37·89	13,180	34·78	7,000	34·48	6,300	34·55	6,850
17	37·50	12,000	38·27	14,150	37·90	13,200	34·78	7,050	34·58	6,300	34·56	6,950
18	37·49	12,000	38·13	13,850	37·95	13,300	34·80	7,140	34·61	6,760	34·58	7,050
19	37·45	12,000	38·14	13,960	38·02	13,450	34·57	6,550	34·67	6,900	34·58	7,180
20	37·20	11,600	38·17	13,950	37·91	12,600	34·31	6,050	34·70	7,240	34·57	7,220
21	37·17	11,600	38·20	14,040	37·62	11,420	34·41	6,940	34·70	7,200	34·35	6,700
22	37·27	11,850	38·18	14,300	37·43	12,280	34·62	6,800	34·70	7,150	34·34	6,700
23	37·35	12,050	38·16	14,250	37·02	10,130	34·67	6,900	34·47	6,700	34·55	6,900
24	37·84	13,250	38·04	14,000	36·65	9,260	34·68	7,000	34·37	6,550	34·58	7,000
25	38·25	14,200	37·99	13,900	36·51	9,250	34·72	7,050	34·58	7,040	34·36	6,500
26	38·31	14,300	38·02	13,900	36·38	9,230	34·47	6,780	34·65	7,100	34·34	6,600
27	38·15	14,100	38·04	14,350	36·12	8,760	34·40	6,600	34·66	7,230	34·55	7,000
28	38·13	14,100	38·06	13,730	35·57	6,550	34·61	7,000	34·67	7,250	34·30	6,650
29	38·30	14,550	38·01	13,880	35·28	7,330	34·67	7,175	34·70	7,300	34·35	6,700
30	38·40	14,800	38·03	14,130	35·36	7,300	34·68	7,200	34·45	6,850	34·51	7,200
31	38·46	15,000	37·91	13,350	.....	.....	34·69	7,125	.....	.....	34·60	7,300

Note.—Gauge heights are referred to gauge at Keewatin River Bridge.

Daily Gauge Height and Discharge of West Branch, Winnipeg River at North Tunnel Island for 1914.

(Drainage area, 26,400 square miles).

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	34·62	7,260	34·31	6,870	35·68	9,660	35·79	9,300	35·96	9,790	38·55	15,725
2	34·65	7,370	34·25	6,860	35·65	9,400	35·84	9,300	36·00	9,700	38·72	16,025
3	34·67	7,370	34·43	7,150	35·79	9,400	35·88	9,320	35·86	9,670	39·05	16,225
4	34·48	7,050	34·51	7,170	35·80	9,380	35·90	9,320	35·86	9,630	39·07	16,375
5	34·36	6,740	34·56	7,150	35·82	9,410	35·73	9,000	36·04	9,600	39·10	16,450
6	34·45	6,590	34·41	6,850	35·84	9,440	35·70	8,450	36·15	9,650	39·06	16,425
7	34·47	6,950	34·38	6,750	35·88	9,480	35·79	9,200	36·32	9,980	38·89	16,400
8	34·51	7,050	34·30	6,640	35·74	9,170	35·82	9,200	36·40	10,200	38·99	16,500
9	34·58	7,260	34·33	6,460	35·72	8,940	35·77	9,200	36·38	9,890	39·33	16,925
10	34·65	7,370	34·50	6,650	35·90	9,400	35·64	8,650	36·23	9,300	39·48	17,400
11	34·47	6,950	34·55	6,650	35·96	9,420	35·64	8,600	36·22	9,150	39·48	17,425
12	34·40	6,840	34·58	6,650	36·01	9,520	35·53	8,560	36·40	10,144	39·50	17,425
13	34·52	7,050	34·59	6,770	36·03	9,640	35·59	8,100	36·47	10,300	39·54	17,500
14	34·62	7,260	34·60	6,850	36·03	9,570	35·64	8,360	36·50	10,278	39·39	17,275
15	34·63	7,370	34·43	6,750	35·82	9,000	35·77	8,620	36·52	10,670	39·35	17,125
16	34·64	7,370	34·34	6,550	35·76	8,880	35·73	8,420	36·45	10,289	39·50	17,100
17	34·58	7,260	34·49	6,750	35·92	9,100	35·58	8,400	36·21	10,125	39·52	16,900
18	34·35	6,740	34·53	6,760	35·98	9,350	35·61	8,635	36·31	10,643	39·55	17,200
19	34·24	6,530	34·58	7,070	35·98	9,470	35·55	8,870	36·47	11,050	39·68	17,650
20	34·42	6,840	34·59	7,170	36·00	9,470	35·61	9,280	36·57	11,500	39·83	17,900
21	34·48	7,050	34·69	7,450	36·00	9,560	35·83	9,600	36·79	12,110	39·73	17,900
22	34·41	6,560	34·69	7,470	35·79	9,180	35·91	9,760	37·25	12,580	39·59	18,100
23	34·35	6,460	34·81	7,680	35·72	8,950	35·83	9,180	37·33	12,700	39·79	18,800
24	34·34	6,460	35·31	8,780	35·86	9,200	35·74	9,220	37·20	12,600	39·90	19,150
25	34·19	6,150	35·44	9,110	35·92	9,240	35·72	9,200	37·30	12,900	40·02	19·250
26	34·21	6,180	35·58	9,440	35·95	9,350	35·64	9,170	37·53	13,440	40·15	19,325
27	34·45	6,690	35·73	9,770	35·95	9,400	35·65	8,240	37·87	14,400	40·13	19,300
28	34·50	6,820	35·85	9,990	35·92	9,400	35·80	9,510	38·25	15,493	40·02	19,050
29	34·53	6,970	.....	.....	35·78	9,100	35,87	9,845	38·48	16,000	39·98	19,050
30	34·54	7,050	.....	.....	35·67	8,940	35·95	9,780	38·66	16,168	40·05	19,150
31	34·55	7,050	.....	.....	35·77	9,100	.....	.....	38,66	16,210	.....	.....

	July.		August.		September.		October.		November.		December.	
1	40·01	18,700	39·99	18,650	37·69	12,850	37·39	12,450	35·57	8,850	35·70	9,050
2	39·85	18,750	39·76	18,500	37·65	12,850	37·38	12,450	35·49	8,750	35·75	9,125
3	39·90	18,800	39·80	18,550	37·49	12,850	38·38	12,400	35·57	8,800	35·77	9,200
4	39·90	18,800	39·95	18,625	37·41	12,875	37·23	12,050	35·55	8,850	35·77	9,200
5	39·87	18,800	40·00	18,640	37·37	12,750	37·11	12,000	35·51	8,800	35·79	9,190
6	39·86	18,800	39·91	18,550	37·32	12,700	37·21	12,100	35·52	8,800	35·73	8,025
7	39·93	18,900	39·88	18,525	37·31	12,675	37·23	12,150	35·51	8,775	35·56	8,205
8	40·07	19,100	39·88	18,400	37·32	12,675	37·23	12,200	35·42	8,650	35·64	8,400
9	40·14	19,250	39·70	18,250	37·35	12,750	27·26	12,250	35·46	8,725	35·62	8,425
10	40·12	19,250	39·60	18,150	37·41	12,800	37·33	12,250	35·63	8,875	35·61	8,425
11	40·11	19,200	39·69	18,100	37·35	12,775	37·34	12,150	35·65	8,975	35·61	8,400
12	40·00	19,150	39·71	18,075	37·36	12,775	37·16	12,175	35·67	8,975	35·68	8,425
13	39·98	19,150	39·71	18,000	37·25	12,525	37·18	12,175	35·71	8,975	35·53	7,900
14	40·14	19,200	39·68	17,875	37·24	12,550	37·22	11,050	35·73	8,950	35·51	8,500
15	40·19	19,400	39·67	17,825	37·37	12,750	36·63	9,850	35·59	8,550	35·63	8,925
16	40·23	19,550	39·53	17,750	37·42	12,750	36·40	9,400	35·53	8,400	35·64	8,875
17	40·28	19,600	39 43	17,800	37·42	12,725	36·24	9,050	35·68	8,425	35·65	8,850
18	40·30	19,450	39·55	18,825	37·42	12,700	36·02	8,800	35·70	8,775	35·60	8,775
19	40·13	19,520	39·60	17,925	37·49	12,700	35·89	8,900	35·67	9,025	35·61	8,750
20	40·07	19,100	39·62	18,025	37·45	12,575	36·03	9,150	35·69	9,025	35·49	8,100
21	40·19	19,050	39·66	18,075	37·38	12,425	36·05	9,225	35·69	9,000	35·47	8,350
22	40·22	19,100	39·67	18,100	37·43	12,375	36·06	9,175	35·56	8,850	35·60	8,925
23	40·24	19,100	39·44	17,775	37·47	12,375	36·01	9,025	35·49	9,450	35·60	8,900
24	40·24	19,100	39·34	17,625	37·45	12,375	35·92	8,925	35·62	9,550	35·61	8,875
25	40·13	19,050	39·43	17,575	37·48	12,350	35·73	8,900	35·68	9,600	35·55	8,800
26	39·92	19,000	39·12	15,500	37·48	12,325	35·52	9,025	35·70	9,650	35·51	8,675
27	39·88	18,900	38·64	14,350	37·23	12,275	35·69	9,100	35·71	9,600	35·42	8,150
28	40·06	19,200	38·24	13,750	37·10	12,300	35·72	9,100	35·70	9,400	35·45	8,300
29	40·10	19,400	38·09	13,400	37·28	12,425	35·76	9,100	35·50	9,300	35·56	8,825
30	40·12	19,500	37·89	13,200	37·31	12,475	35·86	9,050	35·51	9,100	35·63	8,850
31	40·12	19,450	37·77	13,050	.....	.....	35·86	8,975	.....	.....	35·65	8,900

Note.—Gauge heights are referred to gauge at Keewatin River Bridge.

SESSIONAL PAPER No. 25f

Monthly Discharge of West Branch, Winnipeg River at North Tunnel Island for the year 1912.

(Drainage area 26,400 square miles).

Month.	Discharge in Second-Feet.			Run-Off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
January	4,290	4,160	4,250	261,300
February	4,720	4,160	4,410	253,700
March	4,720	4,570	4,650	285,900
April	5,190	4,720	4,930	293,400
May	5,690	4,870	5,290	325,300
June	5,190	3,920	4,360	259,400
July	4,040	3,540	3,870	238,000
August	4,645	3,980	4,350	267,500
September	5,190	4,160	4,690	279,100
October	10,540	5,190	8,710	535,600
November	10,760	7,680	9,870	587,300
December	10,540	9,880	10,350	636,400
The year	10,760	3,540	5,810	4,222,900

Monthly Discharge of West Branch, Winnipeg River at North Tunnel Island for the year 1913.

(Drainage area 26,400 square miles).

Month.	Discharge in Second-Feet.			Run-Off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
January	10,430	10,100	10,200	627,200
February	10,320	5,690	8,300	461,000
March	6,050	5,190	5,800	356,600
April	14,830	5,190	7,620	453,400
May	19,450	15,050	17,250	1,060,700
June	19,560	18,100	18,980	1,129,400
July	18,250	11,600	14,050	863,900
August	15,020	13,350	14,160	870,700
September	13,880	6,550	11,890	707,500
October	7,250	6,050	6,950	427,300
November	7,300	6,200	6,870	408,800
December	7,450	6,000	6,830	420,000
The year	19,560	5,190	10,740	7,786,500

Monthly Discharge of West Branch, Winnipeg River at North Tunnel Island for the year 1914.

[Drainage area, 26,400 squnre miles.]

Month.	Discharge in Second-Feet.			Run-Off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
January	7,370	6,150	6,940	426,700
February	9,980	6,460	7,360	408,800
March	9,660	8,880	9,310	572,500
April	9,760	8,100	9,010	536,100
May	16,210	9,150	11,490	706,500
June	19,325	15,725	17,570	1,045,500
July	19,600	18,700	19,130	1,176,200
August	18,650	13,050	17,300	1,063,700
September	12,875	12,275	12,610	750,400
October	12,450	8,800	10,470	643,800
November	9,050	8,400	8,980	534,400
December	9,200	7,900	8,650	531,900
The year	19,600	6,150	11,570	8,396,500

COMBINED DISCHARGE OF LAKE OF THE WOODS OUTLETS.

Combined Discharge of Winnipeg River below Lake of the Woods Outlets for 1912.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		5,246		5,532		6,267		6,020		6,455		6,466
2		5,592		5,485		6,252		6,189		6,611		5,478
3		5,726		5,698		5,767		6,296		6,571		4,978
4		5,698		5,171		6,074		6,289		5,956		5,942
5		5,533		5,574		6,066		6,287		6,754		6,282
6		5,363		5,656		6,019		6,305		6,422		6,137
7		5,275		5,722		6,097		6,106		6,670		5,568
8		5,637		5,744		6,070		6,120		6,804		5,121
9		5,855		5,748		6,109		6,291		6,833		4,962
10		5,816		5,717		5,731		6,194		6,843		4,761
11		5,812		5,219		5,920		6,321		6,878		4,831
12		5,787		5,481		6,212		6,330		6,382		4,913
13		5,760		5,750		6,129		6,382		6,640		5,507
14		5,301		5,702		6,136		5,722		7,006		5,584
15		5,431		5,793		6,152		6,090		7,045		5,603
16		5,633		5,856		6,085		6,286		6,968		5,603
17		5,576		5,978		5,619		6,396		6,716		5,516
18		5,690		5,458		5,985		6,315		6,747		5,710
19		5,647		5,830		6,180		6,338		5,980		5,842
20		5,551		6,083		6,184		6,373		6,280		5,853
21		5,153		6,121		6,137		5,851		6,548		5,826
22		5,422		5,945		6,088		6,089		6,568		5,565
23		5,612		6,238		5,883		6,438		6,635		4,975
24		5,618		6,102		5,646		6,496		6,527		5,015
25		5,551		5,596		6,001		6,495		6,370		5,274
26		5,703		5,954		6,161		6,557		5,806		5,296
27		5,684		6,275		5,809		6,649		5,783		5,306
28		5,266		6,321		6,131		6,006		6,345		5,238
29		5,272		6,261		6,140		6,314		6,035		5,197
30		5,522				5,847		6,607		6,330		4,674
31		5,531				5,464				6,174		

	July.		August.		September.		October.		November.		December.	
1		4,475		5,262		4,756		5,825		11,675		11,034
2		4,436		5,208		5,299		5,904		11,782		10,881
3		4,959		5,287		5,804		5,901		10,657		11,397
4		4,893		4,726		5,723		6,899		11,154		11,378
5		4,956		5,114		5,804		8,102		11,669		11,385
6		5,025		5,401		5,207		7,461		11,674		11,411
7		4,591		5,454		5,283		8,647		11,550		11,416
8		4,665		5,021		4,955		9,240		9,996		11,228
9		4,555		5,518		5,136		9,239		9,761		11,375
10		5,061		5,521		5,283		9,574		8,552		11,752
11		5,002		5,018		5,470		9,746		8,648		11,848
12		5,106		5,300		5,466		9,773		9,467		11,856
13		5,017		5,523		5,550		8,883		10,670		11,831
14		4,580		5,602		5,577		9,444		11,122		11,796
15		4,562		5,664		5,330		9,881		11,208		11,429
16		5,111		5,665		5,451		10,197		11,117		11,648
17		4,969		5,673		5,481		10,744		10,452		11,808
18		5,122		5,106		5,285		11,086		10,787		11,842
19		4,904		5,138		5,205		11,308		11,233		11,846
20		4,875		5,599		5,289		10,321		11,043		11,851
21		4,425		5,747		5,351		10,618		11,258		11,861
22		4,605		5,752		5,169		10,776		11,398		11,232
23		4,907		5,815		5,361		11,747		11,618		11,250
24		5,111		5,890		5,525		11,628		10,822		11,543
25		5,097		5,230		5,660		11,605		11,175		11,193
26		5,072		5,314		5,753		11,294		11,620		11,558
27		5,197		5,276		5,695		10,412		11,840		11,687
28		4,672		5,554		5,828		10,771		12,010		11,709
29		4,970		5,815		5,447		11,218		11,960		11,068
30		5,079		5,677		5,660		11,496		11,795		11,437
31		4,980		5,431				11,660				11,594

SESSIONAL PAPER No. 25f

Combined Discharge of Winnipeg River below Lake of the Woods Outlets for 1913.

[Drainage area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge.	Gauge Height	Discharge	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		11,553		11,708		6,981		6,686		16,325		19,605
2		11,584		11,547		6,978		6,616		16,422		19,719
3		11,739		11,475		7,208		6,204		16,646		20,474
4		11,819		11,482		7,410		6,039		15,798		20,531
5		11,344		11,403		7,306		6,044		16,000		20,701
6		11,535		11,394		7,279		5,847		16,710		20,872
7		11,837		11,358		7,236		6,119		16,968		20,709
8		11,716		11,244		7,147		6,410		16,944		19,937
9		11,802		10,751		6,632		6,738		17,070		19,863
10		11,584		10,742		6,388		6,450		17,180		20,579
11		11,605		10,739		7,178		6,200		16,277		20,703
12		11,166		10,621		7,269		6,184		16,376		20,444
13		11,336		10,446		7,306		5,898		17,599		20,349
14		11,586		10,298		7,347		5,915		18,347		20,118
15		11,461		10,152		7,353		6,075		19,238		19,647
16		11,565		9,361		6,625		6,456		19,579		19,570
17		11,617		9,258		6,484		6,866		19,697		20,273
18		11,637		9,045		7,182		7,106		19,050		20,582
19		11,172		8,747		7,176		7,205		18,978		20,582
20		11,473		8,340		7,343		6,432		19,252		20,561
21		11,659		8,043		7,350		6,654		19,720		20,451
22		11,707		7,664		7,404		9,237		20,128		19,685
23		11,733		6,948		6,575		10,938		20,806		19,674
24		11,693		6,848		6,486		12,702		19,503		19,927
25		11,640		7,138		7,072		14,132		19,223		20,136
26		11,225		7,250		6,955		14,827		19,232		20,042
27		11,358		7,081		7,002		14,186		19,469		19,850
28		11,588		6,895		6,915		14,542		19,880		19,768
29		11,489				6,905		15,705		20,223		18,882
30		11,508				6,090		16,023		20,383		18,837
31		11,583				6,101				20,443		

[Drainage area, 26,400 square miles.]

	July.		August.		September.		October.		November.		December.	
1		18,674		15,875		14,555		8,407		8,447		8,287
2		18,786		15,734		14,380		8,562		7,317		8,682
3		19,476		14,921		14,140		8,552		7,612		8,857
4		19,604		14,867		14,206		8,437		8,217		8,842
5		18,570		14,664		14,244		6,977		8,332		8,477
6		17,704		14,923		13,986		7,997		8,392		8,087
7		17,142		14,981		13,842		8,217		8,422		6,827
8		16,964		15,170		13,643		8,442		8,147		7,327
9		15,596		15,150		13,848		8,347		7,087		7,792
10		13,871		14,665		13,874		8,542		7,337		7,962
11		13,341		14,704		13,988		8,342		8,317		8,057
12		13,338		14,955		13,928		7,592		8,337		8,277
13		12,652		14,997		13,959		8,027		8,302		8,122
14		13,224		14,952		13,725		8,352		8,202		7,112
15		13,096		15,212		13,699		8,322		8,142		7,187
16		13,194		15,267		13,608		8,352		6,997		7,657
17		13,224		14,850		13,934		8,342		7,692		8,082
18		13,246		14,550		14,021		8,497		8,112		8,407
19		12,931		14,668		14,264		7,272		8,287		8,127
20		12,237		14,648		13,811		7,212		8,612		8,237
21		12,267		14,731		12,207		8,337		8,257		7,632
22		12,519		15,009		13,440		8,147		8,482		7,692
23		12,715		14,951		11,430		8,277		7,422		8,232
24		14,119		14,681		10,609		8,347		7,777		8,482
25		15,061		14,593		10,576		8,427		8,432		7,572
26		15,201		14,655		10,551		7,347		8,582		7,932
27		14,751		15,058		10,074		7,732		8,627		8,457
28		14,960		14,426		7,260		8,417		8,627		7,652
29		15,487		14,582		8,421		8,552		8,702		7,992
30		15,720		14,832		8,542		8,580		7,592		8,642
31		15,831		14,017				8,482				8,797

Combined Discharge of Winnipeg River below Lake of the Woods Outlets for 1914.

[Drainage Area, 26,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1		8,692		7,817		10,602		10,017		10,463		16,594
2		8,792		7,747		10,607		10,042		10,363		16,944
3		8,767		8,112		10,547		10,097		10,323		17,149
4		7,987		8,157		10,497		10,127		10,278		17,262
5		7,667		8,182		10,542		9,737		10,273		17,394
6		7,832		7,857		10,542		9,242		10,493		17,334
7		7,792		7,812		10,622		10,057		10,828		17,039
8		8,277		7,417		9,982		10,032		11,008		17,379
9		8,657		7,507		10,172		9,967		10,743		17,821
10		8,752		7,727		10,657		9,352		9,948		18,304
11		8,032		7,752		10,682		9,372		10,070		18,356
12		8,172		7,737		10,752		9,297		11,109		18,371
13		8,567		7,842		10,822		8,852		11,260		18,481
14		8,647		7,897		10,707		9,087		11,223		17,959
15		8,687		7,712		9,702		9,512		11,365		18,011
16		8,417		7,547		9,712		9,342		11,209		17,979
17		8,172		7,752		10,282		9,337		10,760		17,782
18		7,557		7,717		10,482		9,607		11,403		18,094
19		7,327		8,082		10,362		9,557		11,925		18,551
20		7,737		8,207		10,597		10,217		12,370		18,792
21		7,997		8,467		10,597		10,457		13,005		18,576
22		7,532		8,472		9,982		10,447		13,480		19,044
23		7,407		8,732		10,037		9,872		13,625		19,867
24		7,467		9,777		10,277		9,907		13,235		20,166
25		7,077		10,047		10,222		9,887		13,555		20,259
26		7,147		10,332		10,232		9,812		14,345		20,352
27		7,657		10,657		10,267		8,927		15,300		20,302
28		7,787		11,172		10,217		10,222		16,363		19,737
29		7,967				9,812		10,537		16,880		19,786
30		8,077				9,662		10,462		17,078		19,891
31		8,077				9,812				16,875		

	July.		August.		September.		October.		November.		December.	
1		19,421		19,419		13,842		13,324		9,506		10,015
2		19,482		19,201		13,562		13,325		9,626		10,131
3		19,541		19,317		13,562		13,313		9,736		10,210
4		19,582		19,591		13,577		12,658		9,795		10,179
5		19,619		19,625		13,742		13,092		9,739		10,081
6		19,584		19,545		13,367		13,397		9,751		8,739
7		19,671		19,280		13,617		13,447		9,735		9,150
8		20,059		19,159		13,857		13,517		9,361		9,413
9		19,994		18,943		13,732		13,557		9,476		9,444
10		20,229		18,897		13,892		13,612		9,864		9,554
11		20,019		18,860		13,497		12,850		9,937		9,433
12		19,834		18,836		13,667		12,822		9,950		9,441
13		19,881		18,765		13,181		13,179		9,935		8,687
14		19,939		18,633		13,732		12,386		9,917		9,605
15		20,149		18,583		13,742		11,115		9,306		10,049
16		20,311		18,457		13,903		10,671		9,343		10,115
17		20,371		18,567		13,667		10,333		9,445		9,944
18		20,476		18,612		13,864		9,487		9,824		9,844
19		19,944		18,917		13,565		9,866		10,065		9,825
20		20,019		19,272		13,215		10,421		10,065		8,926
21		19,811		19,332		13,329		10,260		9,989		9,573
22		19,866		19,112		13,492		10,436		9,601		10,056
23		19,859		18,497		13,253		9,752		10,402		10,141
24		19,857		18,887		13,475		9,581		10,520		10,029
25		19,794		18,917		13,242		9,521		10,708		9,689
26		19,694		16,592		13,138		9,707		10,604		9,604
27		19,644		15,590		12,903		9,817		10,601		8,973
28		19,959		14,972		13,187		9,795		10,362		9,428
29		20,171		14,127		13,322		10,126		9,980		10,030
30		20,286		13,877		13,377		10,091		10,015		10,081
31		20,218		13,777				9,852				10,000

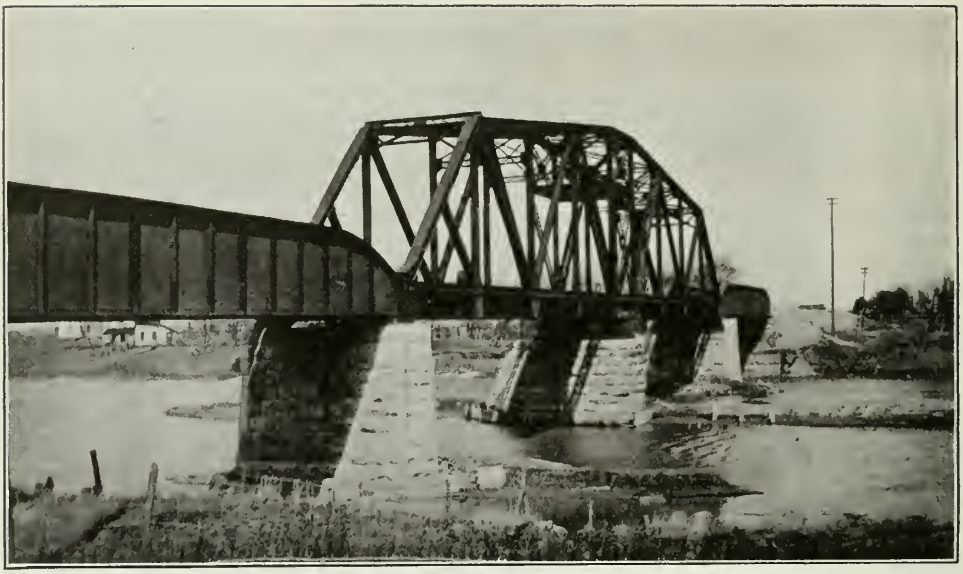
SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Winnipeg River at Outlets of the Lake of the Woods, for the years 1912–14.

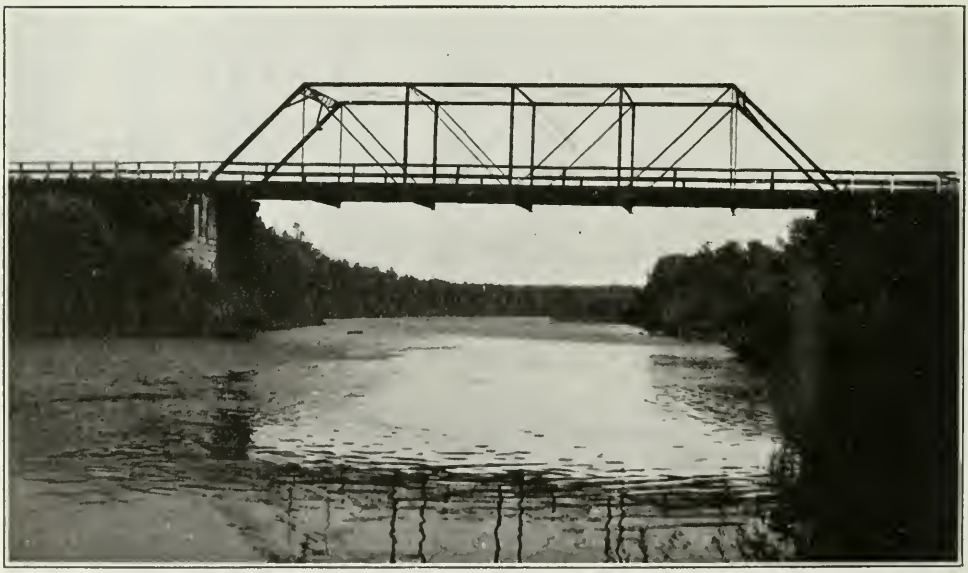
Month.	Discharge in Second-feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
January	5,855	5,153	5,555	0·210	0·242	341,600
February	6,321	5,171	5,795	0·220	0·229	333,300
March	6,267	5,464	6,010	0·228	0·263	369,500
April	6,649	5,722	6,270	0·237	0·264	373,100
May	7,045	5,783	6,505	0·246	0·284	400,000
June	6,466	4,674	5,435	0·206	0·230	323,400
July	5,197	4,425	4,870	0·184	0·212	299,400
August	5,890	4,726	5,430	0·206	0·238	333,900
September	5,828	4,756	5,425	0·205	0·229	322,800
October	11,747	5,825	9,720	0·368	0·424	597,700
November	12,010	8,552	10,990	0·416	0·464	654,000
December	11,861	10,881	11,520	0·436	0·503	708,300
The year	12,010	4,425	6,960	0·263	3·582	5,057,000
1913.						
January	11,837	11,166	11,560	0·438	0·505	710,800
February	11,708	6,848	9,570	0·363	0·378	531,500
March	7,410	6,090	6,990	0·265	0·306	429,800
April	16,023	5,847	8,550	0·324	0·362	508,800
May	20,806	15,798	18,370	0·696	0·802	1,129,500
June	20,782	18,837	20,100	0·761	0·849	1,196,000
July	19,694	12,237	15,020	0·569	0·656	923,500
August	15,875	14,017	14,880	0·563	0·649	914,900
September	14,555	7,260	13,100	0·496	0·553	779,500
October	8,580	7,212	8,180	0·310	0·357	503,000
November	8,702	7,087	8,090	0·306	0·341	481,400
December	8,857	7,112	8,050	0·305	0·352	495,000
The year	20,806	5,847	11,870	0·449	6·110	8,603,700
1914.						
January	8,792	7,077	8,020	0·304	0·351	493,100
February	11,172	7,417	8,360	0·317	0·330	464,300
March	10,822	9,662	10,320	0·391	0·451	634,500
April	10,537	8,852	9,780	0·370	0·413	582,000
May	17,078	9,948	12,300	0·466	0·537	756,300
June	20,352	16,594	18,450	0·699	0·780	1,097,900
July	20,476	19,421	19,910	0·754	0·869	1,224,200
August	19,625	13,777	18,200	0·689	0·794	1,119,100
September	13,903	12,903	13,520	0·512	0·571	804,500
October	13,612	9,487	11,460	0·434	0·500	704,600
November	10,708	9,306	9,900	0·375	0·418	589,100
December	10,210	8,687	9,850	0·373	0·430	605,700
The year	20,476	7,077	12,510	0·474	6·444	9,075,300

WINNIPEG RIVER AND TRIBUTARIES.

Winnipeg River.—The Winnipeg river is one of the most important in the province of Manitoba, forming the source of a power supply for the city of Winnipeg. It joins lake of the Woods to lake Winnipeg, flowing in a westerly direction from the former to the latter. The drainage area of this river is 53,500 square miles above the mouth. The basin has all the characteristics of of the Laurentian formation, being dotted with lakes, ponds, and muskegs. A considerable portion of the basin is composed of lake areas, the size of which range between a few square miles up to 1,500 miles, the latter being the size of the lake of the Woods. The country drained is rough and more or less timbered. The upper part of the area has been lumbered to a considerable extent, and still affords a field for such industry.



Assiniboine River, Headingly. Metor section at Bridge.



Souris River, Wawanesa. Meter section at Bridge.

The river itself is of considerable proportions, and is in the nature of lake-like expanses which are joined by short stretches of swift water or falls. On account of these features, splendid opportunity is offered for the development of water-power. At the present time advantage has been taken of these possibilities in two cases, and developments are to be found at Point du Bois, where the city of Winnipeg has a plant, and on the Pinawa channel, where the Winnipeg Street Railway plant is in operation. A number of other sites are capable of economic development, and it has been estimated that a total output of approximately 400,000 h.-p. is available from this river within the province of Manitoba.

In consequence of the importance of this river, a number of stations at which records of discharge have been obtained have been established. They are as follows:—

1.—The Dalles.[1]
2.—Throat Rapids.[1]
3.—Minaki.
4.—Whitedog Rapids.
5.—Slave Falls.
6.—Otter Falls.
7.—Pinawa Channel.
8.—Grand du Bonnet Falls.

At some of these points, continuous discharges are not available, the records being confined to a few isolated meterings.

Tributaries.—The tributaries of the Winnipeg river are, with one exception, of minor importance, having for the most part small drainage areas. The exception is, however, of the greatest importance, as nearly one-half of the total drainage area above the junction is tributary to it. This river is the English, which enters the Winnipeg from the north, just within the province of Ontario. The other tributaries of the Winnipeg river are: the Whiteshell river, which joins the main river in the lake-like expanse known as Jessie lake; the Whitemouth, which enters just below the Seven Sisters rapids; and the Bird river, which flows into Lac du Bonnet.

Of these tributaries the Whitemouth is the only one for which daily records of discharge are available.

Winnipeg River At Minaki.

History.—This station, established by C. O. Allen on September 23, 1913, was necessitated by the study of the early gauging records in the vicinity of the Lake of the Woods outlets.

Location of Section.—The section is located on the down-stream side of the Grand Trunk Pacific Railway bridge, three-quarters of a mile east of the Minaki station and one-quarter of a mile downstream from the Holst Point hotel. The initial point is marked by three spikes driven in the guard rail at the west end of the bridge on the downstream side.

Records available.—Daily gauge records, for which the station was primarily established, are available since September 24, 1913. Intermittent meterings in connection with the study of the upper river have been made at the section, but, on account of the physical conditions at the station, no attempt has been made to construct a discharge curve.

Drainage area.—The drainage area above Minaki is 27,000 square miles.

Gauge.—A vertical staff gauge, 6 feet long, is fastened to a plank which is spiked to the ice breaker at the east end of the bridge, and is 30 feet downstream from the section. It is referred to three bench-marks set to W. P. S. datum.

[1] See 'Miscellaneous Meterings.'

Channel.—It is straight for 50 feet above the station and 1,000 feet below. The channel is divided by a pier of the bridge which stands in the river about 65 feet from the east shore. The stream is moderately swift, but the bed of the stream is not liable to shift. It is confined to the two channels under all stages.

Discharge measurements.—They are made from the bridge deck, the intervals being marked on the guard rail.

Accuracy.—The channel forms a connecting link or strait between two lake-like expanses; on this account the discharge does not always bear the same relation to gauge heights, the ponding effect below being noticeable. A discharge curve for the station has not been constructed.

Discharge Measurements of Winnipeg River at G.T.R. Bridge, Minaki, 1912–13.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 15	A. Pirie	1374	349	9,456	0·50	.....	4,740
1913.							
Sept. 23	C. O. Allen	1435	363	9,414	1·40	33·99	13,180
" 25	"	1435	363	9,368	1·38	33·88	12,927
Nov. 27	"	1375	357	8,947	1·02	32·26	9,126
" 28	"	1375	357	8,836	1·02	32·27	9,012

Winnipeg River—Whitedog Falls, North and South Channels.

History.—The meter section on the south channel at Whitedog was established on May 18, 1914, by S. C. O'Grady, and on the north channel on May 23, 1914, since which date it has been in operation.

Location of Section.—The section on the south channel is located about 150 feet above the second falls, reached from the portage at the Hudson's Bay store. The initial point is marked by a nail driven in a blazed tree on the north side of the river, about 150 feet above the second falls.

The section on the north channel is 50 feet above the head of the first falls. The initial point is a white arrow painted on the solid rock on the right bank of the channel. The discharge measurements are referred to the gauge at Minaki.

Records available.—The discharge measurements were taken since the establishment of the stations and are referred to the gauge at Minaki, which has been operated since September 24, 1913. Daily discharge records are available since that date. The discharges of these stations must be combined to give the total discharge of the Winnipeg river at that point.

Drainage area.—The drainage area above these sections is 27,500 square miles.

Gauge.—The gauge on the south channel is a vertical staff gauge, bolted to the rock on the left bank, 30 feet above the section; it reads direct.

On the north channel a vertical staff gauge is bolted to the rock on the right bank, 40 feet above the section; it also reads direct.

Owing to the absence of a gauge reader at these sections, all meterings are referred to the gauge at Minaki, which has been read daily since September, 1913.

Channel.—The south channel is approximately 400 feet wide, and is composed of rock and not subject to shifting, the control for the section being the crest of the falls, 150 feet below. The banks are high enough to ensure that under flood conditions no overflow will occur. The channel is straight and free from eddies under nearly all conditions.

The north channel is much narrower. It is also composed of clay and solid rock and free from likelihood of shifting, the control being only 50 feet below. The channel is straight both above and below the section for a sufficient distance to ensure freedom from eddies.

Discharge Measurements.—Sufficient meterings have been made to define the discharge curve over a range of 2.5 feet, forty-one in all being taken at the north channel, and twenty-nine at the south channel. They are made in the first case from a boat, and in the north channel by means of a cable carrier.

Accuracy.—The discharge curve is well defined between gauge heights 1,033 and 1,036 W.P.S. datum; above and below those heights the curve is only fairly well defined.

DISCHARGE MEASUREMENTS of Winnipeg River at Whitedog, North Channel, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 23	S. C. O'Grady	1462	41	234	2·15	33·56	504
" 23	"	1462	41	234	2·12	33·56	495
July 7	T. J. Moore	1196	41	293	3·51	35·56	1,028
" 7	"	1196	41	293	3·47	35·56	1,018
Aug. 26	C. C. Galloway	1196	40	295	3·16	34·96	929
" 27	"	1196	40	292	3·00	34·90	880
" 27	"	1196	40	292	3·04	34·90	889
" 28	S. C. O'Grady	1196	40	289	2·84	34·82	819
" 28	"	1196	40	289	2·81	34·82	812
" 29	"	1196	40	285	2·94	34·70	836
" 30	"	1196	40	278	2·85	34·61	794
Sept. 1	"	1196	40	269	2·72	34·46	733
" 1	"	1196	40	269	2·84	34·46	761
" 2	"	1196	40	262	2·65	34·41	695
Oct. 12	"	1196	40	252	2·35	34·11	594
" 14	"	1196	41	259	2·44	33·96	631
" 15	"	1196	41	255	2·37	33·97	602
" 15	"	1196	41	255	2·39	33·97	609
" 16	"	1196	41	253	2·40	33·84	607
" 16	"	1196	41	253	2·40	33·84	607
" 17	"	1196	41	246	2·22	33·74	546
" 17	"	1196	41	246	2·22	33·74	552
" 18	"	1196	41	247	2·12	33·63	524
" 18	"	1196	41	247	2·15	33·63	530
" 19	"	1196	41	239	2·18	33·50	521
" 19	"	1196	41	239	2·19	33·50	524
" 20	"	1196	41	235	2·06	33·46	481
" 20	"	1196	41	235	2·07	33·46	486
" 21	"	1196	41	233	1·99	33·38	462
" 21	"	1196	41	233	1·99	33·38	464
" 22	C. C. Galloway	1196	41	231	1·97	33·33	454
" 22	"	1196	41	231	1·98	33·33	456
" 23	S. C. O'Grady	1196	41	228	1·92	33·29	439
" 23	"	1196	41	228	1·88	33·29	428
" 25	"	1196	41	223	1·90	33·19	424
" 25	"	1196	41	223	1·90	33·19	423
" 26	"	1196	41	221	1·86	33·13	410
" 26	"	1196	41	221	1·85	33·13	408
" 27	"	1196	41	219	1·71	33·06	373
" 28	"	1196	38	218	1·70	33·04	369
" 28	"	1196	38	218	1·70	33·04	370

NOTE.—Gauge heights at Minaki employed.

Daily Gauge Height and Discharge of Winnipeg River at Whitedog, North Channel, for 1913.

[Drainage area 27,500 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
					Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1							33·14	397	32·22	181	32·22	181
2							33·09	385	32·22	181	32·27	192
3							32·99	360	32·22	181	32·32	204
4							32·84	324	32·12	158	32·22	181
5							32·79	312	32·22	181	32·27	192
6							32·79	312	32·22	181	32·22	181
7							32·67	284	32·32	204	32·27	192
8							32·52	249	32·32	204	32·32	204
9							32·62	272	32·22	181	32·22	181
10							32·52	249	32·12	158	32·27	192
11							32·52	249	32·22	181	32·32	204
12							32·52	249	32·32	204	32·32	204
13							32·57	261	32·32	204	32·32	204
14							32 42	226	32·22	181	32·32	204
15							32 37	215	32·22	181	32·27	192
16							32·32	204	32·22	181	32·22	181
17							32·27	192	32·22	181	32·22	181
18							32 22	181	32·32	204	32·32	204
19							32·37	215	32·22	181	32·22	181
20							32·22	181	32·27	192	32·27	192
21							32·22	181	32·22	181	32·22	181
22							32·22	181	32·17	169	32·22	181
23							32·22	181	32·22	181	32·22	181
24					33·64	529	32·22	181	32·27	192	32·22	181
25					33·54	502	32·22	181	32·22	181	32·22	181
26					33·59	515	32·22	181	32·27	192	32·22	181
27					33·49	488	32·17	169	32·22	181	32·17	169
28					33·44	475	32·22	181	32·22	181	32·22	181
29					33·34	448	32·22	181	32·22	181	32·27	192
30					33·29	435	32·22	181	32·22	181	32·22	181
31							32·22	181			32·22	181

Note.—Open-water conditions all the year round.
Below gauge height 1,033·00 the rating curve is not well defined.
Gauge heights refer to readings on the Minaki gauge.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Winnipeg River, at Whitedog, North Channel, for 1914.

[Drainage area, 27,500 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	32·26	190	32·16	167	32·16	167	33·01	365	33·11	390	34·51	779
2	32·31	201	32·16	167	32·16	167	32·96	352	33·11	390	34·56	794
3	32·36	213	32·16	167	32·26	190	32·96	352	33·06	377	34·80	869
4	32·36	213	32·16	167	32·26	190	32·96	352	33·16	402	34·91	904
5	32·31	201	32·16	167	32·36	213	33·01	365	33·11	390	34·96	920
6	32·26	190	32·16	167	32·46	236	32·96	352	33·21	415	34·98	927
7	32·26	190	32·11	155	32·56	259	33·01	365	33·26	428	35·06	953
8	32·26	190	32·11	155	32·56	259	33·06	377	33·26	428	35·08	959
9	32·26	190	32·06	144	32·56	259	33·06	377	33·32	443	35·14	979
10	32·26	190	32·06	144	32·56	259	32·96	352	33·34	448	35·22	1,010
11	32·26	190	32·06	144	32·76	305	32·96	352	33·35	451	35·26	1,020
12	32·26	190	32·06	144	32·76	305	33·01	365	33·36	454	35·31	1,040
13	32·31	201	32·06	144	32·86	328	32·96	352	33·38	459	35·36	1,050
14	32·26	190	32·06	144	32·96	352	32·91	340	33·36	454	35·34	1,050
15	32·26	190	32·06	144	32·96	352	32·91	340	33·36	454	35·36	1,050
16	32·26	190	31·96	121	32·96	352	32·86	328	33·41	467	35·32	1,040
17	32·26	190	31·96	121	32·96	352	32·86	328	33·42	469	35·31	1,040
18	32·26	190	31·96	121	32·96	352	33·01	365	33·43	472	35·36	1,050
19	32·26	190	31·96	121	33·06	377	32·91	340	33·53	499	35·36	1,050
20	32·26	190	31·96	121	33·06	377	32·96	352	33·46	480	35·36	1,050
21	32·26	190	31·96	121	33·06	377	33·01	365	33·46	480	35·41	1,070
22	32·26	190	31·96	121	33·06	377	33·06	377	33·50	491	35·44	1,080
23	32·21	178	31·96	121	33·16	402	33·01	365	33·56	507	35·40	1,070
24	32·21	178	31·96	121	33·16	402	33·06	377	33·56	507	35·44	1,080
25	32·21	178	31·96	121	33·06	377	33·01	365	33·72	551	35·48	1,090
26	32·21	178	31·96	121	33·06	377	33·06	377	33·91	604	35·52	1,110
27	32·16	167	31·96	121	33·06	377	33·06	377	33·96	618	35·56	1,120
28	32·16	167	31·96	121	33·06	377	33·06	377	34·02	635	35·58	1,130
29	32·16	167	.....	.....	33·06	377	33·16	402	34·18	681	35·51	1,100
30	32·16	167	.....	.....	33·01	365	33·11	390	34·33	725	35·56	1,120
31	32·16	167	.....	.....	33·01	365	.....	.....	34·44	758	.....	.....

	July.		August.		September.		October.		November.		December.	
1	35·61	1,140	35·56	1,120	34·46	764	33·94	612	33·09	385	32·92	343
2	35·60	1,140	35·58	1,130	34·41	749	33·91	604	33·03	370	32·96	352
3	35·58	1,130	35·56	1,120	34·36	734	33·90	601	33·04	372	32·94	348
4	35·56	1,120	35·52	1,110	34·26	704	33·90	601	32·97	355	32·93	345
5	35·61	1,140	35·46	1,090	34·16	675	33·89	598	32·96	352	32·91	340
6	35·60	1,140	35·44	1,080	34·06	646	33·88	595	32·93	345	.....	.....
7	35·56	1,120	35·46	1,090	34·01	632	33·86	590	32·89	336	.....	.....
8	35·52	1,110	35·41	1,070	33·96	618	33·84	584	32·92	343	.....	.....
9	35·56	1,120	35·50	1,100	34·04	641	33·86	590	32·86	328	.....	.....
10	35·46	1,090	35·46	1,090	34·00	629	33·87	593	32·92	343	.....	.....
11	35·56	1,120	35·41	1,070	33·94	612	34·04	641	32·90	338	.....	.....
12	35·66	1,160	35·36	1,050	33·91	604	34·11	661	32·88	333	.....	.....
13	35·66	1,160	35·32	1,040	33·94	612	34·02	635	32·89	336	.....	.....
14	35·61	1,140	35·26	1,020	33·96	618	33·96	618	32·90	338	.....	.....
15	35·61	1,140	35·21	1,000	33·94	612	33·97	621	32·96	352	.....	.....
16	35·66	1,160	35·26	1,020	33·96	618	33·84	584	32·91	340	.....	.....
17	35·70	1,170	35·25	1,020	33·94	612	33·74	556	32·94	348	.....	.....
18	35·72	1,180	35·36	1,050	34·00	629	33·63	526	32·86	328	.....	.....
19	35·61	1,140	35·30	1,030	34·01	632	33·50	491	32·95	350	.....	.....
20	35·66	1,160	35·26	1,020	34·02	635	33·46	480	32·91	340	.....	.....
21	35·66	1,160	35·26	1,020	34·01	632	33·38	459	32·95	350	.....	.....
22	35·71	1,170	35·21	1,000	34·06	646	33·33	446	32·92	343	.....	.....
23	35·70	1,170	35·16	986	34·06	646	33·29	435	32·91	340	.....	.....
24	35·68	1,160	35·10	966	34·01	632	33·24	422	32·92	343	.....	.....
25	35·66	1,160	35·02	940	34·00	629	33·19	409	32·96	352	.....	.....
26	35·66	1,160	34·96	920	33·98	623	33·13	395	33·00	362	.....	.....
27	35·61	1,140	34·90	901	33·96	618	33·06	377	32·95	350	.....	.....
28	35·56	1,120	34·82	875	33·96	618	33·04	372	32·93	345	.....	.....
29	35·46	1,090	34·70	837	33·97	621	33·03	370	32·91	340	.....	.....
30	35·60	1,140	34·61	809	33·96	618	33·04	372	32·94	348	.....	.....
31	35·60	1,140	34·56	794	.....	.....	33·06	377	.....	.....	.....	.....

Note.—Open water conditions all the year round. Below gauge height 1,033·00 the rating curve is not well defined. Gauge heights refer to readings on the Minaki gauge.

Monthly Discharge of Winnipeg River at North Channel, Whitedog, for the year 1913–14.

[Drainage area, 27,500 square miles.]

Month.	Discharge in Second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
1913.				
September	.....	.....	[1]550	32,700
October	397	169	235	14,500
November	204	158	184	10,900
December	204	169	188	11,600
The period	397	158	289	69,700
1914.				
January	213	167	187	11,500
February	167	121	139	7,700
March	402	167	317	19,500
April	402	328	362	21,500
May	758	377	494	30,400
June	1,130	779	1,020	60,700
July	1,180	1,090	1,140	70,100
August	1,130	794	1,010	62,100
September	764	604	643	38,300
October	661	370	523	32,200
November	385	328	347	20,600
December	.....	.....	[1]325	20,000
The year	1,180	121	542	394,600

Note.—Discharges marked thus (1) estimated.

Monthly Discharge of Winnipeg River at Whitedog Falls, for the year 1913–14.

[Drainage area, 27,500 square miles.]

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1913.						
September	.....	.....	[1]12,600	0·458	0·511	749,800
October	10,500	7,300	8,250	0·300	0·346	507,300
November	7,800	7,150	7,550	0·274	0·306	449,300
December	7,800	7,300	7,600	0·276	0·318	467,300
The period	10,500	7,150	9,000	0·327	1·481	2,173,700
1914.						
January	7,900	7,300	7,600	0·276	0·318	467,300
February	7,300	6,700	6,950	0·253	0·264	386,000
March	10,500	7,300	9,400	0·342	0·394	578,000
April	10,500	9,600	10,000	0·363	0·405	595,000
May	15,600	10,200	11,800	0·429	0·495	725,600
June	21,400	15,900	19,600	0·713	0·796	1,166,300
July	22,200	20,800	21,600	0·786	0·906	1,328,100
August	21,400	16,400	19,600	0·713	0·822	1,205,200
September	15,700	13,300	13,800	0·502	0·560	821,200
October	14,200	10,100	12,200	0·444	0·512	750,100
November	10,300	9,600	9,800	0·356	0·397	583,100
December	.....	.....	[1]9,700	0·353	0·407	596,400
The year	22,200	6,700	12,700	0·461	6·276	9,202,300

Note.—Discharges marked thus (1) estimated. This table gives the total combined discharges, run-off, etc., for the North and South channels of Whitedog falls.

Discharge Measurements of Winnipeg River at Whitedog, South Channel, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 18	S. C. O'Grady	1,196	330	6,665	1·74	33·43	11,589
July 6	T. J. Moore	1,196	350	7,469	2·50	35·60	18,705
" 6	"	1,196	350	7,469	2·27	35·60	16,991
Aug. 26	S. C. O'Grady	1,196	358	7,387	2·31	34·96	17,041
" 27	"	1,196	358	7,332	2·32	34·90	17,032
" 28	"	1,196	348	7,322	2·29	34·82	16,769
" 29	"	1,196	357	7,285	2·33	34·70	16,917
" 30	"	1,196	357	7,211	2·18	34·61	15,687
" 31	"	1,196	356	7,158	2·15	34·56	15,420
Sept. 1	"	1,196	356	7,088	2·08	34·46	14,766
" 2	"	1,196	356	7,042	2·01	34·41	14,137
" 3	"	1,196	344	6,982	2·03	34·36	14,135
Oct. 13	"	1,196	339	6,818	1·95	34·02	13,287
" 13	"	1,196	339	6,818	1·91	34·02	13,013
" 14	"	1,196	339	6,810	1·90	33·96	13,046
" 15	"	1,196	339	6,778	1·89	33·97	12,827
" 16	"	1,196	339	6,745	1·85	33·84	12,502
" 17	"	1,196	333	6,682	1·85	33·74	12,325
" 18	"	1,196	333	6,644	1·79	33·63	11,887
" 19	"	1,196	331	6,558	1·78	33·50	11,649
" 20	"	1,196	330	6,540	1·69	33·46	11,061
" 21	"	1,196	330	6,477	1·66	33·38	10,775
" 23	"	1,196	329	6,443	1·64	33·29	10,578
" 24	"	1,196	329	6,443	1·62	33·24	10,413
" 25	"	1,196	329	6,414	1·55	33·19	9,921
" 26	"	1,196	328	6,362	1·61	33·13	10,256
" 27	"	1,196	328	6,346	1·58	33·06	10,052
" 28	"	1,196	328	6,329	1·51	33·04	9,544
" 29	"	1,196	328	6,313	1·52	33·03	9,585

Note.—Gauge heights at Minaki employed.

Daily Gauge Height and Discharge of Winnipeg River at Whitedog, South Channel, for 1913.

[Drainage area, 27,500 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							33·14	10,100	32·22	7,300	32·22	7,300
2							33·09	9,960	32·22	7,300	32·27	7,450
3							32·99	9,600	32·22	7,300	32·32	7,600
4							32·84	9,150	32·12	7,000	32·22	7,300
5							32·79	9,000	32·22	7,300	32·27	7,450
6							32·79	9,000	32·22	7,300	32·22	7,300
7							32·67	8,650	32·32	7,600	32·27	7,450
8							32·52	8,200	32·32	7,600	32·32	7,600
9							32·62	8,500	32·22	7,300	32·22	7,300
10							32·52	8,200	32·12	7,000	32·27	7,450
11							32·52	8,200	32·22	7,300	32·32	7,600
12							32·52	8,200	32·32	7,600	32·32	7,600
13							32·57	8,350	32·32	7,600	32·32	7,600
14							32·42	7,900	32·22	7,300	32·32	7,600
15							32·37	7,750	32·22	7,300	32·27	7,450
16							32·32	7,600	32·22	7,300	32·22	7,300
17							32·27	7,450	32·22	7,300	32·22	7,300
18							32·22	7,300	32·32	7,600	32·32	7,600
19							32·37	7,750	32·22	7,300	32·22	7,300
20							32·22	7,300	32·27	7,450	32·27	7,450
21							32·22	7,300	32·22	7,300	32·22	7,300
22							32·22	7,300	32·17	7,150	32·22	7,300
23							32·22	7,300	32·22	7,300	32·22	7,300
24					33·64	11,700	32·22	7,300	32·27	7,450	32·22	7,300
25					33·54	11,400	32·22	7,300	32·22	7,300	32·22	7,300
26					33·59	11,600	32·22	7,300	32·27	7,450	32·22	7,300
27					33·49	11,200	32·17	7,150	32·22	7,300	32·17	7,150
28					33·41	11,100	32·22	7,300	32·22	7,300	32·22	7,300
29					33·34	10,700	32·22	7,300	32·22	7,300	32·27	7,450
30					33·29	10,600	32·22	7,300	32·22	7,300	32·22	7,300
31							32·22	7,300			32·22	7,300

Note.—Discharge curve is only defined between gauge heights 1,033·00 and 1,035·00. Gauge heights refer to readings on the Minaki gauge.

Daily Gauge Height and Discharge of Winnipeg River at Whitedog, South Channel, for 1914.

[Drainage area, 27,500 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	32·26	7,450	32·16	7,150	32·16	7,150	33·01	9,700	33·11	10,000	34·51	15,100
2	32·31	7,600	32·16	7,150	32·16	7,150	32·96	9,550	33·11	10,000	34·56	15,300
3	32·36	7,750	32·16	7,150	32·26	7,450	32·96	9,550	33·06	9,850	34·80	16,400
4	32·36	7,750	32·16	7,150	32·26	7,450	32·96	9,550	33·16	10,100	34·91	16,900
5	32·31	7,600	32·16	7,150	32·36	7,750	33·01	9,700	33·11	10,000	34·96	17,200
6	32·26	7,450	32·16	7,150	32·46	8,050	32·96	9,550	33·21	10,300	34·98	17,300
7	32·26	7,450	32·11	7,000	32·56	8,350	33·01	9,700	33·26	10,500	35·06	17,700
8	32·26	7,450	32·11	7,000	32·56	8,350	33·06	9,850	33·26	10,500	35·08	17,800
9	32·26	7,450	32·06	6,850	32·56	8,350	33·06	9,850	33·32	10,700	35·14	18,100
10	32·26	7,450	32·06	6,850	32·56	8,350	32·96	9,550	33·34	10,700	35·22	18,500
11	32·26	7,450	32·06	6,850	32·76	8·950	32·96	9,550	33·35	10,800	35·26	18,700
12	32·26	7,450	32·06	6,850	32·76	8,950	33·01	9,700	33·36	10,800	35·31	18,900
13	32·31	7,600	32·06	6,850	32·86	9,250	32·96	9,550	33·38	10,900	35·36	19,200
14	32·26	7,450	32·06	6,850	32·96	9,550	32·91	9,400	33·36	10,800	35·34	19,100
15	32·26	7,450	32·06	6·850	32·96	9,550	32·91	9,400	33·36	10,800	35·36	19,200
16	32·26	7,450	31·96	6,550	32·96	9,550	32·86	9,250	33·41	11,000	35·32	19,000
17	32·26	7,450	31·96	6,550	32·96	9,550	32·86	9,250	33·42	11,000	35·31	18,900
18	32·26	7,450	31·96	6,550	32·96	9,550	33·01	9,700	33·43	11,000	35·36	19,200
19	32·26	7,450	31·96	6,550	33·06	9,850	32·91	9,400	33·53	11,400	35·36	19,200
20	32·26	7,450	31·96	6,550	33·06	9,850	32·96	9,550	33·46	11,100	35·36	19,200
21	32·26	7,450	31·96	6,550	33·06	9,850	33·01	9,700	33·46	11,100	35·41	19,400
22	32·26	7,450	31·96	6,550	33·06	9,850	33·06	9,850	33·50	11,300	35·44	19,600
23	32·21	7,300	31·96	6,550	33·16	10,100	33·01	9,700	33·56	11,500	35·40	19,400
24	32·21	7,300	31·96	6,550	33·16	10,100	33·06	9,850	33·56	11,500	35·44	19,600
25	32·21	7,300	31·96	6,550	33·06	9,850	33·01	9,700	33·72	12,000	35·48	19,800
26	32·21	7,300	31·96	6,550	33·06	9,850	33·06	9,850	33·91	12,700	35·52	20,000
27	32·16	7,150	31·96	6,550	33·06	9,850	33·06	9,850	33·96	12,900	35·56	20,200
28	32·16	7,150	31·96	6,550	33·06	9,850	33·06	9,850	34·02	13,100	35·58	20,300
29	32·16	7,150	.....	.....	33·06	9,850	33·16	10,100	34·18	13,700	35·51	19,900
30	32·16	7,150	.....	.....	33·01	9,700	33·11	10,000	34·33	14,300	35·56	20,200
31	32·16	7,150	.....	.....	33·01	9,700	.....	.....	33·44	14,800	.....	.....

	July.		August.		September.		October.		November.		December.	
1	35·61	20,400	35·56	20,200	34·46	14,900	33·94	12,800	33·09	9,900	32·92	9,400
2	35·60	20,400	35·58	20,300	34·41	14,700	33·91	12,700	33·03	9,750	32·96	9,550
3	35·58	20,300	35·56	20,200	34·36	14,500	33·90	12,700	33·04	9,750	32·94	9,450
4	35·56	20,200	35·52	20,000	34·26	14,100	33·90	12,700	32·97	9,550	32·93	9,450
5	35·61	20,400	35·46	19,700	34·16	13,700	33·89	12,600	32·96	9,550	32·91	9,400
6	35·60	20,400	35·44	19,600	34·06	13,300	33·88	12,600	32·93	9,450	.....	.....
7	35·56	20,200	35·46	19,700	34·01	13,100	33·86	12,500	32·89	9,300	.....	.....
8	35·52	20,000	35·41	19,400	33·96	12,900	33·84	12,500	32·92	9,400	.....	.....
9	35·56	20,200	35·50	19,900	34·04	13,200	33·86	12,500	32·86	9,250	.....	.....
10	35·46	19,700	35·46	19,700	34·00	13,100	33·87	12,600	32·92	9,400	.....	.....
11	35·56	20,200	35·41	19,400	33·94	12,800	34·04	13,200	32·90	9,350	.....	.....
12	35·66	20,700	35·36	19,200	33·91	12,700	34·11	13,500	32·88	9,300	.....	.....
13	35·66	20,700	35·32	19,000	33·94	12,800	34·02	13,100	32·89	9,300	.....	.....
14	35·61	20,400	35·26	18,700	33·96	12,900	33·96	12,900	32·90	9,350	.....	.....
15	35·61	20,400	35·21	18,400	33·94	12,800	33·97	12,900	32·96	9,550	.....	.....
16	35·66	20,700	35·26	18,700	33·96	12,900	33·84	12,500	32·91	9,400	.....	.....
17	35·70	20,900	35·25	18,600	33·94	12,800	33·74	12,100	32·94	9,450	.....	.....
18	35·72	21,000	35·36	19,200	34·00	13,100	33·63	11,700	32·86	9,250	.....	.....
19	35·61	20,400	35·30	18,900	34·01	13,100	33·50	11,300	32·95	9,500	.....	.....
20	35·66	20,700	35·26	18,700	34·02	12,100	33·46	11,100	32·91	9,400	.....	.....
21	35·66	20,700	35·26	18,700	34·01	13,100	33·38	10,900	32·95	9,500	.....	.....
22	35·71	20,900	35·21	18,400	34·06	13,300	33·33	10,700	32·92	9,400	.....	.....
23	35·70	20,900	35·16	18,200	34·06	13,300	33·29	10,600	32·91	9,400	.....	.....
24	35·68	20,800	35·10	17,900	34·01	13,100	33·24	10,400	32·92	9,400	.....	.....
25	35·66	20,700	35·02	17,500	34·00	13,100	33·19	10,200	32·96	9,550	.....	.....
26	35·66	20,700	34·96	17,200	33·98	13,000	33·13	10,000	33·00	9,650	.....	.....
27	35·61	20,400	34·90	16,900	33·96	12,900	33·06	9,850	32·95	9,500	.....	.....
28	35·56	20,200	34·82	16,500	33·96	12,900	33·04	9,750	32·93	9,450	.....	.....
29	35·46	19,700	34·70	15,900	33·97	12,900	33·03	9,750	32·91	9,400	.....	.....
30	35·60	20,400	34·61	15,500	33·96	12,900	33·04	9,750	32·94	9,450	.....	.....
31	35·60	20,400	34·56	15,300	.....	.....	33·06	9,850	.....	.....	.....	.....

Note.—Discharge curve is only defined between gauge heights 1033·00 and 1035·00.
Gauge heights refer to readings on the Minaki gauge.

SESSIONAL PAPER No. 25f

Monthly Discharge of Winnipeg River at South Channel, Whitedog, for the years 1913–14.

(Drainage area, 27,500 square miles.)

Month.	Discharge in Second-Feet.			Run-Off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
1913				
September	.....	.....	[1]12,000	714,000
October	10,100	7,150	8,000	491,900
November	7,600	7,000	7,350	437,400
December	7,600	7,150	7,400	455,000
The period	10,100	7,000	8,690	2,098,300
1914				
January	7,750	7,150	7,400	455,000
February	7,150	6,550	6,800	377,700
March	10,100	7,150	9,100	559,500
April	10,100	9,250	9,650	574,200
May	14,800	9,850	11,300	694,800
June	20,300	15,100	18,600	1,106,800
July	21,000	19,700	20,500	1,260,500
August	20,300	15,300	18,600	1,143,700
September	14,900	12,700	13,200	785,500
October	13,500	9,750	11,700	719,400
November	9,900	9,250	9,450	562,300
December	.....	.....	[1]9,400	578,000
The year	21,000	6,550	12,200	8,817,400

Note.—Discharges marked thus (1) estimated.

Fairford River at Fairford. Meter Section at Bridge, 1912.

Winnipeg River at Slave Falls.

History.—A number of meterings of the Winnipeg river were made by various interested parties between March, 1906, and October, 1911. These have all been referred to gauge heights in the tail-race of the plant at Point du Bois, though they were taken at various points in the river. The majority were taken at Otter falls. On October 1, 1911, D. L. McLean established a metering station at Slave falls, and this has been operated from that date. All meterings are referred to the gauge at the Point du Bois tail-race.

Location of section.—The metering section is located about 250 feet above the crest of the Slave falls, which is about 4 miles below the city of Winnipeg's plant at Point du Bois. The initial point is a chisel mark on the rock marked by paint, on the right bank near the cable tower.

Records available.—By referring the meterings made to the Point du Bois gauge, records of daily discharge have been computed from January, 1907, to October, 1911. Since that date daily discharges based upon records of discharge at Slave falls, referred to the Point du Bois gauge made by the Manitoba Hydrographic Survey, are available.

Drainage area.—The drainage area above Otter falls is 50,500 square miles, and above Slave falls the area is 49,700 square miles.

Gauge.—A vertical staff gauge nailed to a 4-inch by 6-inch timber braced in a crevice of the rock about 75 feet downstream from the section on the right bank. It is referred to B.-M. No. 189, W.P.S. 200 feet above the initial point.

Channel.—The channel is straight for 100 feet above and 350 feet below the gauge at nearly all stages. The bed is of solid rock with a few large boulders at the left side of the section. It is permanent and all the water at all stages is confined to the section.

Discharge Measurements.—Meterings are made from a cable car running on a cable stretched across the section. Meterings covering practically the complete range in stage have been taken.

Accuracy.—The discharge curve is well defined over the range in gauge height, both when plotted to the Slave Falls and Point du Bois gauges. On account of the drop at the falls below the station there is no possibility of back-water effect. Also the section is an open-water one at all seasons, so that the open-water rating applies the year round. The section is a very favourable one, and the accuracy of the records is high.

DISCHARGE MEASUREMENTS of Winnipeg River at Slave Falls, 1911–14.

Date.	Hydrographer.	Meter. No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1911			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 13	A. M. Beale	285	.....	7,266	3·59	161·90	26,115
" 29	"	1,187	269	7,230	3·65	161·50	26,391
1912							
May 8	A. M. Beale	1,197	260	6,761	2·91	160·52	19,675
" 14	G. H. Burnham	1,197	264	7,014	3·26	161·20	22,865
" 28	A. M. Beale	1,197	273	7,366	3·65	161·88	26,886
June 4	E. B. Patterson	1,196	264	7,542	3·85	162·15	28,037
" 6	G. H. Burnham	1,187	277	7,565	3·95	162·50	29,882
" 10	E. B. Patterson	1,197	277	7,537	3·92	162·25	29,545
" 17	W. H. Richardson	1,197	273	7,449	3·80	162·09	28,206
" 24	"	1,197	272	7,396	3·67	161·90	27,143
July 6	"	1,197	272	7,238	3·56	161·75	25,767
" 8	"	1,197	271	7,237	3·55	161·78	25,691
" 11	"	1,197	271	7,446	3·54	161·76	26,358
" 15	"	1,197	271	7,446	3·58	161·77	26,657
" 16	"	1,197	272	7,473	3·60	161·79	26,903
" 17	"	1,197	271	7,473	3·54	161·80	26,454
" 18	"	1,197	271	7,446	3·52	161·78	26,210
" 19	"	1,197	271	7,473	3·55	161·75	26,529
" 20	"	1,197	271	7,473	3·55	161·76	26,529
Aug. 20	Alex. Pirie	1,197	272	7,369	3·74	161·98	27,560
Oct. 23	"	1,197	293	7,935	4·43	163·28	35,152
Nov. 21	"	1,462	291	7,785	3·95	162·85	30,761
Dec. 31	"	1,462	274	7,430	3·64	162·10	27,095
1913							
Mar. 5	A. Pirie	1,469	268	6,717	2·85	160·65	19,110
May 1	"	1,186	266	6,943	3·30	160·89	22,912
June 24	S. C. O'Grady	285	281	7,850	4·46	162·96	34,998
July 18	A. Hannington	285	277	7,522	4·03	162·11	30,290
Oct. 1	C. O. Allen	1,435	264	7,268	2·96	161·03	21,513
Nov. 5	"	1,435	256	6,535	2·54	159·92	16,600

NOTE.—Gauge heights referred to tail-race gauge at Point du Bois.
Partial ice Cover.

Discharge Measurements of Winnipeg River at Slave Falls, 1911–14—*Con.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 13	E. B. Patterson	1,497	255	6,119	2·17	159·4	13,268
Feb. 11	C. O. Allen	1,497	254	5,954	2·00	159·53	11,922
April 8	"	1,497	255	6,169	2·36	159·60	14,584
May 6	G. J. Lamb	1,375	257	6,517	2·59	159·85	16,876
" 18	"	1,375	260	6,681	2·81	160·45	18,774
" 24	"	1,375	262	6,781	2·95	160·60	20,004
June 4	A. Pirie	1,939	274	7,481	3·85	162·12	28,829
" 5	"	1,939	274	7,480	3·85	162·12	28,839
" 9	"	1,939	280	7,775	4·18	162·62	32,500
" 10	"	1,939	280	7,775	4·24	162·72	32,938
" 11	"	1,939	280	7,788	4·27	162·77	33,306
" 13	"	1,939	281	7,820	4·29	162·82	33,615
" 15	"	1,939	281	7,820	4·30	162·95	33,638
" 22	"	1,939	290	7,917	4·38	163·10	34,713
" 23	"	1,939	282	7,877	4·32	163·12	34,310
" 24	"	1,939	284	7,896	4·36	163·12	34,428
" 26	"	1,939	293	7,951	4·45	163·12	35,394
" 29	"	1,939	293	7,964	4·45	163·27	35,459
" 30	"	1,939	294	7,994	4·46	163·32	35,683
July 3	"	1,939	294	8,023	4·52	163·35	36,366
" 7	"	1,939	293	7,965	4 49	163·32	35,672
" 13	"	1,939	295	8,063	4·53	163·38	36,561
" 14	"	1,939	295	8,063	4·55	163·40	36,759
" 15	"	1,939	295	8,063	4·55	163·36	36,690
" 18	"	1,939	295	8,063	4·50	163·35	36,310
" 20	"	1,939	294	8,048	4·50	163·35	36,173
" 22	"	1,939	294	8,048	4·55	163·40	36,605
" 23	"	1,939	294	8,048	4·57	163·32	36,381
" 24	"	1,939	294	8,033	4·55	163·30	36,592
" 25	"	1,939	293	8,004	4·23	163·36	33,855
" 28	"	1,939	293	8,004	4·44	163·28	35,529
" 29	"	1,939	293	7,989	4·52	163·30	36,116
" 30	"	1,939	292	7,960	4·45	163·28	35,429
" 31	"	1,939	292	7,932	4·41	163·15	34,957
Aug. 1	"	1,939	292	7,932	4·38	163·14	34,744
" 3	"	1,939	292	7,932	4·34	163·08	34,468
" 4	"	1,939	291	7,896	4·32	163·14	34,115
" 5	"	1,939	281	7,834	4·30	163·06	33,689
" 6	"	1,939	281	7,834	4·27	163·01	33,416
Sept. 10	"	1,939	272	7,322	3·58	161·77	26,282
" 11	"	1,939	271	7,292	3·55	161·67	25,942
" 14	"	1,939	271	7,292	3·57	161·70	26,019
" 15	"	1,939	271	7,292	3·54	161·62	25,834
" 16	"	1,939	269	7,260	3·38	161·62	24,608
" 17	"	1,939	269	7,234	3·51	161·65	25,446
" 18	"	1,939	269	7,234	3·47	161·57	25,105
" 19	"	1,939	269	7,208	3·45	161·52	24,938
" 22	"	1,939	269	7,234	3·49	161·67	25,223
" 23	"	1,939	269	7,260	3·53	161·67	25,597
" 24	"	1,939	269	7,234	3·51	161·65	25,376
" 25	"	1,939	269	7,234	3·50	161·62	25,301
" 28	"	1,939	269	7,260	3·50	161·62	25,388
" 29	"	1,939	269	7,234	3·44	161·66	24,911
" 30	"	1,939	269	7,234	3·46	161·57	25,048
Oct. 1	"	1,939	269	7,207	3·44	161·60	24,801
" 2	"	1,939	269	7,207	3·43	161·50	24,705
" 7	"	1,939	269	7,207	3·43	161·57	24,639
" 8	"	1,939	269	7,207	3·41	161·55	24,574
" 26	"	1,760	265	7,088	3·32	161·32	23,533
" 28	"	1,760	264	7,061	3·24	161·12	22,877
" 29	"	1,760	263	7,031	3·21	161·07	22,570
" 30	"	1,760	263	7,031	3·21	161·12	22,570
" 31	"	1,760	262	7,001	3·19	161·07	22,333
Nov. 2	"	1,760	262	7,001	3·21	161·12	22,472
" 3	"	1,760	261	6,974	3·15	160·95	21,967
" 5	"	1,760	261	6,948	3·14	160·92	21,817
" 6	"	1,760	261	6,948	3·14	160·87	21,817
" 7	"	1,760	261	6,921	3·05	160·85	21,109
" 9	"	1,760	261	6,974	3 20	161·05	22,317
" 10	"	1,760	260	6,893	3·03	160·80	20,886
" 11	"	1,760	260	6,893	3·02	160·77	20,817
" 13	"	1,760	259	6,892	3·01	160·95	20,745
" 19	"	1,760	259	6,865	2·98	160·77	20,458
" 20	"	1,760	259	6,865	2·98	160·77	20,458
" 21	"	1,760	258	6,813	2·98	160·72	20,303
" 23	"	1,760	259	6,865	3·01	160·77	20,664
" 24	"	1,760	259	6,839	2·90	160·80	20,243
" 25	"	1,760	259	6,839	2·98	160·77	20,380
" 27	"	1,760	258	6,813	2·97	160·72	20,235
" 28	"	1,760	258	6,813	2·96	160·70	20,166
" 30	"	1,760	259	6,839	2·98	160·75	20,380
Dec. 2	"	1,760	259	6,839	2·98	160·77	20,380
" 4	"	1,760	259	6,813	2·97	160·80	20,235
" 5	"	1,760	259	6,813	2·96	160·75	20,166
" 9	"	1,760	258	6,787	2·89	160·65	19,614
" 10	"	1,760	259	6,787	2·89	160·67	19,614

Note.—Gauge heights referred to tail-race gauge at Point du Bois.

Daily Gauge Height and Discharge of Winnipeg River at Slave Falls, for 1911.

[Drainage area, 49,700 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Sec.-ft.	Feet.	Feet.	Sec.-ft.
1	59·50	13,900	59·50	13,900	59·42	13,500	59·00	11,300	59·25	12,600	60·10	17,000
2	59·58	14,300	59·54	14,100	59·30	12,900	58·90	10,800	59·30	12,900	60·15	17,200
3	59·66	14,700	59·58	14,300	59·30	12,900	59·00	11,300	59·30	12,900	60·20	17,500
4	59·78	15,300	59·46	13,700	59·30	12,900	59·10	11,800	59·30	12,900	60·20	17,500
5	59·72	15,000	59·55	14,100	59·35	13,100	59·08	11,700	59·35	13,100	60·20	17,500
6	59·70	14,900	59·65	14,600	59·38	13,300	59·02	11,400	59·40	13,400	60·20	17,500
7	59·70	14,900	59·54	14,100	59·42	13,500	59·02	11,400	59·45	13,600	60·20	17,500
8	59·70	14,900	59·42	13,500	59·20	12,300	59·02	11,400	59·40	13,400	60·20	17,500
9	59·71	15,000	59·48	13,800	59·15	12,100	59·02	11,400	59·45	13,600	60·25	17,800
10	59·75	15,200	59·50	13,900	59·18	12,200	59·00	11,300	59·47	13,700	60·25	17,800
11	59·80	15,400	59·48	13,800	59·00	11,400	59·00	11,300	59·48	13,800	60·30	18,000
12	59·95	16,200	59·40	13,400	59·40	13,400	59·05	11,600	59·50	13,900	60·35	18,300
13	60·00	16,500	59·32	13,000	59·12	11,900	59·05	11,600	59·50	13,900	60·35	18,300
14	60·05	16,700	59·23	12,500	59·18	12,200	59·05	11,600	59·60	14,400	60·35	18,300
15	60·10	17,000	59·23	12,500	59·14	12,000	59·12	11,900	59·70	14,900	60·35	18,300
16	60·15	17,200	59·23	12,500	59·14	12,000	59·15	12,100	59·77	15,300	60·35	18,300
17	60·00	16,500	59·23	12,500	59·14	12,000	59·15	12,100	59·79	15,400	60·38	18,500
18	59·78	15,300	59·25	12,600	59·12	11,900	59·17	12,200	59·85	15,700	60·36	18,300
19	59·76	15,200	59·28	12,700	59·10	11,800	59·17	12,200	59·87	15,800	60·40	18·600
20	59·72	15,000	59·30	12,900	59·08	11,700	58·17	12,200	59·90	15,900	60·40	18,600
21	59·68	14,800	59·30	12,900	59·05	11,600	59·25	12,600	59·90	15,900	60·39	18,500
22	59·64	14,600	59·27	12,700	59·10	11,800	59·25	12,600	59·88	15,800	60·43	18,700
23	59·62	14,500	59·25	12,600	59·12	11,900	59·25	12,600	59·90	15,900	60·46	18,900
24	59·60	14,400	59·22	12,400	59·15	12,100	59·25	12,600	59·90	15,900	60·50	19,100
25	59·60	14,400	59·22	12,400	59·13	12,000	59·25	12,600	59·90	15,900	60·58	19,500
26	59·40	13,400	59·25	12,600	59·00	11,400	59·27	12,700	59·95	16,200	60·60	19,600
27	59·40	13,400	59·30	12,900	58·90	10,800	59·32	13,000	59·98	16,400	60·60	19,600
28	59·40	13,400	59·35	13,100	59·10	11,800	59·31	12,900	60·02	16,600	60·60	19,600
29	59·45	13,600	.....	.....	59·07	11,700	59·30	12,900	60·05	16,700	60·62	19,800
30	59·45	13,600	.....	.....	59·15	12,100	59·25	12,600	60·10	17,000	60·62	19,800
31	59·50	13,900	.....	.....	59·05	11,600	.....	.....	60·10	17,000	.....	.....

	July.		August.		September.		October.		November.		December.	
1	60·62	19,800	61·62	25,300	61·68	25,700	61·47	24,500	61·60	25,200	60·75	20,400
2	60·62	19,800	61·61	25,300	61·65	25,500	61·50	24,700	61·57	25,000	60·72	20,300
3	60·64	19,900	61·60	25,200	61·62	25,300	61·50	24,700	61·55	24,900	60·68	20,100
4	60·66	20,000	61·63	25,400	61·65	25,500	61·56	25,000	61·50	24,700	60·65	19,900
5	60·66	20,000	61·65	25,500	61·65	25,500	61·64	25,400	61·45	24,400	60·65	19,900
6	60·66	20,000	61·68	25,700	61·64	25,500	61·75	26,100	16·42	24,200	60·62	19,800
7	60·66	20,000	61·72	25,900	61·60	25,200	61·79	26,300	61·37	23,900	60·60	19,600
8	60·78	20,600	61·78	26,200	61·55	24,900	61·85	26,700	61·36	23,800	60·60	19,600
9	60·90	21,300	61·84	26,600	61·48	24,500	61·85	26,700	61·34	23,700	60·56	19,400
10	60·90	21,300	61·90	27,000	61·45	24,400	61·85	26,700	61·33	23,700	60·56	19,400
11	60·95	21,500	61·87	26,800	61·46	24,400	61·90	27,000	61·33	23,700	60·60	19,600
12	61·05	22,100	61·85	26,700	61·40	24,100	61·93	27,100	61·30	23,500	60·60	19,600
13	61·10	22,400	61·85	26,700	61·38	24,000	61·80	26,400	61·25	23,200	60·60	19,600
14	61 15	22,700	61·85	26,700	61·40	24,100	61·80	26,400	61·20	22,900	60·55	19,400
15	61·18	22,800	61·85	26,700	61·43	24,800	61·80	26,400	61·15	22,600	60·55	19,400
16	61·25	23,200	61·83	26,500	61·43	24,300	61·80	26,400	61·15	22,600	60·56	19,400
17	61·34	23,700	61·81	26,400	61·45	24,400	61·65	25,500	61·10	22,400	60·66	20,000
18	61·42	24,200	61·81	26,400	61·47	24,500	61·70	25,800	61·10	22,400	60·55	19,400
19	61·48	24,500	61·80	26·400	61·50	24,700	61·75	26,100	61·10	22,400	60·54	19,300
20	61·48	24,500	61·78	26,200	61·53	24,800	61·75	26,100	61·05	22,100	60·53	19,300
21	61·52	24,800	61·77	26,200	61·56	25,000	61·78	26,200	61·05	22,100	60·52	19,200
22	61·52	24,800	61·75	26,100	61·57	25,000	61·80	26,400	61·05	22,100	60·50	19,100
23	61·52	24,800	61·76	26,100	61·57	25,000	61·75	26,100	61·00	21,800	60·50	19,100
24	61·52	24,800	61·76	26,100	61·54	24,900	61·75	26,100	61·00	21,800	60·48	19,000
25	61·52	24,800	61·75	26,100	61·51	24,700	61·70	25,800	60·95	21,500	60·50	19,100
26	61·55	24,900	61·75	26,100	61·48	24,500	61·70	25,800	60·90	21,300	60·46	18,900
27	61·60	25,200	61·73	26,000	61·45	24,400	61·70	25,800	60·90	21,300	60·42	18,700
28	61·62	25,300	61·70	25,800	61·48	24,500	61·70	25,800	60·88	21,200	60·40	18,600
29	61·62	25,300	61·70	25,800	61·45	24,400	61·68	25,700	60·85	21,000	60·35	18,300
30	61·62	25,300	61·68	25,700	61·48	24,500	61·65	25,500	60·80	20,700	60·30	18,000
31	61·62	25,300	61·68	25,700	.....	.....	61·60	25,200	.....	.....	60·30	18,000

Note.—Daily discharges are taken from rating curve plotted for Slave Falls. Gauge heights are referred to tail-race gauge at Point du Bois.

SESSIONAL PAPER No. 25f

Daily Discharge and Gauge Height of Winnipeg River at Slave Falls, for 1912.

[Drainage Aresa, 49,700 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	60·30	18,000	60·40	18,600	59·85	15,700	[1]59·19	12,300	[1]60·01	16,500	62·05	27,900
2	60·30	18,000	60·40	18,600	59·84	15,600	[1]59·20	12,300	60·07	16,800	62·15	28,500
3	60·30	18,000	60·35	18,300	59·83	15,600	[1]59·21	12,400	60·10	17,000	62·15	28,500
4	60·35	18,300	60·30	18,000	59·82	15,500	59·23	12,500	60·45	18,808	[1]62·27	29,200
5	60·40	18,600	60·28	17,900	59·80	15,400	59·23	12,500	60·50	19,100	[1]62·39	29,900
6	60·65	19,900	60·28	17,900	59·77	15,300	[1]59·24	12,500	60·40	18,600	62·50	30,600
7	61·00	21,800	60·28	17,900	59·75	15,200	[1]59·25	12,600	60·48	19,000	62·50	30,600
8	61·05	22,100	60·25	17,800	59·72	15,000	[1]59·26	12,600	60·52	19,200	62·55	30,900
9	61·10	22,400	60·23	17,700	59·68	14,800	[1]59·27	12,700	60·65	19,900	62·30	29,400
10	61·10	22,400	60·20	17,500	59·66	14,700	[1]59·28	12,700	[1]60·75	20,460	62·25	29,100
11	61·10	22,400	60·15	17,200	59·64	14,600	[1]59·29	12,800	60·85	21,000	[1]62·21	28,800
12	61·10	22,400	60·12	17,100	59·62	14,500	59·29	12,800	[1]60·92	21,400	[1]62·17	28,600
13	61·05	22,100	60·10	17,000	59·59	14,300	[1]59·30	12,900	61·00	21,800	[1]62·13	28,300
14	61·05	22,100	60·05	16,700	[1]59·56	14,200	[1]59·31	12,900	61·20	22,900	[1]62·19	28,700
15	61·00	21,800	60·02	16,600	[1]59·53	14,000	[1]59·32	13,000	61·35	23,800	62·05	27,900
16	60·95	21,500	60·00	16,500	[1]59·50	13,900	[1]59·33	13,000	[1]61·37	23,900	62·05	27,900
17	60·70	20,200	60·00	16,500	[1]59·47	13,700	[1]59·34	13,100	61·40	24,100	62·03	27,700
18	60·70	20,200	60·00	16,500	[1]59·44	13,600	[1]59·35	13,100	61·43	24,300	62·15	28,500
19	60·70	20,200	59·98	16,400	[1]59·40	13,400	59·35	13,100	[1]61·47	24,500	62·01	27,600
20	60·65	19,900	59·97	16,300	[1]59·38	13,300	[1]59·40	13,400	61·50	24,700	62·03	27,700
21	60·60	19,600	59·96	16,300	[1]59·33	13,000	[1]59·45	13,600	61·51	24,700	62·03	27,700
22	60·55	19,400	59·95	16,200	59·30	12,900	[1]59·50	13,900	61·53	24,900	62·00	27,600
23	60·55	19,400	59·94	16,100	[1]59·24	12,500	[1]59·55	14,100	61·62	25,300	61·95	27,300
24	60·55	19,400	59·93	16,100	[1]59·18	12,200	[1]59·60	14,400	61·70	25,800	61·90	27,000
25	60·50	19,100	59·92	16,000	59·12	11,900	[1]59·65	14,600	61·74	26,000	61·80	26,400
26	60·45	18,800	59·91	16,000	[1]59·13	12,000	[1]59·71	15,000	[1]61·79	26,300	61·89	26,900
27	60·45	18,800	59·89	15,900	[1]59·14	12,000	[1]59·77	15,300	61·85	26·700	61·88	26,800
28	60·45	18,800	59·89	15,900	[1]59·15	12,100	[1]59·83	15,600	61·88	26,800	[1]61·88	26,800
29	60·43	18,700	59·88	15,800	[1]59·16	12,100	[1]59·89	15,900	61·91	27,000	61·89	26,900
30	60·41	18,600	.....	.....	[1]59·17	12,200	[1]59·95	16,200	61·95	27,300	61·87	26,800
31	60·40	18,600	.....	.....	[1]59·18	12,200	.....	.....	61·98	27,400	.....	.....

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	61·96	27,300	62·05	27,900	61·99	27,500	[1]62·52	30,700	63·25	35,800	62·60	31,300
2	61·89	26,900	62·05	27,900	61·99	27,500	[1]62·55	30,900	63·25	35,800	62·60	31,300
3	61·87	26,800	62·01	27,600	62·00	27,600	[1]62·58	31,100	63·25	35,800	62·60	31,300
4	61·84	26,600	62·05	27,900	62·47	30,400	[1]62·61	31,300	63·25	35,800	62·60	31,300
5	61·79	26,300	62·09	28,100	62·35	29,700	[1]62·64	31,500	63·20	35,400	62·60	31,300
6	61·75	26,100	62·07	28,000	62·16	28,500	[1]62·67	31,700	63·15	35,100	62·60	31,300
7	61·76	26,100	62·10	28,200	62·25	29,100	62·70	31,900	63·15	35,100	62·50	30,600
8	61·78	26,200	63·05	27,900	62·25	29,100	62·70	31,900	63·15	35,100	62·50	30,600
9	61·76	26,100	62·05	27,900	62·26	29,100	62·74	32,200	63·15	35,100	62·50	30,600
10	61·76	26,100	62·06	27,900	62·25	29,100	62·80	32,600	63·15	35,100	62·50	30,600
11	61·75	26,100	62·07	28,000	62·23	28,900	62·91	33,400	63·15	35,100	62·40	30,000
12	61·76	26,100	62·08	28,000	62·25	29,100	62·96	33,700	63·10	34,700	62·40	30,000
13	61·76	26,100	62·09	28,100	62·25	29,100	62·98	33,800	63·10	34,700	62·40	30,000
14	61·75	26,100	[1]62·03	27,700	62·27	29,200	63·03	34,200	63·00	34,000	62·30	29,400
15	61·77	26,300	[1]62·03	27,700	62·30	29,400	63·05	34,300	62·90	33,300	62·30	29,400
16	61·79	26,300	62·03	27,700	[1]62·32	29,500	63·06	34,400	62·85	32,900	62·30	29,400
17	61·80	26,400	62·02	27,700	[1]62·35	29,700	63·10	34,700	62·85	32,900	62·20	28,800
18	61·78	26,200	62·04	27,800	[1]62·37	29,800	63·10	34,700	62·85	32,900	62·20	28,800
19	61·75	26,100	62·05	27,900	[1]62·40	30,000	63·15	35,100	62·85	32,900	62·20	28,800
20	61·76	26,100	61·98	27,400	[1]62·42	30,100	63·20	35,400	62·85	32,900	62·20	28,800
21	61·74	26,000	62·00	27,600	62·45	30,300	63·28	36,000	62·80	32,600	62·20	28,800
22	61·70	25,800	62·05	27,900	63·46	30,400	63·28	36,000	62·80	32,600	62·20	28,800
23	61·75	26,100	62·03	27,700	62·48	30,500	63·28	36,000	62·80	32,600	62·20	28,800
24	61·77	26,200	61·98	27,400	62·51	30,700	63·25	35,800	62·80	32,600	62·20	28,800
25	61·79	26,300	62·00	27,600	62·58	31,100	63·25	35,800	62·75	32,200	62·20	28,800
26	61·80	26,400	62·00	27,600	62·57	31,100	63·20	35,400	62·75	32,200	62·20	28,800
27	61·84	26,600	62·00	27,600	62·56	31,000	63·20	35,400	62·75	32,200	62·20	28,800
28	61·85	26,700	62·00	27,600	62·56	31,000	63·20	35,400	62·75	32,200	62·20	28,800
29	61·89	26,900	61·99	27,500	62·46	30,400	63·25	35,800	62·75	32,200	62·20	28,800
30	61·90	27,000	62·00	27,600	[1]62·49	30,600	63·25	35,800	62·75	32,200	62·10	28,200
31	61·94	27,200	62·00	27,600	.....	.....	63·30	36,200	.....	.....	62·10	28,200

NOTE.—Daily discharges are taken from rating curve plotted for Slave falls. Gauge heights are referred to tail race gauge at Point du Bois. Gauge heights marked thus [1] interpolated.

Daily Gauge Height and Discharge of Winnipeg River at Slave Falls, for 1913.

[Drainage area, 49,700 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	62·10	28,200	62·10	28,200	60·90	21,300	59·90	15,900	60·89	21,200	62·81	32,600
2	62·00	27,600	62·10	28,200	60·90	21,300	59·95	16,200	61·11	22,400	62·94	33,600
3	62·00	27,600	62·10	28,200	60·90	21,300	59·95	16,200	61·18	22,800	62·89	33,200
4	62·00	27,600	62·10	28,200	60·80	20,700	60·00	16,500	61·27	23,300	62·96	33,700
5	62·00	27,600	62·10	28,200	60·80	20,700	60·00	16,500	61·51	24,700	63·00	34,000
6	62·00	27,600	62·10	28,200	60·80	20,700	60·00	16,500	61·61	25,300	62·93	33,500
7	62·00	27,600	62·10	28,200	60·80	20,700	60·00	16,500	61·72	25,900	62·96	33,700
8	62·00	27,600	62·00	27,600	60·70	20,200	60·00	16,500	61·70	25,800	62·92	33,400
9	62·00	27,600	62·00	27,600	60·70	20,200	60·00	16,500	61·82	26,500	63·03	34,200
10	62 00	27,600	62·00	27,600	60·60	19,500	60·00	16,500	61·89	26,900	63·02	34,100
11	62·00	27,600	62·00	27,600	60·60	19,600	60·05	16,700	61·98	27,400	63·05	34,300
12	62·10	28,200	62·00	27,600	60·50	19,100	60·05	16,700	62·03	27,700	63·05	34,300
13	62·10	28,200	62·00	27,600	60·50	19,100	60·05	16,700	62·03	27,700	63·11	34,800
14	62·10	28,200	62·00	27,600	60·50	19,100	60·05	16,700	62·10	28,200	63·05	34,300
15	62·10	28,200	61·90	27,000	60·40	18,600	60·05	16,700	62·11	28,200	62·94	33,600
16	62·10	28,200	61·90	27,000	60·40	18,600	60·10	17,000	62·14	28,400	63·01	34,100
17	62·10	28,200	61·80	26,400	60·40	18,600	60·10	17,000	62·12	28,300	63·02	34,100
18	62·10	28,200	61·80	26,400	60·30	18,000	60·15	17,200	62·15	28,500	62·99	33,900
19	62·10	28,200	61·60	25,200	60·30	18,000	60·15	17,200	62·37	29,800	62·94	33,600
20	62·10	28,200	61·60	25,200	60·30	18,000	60·20	17,500	62·43	30,200	62·90	33,300
21	62·10	28,200	61·30	23,500	60·20	17,500	60·20	17,500	62·43	30,200	62·88	33,100
22	62·10	28,200	61·30	23,500	60·20	17,500	60·30	18,000	62·43	30,200	62·87	33,100
23	62·10	28,200	61·20	22,900	60·10	17,000	60·30	18,000	62·68	31,800	62·95	33,600
24	62·10	28,200	61·10	22,400	60·10	17,000	60·40	18,600	62·70	31,900	62·96	33,700
25	62·10	28,200	61·10	22,400	60·10	17,000	60·50	19,100	62·78	32,400	62·85	32,900
26	62·10	28,200	61·00	21,800	60·10	17,000	60·50	19,100	62·80	32,600	62·86	33,000
27	62·10	28,200	61·00	21,800	60·10	17,000	60·60	19,600	62·76	32,300	62·85	32,900
28	62·10	28,200	61·00	21,800	60·10	17,000	60·70	20,200	62·88	33,100	62·92	33,400
29	62·10	28,200	.....	.....	60·00	16,500	60·70	20,200	62·86	33,000	62·85	32,900
30	62·10	28,200	.....	.....	60·00	16,500	60·70	20,200	62·83	32,800	62·91	33,400
31	62·10	28,200	.....	.....	59·90	15,900	.....	.....	62·86	33,000	.....	.....

	July.		August.		September.		October.		November.		December.	
1	62·89	33,200	61·90	27,000	61·84	26,600	61·03	22,000	59·80	15,400	59·89	15,900
2	62·93	33,500	61·90	27,000	61·80	26,400	60·93	21,400	59·60	14,400	59·82	15,500
3	62·91	33,300	61·87	26,800	61·81	26,400	60·75	20,500	59·70	14,900	59·82	15,500
4	62·91	33,300	62·00	27,600	61·80	26,400	60·59	19,600	59·70	14,900	59·77	15,300
5	62·82	32,700	61·94	27,200	61·77	26,200	60·62	19,800	59·91	16,000	59·79	15,400
6	62·75	32,200	61·98	27,400	61·70	25,800	60·70	20,200	59·87	15,800	59·77	15,300
7	62·81	32,600	62·02	27,700	61·60	25,200	60·42	18,700	59·84	15,600	59·54	14,100
8	62·72	32,000	62·01	27,600	61·77	26,200	60·45	18,800	59·84	15,600	59·82	15,500
9	62·71	32,000	62·02	27,700	61·76	26,100	60·46	18,900	59·84	15,600	59·76	15,200
10	62·73	32,100	61·97	27,400	61·70	25,800	60·45	18,800	[1]59·83	15,600	59·79	15,400
11	62·80	32,600	62·07	28,000	61·62	25,300	60·32	18,100	[1]59·83	15,600	59·74	15,100
12	62·68	31,800	62·09	28,100	61·66	25,600	60·16	17,300	[1]59·82	15,500	59·69	14,800
13	62·52	30,700	62·12	28,300	61·62	25,300	60·32	18,100	[1]59·82	15,500	59·72	15,000
14	62·52	30,700	62·07	28,000	61·54	24,900	60·27	17,900	[1]59·81	15,500	59·56	14,200
15	62·51	30,700	62·16	28,500	61·81	26,400	60·19	17,400	[1]59·80	15,400	59·59	14,300
16	62·37	29,800	62·13	28,300	61·59	25,200	60·19	17,400	59·79	15,400	59·59	14,300
17	62·24	29,000	62·09	28,100	61·58	25,100	60·16	17,300	[1]59·78	15,300	59·64	14,600
18	62·11	28,200	62·20	28,800	61·63	25,400	60·06	16,800	[1]59·77	15,300	59·58	14,300
19	62·07	28,000	62·19	28,700	61·48	24,500	59·65	14,600	[1]59·76	15,200	59·56	14,200
20	61·99	27,500	62·14	28,400	61·43	24,300	60·02	16,600	[1]59·75	15,200	59·49	13,800
21	61·98	27,400	62·06	27,900	61·36	23,900	60·07	16,800	[1]59·73	15,100	59·42	13,500
22	62·00	27,600	62·05	27,900	61·58	25,100	60·02	16,600	[1]59·71	15,000	59·46	13,700
23	61·94	27,200	61·98	27,400	61·53	24,800	60·02	16,600	59·69	14,800	59·49	13,800
24	61·90	27,000	61·96	27,300	61·48	24,500	60·00	16,500	[1]59·73	15,100	59·59	14,300
25	61·93	27,100	61·95	27,300	61·40	24,100	59·78	15,300	[1]59·77	15,300	59·44	13,600
26	61·82	26,500	61·92	27,100	61·35	23,800	59·99	16,400	[1]59·81	15,500	59·39	13,300
27	61·72	25,900	61·92	27,100	61·25	23,200	60·60	19,600	59·84	15,600	59·32	13,000
28	61·85	26,700	61·88	26,800	61·16	22,700	60·10	17,000	59·86	15,700	59·38	13,300
29	61·89	26,900	61·85	26,700	61·24	23,200	60·10	17,000	59·82	15,500	59·51	13,900
30	61·88	26,800	61·85	26,700	61·13	22,500	60·00	16,500	59·64	14,600	59·54	14,100
31	61·89	26,900	61·78	26,200	.....	.....	60·00	16,500	.....	.....	59·51	13,900

Notes.—Daily discharges are taken from rating curve plotted for Slave falls. Gauge heights are referred to tail-race gauge at Point du Bois. Gauge heights marked thus [1] interpolated.

Daily Gauge Height and Discharge of Winnipeg River at Slave Falls, for 1914.

[Drainage area, 49,700 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	59·37	13,200	59·17	12,200	59·10	11,800	59·57	14,200	59·80	15,400	61·55	24,900
2	59·47	13,700	59·35	13,100	59·32	13,000	59·52	14,000	59·72	15,000	61·50	24,700
3	59·50	13,900	59·27	12,700	59·32	13,000	59·52	14,000	59·62	14,500	61·95	26,300
4	59·37	13,200	59·37	13,200	59·32	13,000	59·50	13,900	59·85	15,700	62·12	28,300
5	59·55	14,100	59·35	13,100	59·27	12,700	59·42	13,500	59·92	16,000	62·12	28,300
6	59·50	13,900	59·35	13,100	59·42	13,500	59·57	14,200	59·85	15,700	62·27	29,200
7	59·50	13,900	59·25	12,600	59·40	13,400	59·52	14,000	60·05	16,700	62·32	29,500
8	59·55	14,100	59·30	12,900	59·30	12,900	59·60	14,400	59·95	16,200	62·42	30,100
9	59·50	13,900	59·50	13,900	59·55	14,100	59·57	14,200	60·10	17,000	62·62	31,400
10	59·42	13,500	59·37	13,200	59·57	14,200	59·42	13,500	59·95	16,200	62·72	32,000
11	59·37	13,200	59·45	13,600	59·47	13,700	59·47	13,700	60·25	17,800	62·77	32,400
12	59·42	13,500	59·47	13,700	59·47	13,700	59·42	13,500	60·15	17,200	62·82	32,700
13	59·40	13,400	59·45	13,600	59·47	13,700	59·60	14,400	60·20	17,500	62·82	32,700
14	59·42	13,500	59·55	14,100	59·52	14,000	59·57	14,200	60·25	17,800	62·82	32,700
15	59·52	14,000	59·22	12,400	59·42	13,500	59·62	14,500	60·30	18,000	62·95	33,600
16	59·47	13,700	59·45	13,600	59·57	14,200	59·57	14,200	60·25	17,800	62·87	33,100
17	59·37	13,200	59·47	13,700	59·52	14,000	59·57	14,200	60·25	17,800	62·92	33,400
18	59·27	12,700	59·37	13,200	59·62	14,500	59·57	14,200	60·45	18,800	63·02	34,100
19	59·57	14,200	59·32	13,000	59·52	14,000	59·57	14,200	60·45	18,800	63·05	34,300
20	59·45	13,600	59·37	13,200	59·57	14,200	59·67	14,700	60·50	19,100	62·92	33,400
21	59·60	14,400	59·32	12,900	59·50	13,900	59·67	14,700	60·55	19,400	62·92	33,400
22	59·57	14,200	59·07	11,700	59·40	13,400	59·70	14,900	60·55	19,400	63·10	34,700
23	59·47	13,700	59·40	13,400	59·52	14,000	59·72	15,000	60·55	19,400	63·12	34,800
24	59·50	13,900	59·42	13,500	59·57	14,200	59·72	15,000	60·60	19,600	63·12	34,800
25	59·22	12,400	59·37	13,200	59·50	13,900	59·62	14,500	60·65	19,900	63·12	34,800
26	59·47	13,700	59·32	12,900	59·57	14,200	59·60	14,400	60·85	21,000	63·12	34,800
27	59·40	13,400	59·22	12,400	59·52	14,000	59·77	15,300	61·00	21,800	63·12	34,800
28	59·27	12,700	59·27	12,700	59·50	13,900	59·82	15,500	61·00	21,800	63·10	34,700
29	59·37	13,200	.....	.....	59·42	13,500	59·80	15,400	61·10	22,400	63·27	35,900
30	59·32	13,000	.....	.....	59·57	14,200	59·77	15,300	61·20	22,900	63·32	36,300
31	59·25	12,600	.....	.....	59·52	14,000	.....	.....	61·20	22,900	.....	.....

	July.		August.		September.		October.		November.		December.	
1	63·27	35,900	63·07	34,500	62·42	30,100	61·60	25,200	60·92	21,400	60·82	20,800
2	63·37	36,700	63·05	34,300	62·27	29,200	61·50	24,700	61·12	22,500	60·77	20,600
3	63·32	36,300	63·02	34,100	62·20	28,800	61·45	24,400	60·95	21,500	60·77	20,600
4	63·32	36,300	63·05	34,300	62·12	28,300	61·37	23,900	61·02	21,900	60·80	20,700
5	63·20	35,400	63·02	34,100	62·07	28,000	61·57	25,000	60·92	21,400	60·75	20,500
6	63·42	37,100	62·92	33,400	61·82	26,500	61·57	25,000	60·87	21,100	60·57	19,500
7	63·32	36,300	62·82	32,700	61·82	26,500	61·57	25,000	60·85	21,000	60·72	20,300
8	63·35	36,500	62·82	32,700	61·82	26,500	61·55	24,900	60·75	20,500	60·70	20,200
9	63·32	36,300	62·72	32,000	61·80	26,400	61·47	24,500	61·05	22,100	60·65	19,900
10	63·30	36,100	62·80	32,600	61·77	26,200	61·52	24,800	60·80	20,700	60·67	20,000
11	63·27	35,900	62·82	32,700	61·67	25,600	61·57	25,000	60·77	20,600	60·67	20,000
12	63·27	35,900	62·77	32,400	61·72	25,900	61·67	25,600	60·75	20,500	60·65	19,900
13	63·37	36,700	62·80	32,600	61·62	25,300	61·77	26,200	60·95	21,500	60·52	19,200
14	63·40	36,900	62·77	32,400	61·70	25,800	61·82	26,500	60·87	21,100	60·67	20,000
15	63·42	37,100	62·70	31,900	61·62	25,300	61·77	26,200	60·72	20,300	60·62	19,700
16	63·45	37,300	62·62	31,400	61·62	25,300	61·75	26,100	60·92	21,400	60·60	19,600
17	63·37	36,700	62·77	32,400	61·65	25,500	61·67	25,600	60·87	21,100	60·57	19,500
18	63·32	36,300	62·77	32,400	61·57	25,000	61·65	25,500	60·80	20,700	60·50	19,100
19	63·27	35,900	62·67	31,700	61·52	24,800	61·62	25,300	60·77	20,600	60·47	18,900
20	63·40	36,900	62·62	31,400	61·45	24,400	61·62	25,300	60·77	20,600	60·35	18,300
21	63·45	37,300	62·60	31,300	61·67	25,600	61·60	25,200	60·72	20,300	60·62	19,700
22	63·37	36,700	62·57	31,100	61·67	25,600	61·52	24,800	60·70	20,200	60·50	19,100
23	63·42	37,100	62·57	31,100	61·67	25,600	61·37	23,900	60·77	20,600	60·42	18,700
24	63·37	36,700	62·67	31,700	61·65	25,500	61·32	23,600	60·80	20,700	60·42	18,700
25	63·40	36,900	62·62	31,400	61·62	25,300	61·30	23,500	60·77	20,600	60·35	18,300
26	63·27	35,900	62·62	31,400	61·57	25,000	61·32	23,600	60·72	20,300	60·32	18,100
27	63·37	36,700	62·62	31,400	61·45	24,400	61·37	23,900	60·72	20,300	60·40	18,600
28	63·30	36,100	62·60	31,300	61·62	25,300	61·12	22,500	60·70	20,200	60·47	18,900
29	63·27	35,900	62·57	31,100	61·60	25,200	61·07	22,200	60·70	20,200	60·47	18,900
30	63·22	35,600	62·40	30,000	63·57	25,000	61·12	22,500	60·75	20,500	60·45	18,800
31	63·07	34,500	62·52	30,700	.....	.....	61·07	22,200	.....	.....	60·42	18,700

NOTE.—Daily discharges are taken from rating curve plotted for Slave falls. Gauge heights are referred to tail-race gauge at Point du Bois.

Monthly Discharge of Winnipeg River at Slave Falls, for the years 1911–14.

[Drainage Area, 49,700 square miles.]

Month.	Discharge in Second-feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage. area.	Total in acre-feet.
1911.						
January	17,200	13,400	14,900	0·300	0·346	916,200
February	14,600	12,400	13,200	0·266	0·277	733,100
March	13,500	10,800	12,200	0·245	0·283	750,100
April	13,000	10,800	12,000	0·241	0·269	714,000
May	17,000	12,600	14,900	0·300	0·346	916,200
June	19,800	17,000	18,400	0·370	0·413	1,094,900
July	25,300	19,800	22,900	0·461	0·532	1,408,100
August	27,000	25,200	26,100	0·525	0·605	1,604,800
September	25,700	24,000	24,800	0·499	0·557	1,475,700
October	27,100	24,500	25,900	0·521	0·601	1,592,500
November	25,200	20,700	22,900	0·461	0·514	1,362,600
December	20,400	18,000	19,300	0·388	0·447	1,186,700
The year	27,100	10,800	18,900	0·381	5·190	13,754,900
1912.						
January	22,400	18,000	20,000	0·402	0·464	1,229,800
February	18,600	15,800	16,900	0·340	0·367	972,100
March	15,700	11,900	13,800	0·278	0·321	848,500
April	16,200	12,300	13,500	0·272	0·304	803,300
May	27,400	16,500	22,800	0,459	0·529	1,401,900
June	30,900	26,800	28,200	0·567	0·633	1,678,000
July	27,300	25,800	26,400	0·531	0·612	1,623,300
August	28,100	27,400	27,800	0·559	0·645	1,709,400
September	31,100	27,500	29,700	0·598	0·667	1,767,300
October	36,200	30,700	34,000	0·684	0·789	2,090,600
November	35,800	32,200	33,800	0·680	0·759	2,011,200
December	31,300	28,200	29,700	0·598	0·689	1,826,200
The year	36,200	11,900	24,700	0·497	6·779	17,961,600
1913.						
January	28,200	27,600	28,000	0·563	0·649	1,721,700
February	28,200	21,800	26,000	0·523	0·545	1,444,000
March	21,300	15,900	18,700	0·376	0·434	1,149,800
April	20,200	15,900	17,500	0·352	0·393	1,041,300
May	33,100	21,200	28,500	0·573	0·661	1,752,400
June	34,800	32,600	33,600	0·676	0·754	1,999,300
July	33,500	25,900	29,700	0·598	0·689	1,826,200
August	28,800	26,200	27,600	0·555	0·640	1,697,100
September	26,600	22,500	25,000	0·503	0·561	1,487,600
October	22,000	14,600	17,900	0·360	0·415	1,100,600
November	16,000	14,400	15,300	0·308	0·344	910,400
December	15,900	13,000	14,500	0·292	0·337	891,600
The year	34,800	13,000	23,500	0·473	6·422	17,022,000
1914.						
January	14,400	12,400	13,500	0·272	0·314	830,100
February	14,100	11,700	13,100	0·264	0·275	727,500
March	14,500	11,800	13,700	0·276	0·318	842,400
April	15,300	13,500	14,400	0·290	0·324	856,900
May	22,900	14,500	18,400	0·370	0·427	1,131,400
June	36,300	24,700	32,200	0·648	0·723	1,916,000
July	37,300	34,500	36,400	0·732	0·844	2,238,100
August	34,500	30,000	32,200	0·648	0·747	1,979,900
September	30,100	24,400	26,100	0·525	0·586	1,553,100
October	26,500	22,200	24,600	0·495	0·571	1,512,600
November	22,500	20,200	20,900	0·421	0·470	1,242,600
December	20,800	18,100	19,500	0·392	0·452	1,199,000
The year	37,300	11,700	22,100	0·444	6·051	16,030,600

SESSIONAL PAPER No. 25f

Discharge Measurements of Winnipeg River near Otter Falls. 1903, 1907-11.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1903.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 11	W. E. S. R. Co.					101·45	40,240[1]
1907.							
Aug. 2	"					101·45	31,028
Oct. 8	"					102·1	39,800
1908.							
July 12 & 14	"					104·2	42,979
Nov. 7 & 8	"					104·6	29,980
1909.							
May 24	"					104·25	26,365
July 17	"					105·0	26,000
Oct. 7	"					105·3	22,500
1910.							
July 28	"					105·04	29,324
1911.							
May 19	"					102·6	15,807

[1] Float measurement.
Note.—Gauge heights refer to upper gauge at control dam.

Daily Gauge Height and Discharge of Winnipeg River at Otter Falls, for 1907.

[Drainage area, 53,000 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	61·80	27,860	60·4	19,180	60·0	16,700	59·6	14,400	60·8	21,660
2	.....	.....	61·72	27,550	60·4	19,180	59·9	16,100	59·7	14,950	60·8	21,660
3	.....	.....	.....	27,550	.....	18,560	59·8	15,500	59·6	14,400	60·8	21,660
4	.....	.....	61·80	27,860	60·2	17,940	59·7	14,950	59·6	14,400	60·8	21,660
5	.....	.....	62·0	29,100	60·3	18,560	59·6	14,400	59·6	14,400	60·9	22,280
6	.....	.....	62·0	29,100	60·4	19,180	59·6	14,400	59·6	14,400	61·0	22,990
7	.....	.....	61·8	27,860	60·3	18,560	59·6	14,400	59·7	14,950	61·2	24,140
8	.....	.....	61·6	26,620	60·4	19,180	59·6	14,400	59·8	15,500	61·2	24,140
9	.....	.....	61·2	24,140	60·2	17,940	59·6	14,400	59·7	14,950	61·2	24,140
10	.....	.....	.....	24,140	.....	17,320	59·6	14,400	59·7	14,950	61·2	24,140
11	.....	.....	61·2	24,140	60·0	16,700	59·6	14,400	59·7	14,950	61·4	25,380
12	.....	.....	61·2	24,140	60·2	17,940	59·6	14,400	59·7	14,950	61·6	26,620
13	.....	.....	60·6	20,420	60·2	17,940	59·6	14,400	59·7	14,950	61·8	27,860
14	.....	.....	60·8	21,660	60·2	17,940	59·6	14,400	59·7	14,950	61·8	27,860
15	.....	.....	60·4	19,180	60·3	18,560	59·6	14,400	59·7	14,950	62·0	29,100
16	.....	.....	60·4	19,180	60·1	17,320	59·6	14,400	59·7	14,950	62·0	29,100
17	.....	.....	.....	19,180	60·1	17,320	59·6	14,400	59·7	14,950	62·0	29,100
18	.....	.....	60·3	18,560	60·1	17,320	59·6	14,400	59·8	15,500	62·2	30,340
19	.....	.....	60·6	20,420	60·1	17,320	59·6	14,400	60·0	16,700	62·2	30,340
20	.....	.....	60·5	19,800	60·1	17,320	59·6	14,400	60·1	17,320	62·2	30,340
21	.....	.....	60·6	20,420	60·0	16,700	59·6	14,400	60·1	17,320	62·3	30,960
22	.....	.....	60·4	19,180	59·9	16,100	59·6	14,400	60·2	17,940	62·4	31,580
23	61·5	26,000	60·4	19,180	59·9	16,100	59·6	14,400	60·2	17,940	62·5	32,200
24	.....	26,000	.....	19,800	59·8	15,500	59·6	14,400	60·1	17,320	62·6	32,820
25	.....	26,000	60·6	20,420	59·8	15,500	59·6	14,400	60·1	17,320	62·6	32,820
26	61·5	26,000	60·8	21,660	59·8	15,500	59·6	14,400	60·2	17,940	62·6	32,820
27	.....	26,700	60·7	21,040	59·8	15,500	59·6	14,400	60·3	18,560	62·6	32,820
28	.....	27,400	60·6	20,420	59·8	15,500	59·6	14,400	60·4	19,180	62·7	33,440
29	61·85	28,170	.....	.....	59·9	16,100	59·6	14,400	60·5	19,800	62·7	33,440
30	.....	28,170	.....	.....	60·0	16,700	59·6	14,400	60·5	19,800	62·7	33,440
31	61·85	28,170	.....	.....	60·0	16,700	.....	.....	60·6	20,420	.....	.....

	July.		August.		September.		October.		November.		December.	
1	62·7	33,440	62·2	30,340	62·9	34,680	63·6	39,020	64·2	42,740	64·2	42,740
2	62·8	34,060	62·3	30,960	63·0	25,300	63·6	39,020	64·2	42,740	64·2	42,740
3	62·8	34,060	62·2	30,340	63·0	35,300	63·8	40,260	64·2	42,740	64·2	42,740
4	62·7	33,440	62·2	30,340	63·0	35,300	63·8	40,260	64·2	42,740	64·2	42,740
5	62·8	34,060	62·2	30,340	63·0	35,300	64·0	41,500	64·2	42,740	64·1	42,120
6	62·7	33,440	62·2	30,340	63·1	35,920	64·2	42,740	64·2	42,740	64·1	42,120
7	62·8	34,060	62·2	30,340	63·2	36,540	64·2	42,740	64·2	42,740	64·0	41,500
8	62·7	33,440	62·2	30,340	63·2	36,540	64·2	42,740	64·2	42,740	64·0	41,500
9	62·6	32,820	62·2	30,340	63·2	36,540	64·2	42,740	64·2	42,740	64·0	41,500
10	62·5	32,200	62·2	30,340	63·2	36,540	64·2	42,740	64·2	42,740	64·0	41,500
11	62·5	32,200	62·2	30,340	63·2	36,540	64·2	42,740	64·2	42,740	63·8	40,260
12	62·5	32,200	62·2	30,340	63·2	36,540	64·2	42,740	64·2	42,740	63·8	40,260
13	62·4	31,580	62·2	30,340	63·2	36,540	64·3	43,360	64·2	42,740	63·8	40,260
14	62·4	31,580	62·2	30,340	63·3	37,160	64·2	42,740	64·2	42,740	63·7	39,640
15	62·4	31,580	62·2	30,340	63·4	37,780	64·2	42,740	64·2	42,740	63·6	39,020
16	62·4	31,580	62·2	30,340	63·4	37,780	64·2	42,740	64·2	42,740	63·6	39,020
17	62·4	31,580	62·2	30,340	63·4	37,780	64·2	42,740	64·2	42,740	63·6	39,020
18	62·4	31,580	62·2	30,340	63·4	37,780	64·2	42,740	64·2	42,740	63·6	39,020
19	62·4	31,580	62·2	30,340	63·4	37,780	64·2	42,740	64·2	42,740	63·6	39,020
20	62·4	31,580	62·4	31,580	63·4	37,780	64·2	42,740	64·2	42,740	63·5	38,400
21	62·4	31,580	62·6	32,820	63·4	37,780	64·3	43,360	64·2	42,740	63·4	37,780
22	62·4	31,580	62·6	32,820	63·4	37,780	64·4	43,980	64·2	42,740	63·4	37,780
23	62·4	31,580	62·6	32,820	63·4	37,780	64·3	43,360	64·2	42,740	63·4	37,780
24	62·4	31,580	62·6	32,820	63·4	37,780	64·3	43,360	64·2	42,740	63·3	37,160
25	62·4	31,580	62·6	32,820	63·4	37,780	64·4	43,360	64·2	42,740	63·4	37,780
26	62·3	30,960	62·6	32,820	63·4	37,780	64·3	43,360	64·2	42,740	63·4	37,780
27	62·2	30,340	62·6	32,820	63·6	39,020	64·3	43,360	64·2	42,740	63·3	37,160
28	62·2	30,340	62·6	32,820	63·6	39,020	64·3	43,360	64·1	42,120	63·2	36,540
29	62·2	30,340	62·6	32,820	63·6	39,020	64·3	43,360	64·1	42,120	63·2	36,540
30	62·2	30,340	62·7	33,440	63·6	39,020	64·2	42,740	64·1	42,120	63·2	36,540
31	62·2	30,340	62·8	34,060	.....	.....	64·2	42,740	.....	.....	63·2	36,540

Notes.—Daily discharges are taken from rating curve plotted for Otter falls. The gauge heights are referred to tail-race gauge at Point du Bois.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Winnipeg River at Otter Falls, for 1908.

[Drainage area, 50,550 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	63·2	36,540	63·8	40,260	62·7	33,440	61·8	27,860	62·0	29,100	63·5	38,400
2	63·2	36,540	63·9	40,880	62·6	32,820	62·0	29,100	62·1	29,720	63·5	38,400
3	63·3	37,160	63·8	40,260	62·6	32,820	61·9	28,480	62·1	29,720	63·5	38,400
4	63·3	37,160	63·6	39,020	62·5	32,200	61·8	27,860	62·1	29,720	63·5	38,400
5	63·2	36,540	63·8	40,260	62·5	32,200	62·0	29,100	62·1	29,720	63·5	38,400
6	63·2	36,540	63·8	40,260	62·5	32,200	62·0	29,100	62·2	30,340	63·5	38,400
7	63·3	37,160	63·8	40,260	62·5	32,200	62·0	29,100	62·1	29,720	63·5	38,400
8	63·2	36,540	63·8	40,260	62·6	32,820	61·9	28,480	62·2	30,340	63·5	38,400
9	63·3	36,540	63·6	39,020	62·7	33,440	61·9	28,480	62·2	30,340	63·6	39,020
19	63·3	37,160	63·4	37,780	62·7	33,440	61·9	28,480	62·2	30,340	63·8	40,260
11	63·2	36,540	63·2	36,540	62·6	32,820	61·9	28,480	62·2	30,340	64·0	41,500
12	63·2	36,540	63·0	35,300	62·4	31,580	61·9	28,480	62·3	30,960	64·2	42,740
13	63·2	36,540	62·8	34,060	62·4	31,580	61·9	28,480	62·4	31,580	64·2	42,740
14	63·2	36,540	62·8	34,060	62·4	31,580	61·9	28,480	62·4	31,580	64·2	42,740
15	63·2	36,540	62·8	34,060	62·3	30,960	61·9	28,480	62·4	31,580	64·2	42,740
16	63·2	36,540	62·8	34,060	62·6	32,820	61·9	28,480	62·4	31,580	64·2	42,740
17	63·2	36,540	62·8	34,060	62·4	31,580	61·9	28,480	62·4	31,580	64·2	42,740
18	63·2	36,540	62·8	34,060	62·4	31,580	61·7	27,240	62·5	32,200	64·2	42,740
19	63·2	36,540	62·8	34,060	62·4	31,580	61·7	27,240	62·5	32,200	64·2	42,740
20	63·2	36,540	62·8	34,060	62·2	30,340	61·8	27,860	62·5	32,200	64·3	43,360
21	63·2	36,540	62·8	34,060	62·4	31,580	61·8	27,860	62·8	34,060	64·3	43,360
22	63·2	36,540	62·6	32,820	62·4	31,580	61·8	27,860	62·9	34,680	64·3	43,360
23	63·2	36,540	62·8	34,060	62·2	30,340	61·8	27,860	63·0	35,300	64·3	43,360
24	63·2	36,540	63·1	35,920	62·1	29,720	62·0	29,100	63·0	35,300	64·3	43,360
25	63·2	35,920	63·3	37,160	62·1	29,720	62·0	29,100	63·0	35,300	64·3	43,360
26	63·0	35,300	63·3	37,160	62·1	29,720	62·0	29,100	63·2	36,540	64·3	43,360
27	63·0	35,300	63·3	37,160	62·1	29,720	62·0	29,100	63·2	36,540	64·4	43,980
28	63·4	37,780	63·2	36,540	62·1	29,720	62·0	29,100	63·2	36,540	64·4	43,980
29	63·6	39,020	63·0	35,300	62·0	29,100	62·0	29,100	63·2	36,540	64·4	43,980
30	63·8	40,260	.....	.....	62·0	29,100	62·0	29,100	63·3	37,160	64·4	43,980
31	63·8	40,260	.....	.....	61·9	28,480	.....	.....	63·4	37,780	.....	.....

	July.		August.		September.		October.		November.		December.	
1	64·3	43,360	64·0	41,500	63·4	37,780	62·8	34,060	62·1	29,720	61·3	24,760
2	64·4	43,980	64·0	41,500	63·6	39,020	62·8	34,060	62·0	29,100	61·3	24,760
3	64·4	43,980	64·0	41,500	63·6	39,020	62·9	34,680	62·1	29,720	61·2	24,140
4	64·4	43,980	63·9	40,880	63·5	38,400	62·8	34,060	62·1	29,720	61·2	24,140
5	64·4	43,980	63·8	40,260	63·5	38,400	62·7	33,440	62·1	29,720	61·2	24,140
6	64·4	43,980	63·8	40,260	63·5	38,400	62·6	32,820	62·2	30,340	61·2	24,140
7	64·4	43,980	63·8	40,260	63·5	38,400	62·7	33,440	62·1	29,720	61·2	24,140
8	64·4	43,980	63·8	40,260	63·5	38,400	62·7	33,440	62·0	29,100	61·2	24,140
9	64·4	43,980	63·8	40,260	63·4	37,780	62·7	33,440	62·0	29,100	61·3	24,760
10	64·4	43,980	63·8	40,260	63·4	37,780	62·7	33,440	62·0	29,100	61·2	24,140
11	64·3	43,360	63·8	40,260	63·3	37,160	62·7	33,440	62·0	29,100	61·2	24,140
12	64·3	43,360	63·8	40,260	63·2	36,540	62·7	33,440	62·0	29,100	61·2	24,140
13	64·3	43,360	63·8	40,260	63·1	35,920	62·7	33,440	62·1	29,720	61·2	24,140
14	64·3	43,360	63·8	40,260	63·0	35,300	62·7	33,440	62·1	29,720	61·2	24,140
15	64·3	43,360	63·7	39,640	62·9	34,680	62·6	32,820	62·0	29,100	61·0	22,900
16	64·3	43,360	63·7	39,640	62·9	34,680	62·6	32,820	62·0	29,100	61·0	22,900
17	64·3	43,360	63·6	39,020	62·9	34,680	62·8	34,060	62·0	29,100	61·1	23,520
18	64·3	43,360	63·6	39,020	62·9	34,680	62·7	33,440	62·0	29,100	61·1	23,520
19	64·3	43,360	63·6	39,020	62·9	34,680	62·7	33,440	62·0	29,100	61·1	23,520
20	64·2	42,740	63·6	39,020	62·9	34,680	62·7	33,440	61·8	27,860	61·1	23,520
21	64·1	42,120	63·6	39,020	62·9	34,680	62·7	33,440	61·8	27,860	61·0	22,900
22	64·1	42,120	63·6	39,020	62·8	34,060	62·6	32,820	61·8	27,860	61·0	22,900
23	64·1	42,120	63·6	39,020	62·8	34,060	62·6	32,820	61·7	27,240	61·0	22,900
24	64·1	42,120	63·6	39,020	62·8	34,060	62·5	32,200	61·7	27,240	60·9	22,280
25	64·1	42,120	63·6	39,020	62·8	34,060	62·5	32,200	61·6	26,620	60·9	22,280
26	64·1	42,120	63·5	38,400	62·8	34,060	62·5	32,200	61·6	26,620	60·9	22,280
27	64·0	41,500	63·5	38,400	62·8	34,060	62·5	32,200	61·5	26,000	60·8	21,660
28	64·0	41,500	63·4	37,780	62·8	34,060	62·5	32,200	61·4	25,380	60·8	21,660
29	64·0	41,500	63·4	37,780	62·8	34,060	62·4	31,580	61·4	25,380	60·8	21,660
30	64·0	41,500	63·4	37,780	62·7	33,440	62·4	31,580	61·4	25,380	60·8	21,660
31	.....	.....	63·4	37,780	.....	.....	62·2	30,340	.....	.....	60·8	21,660

Notes.—Daily discharges are taken from rating curve plotted for Otter falls. The gauge heights are referred to tailrace gauge at Point du Bois.

Daily Gauge Height and Discharge of Winnipeg River at Otter Falls, for 1909.

[Drainage Area, 50,550 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	60·89	22,280	60·99	22,900	60·89	22,280	60·10	17,320	60·00	16,700	61·20	24,140
2	60·89	22,280	60·99	22,900	60·79	21,660	60·10	17,320	59·90	16,100	61·20	24,140
3	60·89	22,280	60·99	22,900	60·69	21,040	60·10	17,320	59·90	16,100	61·25	24,450
4	60·89	22,280	60·99	22,900	60·59	20,420	60·00	16,700	59·90	16,100	61·20	24,140
5	60·89	22,280	60·99	22,900	60·59	20,420	60·00	16,700	59·90	16,100	61·30	24,760
6	60·89	22,280	60·99	22,900	60·49	19,800	60·10	17,320	59·90	16,100	61·30	24,760
7	60·99	22,900	60·19	24,140	60·49	19,800	60·10	17,320	60·00	16,700	61·30	24,760
8	61·29	24,760	60·29	24,760	60·49	19,800	60·00	16,700	60·10	17,320	61·25	24,450
9	61·69	27,240	60·39	25,380	60·49	19,800	60·00	16,700	60·20	17,940	61·30	24,760
10	61·79	27,860	60·39	25,380	60·49	19,800	60·00	16,700	60·20	17,940	61·30	24,760
11	61·69	27·240	61·39	25·380	60·49	19·800	60·00	16,700	60·30	18,560	61·25	24,450
12	61·69	27,240	61·49	26,000	60·49	19,800	60·00	16,700	60·40	19,180	61·30	24,760
13	61·89	28,480	61·59	26,620	60·39	19,180	60·00	16,700	60·50	19,800	61·30	24,760
14	61·89	28,480	61·59	26,620	60·39	19,180	60·00	16,700	60·60	20,420	61·30	24,760
15	61·79	27,860	61·59	26,620	60·39	19,180	60·00	16,700	60·70	21,040	61·25	24,450
16	61·79	27,860	61·59	26,620	60·39	19,180	60·00	16,700	60·70	21,040	61·30	24,760
17	61·79	27,860	61·59	26,620	60·29	18,560	59·90	16,100	60·70	21,040	61·25	24,450
18	61·69	27,240	61·39	25,380	60·09	17,320	59·90	16,100	60·80	21,660	61·30	24,760
19	61·59	26,620	61·19	24,140	60·19	17,940	59·90	16,100	60·80	21,660	61·20	24,140
20	61·59	26,620	60·99	22,900	.....	17,940	59·90	16,100	60·80	21,660	61·20	24,140
21	61·49	26,000	60·89	22,280	.....	17,940	60·00	16,700	60·90	22,280	61·30	24,760
22	61·09	23,520	60·89	22,280	.....	17,320	59·90	16,100	60·90	22,280	61·25	24,450
23	.....	23,210	60·99	22,900	.....	17,320	60·00	16,700	61·00	22,900	61·25	24,450
24	60·99	22,900	60·99	22,900	60·09	17,320	60·00	16,700	61·00	22,900	61·30	24,760
25	.....	22,900	61·09	23,520	60·09	17,320	60·00	16,700	61·10	23,520	61·30	24,760
26	.....	22,900	61·09	23,520	60·09	17,320	60·00	16,700	61·10	23,520	61·30	24,760
27	.....	22,900	60·99	22,900	60·09	17,320	60·00	16,700	61·10	23,520	61·25	24,450
28	.....	22,900	60·99	22,900	60·09	17,320	60·00	16,700	61·10	23,520	61·25	24,450
29	.....	22,900	.....	.....	60·09	17,320	60·00	16,700	61·10	23·520	61·30	24,760
30	.....	22,900	.....	.....	60·09	17,320	60·00	16,700	61·20	24,140	61·30	24,760
31	.....	22,900	.....	.....	59·99	16,700	.....	.....	61·20	24,140	.....	.....

	July.		August.		September.		October.		November.		December.	
1	61·25	24,450	61·25	24·450	61·10	23·520	60·80	21,660	60·50	19,800	60·70	21,040
2	61·25	24,450	61·25	24,450	61·00	22,900	60·75	21,350	60·45	19,490	60·75	21,350
3	61·30	24,760	61·20	24,140	61·00	22,900	60·75	21,350	60·50	19,800	60·75	21,350
4	61·30	24,760	61·20	24,140	61·00	22,900	60·75	21,350	60·55	20,110	60·75	21,350
5	61·30	24,760	61·20	24,140	61·05	23,210	60·75	21,350	60·55	20,110	60·75	21,350
6	61·30	24,760	61·30	24,760	61·00	22,900	60·75	21,350	60·55	20,110	60·75	21,350
7	61·35	25,070	61·30	24,760	60·90	22,280	60·75	21,350	60·55	20,110	60·75	21,350
8	61·35	25,070	61·30	24,760	60·95	22,590	60·70	21,040	60·55	20,110	60·80	21,660
9	61·35	25,070	61·30	24,760	60·85	21,970	60·65	20,730	60·55	20,110	60·85	21,970
10	61·35	25,070	61·30	24,760	60·90	22,280	60·60	20,420	60·55	20,110	60·95	22,590
11	61·30	24,760	61·25	24,450	60·90	22,280	60·55	20,110	60·55	20,110	60·95	22,590
12	61·30	24,760	61·25	24,450	60·90	22,280	60·55	20,110	60·55	20,110	60·95	22,590
13	61·30	24,760	61·30	24,760	60·95	22,590	60·50	19,800	60·60	20,420	60·95	22,590
14	61·30	24,760	61·35	25,070	60·95	22,590	60·50	19,800	60·60	20,420	60·95	22,590
15	61·30	24,760	61·35	25,070	60·90	22,280	60·50	19,800	60·60	20,420	60·95	22,590
16	61·30	24,760	61·35	25,070	60·90	22,280	60·50	19,800	60·60	20,420	60·95	22,590
17	61·30	24,760	61·30	24,760	60·90	22,280	60·45	19,490	60·60	20,420	60·95	22,590
18	61·30	24,760	61·30	24,760	60·95	22,590	60·50	19,800	60·65	20,730	60·95	22,590
19	61·30	24,760	61·30	24,760	60·90	22,280	60·55	20,110	60·65	20,730	60·95	22,590
20	61·30	24,760	61·20	24,140	60·90	22,280	60·55	20,110	60·65	20,730	60·95	22,590
21	61·30	24,760	61·25	24,450	60·85	21,970	60·50	19·800	60·65	20,730	60·95	22,590
22	61·30	24,760	61·25	24,450	60·85	21,970	60·55	20,110	60·65	20,730	60·95	22,590
23	61·30	24,760	61·25	24,450	60·85	21,970	60·55	20,110	60·70	21,040	60·95	22,590
24	61·30	24,760	61·25	24,450	60·80	21,660	60·55	20,110	60·70	21,040	61·00	22,900
25	61·25	24,450	61·25	24,450	60·80	21,660	60·55	20,110	60·70	21,040	61·00	22,900
26	61·20	24,140	61·25	24,450	60·80	21,660	60·50	19,800	60·70	21,040	61·00	22,900
27	61·25	24,450	61·30	24,760	60·80	21,660	60·45	19,490	60·70	21,040	61·05	23,210
28	61·20	24,140	61·30	24,760	60·80	21,660	60·55	20,110	60·70	21,040	61·20	24,140
29	61·20	24,140	61·25	24,450	60·80	21,660	60·55	20,110	60·70	21,040	61·35	25,070
30	61·15	23,830	61·15	23,830	60·80	21,660	60·50	19,800	60·70	21,040	61·20	24,140
31	61·20	24,140	61·10	23,520	.....	.....	60·50	19,800	.....	.....	61·20	24,140

Note.—Daily discharges are taken from rating curve plotted for Otter falls. Gauge heights are referred to tail-race gauge at Point du Bois.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Winnipeg River at Otter Falls, for 1910.

Day.	January		February		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Feet.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	61·20	24,140	61·30	24,760	61·20	24,140	61·40	25,380	65·50	50,880	65·70	52,160
2	61·20	24,140	61·30	24,760	61·20	24,140	61·50	26,000	65·55	51,200	65·65	51,840
3	61·20	24,140	61·30	24,760	61·20	24,140	61·60	26,620	65·70	52,160	65·60	51,520
4	61·50	26,000	61·30	24,760	61·20	24,140	61·70	27,240	65·75	52,480	65·55	51,200
5	61·35	25,070	61·30	24,760	61·20	24,140	61·90	28,480	65·80	52,800	65·60	51,520
6	61·40	25,380	61·30	24,760	61·20	24,140	62·20	30,340	65·85	53,120	65·65	51,840
7	61·40	25,380	61·25	24,450	61·20	24,140	62·40	31,580	65·90	53,440	65·65	51,840
8	61·50	26,000	61·20	24,140	61·20	24,140	62·60	32,820	65·85	53,120	65·65	51,840
9	61·70	27,240	61·20	24,140	61·20	24,140	62·80	34,060	65·80	52,800	65·65	51,840
10	61·50	26,000	61·20	24,140	61·20	24,140	63·10	35,920	65·80	52,800	65·65	51,840
11	61·50	26,000	61·20	24,140	61·20	24,140	63·30	37,160	65·80	52,800	65·60	51,520
12	61·50	26,000	61·20	24,140	61·20	24,140	63·50	38,400	65·80	52,800	65·50	50,880
13	61·50	26,000	61·20	24,140	61·15	23,830	63·60	39,020	65·80	52,800	65·45	50,560
14	61·50	26,000	61·20	24,140	61·15	23,830	63·75	39,950	65·80	52,800	63·35	49,920
15	61·50	26,000	61·20	24,140	61·15	23,830	63·90	40,880	65·85	53,120	65·25	49,280
16	61·45	25,690	61·20	24,140	61·15	23,830	64·00	41,500	65·90	53,440	65·15	48,650
17	61·40	25,380	61·20	24,140	61·15	23,830	64·15	42,430	65·85	53,120	65·05	48,020
18	61·40	25,380	61·20	24,140	61·15	23,830	64·40	43,980	65·85	53,120	64·95	47,390
19	61·35	25,070	61·20	24,140	61·15	23,830	64·55	44,910	65·85	53,120	64·85	46,770
20	61·35	25,070	61·20	24,140	61·15	23,830	64·75	46,150	65·85	53,120	64·85	46,770
21	61·35	25,070	61·20	24,140	61·15	23,830	64·75	46,150	65·85	53,120	64·80	46,460
22	61·30	24,760	61·20	24,140	61·15	23,830	64·75	46,150	65·85	53,120	64·80	46,460
23	61·35	25,070	61·20	24,140	61·15	23,830	64·85	46,770	65·85	53,120	64·75	46,150
24	61·35	25,070	61·20	24,140	61·15	23,830	65·00	47,700	65·85	53,120	64·75	46,150
25	61·35	25,070	61·20	24,140	61·10	23,520	65·20	48,960	65·80	52,800	64·70	45,840
26	61·30	24,760	61·20	24,140	61·05	23,210	65·25	49,280	65·80	52,800	64·65	45,530
27	61·30	24,760	61·20	24,140	61·00	22,900	65·30	49,600	65·80	52,800	64·55	44,910
28	61·30	24,760	61·20	24,140	61·00	22,900	65,30	49,600	65·85	53,120	64·50	44,600
29	61·30	24,760	.....	.....	61·05	23,210	65·30	49,600	65·85	53,120	64·40	43,980
30	61·30	24,760	.....	.....	61·05	23,210	65·40	50,240	65·80	52,800	64·30	43,360
31	61·20	24,140	.....	.....	61·20	24,140	.....	.....	65·75	52,480	.....	.....

	July.		August.		September		October.		November.		December	
1	64·25	43,050	61·80	27,860	60·80	21,660	60·25	18,250	59·78	15,500	59·38	13,450
2	64·20	42,740	61·90	28,480	60·80	21,660	60·20	17,940	59·74	15,180	59·35	13,250
3	64·20	42,740	61·50	26,930	60·70	21,040	60·20	17,940	59·74	15,180	59·35	13,250
4	64·15	42,430	61·65	26,620	60·70	21,040	60·25	18,250	59·70	14,950	59·35	13,250
5	64·10	42,120	61·55	26,310	60·70	21,040	60·15	17,630	59·70	14,950	59·30	13,050
6	64·00	41,500	61·60	26,620	60·70	21,040	60·20	17,940	59·70	14,950	59·30	13,050
7	64·00	41,500	61·55	26,310	60·65	20,730	60·20	17,940	59·70	14,950	59·30	13,050
8	63·90	40,889	61·50	26,000	60·50	19,800	60·20	17,940	59·70	14,950	59·30	13,050
9	63·90	40,880	61·45	25,690	60·45	19,490	60·20	17,940	59·65	14,630	59·30	13,050
10	63·90	40,880	61·50	26,000	60·45	19,490	60·20	17,940	59·60	14,400	59·30	13,050
11	63·85	40,570	61·45	25,690	60·50	19,800	60·15	17,630	59·60	14,400	59·30	13,050
12	63,75	39,950	61·40	25,380	60·40	19,180	60·15	17,630	59·65	14,630	59·30	13,050
13	63·70	39,640	61·35	25,070	60·45	19,490	60·05	17,010	59·65	14,630	59·30	13,050
14	63·70	39,640	61·35	25,070	60·40	19,180	60·00	16,700	59·60	14,400	59·30	13,050
15	63·60	39,020	61·35	25,070	60·40	19,180	60·00	16,700	59·50	13,900	59·20	12,780
16	63·55	38,710	61·35	25,070	60·40	19,180	60·05	17,010	59·44	13,680	59·20	12,700
17	63·40	37,780	61·40	25,380	60·35	18,870	60·00	16,700	59·50	13,900	59·20	12,700
18	63·25	36,850	61·15	23,830	60·40	19,180	60·00	16,700	59·40	13,450	59·20	12,700
19	63·10	35,920	61·30	24,760	60·45	19,490	60·05	17,010	59·50	13,900	59·20	12,700
20	63·00	35,300	61·00	22,900	60·40	19,180	60·05	17,010	59·55	14,150	59·25	12,880
21	62·85	34,370	61·15	23,830	60·30	18,560	60·10	17,320	59·50	13,900	59·25	12,880
22	62·65	33,130	61·00	22,900	60·35	18,870	60·00	16,700	59·45	13,680	59·18	12,700
23	62·55	32,510	61·15	23,830	60·35	18,870	59·95	16,100	59·40	13,450	59·14	12,530
24	62·50	32,200	61·10	23,520	60·40	19,180	59·90	16,100	59·50	13,900	59·12	12,400
25	62·50	32,200	61·00	22,900	60·40	19,180	59·90	16,100	59·50	13,900	59·10	12,400
26	62·45	31,890	60·95	22,590	60·40	19,180	59·92	16,100	59·50	13,900	59·10	12,400
27	62·35	31,270	60·90	22,280	60·40	19,180	59·87	15,800	59·50	13,900	59·20	12,700
28	62·25	30,650	60·90	22,280	60·30	18,560	59·85	15,800	59·50	13,900	59·15	12,550
29	62·05	29,410	60·90	22,280	60·35	18,870	59·85	15,800	59·45	13,680	59·50	13,050
30	61·85	28,170	60·90	22,280	60·35	18,870	59·82	15,590	59·42	13,450	59·55	13,250
31	61·75	27,550	60·85	21,970	.....	.....	59·80	15,500	.....	.....	59·40	13,450

NOTE.—Daily discharges are taken from rating curve plotted for Otter Falls. Gauge heights are referred to tail race gauge at Point du Bois.

Monthly Discharge of Winnipeg River at Otter Falls, for the years 1907-10.

[Drainage Area, 50,550 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1907.						
January	28,170	26,000	26,960	0·533	0·615	1,657,700
February	29,100	18,560	22,880	0·452	0·471	1,270,700
March	19,180	15,500	17,320	0·343	0·395	1,064,900
April	16,700	14,400	14,590	0·288	0·321	868,200
May	20,420	14,400	16,290	0·322	0·371	1,001,600
June	33,440	21,660	28,030	0·554	0·618	1,667,900
July	34,060	30,340	32,020	0·634	0·731	1,968,800
August	34,060	30,340	31,340	0·620	0·715	1,927,000
September	39,020	34,680	37,140	0·735	0·820	2,210,000
October	43,980	39,020	42,520	0·841	0·970	2,614,400
November	42,740	42,120	42,680	0·845	0·913	2,539,600
December	42,740	36,540	39,500	0·782	0·902	2,428,800
The year	43,980	14,400	29,460	0·579	7·872	21,219,600
1908.						
January	40,260	35,300	36,880	0·729	0·841	2,267,700
February	40,880	32,820	36,650	0·725	0·782	2,108,200
March	33,440	28,480	31,380	0·621	0·716	1,924,500
April	29,100	27,240	28,500	0·564	0·629	1,695,900
May	37,780	29,100	32,600	0·645	0·744	2,004,500
June	43,980	38,400	41,640	0·824	0·919	2,477,800
July	43,980	41,500	42,980	0·850	0·980	2,642,700
August	41,500	37,780	39,560	0·782	0·902	2,432,500
September	39,020	33,440	35,900	0·710	0·792	2,136,200
October	34,680	30,340	33,040	0·654	0·754	2,031,400
November	30,340	25,380	28,400	0·562	0·627	1,689,900
December	24,760	21,660	23,340	0·462	0·533	1,435,100
The year	43,980	21,660	34,230	0·677	9·219	24,851,400
1909.						
January	28,480	22,280	24,770	0·490	0·565	1,523,000
February	26,620	22,280	24,180	0·478	0·498	1,342,900
March	22,280	16,700	18,820	0·372	0·429	1,157,200
April	17,320	16,100	16,700	0·330	0·368	993,700
May	24,140	16,100	20,300	0·402	0·464	1,248,200
June	24,760	24,140	24,560	0·486	0·542	1,461,400
July	25,070	23,830	24,650	0·488	0·563	1,515,700
August	25,070	23,520	24,530	0·485	0·559	1,508,300
September	23,520	21,660	22,290	0·441	0·492	1,326,400
October	21,660	19,490	20,330	0·402	0·464	1,250,000
November	21,040	19,490	20,470	0·405	0·452	1,218,000
December	25,070	21,040	22,530	0·446	0·514	1,385,300
The year	28,480	16,100	22,010	0·435	5·910	16,930,100
1910.						
January	27,240	24,140	25,260	0·500	0·576	1,553,200
February	24,760	24,140	24,280	0·480	0·500	1,349,500
March	24,140	22,900	23,830	0·472	0·544	1,465,300
April	50,240	25,380	39,900	0·789	0·880	2,374,200
May	53,440	50,880	52,820	1·045	1·204	3,247,700
June	52,160	43,360	48,690	0·963	1·074	2,897,300
July	43,050	27,550	36,950	0·731	0·843	2,272,000
August	28,480	21,970	24,700	0·488	0·563	1,518,700
September	21,660	18,560	19,630	0·388	0·433	1,168,100
October	18,250	15,500	17,000	0·336	0·387	1,045,300
November	15,500	13,450	14,280	0·283	0·316	849,700
December	13,450	12,400	12,920	0·255	0·294	794,400
The year	53,440	12,400	28,360	0·561	7·614	20,535,400

Berens River. First Rapids above Eleventh Falls.

Berens River, Eleventh Falls.

Winnipeg River, Pinawa Channel, below the Control Dam.

History.—The Pinawa channel was a high-water or back channel of the Winnipeg river, and was utilized as a diverting channel for a power-house built about 9 miles below the inlet by the Winnipeg Street Railway. At first the plant depended upon the stage of the river for water down this channel, but the rapid growth of the load necessitated the building of a diverting dam in the main river to ensure sufficient flow down the Pinawa channel. Meterings were made below the control dam by engineers of the company from 1907 to 1911. In May, 1912, the present station was established for the Manitoba Hydrographic Survey by A. M. Beale.

Location of Section.—The station is about 200 feet below the control dam, and 9 miles above the Winnipeg Street Railway's plant on the Pinawa channel. The initial point is a point chiselled in the rock on the left bank of the channel and referenced by a rock painted "I.P. 5 feet N."

Records available.—A daily gauge record at the control dam was kept by the Winnipeg Street Railway Company from April 28, 1906, to the end of 1914. They are not continuous, but cover the greater part of the period. They have been placed at the disposal of the Manitoba Hydrographic Survey.

Daily discharge estimates, based upon a curve plotted from discharge measurements taken between 1907 and 1911, are available. These cover the period of the years from May to October (the open water months). On account of back-water due to ice jams in the channel below, estimates have not been made for the winter months.

Gauge.—A vertical staff gauge bolted to the upstream side of the control dam. It is referred to W.P.S. datum.

Channel.—The channel is straight for 100 feet above the section and the same distance below; the section is regular, being a rock cut channel, the water being confined to the channel at all stages.

Discharge Measurements.—Discharge measurements are made from a boat held in place by a stay line stretched across the channel; a tagged wire also stretched across the channel indicates the intervals.

Diversions.—All the water passing through the dam passes the section, but there is a diversion channel just above the dam, down which water may be diverted.

Accuracy.—For the earlier years the discharge curve is well defined, but since the power station has been heavily loaded the load fluctuation may be noticed at the section, making estimates of discharge rather susceptible to error.

SESSIONAL PAPER No. 25f

Discharge Measurements of Pinawa Channel below Control Dam, 1907–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1907.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 2	W. E. S. R. Co.					101·45	5,571
" 11	"					101·45	[1]5,582
Oct. 8	"					102·10	6,700
1908.							
April 3	"					101·75	4,421
July 12 & 14	"					104·20	5,644
Nov. 7 & 8	"					104·60	5,706
1909.							
Mar. 24	"					101·40	4,545
May 24	"					104·25	5,650
July 17	"					105·00	5,076
1910.							
Mar. 9	"					104·50	8,515
May 5	"					104·50	10,845
July 28	"					105·40	6,832
1911.							
May 19	"					102·60	8,984
1912							
May 11	A. M. Beale	1196	131·5	1,657	5·54	103·00	9,179
June 1	G. H. Burnham	1187	132·0	1,783	5·65	103·53	10,074
" 22	"	1187	131·5	1,758	5·78	103·57	10,159
July 17	"	1187	131·5	1,718	5·75	103·27	9,879
1913.							
Mar. 28	G. H. Burnham	1186	131·5	1,746	4·29	103·51	7,497
July 16	S. C. O'Grady	1435	131·5	1,758	5·68	103·67	9,986
" 28	"	1435	131·5	1,705	5·71	103·36	9,738
1914							
Jan. 15	E. B Patterson	1496	131·5	1,664	4·64	102·90	7,721
Feb. 17	W. J. Ireland	1469	131·5	1,715	4·05	103·30	6,951
May 4	M. S. Madden	1435	131·2	1,594	4·88	102·31	7,780
" 26	"	1435	131·2	1,664	5·01	102·97	8,335
June 5	"	1534	131·2	1,751	5·29	103·52	9,265
" 12	"	1435	131·2	1,778	5·25	103·75	9,332
" 19	"	1435	131·2	1,791	5·55	103·85	9,939
" 29	"	1497	131·2	1,804	5·34	103·90	9,643
July 8	"	1497	131·2	1,817	5·46	104·00	9,926
" 23	E. B Patterson	1497	131·2	1,796	5·82	103·94	10,457
" 27	J. C. Wilson	1497	131·2	1,796	5·77	103·91	10,355
Aug. 1	"	1497	131·2	1,781	5·88	103·82	10,483
" 4	"	1497	131·2	1,781	5·79	103·82	10,320
" 5	"	1497	131·2	1,781	5·75	103·79	10,247
" 8	"	1497	131·2	1,772	5·82	103·74	10,323
" 19	P. K. Telford	1497	131·2	1,770	5·92	103·68	10,495

[1] Weir measurement.

Note.—Gauge heights refer to upper gauge at control dam. Measurements taken by metre over spillway

Daily Gauge Height and Discharge of Winnipeg River at Pinawa Channel, for 1908-9.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	100·75	7,025	98·80	5,520	98·90	5,590	98·80	5,520	99·00	5,660	99·00	5,660
2	100·75	7,025	98·70	5,450	98·80	5,520	98·80	5,520	99·05	5,695	99·00	5,660
3	100·70	6,980	98·70	5,450	98·85	5,555	98·80	5,520	99·05	5,695	99·00	5,660
4	100·70	6,980	98·70	5,450	98·90	5,590	98·80	5,520	99·05	5,695	99·00	5,660
5	100·70	6,980	98·70	5,450	98·90	5,590	98·80	5,520	99·10	5,730	99·00	5,660
6	100·75	7,025	98·70	5,450	98·90	5,590	98·80	5,520	99·10	5,730	99·00	5,660
7	100·75	7,025	98·70	5,450	98·90	5,590	98·80	5,520	99·10	5,730	99·00	5,660
8	100·20	6,560	98·70	5,450	98·90	5,590	98·85	5,555	99·10	5,730	99·00	5,660
9	99·70	6,165	98·65	5,417	98·90	5,590	98·85	5,555	99·10	5,730	99·00	5,660
10	99·70	6,165	98·65	5,417	98·90	5,590	98·85	5,555	99·00	5,660	99·00	5,660
11	99·70	6,165	98·75	5,485	98·85	5,555	98·90	5,590	99·00	5,660	99·00	5,660
12	99·80	6,240	98·80	5,520	98·80	5,520	98·90	5,590	99·00	5,660	99·00	5,660
13	99·20	5,800	99·00	5,660	98·85	5,555	98·90	5,590	99·00	5,660	99·00	5,660
14	99·20	5,800	99·00	5,660	98·85	5,555	98·90	5,590	99·00	5,660	99·00	5,660
15	99·20	5,800	99·00	5,660	98·85	5,555	98·90	5,590	99·00	5,660	99·00	5,660
16	99·20	5,800	99·00	5,660	98·85	5,555	98·95	5,625	99·00	5,660	99·00	5,660
17	99·20	5,800	99·00	5,660	98·85	5,555	98·95	5,625	99·00	5,660	99·00	5,660
18	99·20	5,800	99·00	5,660	98·80	5,520	98·95	5,625	99·00	5,660	99·00	5,660
19	99·20	5,800	99·00	5,660	98·80	5,520	98·95	5,625	99·00	5,660	99·00	5,660
20	99·45	5,977	99·00	5,660	98·85	5,555	98·95	5,625	99·00	5,660	99·00	5,660
21	99·50	6,015	98·90	5,590	98·85	5,555	98·90	5,590	99·00	5,660	99·00	5,660
22	99·50	6,015	98·90	5,590	98·85	5,555	98·90	5,590	99·00	5,660	99·00	5,660
23	99·50	6,015	99·00	5,660	98·85	5,555	98·90	5,590	98·90	5,590	99·00	5,660
24	99·50	6,015	98·90	5,590	98·85	5,555	98·90	5,590	98·90	5,590	99·10	5,730
25	99·50	6,015	98·95	5,625	98·80	5,520	98·90	5,590	98·90	5,590	99·30	5,870
26	99·50	6,015	98·90	5,590	98·80	5,520	98·90	5,590	99·00	5,660	99·50	6,015
27	99·50	6,015	98·90	5,590	98·80	5,520	98·90	5,590	99·10	5,730	99·50	6,015
28	99·60	6,090	98·90	5,590	98·80	5,520	99·00	5,660	99·00	5,660	99·50	6,015
29	99·60	6,090	98·90	5,590	98·80	5,520	99·00	5,660	99·00	5,660	99·50	6,015
30	99·60	6,090	98·90	5,590	98·80	5,520	99·00	5,660	99·00	5,660	99·40	5,940
31	99·30	5,870	.....	.....	98·80	5,520	99·00	5,660	.....	.....	99·40	5,940

	May, 1909.		June, 1909.		July, 1909.		August, 1909.		Sept., 1909.		Oct., 1909.	
1	100·30	6,640	99·85	6,280	98·60	5,385	97·60	4,790	98·50	5,320	99·00	5,660
2	100·30	6,640	99·70	6,165	98·70	5,450	98·50	5,320	98·50	5,320	99·00	5,660
3	100·30	6,640	99·85	6,280	98·60	5,385	98·60	5,385	98·50	5,320	99·00	5,660
4	100·30	6,640	99·85	6,280	98·60	5,385	98·60	5,385	98·70	5,450	98·70	5,450
5	100·40	6,720	98·10	5,080	98·65	5,417	98·50	5,320	98·70	5,450	98·70	5,450
6	100·50	6,800	98·10	5,080	98·65	5,417	98·60	5,385	98·70	5,450	98·70	5,450
7	100·60	6,890	98·05	5,050	98·65	5,417	98·40	5,260	98·80	5,520	99·20	5,800
8	100·60	6,890	98·05	5,050	98·70	5,450	96·70	4,330	98·80	5,520	99·20	5,800
9	100·70	6,980	98·15	5,110	98·70	5,450	98·50	5,320	98·80	5,520	99·20	5,800
10	100·80	7,070	98·15	5,110	98·70	5,450	98·50	5,320	98·80	5,520	99·10	5,730
11	100·90	7,169	98·10	5,080	98·70	5,450	98·50	5,320	98·80	5,520	99·20	5,800
12	101·00	7,260	98·15	5,110	98·70	5,450	98·50	5,320	98·80	5,520	99·50	6,015
13	101·05	7,310	98·20	5,140	98·70	5,450	98·50	5,320	98·80	5,520	99·50	6,015
14	101·30	7,560	98·15	5,110	98·90	5,590	98·50	5,320	98·80	5,520	99·50	6,015
15	100·00	6,400	98·15	5,110	98·90	5,590	98·50	5,320	98·80	5,520	99·50	6,015
16	99·00	5,660	98·15	5,110	98·90	5,590	98·50	5,320	98·80	5,520	99·50	6,015
17	99·20	5,800	98·15	5,110	99·00	5,660	98·50	5,320	98·80	5,520	99·50	6,015
18	99·24	5,828	98·10	5,080	99·00	5,660	98·50	5,320	99·00	5,660	99·50	6,015
19	99·60	6,090	98·10	5,080	99·05	5,695	98·50	5,320	99·00	5,660	99·50	6,015
20	99·60	6,090	98·10	5,080	99·05	5,695	98·50	5,320	99·00	5,660	100·20	6,560
21	99·60	6,090	98·10	5,080	99·10	5,730	98·50	5,320	99·00	5,660	100·20	6,560
22	99·70	6,165	98·15	5,110	99·10	5,730	98·50	5,320	99·00	5,660	100·20	6,560
23	99·65	6,127	98·10	5,080	99·10	5,730	98·50	5,320	99·00	5,660	100·20	6,560
24	99·65	6,127	98·25	5,170	99·10	5,730	98·50	5,320	99·00	5,660	100·20	6,560
25	99·65	6,127	98·30	5,200	99·10	5,730	98·20	5,140	99·00	5,660	100·20	6,560
26	99·55	6,052	98·30	5,200	99·10	5,730	98·20	5,140	99·00	5,660	100·20	6,560
27	99·55	6,052	98·30	5,200	98·60	5,385	98·20	5,140	99·00	5,660	100·65	6,935
28	99·75	6,202	98·50	5,320	98·50	5,320	98·20	5,140	99·00	5,660	100·70	6,980
29	99·70	6,165	98·60	5,385	98·50	5,320	97·30	4,630	99·00	5,660	100·70	6,980
30	99·80	6,240	98·60	5,385	98·50	5,320	98·20	5,140	99·00	5,660	100·70	6,980
31	99·80	6,240	.....	.....	98·50	5,320	98·20	5,140	.....	.....	100·70	6,980

Note: Below gauge height 192·50 the rating curve is not well defined.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Winnipeg River at Pinawa Channel, for 1910–11.

Day.	May, 1910.		June, 1910.		July, 1910.		Aug., 1910.		Sept., 1910.		Oct., 1910.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	104·2	10,975	104·1	10,850	99·6	6,090	99·1	5,730	99·0	5,660	99·1	5,730
2	104·2	10,975	104·1	10,850	99·6	6,090	99·1	5,730	99·0	5,660	99·1	5,730
3	104·2	10,975	104·1	10,850	99·6	6,090	99·1	5,730	99·0	5,660	99·1	5,730
4	104·2	10,975	104·1	10,850	99·5	6,015	99·1	5,730	99·0	5,660	99·1	5,730
5	104·2	10,975	104·1	10,850	99·4	5,940	99·1	5,730	99·0	5,660	99·2	5,800
6	104·2	10,975	104·1	10,850	99·4	5,940	99·1	5,730	98·9	5,590	99·2	5,800
7	104·3	11,100	104·0	10,725	99·4	5,940	99·1	5,730	98·9	5,590	99·2	5,800
8	104·3	11,100	104·0	10,725	99·4	5,940	99·1	5,730	98·9	5,590	99·2	5,800
9	104·3	11,100	104·0	10,725	99·4	5,940	99·1	5,730	98·9	5,590	99·3	5,870
10	104·3	11,100	104·0	10,725	99·4	5,940	99·0	5,660	98·9	5,590	99·3	5,870
11	104·3	11,100	104·0	10,725	99·5	6,015	98·9	5,590	98·9	5,590	98·3	5,870
12	104·3	11,100	104·0	10,725	99·5	6,015	98·9	5,590	98·9	5,590	98·4	5,940
13	104·0	10,725	103·9	10,600	99·6	6,090	98·8	5,520	98·9	5,590	98·4	5,940
14	104·1	10,850	103·9	10,600	99·5	6,015	98·8	5,520	98·9	5,590	98·4	5,940
15	104·4	11,225	103·9	10,600	99·5	6,015	98·8	5,520	98·9	5,590	98·4	5,940
16	104·3	11,100	103·9	10,600	99·5	6,015	98·8	5,520	98·9	5,590	99·4	5,940
17	104·3	11,100	103·1	9,600	99·4	5,940	98·8	5,520	98·9	5,590	99·4	5,940
18	104·3	11,100	103·0	9,475	99·4	5,940	98·8	5,520	98·9	5,590	99·5	6,015
19	104·3	11,100	103·0	9,475	99·4	5,940	98·8	5,520	98·9	5,590	99·5	6,015
20	104·3	11,100	103·0	9,475	99·4	5,940	98·8	5,520	98·9	5,590	99·9	6,320
21	104·3	11,100	103·0	9,475	99·4	5,940	98·9	5,590	98·9	5,590	99·9	6,320
22	104·3	11,100	103·0	9,475	99·3	5,870	98·9	5,590	98·9	5,590	100·4	6,720
23	104·3	11,100	103·0	9,475	99·2	5,800	98·9	5,590	99·0	5,660	100·4	6,720
24	104·3	11,100	101·8	8,080	99·2	5,800	98·9	5,590	99·0	5,660	100·4	6,720
25	104·3	11,100	101·1	7,360	99·2	5,800	98·9	5,590	99·0	5,660	100·4	6,720
26	104·2	10,975	100·3	6,640	99·2	5,800	98·9	5,590	99·0	5,660	100·4	6,720
27	104·2	10,975	100·0	6,400	99·2	5,800	98·9	5,590	99·0	5,660	100·4	6,720
28	104·2	10,975	99·9	6,320	99·2	5,800	98·9	5,590	99·0	5,660	100·4	6,720
29	104·2	10,975	99·91	6,320	99·1	5,730	98·9	5,590	99·0	5,660	100·5	6,800
30	104·2	10,975	99·8	6,240	99·1	5,730	99·0	5,660	99·1	5,730	100·5	6,800
31	104·2	10,975	....	....	99·1	5,730	99·0	5,660	....	....	100·5	6,800

	May, 1911.		June, 1911.		July, 1911.		August, 1911.		Sept., 1911.		Oct., 1911.	
1	102·0	8,300	102·6	8,975	102·9	9,350	103·2	9,735	103·1	9,600	103·1	9,600
2	102·0	8,300	102·6	8,975	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
3	102·1	8,410	102·7	9,100	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
4	102·1	8,410	102·7	9,100	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
5	102·1	8,410	102·7	9,100	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
6	102·1	8,410	102·7	9,100	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
7	102·1	8,410	102·7	9,100	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
8	102·1	8,410	102·7	9,100	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
9	102·2	8,520	102·8	9,225	103·0	9,475	103·2	9,725	103·1	9,600	103·1	9,600
10	102·2	8,520	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	103·1	9,600
11	102·2	8,520	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	103·2	9,725
12	102·3	8,630	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	102·5	8,850
13	102·3	8,630	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	102·1	8,410
14	102·3	8,630	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	102·1	8,410
15	102·4	8,740	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	101·9	8,190
16	102·4	8,740	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	101·7	7,970
17	102·4	8,740	102·8	9,225	103·1	9,600	103·2	9,725	103·1	9,600	101·5	7,760
18	102·4	8,740	102·9	9,350	103·1	9,600	103·2	9,725	103·1	9,600	101·1	7,360
19	102·4	8,740	102·9	9,350	103·1	9,600	103·2	9,725	103·1	9,600	100·9	7,190
20	102·4	8,740	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
21	102·5	8,850	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
22	102·5	8,850	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
23	102·5	8,850	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
24	102·5	8,850	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
25	102·5	8,850	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
26	102·6	8,975	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
27	102·6	8,975	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
28	102·6	8,975	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
29	102·6	8,975	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
30	102·6	8,975	102·9	9,350	103·2	9,725	103·2	9,725	103·1	9,600	100·8	7,070
31	102·6	8,975	....	....	103·2	9,725	103·2	9,725	....	....	100·8	7,070

Note.—Below gauge height 102·50 the rating curve is not well defined.

Daily Gauge Height and Discharge of Winnipeg River at Pinawa Channel, for 1912–13.

Day.	May, 1912.		June, 1912.		July, 1912.		Aug., 1912.		Sept., 1912.		Oct., 1912.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	102·5	8,850	103·5	10,100								
2	102·7	9,100	103·5	10,100								
3	102·7	9,100	103·5	10,100								
4	102·7	9,100	103·6	10,225								
5	102·7	9,100	103·6	10,225								
6	102·8	9,225	103·6	10,225								
7	102·8	9,225	103·6	10,225					103·4	9,975		
8	102·8	9,225	103·6	10,225								
9	102·8	9,225	103·6	10,225								
10	102·9	9,350	103·6	10,225								
11	102·9	9,350	103·6	10,225			101·0	7,260				
12	102·9	9,350	103·6	10,225								
13	102·9	9,350	103·6	10,225								
14	103·0	9,475	103·6	10,225								
15	103·1	9,600	103·6	10,225					103·4	9,975		
16	103·1	9,600	103·5	10,100								
17	103·1	9,600	103·5	10,100	103·2	9,725						
18	103·1	9,600	103·5	10,100								
19	103·2	9,725	103·5	10,100								
20	103·2	9,725	103·4	9,975							103·8	10,475
21	103·2	9,725	103·4	9,975	103·2	9,725						
22	103·5	9,850	103·4	9,975								
23	103·3	9,850	103·4	9,975								
24	103·3	9,850	103·4	9,975								
25	103·3	9,850										
26	103·3	9,850										
27	103·3	9,850					103·2	9,725				
28	103·4	9,975					103·2	9,725				
29	103·4	9,975					103·2	9,725				
30	103·5	10,100										
31	103·5											

	May, 1913.		June, 1913.		July, 1913.		Aug., 1913.		Sept., 1913.		Oct., 1913.	
1			103·60	10,200								
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15			103·70	10,400								
16					103·50	10,100						
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Winnipeg River at Pinawa Channel, for 1914.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1	102·20	8,500	.....	.....	103·89	10,600	103·73	10,400	103·44	10,000	103·10[1]	9,600
2	102·20	8,500	.....	.....	103·90	10,600	103·71	10,400	103·40	10,000	103·10[1]	9,600
3	102·20	8,500	.....	.....	103·93	10,600	103·70	10,400	103·37	9,950	103·10	9,600
4	102·20	8,500	.....	.....	103·93	10,600	103·71	10,400	103·35	9,900	103·10[1]	9,600
5	102·30	8,650	.....	.....	103·90	10,600	103·69	10,300	103·36	9,950	103·05[1]	9,550
6	102·40	8,750	.....	.....	103·90	10,600	103·65	10,300	103·29	9,850	103·05[1]	9,550
7	102·50	8,850	.....	.....	103·90	10,600	103·60	10,200	103·25	9,800	103·05	9,550
8	102·40	8,750	.....	.....	103·90	10,600	103·65	10,300	103·26	9,800	103·05[1]	9,550
9	102·40	8,750	.....	.....	103·87	10,600	103·65	10,300	103·23	9,750	103·10[1]	9,600
10	.....	.....	.....	.....	103·90	10,600	103·62	10,300	103·30	9,750	103·10[1]	9,600
11	.....	.....	.....	.....	103·87	10,600	103·62	10,300	103·20	9,750	103·15[1]	9,650
12	.....	.....	103·65	10,300	103·87	10,600	103·62	10,300	103·20	9,750	103·15	9,650
13	.....	.....	103·65	10,300	103·95	10,700	103·59	10,200	103·17	9,700	103·15[1]	9,650
14	.....	.....	103·65	10,300	103·97	10,700	103·59	10,200	103·15	9,650	103·20[1]	9,750
15	.....	.....	103·70[1]	10,400	103·97	10,700	103·59	10,200	103·15	9,650	103·20	9,750
16	.....	.....	103·70[1]	10,400	103·93	10,600	103·59	10,200	103·10	9,600	103·20[1]	9,750
17	.....	.....	103·70[1]	10,400	103·90	10,600	103·59	10,200	103·13	9,650	103·20[1]	9,750
18	.....	.....	103·75	10,400	103·87	10,600	103·58	10,200	103·13	9,650	103·20[1]	9,750
19	.....	.....	103·80	10,500	103·85	10,500	103·58	10,200	103·12	9,650	103·20	9,750
20	.....	.....	103·80	10,500	103·87	10,600	103·57	10,200	103·10	9,600	103·20[1]	9,750
21	.....	.....	103·80	10,500	103·87	10,600	103·57	10,200	103·10	9,600	103·15[1]	9,650
22	.....	.....	103·81	10,500	103·83	10,500	103·57	10,200	103·10	9,600	103·15	9,650
23	.....	.....	103·80	10,500	103·84	10,500	103·56	10,200	103·15	9,650	103·15[1]	9,650
24	.....	.....	103·82	10,500	103·81	10,500	103·55	10,200	103·15	9,650	103·10[1]	9,600
25	.....	.....	103·82	10,500	103·80	10,500	103·57	10,200	103·15[1]	9,650	103·10[1]	9,600
26	.....	.....	103·83	10,500	103·80	10,500	103·57	10,200	103·15[1]	9,650	103·00	9,500
27	.....	.....	103·83	10,500	103·81	10,500	103·57	10,200	103·15	9,650	103·00[1]	9,500
28	.....	.....	103·83	10,500	103·80	10,500	103·56	10,200	103·15[1]	9,650	103·00[1]	9,500
29	.....	.....	103·84	10,500	103·79	10,500	103·53	10,100	103·10[1]	9,600	102·95	9,400
30	.....	.....	103·90	10,500	103·77	10,400	103·51	10,100	103·10	9,600	102·90[1]	9,350
31	.....	.....	.....	10,600	103·75	10,400	103·48	10,100	.....	.....	102·90[1]	9,350

Note.—Gauge heights marked thus (1) interpolated.

Below gauge height 102·50 the rating curve is not well defined.

MONTHLY DISCHARGE of Winnipeg River at Pinawa Channel (Below Control Dam), for the years 1908–14.

Month.	Discharge in Second-feet.			Run off.
	Maximum.	Minimum.	Mean.	Total in acre-feet.
1908.				
May	7,025	5,800	6,250	384,300
June	5,660	5,417	5,550	330,300
July	5,690	5,520	5,550	341,300
August	5,660	5,520	5,600	344,300
September	5,730	5,590	5,650	336,200
October	6,015	5,660	5,750	353,600
The period	7,025	5,417	5,730	2,090,000
1909.				
May	7,560	5,860	6,450	396,600
June	6,660	5,050	5,300	315,400
July	5,730	5,320	5,500	338,200
August	5,385	4,100	5,200	319,700
September	5,660	5,320	5,550	330,300
October	6,980	5,450	6,150	378,200
The period	7,560	4,100	5,700	2,078,400
1910.				
May	11,225	10,725	11,000	676,400
June	10,850	6,240	9,500	565,300
July	6,090	5,730	5,900	362,800
August	5,730	5,520	5,600	344,300
September	5,730	5,590	5,600	333,200
October	6,800	5,730	6,200	381,200
The period	11,225	10,725	7,300	2,663,200
1911.				
May	8,975	8,300	8,700	534,900
June	9,350	8,975	9,250	550,400
July	9,725	9,350	9,600	590,300
August	9,725	9,725	9,750	599,500
September	9,600	9,600	9,600	571,200
October	9,725	7,070	8,200	504,200
The period	9,725	7,070	9,180	3,350,500
1912.				
May	10,100	8,850	9,250	568,800
June	10,225	9,975	[1]10,000	595,000
July	.....	.....	.....	.....
August	.....	7,260	.....	.....
The period	10,225	7,260	9,600	1,163,800
1914.				
June	10,600	10,300	[1]10,400	618,800
July	10,700	10,400	10,600	651,800
August	10,400	10,100	10,200	627,200
September	10,000	9,600	9,700	577,200
October	9,750	9,350	9,600	590,300
The period	10,700	9,350	10,100	3,065,300

NOTE.—Discharges marked thus (1) estimated.

PINAWA CHANNEL, ABOVE CONTROL DAM.

History.—The station above the control dam on the Pinawa channel was first established tentatively by engineers of the Winnipeg Electric Railway during construction. Mr. Burnham fixed this point as a metering station for the Manitoba Hydrographic Survey in June, 1912.

Location of Section.—The section is on the Pinawa channel, three-quarters of a mile above the control dam and approximately $9\frac{3}{4}$ miles above the plant of the Winnipeg Street Railway. The initial point is a triangle painted black and referenced on the vertical face of rock on the left bank of the channel by a painted mark reading "I.P. 1.5 feet south."

Records Available.—Discharge measurements from 1912 have been taken, and daily gauge heights for the year 1914 have been obtained. No daily discharges have been computed, as there are not sufficient data available on which to base them.

Drainage Area.—The channel is a by-pass of the Winnipeg river, and the drainage area is not significant.

Gauge.—The gauges used in connection with this section are three in number, one at the mouth of the channel and two at the control dam. The upper one of these is used for daily records. It is a vertical staff gauge fastened to the left abutment of the control dam on the upstream side.

Channel.—For 150 feet above and 150 feet below the channel is straight. It is a rock cut, having a depth of about 16 feet under normal conditions, and with high banks not subject to overflow.

Discharge Measurements.—Three have been taken at this point, the measurements are made with Price meter from a boat.

Diversions.—Between the metering section and the control dam there is a by-channel which allows of water being diverted, the amount depending upon the stage, as the flow is controlled by a small dam with a permanent crest.

Discharge Measurements of Pinawa Channel above Control Dam, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
June 3	G. H. Burnham.	1,187	126	2,007	5·17	103·6	10,377
" 22	"	1,187	125	1,944	4·97	103·55	9,660
July 18	"	1,187	125	1,921	5·11	103·27	9,817

Pinawa Channel, Winnipeg Street Railway Power House.

History.—The station was established to obtain a rating on the power station under as wide a range in load and head as possible. One section was established by W. J. Ireland in the forebay on February 18, 1914, and a second in the tail-race by M. S. Madden on May 7, 1914.

Location of Section.—The winter section in the forebay is located about 75 feet above the racks. The initial point is marked on the north side of the forebay below the coping. The summer section is 150 feet below the power-house, in the tail-race of the plant. The initial point is marked by an arrow chiselled on a boulder on the north side of the tail-race.

Records Available.—Discharge measurements taken under a wide range in load and head have been taken, sixty-three being made at the forebay section and 115 at the tail-race section.

Gauges.—The forebay gauge is a vertical staff fastened to the north wing wall, near its intersection with the rack structure; it is referred to W.P.S. datum. The tail-race gauge is a vertical staff fastened to the near wall of the power-house on the north side; it is also referred to W.P.S. datum.

Channel.—The section in the forebay is liable to cross currents due to the operation of the several machines. The tail-race section is in a channel fairly uniform above and below the station.

Discharge Measurements.—The measurements above the station were taken from the ice. In the tail-race they were made from a boat.

Diversions.—All the water going through the power-house passes the section in the forebay, but the measurements made in the tail-race must be corrected for leakage through the dam.

Accuracy.—Sufficient measurements have been made to give a very good rating on the station under a wide range in load and head.

DISCHARGE MEASUREMENTS of Pinawa Channel at Head-race W. E. S. Ry., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Feb. 18	W. J. Ireland	1,469	270	4,763	1·50	87·35	7,174
March 6	M. S. Madden	1,435	267	4,722	1·76	87·4	8,335
" 6	"	1,435	267	4,670	1·69	87·13	7,910
" 7	"	1,435	267	4,742	1·54	87·6	7,329
" 8	"	1,435	267	5,196	0·82	87·5	4,268
" 9	"	1,435	267	4,742	1·61	87·6	7,645
" 9	"	1,435	267	4,691	1·67	87·4	7,836
" 10	"	1,435	268	4,715	1·57	87·5	7,438
" 10	"	1,435	267	4,662	1·63	87·3	7,640
" 11	"	1,435	267	4,688	1·42	87·4	6,680
" 12	"	1,435	267	4,768	1·74	87·7	8,305
" 12	"	1,435	267	4,715	1·66	87·6	7,811
" 12	"	1,435	267	4,715	1·57	87·5	7,423
" 13	"	1,435	267	4,796	1·72	87·8	8,245
" 14	"	1,435	267	4,662	1·94	87·3	9,061
" 14	"	1,435	267	4,566	1·82	86·9	8,325
" 14	"	1,435	267	4,662	1·61	87·3	7,531
" 15	"	1,435	267	5,275	1·89	89·6	4,716
" 18	"	1,435	267	4,688	1·86	87·4	8,737
" 18	"	1,435	267	4,688	1·78	87·4	8,340
" 19	"	1,435	267	4,715	1·80	87·5	8,488
" 19	"	1,435	267	4,715	1·66	87·5	7,822
" 19	"	1,435	267	4,690	1·71	87·4	8,019
" 20	"	1,435	267	4,742	1·72	87·6	8,165
" 20	"	1,435	267	4,688	1·76	87·45	8,251
" 23	"	1,435	267	4,820	1·62	87·9	7,803
" 23	"	1,435	267	4,742	1·85	87·6	8,747
" 24	"	1,435	267	4,742	1·74	87·6	8,227
" 24	"	1,435	267	4,688	1·59	87·4	7,460
" 24	"	1,435	267	4,688	1·60	87·4	7,496
" 26	"	1,435	267	4,715	1·61	87·5	7,598
" 26	"	1,435	267	4,688	1·66	87·4	7,793
" 27	"	1,435	267	4,849	1·62	88·0	7,878
" 27	"	1,435	267	4,768	1·77	87·7	8,446
" 27	"	1,435	267	4,715	1·79	87·5	8,422
" 28	"	1,435	267	4,929	1·48	88·3	7,328
" 28	"	1,435	267	4,919	1·46	88·3	7,190
" 29	"	1,435	267	5,250	0·98	89·5	5,181
" 29	"	1,435	267	5,206	1·08	89·3	5,641
" 29	"	1,435	267	5,206	1·14	89·3	5,971
" 30	"	1,435	267	4,875	1·75	88·1	8,554
April 4	"	1,435	267	4,825	1·50	87·9	7,267
" 5	"	1,435	267	5,119	0·91	89·0	4,676
" 5	"	1,435	267	5,093	0·99	88·9	5,046
" 5	"	1,435	267	5,093	0·97	88·9	4,908
" 5	"	1,435	267	5,093	0·94	88·9	4,804
" 7	"	1,435	267	4,823	1·74	87·9	8,419
" 7	"	1,435	267	4,771	1·48	87·7	7,072
" 7	"	1,435	267	4,878	1·27	88·1	6,174
" 8	"	1,435	267	4,798	1·49	87·8	7,148
" 8	"	1,435	267	4,878	1·23	88·1	6,004
" 10	"	1,435	267	5,065	1·15	88·8	5,809
" 10	"	1,435	267	5,039	1·19	88·7	5,984
" 10	"	1,435	267	5,039	1·17	88·7	5,895
" 10	"	1,435	267	5,012	1·11	88·6	5,542
12	"	1,435	267	5,146	0·97	89·1	4,987
" 12	"	1,435	267	5,119	0·89	89·0	4,593
" 12	"	1,435	267	5,093	0·97	88·9	4,986
" 12	"	1,435	267	5,119	0·90	89·0	4,587
" 13	"	1,435	267	5,124	0·84	88·7	4,326
" 13	"	1,435	267	4,966	1·34	88·1	6,695
" 14	"	1,435	267	5,148	0·73	88·8	3,784
" 14	"	1,435	267	4,963	1·30	88·1	6,479

NOTE.—All measurements taken under ice conditions.

SESSIONAL PAPER No. 25f

Discharge Measurements of Pinawa Channel at Tail-race, W. E. S. Ry., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
May 7	M. S. Madden	1435	283	3,724	1·97	48·4	7,380
" 7	"	1435	283	3,615	2·14	48·0	7,730
" 8	"	1435	283	3,756	2·17	48·5	8,147
" 8	"	1435	283	3,699	2·05	48·3	7,597
" 9	"	1435	283	3,728	1·97	48·4	7,355
" 9	"	1534	283	3,586	2·02	47·9	7,271
" 9	"	1435	283	3,615	2·12	48·0	7,668
" 10	"	1435	283	3,558	1·24	47·8	4,423
" 10	"	1435	283	3,558	1·50	47·8	5,356
" 11	"	1435	283	3,841	2·22	48·8	8·545
" 11	"	1435	283	3,671	2·29	48·2	8·437
" 11	"	1435	283	3,643	2·30	48·1	8,394
" 12	"	1435	283	3,813	2·20	48·7	8,383
" 12	"	1435	283	3,699	2·11	48·3	7,844
" 12	"	1435	283	3,643	2·22	48·1	8,099
" 13	"	1435	283	3,445	1·89	47·4	6,530
" 14	"	1435	283	3,476	1·86	47·6	6,502
" 15	"	1435	283	3,756	2·05	48·5	7,716
" 15	"	1435	283	3,501	1·89	47·7	6,626
" 15	"	1435	283	3,699	2·13	48·3	7,866
" 17	"	1435	283	3,586	1·32	47·9	4,752
" 18	"	1435	283	3,841	2·06	48·8	7,912
" 18	"	1435	283	3,756	1·93	48·5	7·244
" 19	"	1435	283	3,837	2·16	48·8	8,299
" 19	"	1435	283	3,756	1·93	48·5	7,216
" 19	"	1435	283	3,699	2·19	48·3	8,116
" 20	"	1435	283	3,841	2·22	48·8	8,527
" 20	"	1435	283	3,670	2·26	48·2	8,276
" 20	"	1435	283	3,671	2·15	48·2	7,923
" 21	"	1435	283	3,751	2·17	48·6	8,170
" 21	"	1435	283	3,697	2·25	48·3	8,323
" 21	"	1435	283	3,560	1·97	47·8	7,004
" 22	"	1435	283	3,834	2·23	48·9	8,607
" 22	"	1435	283	3,669	2·19	48·2	7,977
" 22	"	1435	283	3,697	2·28	48·3	8,442
" 23	"	1435	283	3,784	1·99	48·6	7,564
" 23	"	1435	283	3,615	1·99	48·0	7,202
" 24	"	1435	283	3,586	1·10	47·9	3 950
" 24	"	1435	283	3,586	1·12	47·9	4,031
" 24	"	1435	283	3,615	1·32	48·0	4,766
" 24	"	1435	283	3,615	1·52	48·0	5,460
" 24	"	1435	283	3,699	1·56	48·3	5,774
" 25	"	1435	283	3,643	1·52	48·1	5,534
" 25	"	1435	282	3,586	1·80	47·9	6,459
" 27	"	1435	283	3,756	2·22	48·5	8,344
" 28	"	1435	283	3,615	1·91	48·0	7,010
" 28	"	1435	283	3,701	2·07	48·3	7,686
" 29	"	1435	283	3,530	1·72	47·7	6,083
" 29	"	1435	283	3,615	1·09	48·0	3,947
" 31	"	1435	283	3,671	1·28	48·2	4,720
" 31	"	1435	283	3,699	1·46	48·3	5,396
" 31	"	1435	283	3,699	1·38	48·3	5,103
June 3	"	1435	283	3,955	1·67	49·2	6,600
" 3	"	1435	283	3,898	1·88	49·0	7,332
" 4	"	1435	283	3,955	1·90	49·2	7,490
" 4	"	1435	283	3,841	1·91	48·8	7,347
" 6	"	1435	283	3,841	1·77	48·8	6,784
" 6	"	1435	283	3,756	1·68	48·5	6,315
" 7	"	1435	283	3,756	1·16	48·5	4,346
" 7	"	1435	283	3,756	1·31	48·5	4,917
" 7	"	1435	283	3,784	1·23	48·6	4,665
" 8	"	1435	283	3,643	0·79	48·1	2,884
" 8	"	1435	283	3,869	2·11	48·9	8 166
" 9	"	1435	283	3,869	2·10	48·9	8,115
" 9	"	1435	283	3,643	1·04	48·1	3,643
" 10	"	1435	283	3,841	2·07	48·8	7,966
" 10	"	1435	283	3,841	2 19	48·8	8,411
" 11	"	1435	283	3,615	1 00	48·0	3,608
" 13	"	1435	283	3,699	1·11	48·3	4 112
" 14	"	1531	283	3,841	1 36	48·8	5,212
" 14	"	1435	283	3,841	1 42	48·8	5,449
" 14	"	1435	283	3,813	1 38	48·7	5 302
" 15	"	1435	283	3,699	0 87	48·3	3,204
" 17	"	1435	283	3,671	1 02	48·2	3,767
" 18	"	1531	283	3,756	1 94	48·5	7 291
" 19	"	1435	283	3,699	1 04	48·3	3 839
" 20	"	1435	283	3,841	1 82	48·8	6,998
" 20	"	1435	283	3,841	1 81	48·8	6 962
" 21	"	1435	283	3,813	1 37	48·7	5,226
" 21	"	1435	283	3,841	1 01	48·8	6,491

DISCHARGE MEASUREMENTS of Pinawa Channel at Tail-race, W. E. S. Ry., 1914—*Concluded.*

Date	Hydrographer.	Meter. No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
June 21	M. S. Madden	1435	283	3,869	1·43	48·9	5,557
" 22	"	1435	283	3,898	2·15	49·0	8,389
" 23	"	1435	283	3,699	1·07	48·3	3,957
" 23	"	1435	283	3,898	2·19	49·0	8,542
" 25	"	1435	283	3,926	2·23	49·1	8,765
" 25	"	1435	283	3,926	2·16	49·1	8,496
" 28	"	1497	283	3,841	1·28	48·8	4,906
" 28	"	1497	283	3,813	1·24	48·7	4,745
" 29	"	1497	283	3,699	0·76	48·3	2,803
July 1	"	1497	283	3,926	1·50	49·1	5,879
" 1	"	1497	283	3,926	1·42	49·1	5,572
" 1	"	1497	283	3,841	1·55	48·8	5,966
" 2	"	1497	283	3,699	0·86	48·3	3,189
" 4	"	1497	283	3,699	0·88	48·3	3,269
" 5	"	1497	283	3,841	1·36	48·8	5,251
" 5	"	1497	283	3,813	1·35	48·7	5,136
" 6	"	1497	283	3,898	2·05	49·0	7,983
" 7	"	1497	283	3,728	0·94	48·4	3,494
" 7	"	1497	283	3,784	1·73	48·6	6,562
" 9	"	1497	283	3,813	1·86	48·7	7,088
" 10	"	1497	283	3,954	1·82	49·2	7,195
" 11	"	1497	283	3,728	0·94	48·4	3,524
" 11	"	1497	283	3,841	1·75	48·8	6,717
" 12	"	1435	283	3,898	1·24	49·0	4,818
" 12	"	1497	283	3,841	1·25	48·8	4,823
" 13	"	1497	283	3,728	0·81	48·4	3,038
" 13	"	1497	283	3,898	1·93	49·0	7,538
" 14	"	1497	283	3,898	2·00	49·0	7,789
" 15	"	1497	283	4,011	2·07	49·4	8,325
" 15	"	1497	283	3,784	1·79	48·6	6,771
" 16	"	1497	283	3,671	1·03	48·2	3,797
" 19	"	1497	283	3,841	1·37	48·8	5,281
" 19	"	1497	283	3,841	1·40	48·8	5,375
" 29	"	1497	283	3,728	0·91	48·4	3,389

Berens River, Twenty-ninth Falls.

SESSIONAL PAPER No. 25f

Daily Discharge of Winnipeg River at Pinawa Channel, for 1913.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1		4,160		6,240		5,920		5,780		5,490		3,640
2		5,720		4,170		4,120		5,680		5,465		5,080
3		5,835		5,640		5,560		5,770		5,235		5,410
4		5,915		5,915		5,750		5,760		3,215		5,470
5		3,860		5,715		5,790		5,260		5,970		5,625
6		6,650		5,730		5,720		3,560		5,500		5,700
7		6,340		5,740		5,800		5,665		5,440		5,550
8		6,160		5,560		5,740		6,135		5,475		3,515
9		6,120		4,040		3,850		6,100		5,440		4,910
10		6,040		5,610		5,540		5,815		5,200		4,900
11		5,990		6,060		5,925		5,880		3,315		5,060
12		4,030		5,920		5,870		5,440		4,700		4,920
13		5,690		6,090		5,850		3,440		4,980		5,100
14		5,640		6,050		5,730		4,720		5,025		5,070
15		5,690		6,090		5,785		5,035		4,835		3,720
16		5,865		4,225		3,900		4,830		4,935		5,490
17		6,050		5,970		5,450		4,860		4,775		5,820
18		5,980		6,250		5,720		5,100		3,210		5,650
19		4,100		6,270		5,960		5,120		5,000		5,640
20		5,815		6,200		5,835		3,370		5,040		5,635
21		6,190		6,140		5,100		4,930		4,990		5,500
22		6,020		6,285		5,465		5,300		4,885		3,835
23		5,950		3,880		3,800		5,420		5,125		5,250
24		5,890		5,770		5,460		5,500		4,050		5,340
25		5,940		6,000		5,920		5,730		3,180		5,500
26		4,100		6,015		5,710		5,520		4,930		5,625
27		5,460		5,870		5,770		3,460		5,250		5,800
28		5,685		5,935		5,740		4,940		5,320		5,270
29		5,830				5,620		5,310		5,120		3,570
30		6,285				3,660		5,600		5,360		5,080
31		6,200				4,900				5,325		

	July.		August.		September.		October.		November.		December.	
1		4,650		5,735		4,035		5,820		5,695		6,500
2		5,550		5,090		4,990		5,635		3,830		6,100
3		5,725		3,800		5,400		5,715		5,840		6,240
4		5,750		5,090		5,500		5,705		6,365		6,050
5		5,310		5,649		5,915		3,670		6,350		6,265
6		3,570		5,670		5,650		5,560		6,415		5,525
7		5,270		5,700		3,735		5,880		6,500		*
8		5,630		5,860		5,435		6,065		6,350		5,514
9		5,760		5,740		5,900		5,925		4,330		6,100
10		5,710		3,600		5,750		5,980		6,180		6,240
11		5,995		4,625		5,900		5,825		6,400		6,350
12		5,700		5,700		5,880		3,535		6,370		6,200
13		3,700		5,915		5,840		5,480		6,540		6,125
14		5,375		5,620		3,710		6,030		6,540		3,940
15		5,710		5,570		5,365		6,050		6,225		5,640
16		5,680		5,650		5,775		6,025		4,100		6,500
17		5,540		3,770		5,720		6,030		6,010		6,560
18		5,540		5,310		5,680		5,865		6,600		6,420
19		5,350		5,750		5,660		3,760		6,490		6,635
20		3,725		5,765		5,950		4,580		6,360		6,335
21		5,240		5,730		3,650		6,180		6,670		4,250
22		5,670		5,760		5,015		6,290		6,440		6,190
23		5,200		5,550		6,000		6,250		4,025		6,640
24		5,525		3,515		6,070		6,220		6,185		6,550
25		5,650		5,300		6,045		6,155		6,540		4,625
26		5,425		5,700		5,850		3,820		6,600		5,580
27		3,770		5,850		5,560		5,080		6,140		5,800
28		5,400		5,760		3,470		6,025		6,135		4,095
29		5,765		5,750		5,415		6,020		5,740		3,950
30		5,840		5,720		5,750		5,910		3,815		6,315
31		5,650		3,675				5,880				6,210

Note.—* Plant shut down part of day, not sufficient data to estimate discharge.

Daily Discharge of Winnipeg River at Pinawa Channel, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		4,900		4,835		5,125		5,930		5,500		5,890
2		5,720		5,870		6,100		6,075		4,880		6,100
3		5,860		6,280		6,310		6,100		3,460		5,940
4		4,230		6,180		6,295		5,760		5,150		6,295
5		6,160		5,910		6,230		4,175		5,640		6,250
6		6,215		5,880		6,300		6,135		5,625		5,740
7		6,325		6,000		6,150		6,400		6,020		4,180
8		6,275		4,715		4,460		6,410		6,270		5,960
9		6,375		5,600		6,130		6,190		6,200		6,510
10		6,080		5,990		6,365		4,710		4,350		6,570
11		4,435		5,940		6,480		6,040		6,190		6,840
12		5,950		6,235		6,515		4,250		6,500		6,600
13		6,290		6,100		6,425		6,060		6,590		6,440
14		6,050		5,900		6,515		6,335		6,410		4,450
15		6,365		4,830		4,740		6,365		6,635		6,440
16		6,590		5,570		6,360		6,225		6,260		6,780
17		6,525		6,200		6,770		6,370		4,485		6,650
18		4,440		6,330		6,750		6,500		6,400		6,950
19		6,365		6,020		6,570		4,275		6,635		6,480
20		6,660		6,070		6,830		6,200		6,880		6,005
21		6,375		6,165		6,615		6,660		6,800		4,710
22		6,400		5,040		4,670		6,640		6,860		6,490
23		6,410		5,785		6,120		6,420		6,250		6,810
24		6,345		6,335		6,525		6,280		4,275		6,940
25		4,565		6,290		6,665		5,980		4,970		6,940
26		5,800		6,385		6,545		4,100		5,930		6,500
27		6,130		6,430		6,460		6,430		6,300		6,500
28		6,250		6,390		5,680		6,740		6,235		4,520
29		6,370				3,970		6,540		6,140		5,575
30		6,240				5,600		6,300		5,750		5,700
31		5,925				5,950				4,450		

	July.		August.		September.		October.		November.		December.	
1		5,210		6,280		6,775		6,720		6,670		6,760
2		6,240		4,525		6,785		6,450		4,830		6,775
3		6,270		6,130		6,760		6,370		6,265		[1]5,115
4		5,740		6,165		6,810		4,660		6,465		6,540
5		4,435		5,850		6,465		6,650		6,220		6,520
6		6,430		5,985		4,735		6,835		6,470		4,390
7		6,450		6,805		5,800		6,810		6,380		6,015
8		6,460		6,670		6,950		6,810		6,400		[1]4,415
9		6,290		4,450		6,865		7,015		4,870		5,455
10		5,995		5,640		6,785		7,010		6,155		6,260
11		6,060		6,780		6,885		4,765		6,660		6,365
12		4,290		6,600		6,875		5,720		6,480		5,640
13		6,220		6,850		4,860		6,990		7,050		4,100
14		6,615		6,770		6,660		6,995		6,670		5,910
15		6,635		6,420		6,720		6,790		6,850		6,220
16		6,985		4,715		5,915		6,930		4,990		6,205
17		6,965		6,560		6,455		6,380		6,570		6,050
18		6,155		6,915		6,425		4,745		6,965		6,140
19		4,675		6,730		6,165		6,285		6,935		5,615
20		6,375		6,485		4,370		6,750		7,050		3,950
21		6,650		6,530		6,350		6,900		6,840		5,950
22		6,800		6,375		6,480		6,730		6,805		6,000
23		6,780		4,650		6,615		6,915		6,430		5,970
24		6,500		6,545		6,740		6,570		6,860		5,935
25		6,550		6,780		6,540		4,825		6,815		4,710
26		4,600		6,640		6,240		6,725		6,910		5,435
27		6,285		6,700		4,375		7,140		6,670		4,140
28		6,150		6,340		6,610		7,000		6,735		5,635
29		6,560		6,250		6,990		7,015		4,860		5,705
30		6,530		4,570		6,880		6,940		6,530		5,815
31		6,620		6,375				6,670				5,730

Note.—[1] On these days ice trouble was experienced.

SESSIONAL PAPER No. 25f

Winnipeg River, Head of Grand du Bonnet Falls.

History.—The station on the Winnipeg river at Grand du Bonnet falls was established December 1, 1911, by A. M. Beale.

Location of Section. —The section is 1½ miles above Grand du Bonnet falls and 400 feet downstream from B.M. 138 B., W.P.S. The initial point is a point chiselled in the rock on a high bare point on the left bank of the river. It is referenced by a 12-inch poplar 56 feet distant, a 6-inch oak tree 31 feet distant, and a 7-inch oak tree 48 feet distant.

Records available. —A record of gauge heights has been kept from July 16, 1911, to March 10, 1912, also from May 16 to November 3, 1913, and from May 14 to July 25, 1914. These records are not continuous during each period. Discharge measurements were taken during the period 1911-12.

Drainage area.—Approximately 53,100 square miles.

Gauge.—A vertical staff gauge is placed in a small bay on the right shore, 500 feet above the crest of the Grand du Bonnet falls, and at the head of the portage. It is referenced to W.P.S. datum.

Channel.—Left shore straight for 500 feet above the station, the right shore is slightly curved. Below the station there is a small bay on the left shore and the right shore is curved about 600 feet below the station; the river bends to the west and widens. There are two channels at the section, divided by a small island 50 feet wide and 500 feet from the left shore, the right channel is 170 feet wide. The bed of the channel is rock and clay, and not subject to shifting.

Discharge measurements.—Are made from a boat held in position by a stay line.

Accuracy.—Not sufficient measurements have been made to define a discharge curve and arrive at the daily discharges.

Pigeon River, Sturgeon Falls.

DISCHARGE MEASUREMENTS of Winnipeg River near Head of Grand du Bonnet Falls, 1911.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Dec. 6, 7, 8	Beale & Pirie	1,187	600	21,910	1·04	5·08	22,827
" 9	"	1,187	600	21,910	1·06	5·05	23,216
1912.							
Mar. 25	A. Pirie	1,187	386	20,394	0·66	3·70	13,432

WHITEMOUTH RIVER.

The source of the Whitemouth river is in Whitemouth lake, which lies in the southeastern part of the province. The course of the river is generally north from the source to its junction with the Winnipeg river just below the Seven Sisters rapids on the latter stream.

The drainage area of the river is 1,566 square miles. The upper part of the river flows through that part of the country known as the Julius muskeg, and as the name would imply, is low and wet. The lower part of the valley is narrow, and the land fertile; a considerable portion has been cleared and is now under cultivation. The lower 2 miles of the river flows through a well-timbered belt of country, spruce, oak, and poplar of merchantable size being plentiful.

The bed of the river is generally of clay, but at the lower end rock ridges extend across the river-bed, and at one point form what is known as Whitemouth falls, which is near the mouth. The valley is generally from 30 to 50 feet in height, and the valley proper varies from 200 to 600 feet wide.

WHITEMOUTH RIVER AT WHITEMOUTH.

History.—The metering section was established at Whitemouth, on the river of that name, by G. H. Burnham, on May 28, 1912.

Location of Section.—The station is located on the downstream side of the traffic bridge which crosses the river about 900 feet northeast of the Canadian Pacific Railway station at Whitemouth. The initial point is marked by three wire nails driven in the handrail of the bridge directly above the south abutment, and the intervals are also marked on the handrail.

Records available.—Daily estimated discharges are available from May 29, 1912, for the open-water months. During the winters of 1912-13 and 1913-14 no gauge records were obtained, but for the winter of 1914 these records are available.

Drainage area.—The drainage area of the river above the station is 1,400 square miles. Much of this territory is low-lying and of a swampy nature; lately it has been cross cut by the drainage system in connection with the construction of the conduit for the Greater Winnipeg water supply, the Whitemouth being used as a discharging channel. This has noticeably affected the flow.

Gauge.—A vertical staff gauge, graduated to tenths, is fastened to a pile of the bridge opposite station 91 of the section. It is referred to a bench-mark consisting of an iron bolt sunk in a concrete pile near the bridge. An arbitrary datum is used.

Channel.—The river is divided into six channels by the pile bents of the bridge. The bed is of clay and liable to slight shifting. The depth over the

section, under normal conditions, averages 4 feet. The banks are not subject to overflow.

Discharge measurements.—Sufficient meterings have been secured to define the discharge curve over a range of 4 feet in gauge height, for open-water conditions. Under ice conditions a number have been taken, but do not define the curve of discharge clearly. The measurements are made from the bridge.

Accuracy.—The accuracy for the discharge curve is high over a range in gauge heights of 4 feet, from 73.8 to 77.3.

DISCHARGE MEASUREMENTS of Whitemouth River at Whitemouth, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 29	G. H. Burnham	1,187	162	991	2·20	77·29	2,179
June 20	"	1,187	151	629	1·07	74·91	673
July 13	"	1,187	151	750	1·41	75·53	1,057
" 15	"	1,187	158	853	1·67	76·15	1,434
Aug. 9	W. G. Worden	1,187	150	700	1·30	75·40	910
Sept. 3	"	1,187	150	835	1·59	76·17	1,328
Oct. 15	R. H. Nelson	1,187	172	937	2·02	76·93	1,892
1913.							
Jan. 24	A. Pirie	1,469	110	189	0·145	73·65	[1]27
April 18	"	1,186	154	752	1·650	75·74	1,241
May 9	G. Ebner	1,186	151	732	1·380	75·32	1,010
Aug. 15	W. J. Ireland	1,469	143	578	0·680	74·40	392
Sept. 26	C. O. Allen	1,435	136	512	0·300	73·89	153
1914.							
Jan. 20	E. J. Budge	1,462	141	207	0·07	73·23	[1]16
Mar. 16	W. J. Ireland	1,462	99	97	0·20	73·33	[1]20
May 20	A. Pirie	1,939	137	636	1·13	74·92	720
July 27	M. S. Madden	1,760	147	609	0·76	74·55	467
Aug. 18	J. A. Page	1,920	136	443	0·10	73·60	44
Sept. 4	H. Boyd	1,919	142	492	0·28	73·80	134
Oct. 7	M. S. Madden	1,911	142	522	0·30	73·94	158
Nov. 3	M. S. Madden	1,912	147	586	0·77	74·51	451
" 30	C. O. Allen	1,911	140	408	0·36	73·85	[1]146
Dec. 28	M. S. Madden	1,462	125	260	0·07	73·52	[1]17

[1]Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Whitemouth River at Whitemouth, for 1912.

[Drainage area, 1,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1											6·80	1,760
2											6·48	1,570
3											6·35	1,500
4											6·53	1,600
5											6·58	1,630
6											6·48	1,570
7											6·25	1,440
8											6·19	1,410
9											6·07	1,340
10											5·67	1,110
11											5·66	1,100
12											5·47	1,000
13											5·45	987
14											5·41	964
15											5·25	873
16											5·21	850
17											4·99	724
18											4·97	713
19											4·94	696
20											4·93	690
21											4·79	610
22											4·63	579
23											4·61	508
24											4·59	496
25											4·59	496
26											4·58	491
27											4·56	479
28											4·54	468
29									7·25	2,010	4·43	405
30									7·26	2,020	4·29	325
31									6·99	1,860		

	July.		August.		September.		October.		November.		December.	
1	4·19	271	5·75	1,160	6·12	1,370	7·22	2,000	6·35	1,500		
2	4·09	226	5·49	1,010	6·16	1,390	7·13	1,940	6·39	1,520		
3	3·97	181	5·38	947	6·15	1,390	6·97	1,850	6·45	1,560		
4	3·94	172	5·06	764	6·20	1,410	6·94	1,840	6·36	1,510		
5	3·93	169	5·05	759	6·68	1,690	6·86	1,790	6·29	1,470		
6	4·33	348	5·03	747	6·56	1,620	6·83	1,770	6·20	1,410		
7	4·38	377	5·07	770	6·47	1,570	6·77	1,740	6·07	1,340		
8	4·77	599	5·18	833	6·36	1,510	7·00	1,870	5·96	1,280		
9	4·98	719	5·37	941	6·32	1,480	7·25	2,010	5·87	1,230		
10	5·03	747	5·37	941	6·37	1,510	7·25	2,010	5·81	1,190		
11	5·07	770	5·36	935	6·42	1,540	7·24	2,010	5·76	1,160		
12	5·06	764	5·36	935	6·44	1,550	7·20	1,980	5·73	1,150		
13	5·59	1,070	5·17	827	6·43	1,550	7·16	1,960	5·67	1,110		
14	5·91	1,250	5·10	787	6·41	1,530	7·05	1,900	5·64	1,100		
15	6·17	1,400	5·02	741	6·38	1,520	6·92	1,820	5·61	1,080		
16	6·22	1,430	4·97	713	6·63	1,660	6·64	1,660	5·57	1,060	4·19	
17	6·22	1,430	4·83	633	6·75	1,730	6·55	1,560	5·57	1,060		
18	6·21	1,420	4·77	599	6·70	1,700	6·37	1,510	5·51	1,020		
19	6·21	1,420	4·73	576	6·63	1,660	6·36	1,510	5·47	1,000		
20	5·91	1,250	4·51	451	6·40	1,530	6·33	1,490	5·45	987		
21	5·83	1,200	4·49	439	6·98	1,860	6·17	1,400	5·36	935		
22	5·73	1,150	4·57	485	7·43	2,120	6·09	1,350	5·31	906		
23	5·84	1,210	4·67	542	7·53	2,170	5·97	1,280	5·23	861		
24	6·03	1,320	4·80	616	7·59	2,210	5·87	1,230	5·39			
25	6·18	1,400	4·86	650	7·57	2,200	5·66	1,110	5·61			
26	6·25	1,410	4·89	667	7·53	2,170	5·51	1,020	5·77			
27	6·29	1,470	4·91	679	7·45	2,130	5·93	1,260	5·83			
28	6·37	1,510	4·95	702	7·44	2,120	6·11	1,360	5·87			
29	6·26	1,450	4·97	713	7·35	2,070	6·21	1,420	5·87			
30	6·12	1,370	5·37	941	7·30	2,040	6·27	1,450	5·87			
31	5·93	1,260	5·97	1,280			6·29	1,470				

Note.—Ice conditions from November 23; information insufficient to compute daily discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Whitemouth River at Whitemouth, for 1913.

[Drainage Area, 1,400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	3·79	.....	3·57	.....	.....	.....	5·78	1,180	4·75	588
2	.....	.....	.....	.....	.....	.....	.....	.....	5·74	1,150	4·72	570
3	.....	.....	.....	.....	.....	.....	.....	.....	5·66	1,110	4·70	560
4	.....	.....	.....	.....	.....	.....	.....	.....	5·60	1,070	4·70	560
5	.....	.....	.....	.....	.....	.....	.....	.....	5·57	1,060	4·70	560
6	.....	.....	.....	.....	.....	.....	.....	.....	5·54	1,040	4·78	605
7	.....	.....	.....	.....	.....	.....	.....	.....	5·45	987	5·06	764
8	.....	.....	.....	.....	3·59	.....	7·56	2,190	5·45	987	4·97	713
9	.....	.....	.....	.....	.....	.....	7·77	2,310	5·37	941	4·88	662
10	.....	.....	.....	.....	.....	.....	7·87	2,379	5·37	941	4·80	616
11	.....	.....	.....	.....	.....	.....	8·27	2,600	5·41	964	4·68	548
12	.....	.....	.....	.....	.....	.....	8·70	2,850	5·39	952	4·63	519
13	.....	.....	.....	.....	.....	.....	7·93	2,400	5·36	935	4·66	536
14	.....	.....	.....	.....	.....	.....	7·41	2,100	5·33	918	4·62	513
15	.....	.....	3·61	.....	3·59	.....	7·33	2,060	5·25	873	4·53	462
16	.....	.....	.....	.....	.....	.....	7·27	2,020	5·15	816	4·53	462
17	.....	.....	.....	.....	.....	.....	7·21	1,990	5·07	770	4·33	348
18	.....	.....	.....	.....	.....	.....	5·74	1,150	5·07	770	4·31	337
19	.....	.....	.....	.....	.....	.....	5·70	1,130	5·03	747	4·19	271
20	.....	.....	.....	.....	.....	.....	5·70	1,130	4·97	713	4·21	282
21	.....	.....	.....	.....	.....	.....	5·67	1,110	4·94	696	4·13	244
22	.....	.....	3·59	.....	3·59	.....	5·66	1,110	4·90	673	4·12	239
23	.....	.....	.....	.....	.....	.....	5·91	1,250	4·90	673	4·05	210
24	3·65	27	.....	.....	.....	.....	6·04	1,320	4·88	662	4·03	202
25	3·79	.....	.....	.....	.....	.....	6·11	1,360	4·86	650	3·97	181
26	.....	.....	.....	.....	.....	.....	6·17	1,400	4·84	639	3·94	172
27	.....	.....	.....	.....	.....	.....	6·17	1,400	4·80	616	3·90	160
28	.....	.....	.....	.....	.....	.....	6·15	1,390	4·80	616	3·90	160
29	.....	.....	.....	.....	.....	.....	6·07	1,340	4·78	605	4·12	239
30	.....	.....	.....	.....	.....	.....	5·95	1,270	4·75	588	4·27	315
31	.....	.....	.....	.....	.....	.....	.....	.....	4·73	576	.....	.....

Day.	July.		August.		September.		October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·81	622	3·91	163	4·53	462	3·83	143	4·71	565
2	4·98	719	3·87	153	4·48	434	3·79	133	4·68	548
3	4·96	707	3·81	138	4·40	388	3·71	117	4·66	536
4	4·93	690	3·79	133	4·38	377	3·69	113	4·34	354
5	4·81	622	3·73	121	4·33	348	3·73	121	4·31	337
6	4·73	576	3·73	121	4·28	320	3·78	131	4·26	309
7	4·64	525	3·67	110	4·21	282	3·76	127	4·21	282
8	4·51	451	3·63	102	4·16	258	3·74	123	4·21	282
9	4·51	451	3·59	96	4·08	222	3·83	143	4·17	262
10	4·45	417	3·56	92	4·13	244	3·91	163	4·13	244
11	4·53	462	3·53	89	4·24	298	4·03	202	4·09	226
12	4·63	519	3·53	89	4·07	218	5·03	747	4·05	210
13	5·21	850	3·49	84	4·05	210	5·20	844	4·05	210
14	5·50	1,020	4·07	218	4·00	190	5·46	992	4·05	210
15	5·55	1,040	4·29	325	3·93	169	5·51	1,020	4·05	210
16	5·71	1,130	4·68	548	3·91	163	5·54	1,040	4·05	
17	5·40	958	5·07	770	3·83	143	5·48	1,000	4·05	
18	5·28	890	5·21	850	3·91	163	5·39	952	4·05	
19	5·06	764	5·16	821	4·03	202	5·42	969	4·05	
20	4·99	724	5·11	793	3·99	187	5·35	930	4·05	
21	4·81	622	5·08	776	3·96	178	5·33	918	4·05	
22	4·65	531	4·99	724	3·95	175	5·23	861	4·05	
23	4·65	531	4·93	690	3·93	169	5·22	855	4·05	
24	4·58	491	4·91	679	3·93	169	5·15	816	4·05	
25	4·53	462	4·83	633	3·91	163	5·11	793	4·05	
26	4·41	394	4·83	633	3·87	153	5·05	759	4·05	
27	4·27	314	4·74	582	3·88	155	4·96	707	4·05	
28	4·14	248	4·66	536	3·86	150	5·01	736	4·05	
29	4·13	244	4·63	519	3·83	143	4·98	719	4·05	
30	4·00	190	4·57	485	3·81	138	4·96	707	4·05	
31	3·99	187	4·59	496			4·81	622	4·05	

Note.—Discharge curve is not well defined below gauge height 73.80. Ice conditions until April 7; information insufficient to compute daily discharges.

Daily Gauge Height and Discharge of Whitemouth River at Whitemouth, for 1914.

(Drainage Area 1,400 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							3·58	.....	4·76	593	5·14	810
2							3·58	.....	4·81	622	5·14	810
3							3·58	.....	4·86	650	7·24	2,010
4							3·58	.....	5·31	907	7·67	2,250
5							3·58	.....	5·57	1,060	7·19	1,980
6							3·58	.....	5·81	1,190	6·28	1,460
7							3·58	.....	5·93	1,260	6·10	1,350
8							3·58	.....	5·97	1,280	6·35	1,500
9							3·58	.....	5·71	1,130	6·72	1,710
10							3·58	.....	5·43	975	6·62	1,650
11							3·58	.....	5·36	935	6·74	1,720
12							3·58	.....	5·27	884	6·46	1,560
13							3·58	.....	5·27	884	6·24	1,450
14							3·58	.....	5·12	798	5·94	1,270
15							3·58	.....	4·98	719	5·72	1,140
16					3·33	20	3·98	.....	4·89	667	5·48	1,000
17							4·69	.....	4·76	593	5·24	867
18							5·55	.....	4·61	508	5·20	844
19							6·02	.....	4·57	485	5·15	816
20	3·23	16					6·08	.....	4·79	610	5·13	804
21							6·16	1,390	5·09	781	5·01	736
22							6·23	1,430	5·21	850	5·01	736
23							6·01	1,310	5·32	912	4·97	713
24							5·76	1,160	5·32	912	4·82	627
25							5·76	1,160	5·34	924	4·69	553
26							5·43	975	5·36	935	4·62	513
27							4·17	827	5·28	890	4·47	428
28							4·96	707	5·24	867	4·39	382
29							4·93	690	5·18	833	4·31	337
30							4·76	593	5·37	941	4·19	271
31							.....	.....	5·32	912	.....	.....

	July.		August.		September.		October.		November.		December.	
1	4·19	271	4·22	287	3·87	153	4·05	210	4·39	382	3·86	.....
2	4·42	399	4·14	248	3·85	148	3·96	178	4·31	337	3·83	.....
3	4·46	422	4·08	222	3·79	133	3·91	163	4·31	337	3·87	.....
4	4·49	439	4·06	214	3·83	143	3·88	155	4·49	439	3·87	.....
5	4·49	439	4·03	202	3·79	133	3·91	163	4·48	434	3·88	.....
6	4·48	434	3·98	184	3·75	125	3·89	158	4·46	422	3·88	.....
7	4·48	434	3·92	166	3·75	125	3·89	158	4·37	371	3·87	.....
8	4·46	422	3·84	145	3·75	125	3·92	166	4·37	371	3·87	.....
9	4·35	360	3·77	129	3·73	121	4·06	214	4·34	354	3·85	.....
10	4·27	315	3·71	117	3·75	125	4·79	610	4·34	354	3·85	.....
11	4·08	222	3·67	110	3·77	129	5·61	1,080	4·33	348	3·83	.....
12	4·80	616	3·65	106	3·79	133	5·59	1,070	4·26	309	3·85	.....
13	7·14	1,950	3·56	92	3·79	133	5·55	1,040	4·26	309	3·85	.....
14	6·62	1,650	3·54	90	3·81	138	5·55	1,040	4·21	282	3·81	.....
15	6·34	1,490	3·54	90	3·84	145	5·51	1,020	4·16	258	3·83	.....
16	5·99	1,290	3·48	83	3·88	155	5·43	975	4·12	239	3·83	.....
17	5·74	1,150	3·54	90	3·91	163	5·36	935	4·11	235	3·83	.....
18	5·44	981	3·60	97	3·87	153	5·31	907	4·08	222	3·83	.....
19	5·42	969	3·60	97	3·87	153	5·25	873	4·08	222	3·73	.....
20	5·38	947	3·53	89	3·87	153	5·22	855	4·08	222	3·62	.....
21	5·30	901	3·49	84	3·89	158	5·18	833	4·08	222	3·52	.....
22	5·26	878	3·47	82	4·00	190	5·18	833	[1]5·00	199	3·55	.....
23	5·13	804	3·47	82	4·16	258	5·01	736	[1]5·00	190	3·55	.....
24	5·04	753	3·69	113	4·19	271	4·89	667	[1]5·00	190	3·52	.....
25	4·92	684	3·71	117	4·24	298	4·76	593	3·93	169	3·53	.....
26	4·77	599	3·76	127	4·24	298	4·74	582	3·93	169	3·53	.....
27	4·61	508	3·81	138	4·20	276	4·69	553	3·93	169	3·53	.....
28	4·52	456	3·83	143	4·15	253	4·61	508	3·93	169	3·49	17
29	4·46	422	3·85	148	4·09	226	4·55	474	[1]3·90	160	3·49	.....
30	4·38	377	3·87	153	4·06	214	4·51	451	3·85	146	3·43	.....
31	4·38	377	3·89	158	.....	.....	4·43	405	.....	.....	3·41	.....

Note.—Ice conditions from January 1 to April 20, not sufficient information to compute daily discharges.
Marked thus [1] interpolated. Ice conditions from 18th November, information insufficient to compute daily discharges for December.

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Whitemouth River at Whitemouth, for the years 1912-14.

(Drainage area, 1,400 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
May	.....	.....	[1]2,000	1·429	1·648	123,000
June	1,760	325	944	0·674	0·752	56,200
July	1,510	169	993	0·709	0·817	61,100
August	1,280	439	770	0·550	0·634	47,300
September	2,210	1,370	1,730	1·236	1·379	102,900
October	2,010	1,020	1,630	1·164	1·342	100,200
November	.....	.....	[1]1,000	0·714	0·797	59,500
December	.....	.....	[1]100	0·071	0·082	6,100
The period	2,210	169	1,150	0·818	7·451	556,300
1913.						
April	.....	.....	[1]1,600	1·143	1·275	95,200
May	1,180	576	836	0·597	0·688	51,400
June	764	160	420	0·300	0·335	25,000
July	1,130	187	592	0·423	0·488	36,400
August	850	84	405	0·289	0·333	24,900
September	462	138	229	0·163	0·182	13,600
October	1,040	113	597	0·426	0·491	36,700
November	.....	.....	[1]230	0·164	0·183	13,700
December	.....	.....	[1]50	0·036	0·041	3,100
The period	1,180	84	551	0·393	4·016	300,000
1914.						
January	.....	.....	[1]15	0·011	0·013	922
February	.....	.....	[1]10	0·007	0·007	555
March	.....	.....	[1]20	0·014	0·016	1,230
April	.....	.....	[1]450	0·321	0·358	26,800
May	1,280	485	855	0·611	0·704	52,600
June	2,250	271	1,080	0·772	0·861	64,300
July	1,950	222	708	0·506	0·583	43,500
August	287	82	136	0·097	0·112	8,400
September	298	121	174	0·124	0·138	10,400
October	1,080	155	600	0·428	0·494	36,900
November	439	146	274	0·195	0·218	16,300
December	.....	.....	[1]50	0·036	0·042	3,075
The year.	2,250	15	364	0·260	3·547	264,982

NOTE.—All marked thus [1]) estimated.

RED RIVER AND TRIBUTARIES.

The Red River.—The Red river, one of the most important flowing in the province of Manitoba, has its source near the central part of the state of Minnesota. It flows south and west to the town of Breckenbridge, then north to the international boundary, forming the boundary in that stretch between the states of Minnesota and North Dakota.

The general direction of the river from Breckenbridge to lake Winnipeg, into which body of water the river empties, is north. The river follows very closely a straight line, though it is very sinuous in its course, nearly doubling its length between the points mentioned.

The drainage basin of the river is 116,347 square miles, of which 42,547 are in Minnesota and Dakota, 50,500 in Saskatchewan, and 23,300 in Manitoba.

The valley of the river is not defined by high banks, as in most cases, but the whole country slopes gently toward the river, which lies in a channel cut to a depth of from 25 to 50 feet below the plain.

The valley of the Red river is the oldest district in the province, the and being practically all settled and farmed. Little standing timber is to be found, only clumps of elm and ash, with poplar and cottonwood, being found along the river.

The stream afforded the first means of access to the country, and was navigated for a number of years before the advent of the railways to the country between Grand Forks and lake Winnipeg. This traffic has, however, practically ceased to exist except upon the stretch of the river between Winnipeg and the lake. The Dominion Government have built a dam and lock near the mouth of the river, and by operating it, an 8-foot depth for navigation purposes is ensured between the lake and the city of Winnipeg.

There are a number of important centres which are located along the river, among these within the province of Manitoba are: Emerson, which is just north of the international boundary; Winnipeg, at the junction of the Assiniboine with the Red river and Selkirk. In addition to these there are a number of small communities located along the banks of the river.

Metering stations have been located from time to time and maintained for certain periods at the following points along the river in the province of Manitoba:

1. At the Canadian Northern Railway bridge at Emerson.
2. Three miles below Emerson.
3. At Elm Park bridge, in Winnipeg.
4. At Redwood bridge, in Winnipeg.

Tributaries.—The tributaries of the Red which enter that river within the province of Manitoba, or close to its boundaries, are: Pembina river, Roseau river, Rat river, Morris river, Assiniboine river, Seine river. Of these, the Assiniboine is the most important, and is given a separate section in this report. The others are considered along with the Red river; they enter it in the order given, from source to mouth. Records of discharge for the Roseau and Rat are fairly continuous, but for the others only isolated meterings are available, and are therefore listed under the head of miscellaneous meterings.

In the case of the Pembina, note should be made that this river flows partly through United States territory. Records of its discharge were kept by the United States Geological Survey at Neche, North Dakota, during the years 1903 to 1910, inclusive, and are included in the report.

Red River at Emerson.

History.—The station was established by S. S. Scovil on May 3, 1912, and has been operated steadily from that date.

Location of Section.—The section is located on the downstream side of the Canadian Northern Railway bridge at Emerson. The initial point is at the inter-section of the end post of the bridge with the wooden hand-rail at the left hand end of the bridge on the downstream side.

Records Available.—Daily gauge height records have been kept for each open-water season since the station was established, and intermittent readings under winter conditions have been obtained for the same period. A discharge curve for open-water and winter conditions has been constructed, and from it estimates of daily discharge have been arrived at.

Drainage Area.—The area tributary to the river above this station is 34,600 square miles, and practically all of it is south of the international boundary.

Gauge.—A 9-foot vertical staff gauge was nailed to the sheet piling around the west pier, 10 feet upstream from the section. On March 5, 1914, it was changed to a position on the west side of the icebreaker above the section, and referred to the Canadian Geodetic Survey datum.

Channel.—The channel is divided by the bridge piers, otherwise it remains the same under all conditions. The bottom is hard clay inlaid with gravel. It is straight for 400 feet above the station and 500 feet below. The banks are high and not subject to overflow except under extraordinary conditions. The floods of 1879, 1882, and 1897 overflowed the banks.

Discharge Measurements.—They are taken from the downstream side of the bridge, except under winter conditions when they are taken from the ice.

Accuracy.—A range in stage under open-water conditions of 26.16 feet is covered, the discharge curve being well defined between gauge heights 749.0 and 765.0, beyond these limits the definition is not so good. Under ice conditions a discharge curve is well defined between the limits 749.0 and 751.5.

DISCHARGE MEASUREMENTS of Red River at Emerson, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
May 3...	S. S. Scovil	1187	222	876	1·88	751·62	1,646
May 18 .	S. S. Scovil	1187	245	1,353	2·25	754·08	3,045
June 12 .	G. H. Burnham	1187	243	885	1·92	751·88	1,699
June 15 .	G. H. Burnham	1187	243	852	1·62	751·30	1,380
July 9 .	G. H. Burnham	1187	214	649	1·53	750·35	994
July 24 .	G. H. Burnham	1187	214	682	1·70	750·71	1,159
Aug. 6 .	W. G. Worden	1187	214	679	1·74	750·69	1,183
Aug. 22 .	W. G. Worden	1187	213	672	1·59	750·22	1,070
Oct. 18 .	G. J. Lamb	1187	243	1,038	1·69	752·35	1,754
Oct. 31 .	G. J. Lamb	1187	221	881	1·63	751·68	1,436
1913.							
April 10 .	G. H. Burnham	1497	357	7,190	3·41	776·27	24,521
April 22 .	A. Pirie	1186	304	3,645	2·81	764·72	10,230
April 29 .	E. Bankson	1469	270	2,437	2·44	759·09	5,936
May 13 .	E. Bankson	1469	244	1,333	2·41	754·57	3,211
July 30 .	A. Pirie	1469	243	638	1·59	750·31	1,015
Aug. 19 .	C. O. Allen	1435	220	492	1·62	749·85	797
Sept. 19 .	C. O. Allen	1435	222	751	1·96	751·35	1,524
1914.							
Jan. 5 .	E. J. Budge	1492	171	797	0·53	750·01	[1]429
Mar. 5 .	W. J. Ireland	1469	200	834	0·57	751·00	[1]478
Mar 23 .	T. J. Moore	1374	214	1,226	0·78	752·54	[1]957
April 27 .	A. Pirie	1187	221	1,789	1·86	754·87	3,332
May 27 .	A. Pirie	1939	239	1,475	1·98	753·70	2,923
June 16 .	C. O. Allen	1760	282	3,184	2·29	759·48	7,303
July 30 .	M. S. Madden	1760	237	1,443	1·46	752·42	2,107
Aug. 15 .	J. A. Page	1919	199	990	1·44	751·07	1,422
Sept 7 .	H. Boyd	1919	196	871	1·36	750·82	1,197
Oct. 13 .	M. S. Madden	1911	222	906	1·28	750·84	1,158
Nov. 4 .	M. S. Madden	1912	252	1,117	1·33	751·64	1,486
Dec. 4 .	C. O. Allen	1912	215	1,245	0·92	751·96	[1]1,151
Dec. 30 .	M. S. Madden	1462	190	669	1·04	751·25	[1]693

[1]Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Red River at Emerson, for 1912.

[Drainage area, 34,600 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1											53·62	2,642
2											53·48	2,564
3									51·60	1,590	53·38	2,509
4									51·64	1,608	53·24	2,432
5									51·85	1,710	53·12	2,366
6									51·82	1,695	53·00	2,300
7									51·97	1,770	52·88	2,234
8									52·12	1,845	52·74	2,157
9									52·27	1,920	52·57	2,070
10									52·42	1,995	52·22	1,895
11									52·85	2,218	52·02	1,795
12									53·18	2,399	51·87	1,720
13									53·70	2,690	51·71	1,640
14									53·91	2,816	51·52	1,554
15									54·05	2,900	51·36	1,482
16									54·10	2,930	51·21	1,415
17									54·09	2,924	51·16	1,392
18									54·09	2,924	51·15	1,388
19									54·07	2,912	51·15	1,388
20									53·94	2,834	51·15	1,388
21									53·87	2,792	51·15	1,388
22									52·62	2,642	51·15	1,388
23									53·52	2,586	51·15	1,388
24									53·42	2,531	51·13	1,379
25									53·32	2,476	51·18	1,401
26									53·12	2,366	51·25	1,432
27									53·30	2,465	51·36	1,482
28									53·59	2,625	51·49	1,541
29									53·67	2,672	51·42	1,509
30									53·70	2,690	51·26	1,437
31									53·72	2,702		

	July.		August.		September.		October.		November.		December.	
1	51·02	1,329	51·92	1,745	50·15	965	54·12	2,942	51·57	1,577	51·07	
2	51·76	1,665	51·62	1,599	50·07	933	54·57	3,212	51·47	1,532	51·22	
3	51·62	1,599	51·24	1,428	50·00	905	54·92	3,422	51·42	1,509	51·42	
4	51·52	1,554	50·92	1,284	49·88	858	55·12	3,542	51·47	1,532	51·37	
5	51·41	1,505	50·82	1,239	49·97	893	54·97	3,452	51·47	1,532	51·32	
6	50·41	1,069	50·71	1,190	49·97	893	54·82	3,362	51·52	1,554	51·27	
7	50·32	1,033	50·67	1,173	50·37	1,053	54·62	3,242	51·47	1,532	51·25	
8	50·22	993	50·56	1,129	50·42	1,073	54·37	3,062	51·42	1,509	51·22	
9	50·35	1,045	50·31	1,029	50·27	1,013	53·97	2,852	51·42	1,509	51·12	
10	50·34	1,041	50·21	989	50·08	937	53·57	2,614	51·42	1,509	51·02	
11	50·32	1,033	50·12	953	50·12	953	53·52	2,476	51·42	1,509	50·92	
12	50·31	1,029	50·17	973	50·17	973	53·12	2,366	51·42	1,509	50·77	
13	50·42	1,073	50·14	961	50·10	945	53·02	2,311	51·47	1,532	50·77	
14	50·27	1,013	50·07	933	49·94	881	52·92	2,256	51·47	1,532	50·77	
15	50·27	1,013	49·98	897	49·88	858	52·82	2,201	51·37	1,487		
16	50·30	1,025	50·02	913	49·97	893	52·52	2,045	51·32	1,464		
17	50·30	1,025	49·99	901	50·10	945	52·42	1,995	51·22	1,419		
18	50·32	1,033	49·88	858	50·27	1,013	52·24	1,905	51·22	1,419		
19	50·35	1,045	49·95	885	50·50	1,105	52·19	1,880	51·22	1,419		
20	50·35	1,045	50·22	993	50·62	1,153	52·07	1,820	51·12	1,374		
21	50·42	1,073	50·40	1,065	50·70	1,185	52·02	1,795	51·02	1,329	50·62	
22	50·52	1,113	50·38	1,057	50·67	1,173	51·92	1,745	50·91	1,280		
23	50·62	1,153	50·22	993	50·72	1,191	51·77	1,670	50·80	1,230		
24	50·71	1,190	50·12	953	50·92	1,284	51·62	1,599	50·89	1,271		
25	50·77	1,217	50·02	913	51·12	1,374	51·52	1,554	50·97	1,306		
26	50·75	1,208	50·10	945	51·27	1,442	51·42	1,509	51·02	1,329	50·42	
27	50·92	1,284	50·17	973	51·37	1,487	51·42	1,509	51·07	1,351		
28	50·92	1,284	50·09	941	51·62	1,599	51·52	1,554	51·07	1,351		
29	50·84	1,248	49·98	897	52·12	1,845	51·62	1,599	51·07	1,351		
30	51·77	1,670	49·92	873	53·22	2,121	51·72	1,645	51·02	1,329		
31	52·30	1,935	50·11	949			51·62	1,599				

Note.—Ice conditions from December 2 to end of year; information insufficient to compute discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Red River at Emerson, for 1913.

(Drainage Area 34,600 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	50·42	.....	.....	.....	.....	.....	51·82	.....	57·77	5,171	52·92	2,256
2	.....	.....	.....	.....	.....	.....	52·82	.....	57·57	5,041	51·82	2,201
3	.....	.....	.....	.....	.....	.....	54·62	.....	56·32	4,262	52·74	2·157
4	50·32	.....	.....	.....	.....	.....	56·22	.....	56·12	4,142	52·72	2,146
5	.....	.....	.....	.....	.....	.....	58·22	.....	56·02	4,082	52·62	2,095
6	.....	.....	.....	.....	.....	.....	65·77	11,232	55·92	4,022	52·57	2,070
7	.....	.....	.....	.....	.....	.....	69·77	15,593	55 62	3,842	52·55	2,060
8	50·22	.....	.....	.....	.....	.....	72·77	19,578	55·42	3,722	52·52	2,045
9	.....	.....	.....	.....	.....	.....	74·77	22,378	55·22	3,602	52·47	2,020
10	.....	.....	.....	.....	.....	.....	76·07	24,198	55·02	3,482	52·42	1.995
11	.....	.....	.....	.....	.....	.....	77·07	25,598	54·82	3,362	52·39	1,980
12	.....	.....	.....	.....	.....	.....	77·07	25,598	54·72	3,302	52·32	1,945
13	.....	.....	.....	.....	.....	.....	76·77	25,178	54·52	3,182	52·27	1,920
14	50·17	.....	.....	.....	.....	.....	76·17	24,338	54·42	3,122	52·17	1,870
15	.....	.....	.....	.....	.....	.....	75·17	22,938	54·22	3,002	52·07	1,820
16	.....	.....	.....	.....	.....	.....	74·17	21,538	54·12	2,942	51·97	1,770
17	.....	.....	.....	.....	.....	.....	73·17	20,138	54·02	2,882	51·84	1,705
18	50·15	.....	.....	.....	.....	.....	71·67	18,055	53·92	2,822	51·74	1,655
19	.....	.....	.....	.....	.....	.....	70·42	16,411	53·82	2,762	51·62	1,599
20	.....	.....	.....	.....	.....	.....	68·77	14,376	53·72	2,702	51·47	1,532
21	.....	.....	.....	.....	.....	.....	66·77	12,200	53·62	2,642	51·37	1,487
22	50·12	.....	.....	.....	.....	.....	65·07	10,588	53·62	2,642	51·32	1,464
23	.....	.....	.....	.....	.....	.....	63·77	9,466	53·52	2,586	51·27	1,442
24	.....	.....	.....	.....	.....	.....	62·47	8,326	53·52	2,586	51·24	1,428
25	.....	.....	.....	.....	.....	.....	61·47	7,653	53·47	2,559	51·20	1,410
26	.....	.....	.....	.....	.....	.....	60·47	6,949	53·32	2,476	51·15	1,388
27	.....	.....	.....	.....	.....	.....	59·77	6,471	53·17	2,394	51·12	1,374
28	.....	.....	.....	.....	.....	.....	58·77	5,826	53·12	2,366	51·02	1,329
29	50·12	.....	.....	.....	.....	.....	58·07	5,366	53·02	2,311	50·92	1,284
30	.....	.....	.....	.....	.....	.....	57·97	5,301	53·02	2,311	50·90	1,275
31	.....	.....	.....	.....	.....	.....	.....	.....	52·97	2,284	.....	.....

Note.—Ice conditions January 1 to April 6; information insufficient to compute discharges. January and February estimated from measurements taken 2½-miles below this station. Discharge curve not well defined above 765·00 gauge height.

	July.		August.		September.		October.		November.		December.	
1	50·87	1,262	50·17	973	50·66	1,129	50·24	1,001	50·92	1,284		
2	50·92	1,284	50·22	933	50·62	1,153	50·22	993	50·72	1,194		
3	50·92	1,284	50·30	1,025	50·42	1,073	50·08	937	50·72	1,194	51·22	
4	50·89	1,270	50·40	1,065	50·34	1,041	49·82	837	50·92	1,284		
5	50·87	1,262	50·57	1,133	50·22	993	49·82	837	51·09	1,360		
6	50·84	1,248	50·82	1,239	50·12	953	49·85	849	51·12	1,374		
7	50·74	1,203	50·54	1,121	50·05	925	49·89	861	.....	1,374		
8	50·72	1,194	50·49	1,101	49·99	901	49·97	893	.....	1,374		
9	50 62	1,153	50·19	981	49·85	848	50·07	933				
10	50·62	1,153	50·18	977	49·72	802	50·15	965			51·27	
11	50·52	1,113	50·17	973	49·82	837	50·22	993				
12	50·79	1,225	50·12	953	49·85	848	50·29	1,021	51·62			
13	51·02	1,329	50·12	953	49·82	837	50·37	1,053				
14	51·42	1,509	50·02	913	50·02	913	50·52	1·113				
15	51·82	1,695	49·92	873	50·32	1,033	50·77	1,217				
16	52·02	1,795	49·82	837	50·59	1,141	51·02	1,329				
17	51·92	1,745	49·72	802	51·02	1,329	51·25	1,433			50·82	
18	51·87	1,720	49·72	802	51·32	1,464	51·36	1,482				
19	51·72	1,645	49·82	837	51·35	1,478	51 30	1,482	51·12			
20	51·57	1,577	49·82	837	51·42	1,509	51·42	1,509				
21	51·37	1,487	49·89	861	51·52	1,554	51·38	1,491				
22	51·32	1,464	49·92	873	51·62	1,599	51·32	1,464				
23	51·24	1,428	49·97	893	51·72	1,645	51·32	1,464				
24	51·20	1,410	50·02	913	51·52	1,554	51·32	1,464			50·62	
25	51 02	1,329	49·92	873	51·32	1,464	51·22	1,419				
26	50·96	1,302	49·89	861	51·12	1,374	51·12	1,374	51 52			
27	50 74	1,203	50·00	905	50·92	1,284	51 07	1,352				
28	50·62	1,153	50·12	953	50 62	1,599	51 02	1,329				
29	50·42	1,073	50·22	993	50·52	1·554	50 93	1,289				
30	50·29	1,021	50·47	1,093	50·37	1,487	50 77	1,217				
31	50·22	993	50·42	1,073			50 82	1,239				

Ice conditions from November 8 to end of year, information insufficient to compute daily discharges.

Daily Gauge Height and Discharge of Red River at Emerson, for 1914.

(Drainage area 46,000 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	[1]50·42	581	[1]51·06	733	[1]50·90	575	53·94	.....	54·22	3,002	53·67	2,672
2	[1]50·32	550	[1]51·08	724	[1]50·92	550	54·12	.....	54·02	2,882	53·47	2,559
3	[1]50·22	519	[1]51·10	730	[1]50·94	525	54·14	.....	54·09	2,924	53·37	2,504
4	[1]50·12	488	51·12	736	[1]50·97	504	54·24	.....	54·15	2,960	53·34	2,487
5	50·01	429	[1]51·09	727	[1]51·00	482	54·52	.....	54·27	3,032	53·34	2,487
6	[1]50·21	516	[1]51·06	718	[1]50·92	457	55·02	.....	55·64	3,854	53·37	2,504
7	50·42	581	[1]51·03	708	[1]50·94	463	55·72	.....	56·71	4,496	53·37	2,504
8	[1]50·48	600	[1]51·00	699	[1]50·96	470	56·62	.....	57·01	4,677	53·35	2,492
9	[1]50·54	618	[1]50·97	690	[1]50·98	476	58·12	.....	57·21	4,807	53·39	2,515
10	[1]50·60	637	[1]50·94	680	[1]51·00	467	58·21	.....	57·01	4,677	53·77	2,732
11	[1]50·66	656	50·92	674	[1]51·02	457	58·71	.....	56·71	4,496	53·97	2,852
12	[1]50·72	674	[1]50·92	674	51·02	457	59·11	.....	56·21	4,196	54·57	3,212
13	[1]50·77	690	[1]50·91	671	[1]51·07	504	59·21	.....	55·91	4,016	55·14	3,554
14	50·82	705	[1]50·90	668	[1]51·17	597	59·41	.....	55·61	3,836	56·91	4,616
15	[1]50·84	711	[1]50·90	668	[1]51·28	693	59·41	.....	55·21	3,596	58·21	5,457
16	[1]50·86	718	[1]50·89	665	[1]51·38	817	59·71	.....	55·01	3,476	59·51	6,302
17	[1]50·88	724	[1]50·88	662	[1]51·43	956	59·91	.....	54·17	2,972	60·21	6,767
18	[1]50·90	730	50·87	659	[1]51·54	990	59·01	5,977	54·14	2,954	60·71	7,117
19	[1]50·92	736	[1]50·87	659	[1]51·62	.....	58·21	5,457	53·84	2,774	60·91	7,257
20	[1]50·95	746	[1]50·86	656	[1]51·83	.....	57·71	5,232	53·57	2,614	60·71	7,117
21	50·97	752	[1]50·85	653	[1]52·03	.....	57·21	4,807	53·37	2,504	60·51	6,977
22	50·97	752	[1]50·84	649	[1]52·24	.....	56·71	4,496	53·24	2,432	60·21	6,767
23	[1]50·98	755	[1]50·83	646	52·46	.....	56·21	4,196	53·12	2,366	59·71	6,432
24	[1]51·00	761	[1]50·82	643	52·72	.....	55·91	4,016	52·12	2,366	58·71	5,782
25	[1]51·00	761	50·82	643	53·02	.....	55·51	3,776	53·22	2,421	58·01	5,327
26	[1]51·01	733	[1]50·84	649	53·34	.....	55·21	3,596	53·37	2,504	57·21	4,807
27	[1]51·02	736	[1]50·86	625	53·62	.....	54·87	3,332	53·62	2,642	56·71	4,496
28	51·02	736	[1]50·88	600	53·87	.....	54·62	3,242	53·83	2,768	56·21	4,196
29	[1]51·02	736	.....	.....	53·97	.....	54·42	3,122	53·94	2,834	55·91	4,016
30	[1]51·03	739	.....	.....	53·87	.....	54·25	3,020	53·92	2,822	55·71	3,896
31	[1]51·04	742	.....	.....	53·87	.....	.....	.....	53·77	2,732	.....	.....

	July.		August.		September.		October.		November.		December.	
1	55·22	3,602	52·08	1,825	50·79	1,226	51·17	1,397	51·62	1,599	51·57	.....
2	56·21	4,196	52·04	1,805	50·99	1,316	51·07	1,352	51·62	1,599	51·02	.....
3	56·71	4,496	51·97	1,770	51·09	1,361	50·94	1,293	51·62	1,599	51·77	.....
4	57·21	4,807	51·85	1,710	51·12	1,374	50·87	1,262	51·62	1,599	51·94	.....
5	57·71	5,132	51·72	1,645	51·12	1,374	50·82	1,239	51·65	1,613	52·17	.....
6	57·91	5,262	51·57	1,577	51·09	1,361	50·77	1,216	51·62	1,599	52·37	.....
7	57·91	5,262	51·47	1,532	51·05	1,343	50·77	1,216	51·59	1,586	53·52	.....
8	57·71	5,132	51·39	1,496	51·02	1,329	50·75	1,208	51·67	1,622	52·62	.....
9	57·71	5,132	51·32	1,464	51·00	1,320	50·74	1,203	51·70	1,635	52·67	.....
10	57·41	4,937	51·30	1,455	50·90	1,275	50·73	1,199	51·72	1,645	52·62	.....
11	56·91	4,616	51·29	1,451	50·90	1,275	50·77	1,216	51·67	1,622	52·62	.....
12	56·71	4,496	51·26	1,437	50·87	1,262	50·82	1,239	51·63	1,604	52·62	.....
13	56·41	4,316	51·22	1,419	50·85	1,253	50·81	1,235	51·50	1,545	52·42	.....
14	55·91	4,016	51·12	1,374	50·82	1,239	50·87	1,262	51·45	1,523	52·32	.....
15	55·02	3,482	51·02	1,329	50·82	1,239	50·90	1,275	51·35	1,478	52·12	.....
16	54·62	3,242	50·97	1,307	50·79	1,226	50·93	1,289	51·20	1,410	52·07	.....
17	54·37	3,092	50·92	1,284	50·77	1,216	51·00	1,320	51·14	1,383	51·97	.....
18	54·12	2,942	50·87	1,261	50·72	1,194	51·05	1,343	51·62	.....	51·82	.....
19	53·92	2,822	50·82	1,239	50·77	1,216	51·12	1,374	51·67	.....	51·82	.....
20	53·67	2,672	50·80	1,230	50·84	1,248	51·22	1,419	51·59	.....	51·82	.....
21	53·44	2,542	50·77	1,216	50·92	1,284	51·32	1,464	51·37	.....	51·82	.....
22	53·32	2,476	50·72	1,194	51·02	1,329	51·42	1,509	51·07	.....	51·84	.....
23	53·22	2,421	50·69	1,181	51·22	1,419	51·42	1,509	50·96	.....	51·57	.....
24	53·12	2,366	50·72	1,194	51·32	1,464	51·52	1,554	50·92	.....	51·37	.....
25	53·02	2,311	50·72	1,194	51·37	1,487	51·52	1,554	50·99	.....	51·27	.....
26	52·92	2,256	50·72	1,194	51·42	1,509	51·52	1,554	51·31	.....	51·22	.....
27	52·77	2,174	50·77	1,216	51·37	1,487	51·62	1,599	51·56	.....	51·22	.....
28	52·52	2,045	50·74	1,203	51·37	1,487	51·62	1,599	51·62	.....	51·27	.....
29	52·47	2,020	50·72	1,194	51·34	1,473	51·62	1,599	51·52	.....	51·27	.....
30	52·35	1,960	50·73	1,199	51·25	1,433	51·72	1,645	51·47	.....	51·23	.....
31	52·22	1,895	50·74	1,203	.....	.....	51·62	1,599	.....	.....	51·23	.....

Note.—Ice conditions January 1 to April 18; not sufficient information to compute daily discharges from March 19 to April 17.

Curve under ice conditions not defined above gauge height 751·50. Gauge heights, marked [1] interpolated. Ice conditions from November 17 to end of year; not sufficient information to compute daily discharges.

SESSIONAL PAPER No. 25f

Monthly Discharge of Red River at Emerson, for the years 1912–14.

]Drainage area, 34,600 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Maximum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
May	2,930	.....	[1]2,150	0·062	0·071	132,200
June	2,640	1,380	1,760	0,051	0,057	104,700
July	1,940	993	1,210	0,035	0·041	74,400
August	1,750	858	1,050	0·031	0·036	64,600
September	2,420	858	1,140	0·033	0·037	67,800
October	3,540	1,510	2,280	0·066	0·076	140,200
November	1,580	1,230	1,440	0·042	0·047	85,700
December	.....	.....	.....	.....	.....	.....
The period	3,540	858	1,580	0·046	0·365	669,600
1913.						
January	.....	.....	[1]500	0·015	0·017	30,700
February	.....	.....	[1]300	0·009	0·009	16,700
March	.....	.....	.....	.....	.....	.....
April	25,600	.....	[1]13,400	0·387	0·432	797,400
May	5,200	2,280	3,180	0·092	0·016	195,600
June	2,260	1,280	1,760	0·051	0·057	104,700
July	1,800	993	1,340	0·038	0·044	82,400
August	1,240	802	957	0·027	0·031	58,800
September	1,650	802	1,210	0·035	0·039	72,000
October	1,510	837	1,190	0·034	0·039	73,200
November	.....	.....	[1]800	0·023	0·025	47,600
December	.....	.....	[1]600	0·018	0·021	36,900
The year	25,600	278	2,290	0·066	0·820	1,516,000
1914						
January	761	429	670	0·019	0·022	41,200
February	736	600	675	0·019	0·020	37,500
March	.....	.....	[1]600	0·017	0·020	36,900
April	.....	.....	[1]2,000	0·058	0·065	119,000
May	4,800	2,420	3,250	0·094	0·108	199,800
June	7,250	2,490	4,400	0·128	0·143	261,800
July	5,250	1,900	3,475	0·101	0·116	213,700
August	1,830	1,180	1,380	0·040	0·046	81,900
September	1,510	1,190	1,330	0·039	0·044	79,100
October	1,650	1,200	1,380	0·040	0·046	84,900
November	.....	.....	[1]1,400	0·040	0·045	83,300
December	.....	.....	[1]800	0·023	0·027	49,200
The year	7,250	429	1,780	0·051	0·702	1,291,300

Note.—Marked thus ([1]) estimated.

Not sufficient information to estimate discharge for December, 1912, and March, 1913.

Red River Two Miles below Emerson.

History.—The station was established by G. H. Burnham on June 13, 1912. It was abandoned in April, 1913, on account of the inaccessability of the station.

Location of Section.—The section was on the farm of Thos. Clark, 2½ miles below the Canadian Northern Railway bridge in the town of Emerson. The initial point is a nail driven in the foot of a blazed elm tree on the right bank of the river, just above high-water mark.

Records available.—Records of daily gauge height from June 17, 1912, to April 12, 1913, are available; also several discharge measurements. The discharge curve was not defined sufficiently well to admit of daily discharge estimates.

Drainage Area.—The drainage area is approximately 34,700 square miles.

Gauge.—A vertical staff 9-foot gauge is spiked to a pile driven in the stream bed 120 feet from the initial point. It is referred to a bench-mark set at arbitrary datum.

Channel.—A single channel under all stages, straight for 900 feet above the section and 1,500 feet below. The bottom is of soft mud and liable to shift. The banks are not liable to overflow.

Discharge measurements—Are made from a boat in summer, and ice in winter.

Discharge Measurements of Red River 2½ miles below Emerson, 1912–13.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
June 17	G. H. Burnham	1,187	196	1,127	1·11	79·48	1,251
July 9	Burnham & Nelson	"	187	927	1·11	78·68	1,029
" 24	"	"	191	992	1·22	79·05	1,210
Aug. 6	Worden & Nelson	"	191	1,000	1·26	79·02	1,260
" 22	W. G. Worden	"	188	902	1·12	78·59	1,010
1913.							
Jan. 15	G. J. Lamb	1,375	190	754	0·66	79·24	500
Feb. 24	A. Pirie	1,462	185	625	0·45	79·47	278

Note.—Measurements taken under ice conditions.

Red River at Elm Park.

History.—The station was established by M. S. Madden on August 19, 1914; the object of establishing a station at this point was to secure information regarding discharge, with a view to making determinations by slope measurement.

Location of Section.—The meter section is situated on the downstream side of Elm Park Traffic bridge which crosses the Red river at Elm park within the city limits of Winnipeg and about 4½ miles above the junction of the Assiniboine and Red rivers. The initial point of the section is marked on the wooden hand-rail at the north end of the bridge on the downstream side.

Records available.—Daily gauge height readings have been taken from August 19, 1914, on. A number of discharge measurements have also been secured.

The presence of the St. Andrews dam in the Red river has a material effect upon the discharge measurements taken at this point, but one of the objects of establishing the station was to secure records over that period when the dam was opened. There have been no estimates made of daily discharge for this station.

Drainage Area.—The area tributary to the Red river above Elm park bridge is 41,060 square miles.

Gauge.—A 9-foot vertical staff gauge was spiked to the wooden ice-breaker opposite station 1+60 on the metering section. This was replaced on November 6 by a vertical staff gauge which was fastened to the concrete pier in midstream and just below the ice-breaker. The gauge is referred to M.H.S. datum.

Channel.—The channel is straight for 1,000 feet above the section and 1,500 feet below; the banks are high and not liable to overflow; the bed of the channel is composed of sand and clay and somewhat liable to shifting. The channel itself is divided into two channels by a centre bridge pier.

Discharge measurements.—The discharge measurements are taken from the downstream side of the bridge.

Accuracy.—Owing to the effect of the operation of the St. Andrews dam it has not been possible to construct a discharge curve for this station. Primarily the station was established with the object of making slope discharge experiments under conditions obtaining when the dam was closed, but owing to the distance that the water is backed up beyond the station, sufficient fall could not be obtained in a stretch of several miles to render the results obtained at all reliable. When the dam is open the discharge measurements are quite reliable.

DISCHARGE MEASUREMENTS of Red River at Elm Park, Winnipeg, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Aug. 19	M. S. Madden	1920	424	5,321	0·23	5·99	1,224
Sept. 28	"	1911	428	5,427	0·31	6·23	1,708
Oct. 22	C. O. Allen	1920	421	5,303	0·42	5·78	2,227
" 23	"	"	400	5,008	0·51	5·06	2,554
"	"	"	403	5,119	0·52	4·98	2,662
" 24	"	"	395	4,816	0·44	4·57	2,119
" 26	"	"	389	4,647	0·54	4·10	2,510
" 27	"	"	381	4,250	0·67	3·18	2,847
" 27	"	"	381	4,222	0·65	3·06	2,744
" 28	"	"	373	3,921	0·65	2·30	2,549
" 28	"	"	373	3,902	0·62	2·22	2,419
" 29	"	"	367	3,675	0·65	1·62	2,389
" 29	"	"	368	3,641	0·62	1·54	2,257
" 30	"	"	366	3,509	0·69	1·15	2,421
" 30	"	"	365	3,487	0·70	1·05	2,441
" 31	"	"	361	3,349	0·63	0·70	2,110
" 31	"	"	364	3,331	0·63	0·66	2,098
Nov. 2	"	"	362	3,227	0·65	0·36	2,098
" 3	"	"	359	3,154	0·69	0·16	2,176

NOTE.—730 should be added to gauge heights given to bring to true gauge height.

RED RIVER AT REDWOOD BRIDGE.

History.—The station was established at Redwood bridge, Winnipeg, on March 8, 1913, by G. H. Burnham.

Location of Section.—The section is located on the downstream side of the Redwood traffic bridge. The initial point of the section is marked on the hand-rail at the left end of the bridge on the downstream side.

Records available.—Daily gauge height readings from January 1, 1910, to June 21, 1914, have been furnished by the City of Winnipeg High Pressure Plant. From August 21, 1912, to the end of 1914, intermittent gauge heights are available from our own records. No estimates of daily discharge have been made.

Drainage Area.—The drainage area lying above the section at Redwood bridge includes the area drained by the Assiniboine river, in addition to that drained by the Red above the station.

Gauge.—The first gauge was installed on August 21, 1912; it was placed on the inside face of the ice-breaker opposite concrete pier, and 6 feet above it. On November 17, 1912, it was replaced by a new gauge which was placed nearer the centre of the ice-breaker. Both were referred to R.P.S. datum.

Channel.—The channel is straight for a considerable distance both above and below the section. The bottom is sandy clay and liable to shift; the banks are high and not liable to overflow. The channel at this point is divided by the piers of the bridge.

Discharge Measurements.—Measurements have been taken from the downstream side of the bridge, but sufficient meterings have not been made to define a discharge curve.

DISCHARGE MEASUREMENTS of Red River at Redwood Bridge, Winnipeg, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sec. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 8..	G. H. Burnham.....	1,197	340	3,397	0·18	728·42	627
1914.							
Jan. 23..	E. J. Budge.....	1,462	316	3,092	0·26	726·85	823

NOTE.—Measurements taken under ice conditions.

PEMBINA RIVER.

The Pembina river is one of the tributaries of the Red river entering from the west. The headwaters rise on the northern slope of Turtle mountain and the main river flows easterly and then south, crossing the international boundary into North Dakota in tp. 1, R. 6 W.P.M.; it then turns east and flows in a direction roughly paralleling the boundary to its junction with the Red river, 5 miles above Emerson.

The drainage area of the Pembina is 4,180 square miles, 1,440 square miles of which are in Dakota, the balance being in Manitoba. In the upper portion of the river the river flows through a well-defined valley, especially in that part where it approaches the boundary. The lower part of the river is in typical prairie country, the banks being cut sharply down from the surrounding country and being composed of clay and sand.

The river-bed is of sand, gravel, and clay, the banks are easily eroded, and the channel is generally shifting. It varies from 20 to 90 feet in width, but in several places in the upper reaches it widens out into lakes, as Pelican, Rock, and Swan lakes.

The country drained is well settled, and good roads are to be found throughout the district.

From records kept by the United States Geological Survey at Neche, N.D., for the years 1903 to 1910, inclusive, it has been found that the discharge varies between 3 c.f.s. in August, September, and October, 1910, to 3,870 c.f.s. in May, 1904.

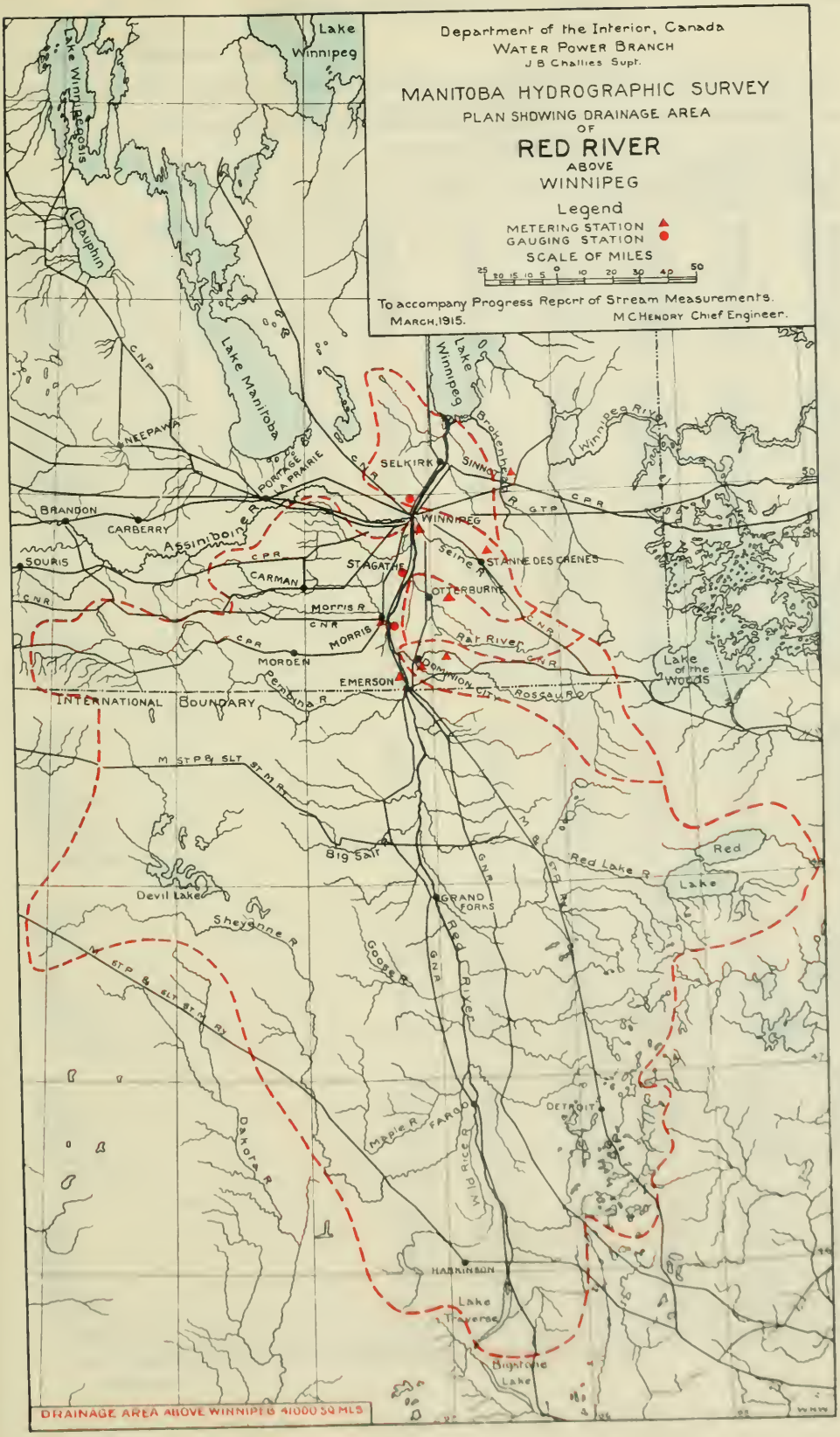
MONTHLY DISCHARGE of Pembina River, at Neche, North Dakota, for 1903.

[Drainage area 2,940 square miles.]

Month.	Discharge in Second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Total in Acre-feet
1903.				
April				
May			202	12,420
June	198	110	149	8,866
July	110	35	60	3,689
August			35	555
September				
October			42	1,749
November			42	1,156
December				
The period				

NOTE—Obtained from records of Water Resources Branch, U.S. Geological Survey.

PLATE III


Department of the Interior, Canada
WATER POWER BRANCH
J B Challies Supt.
MANITOBA HYDROGRAPHIC SURVEY
PLAN SHOWING DRAINAGE AREA
OF
RED RIVER
ABOVE
WINNIPEG
Legend
METERING STATION
GAUGING STATION
SCALE OF MILES
25 20 15 10 5 0 10 20 30 40 50
To accompany Progress Report of Stream Measurements.
MARCH, 1915.
M C HENDRY Chief Engineer.
Lake Winnipeg
Lake Winnipegosis
L. Dauphin
Lake Manitoba
NEEPAWA
PORTAGE LA PRAIRIE
BRANDON
CARBERRY
Assiniboine R.
SOURIS
CARMAN
ST AGATHE
MORRIS
MORDEN
EMERSON
INTERNATIONAL BOUNDARY
Pembina R.
SELKIRK
WINNIPEG
Broken Head R.
Winnipeg River
STANNE DES CHENES
Seine R.
OTTERBURNE
Rat River
Rosseau R.
Lake of the Woods
Big Salt
Devil Lake
Sheyenne R.
Red Lake R.
Red Lake
GRAND FORKS
Red River
Goose R.
DETROIT
Maple R.
FARGO
Wild Rice R.
HARRINGTON
Lake Traverse
Big Stone Lake
DRAINAGE AREA ABOVE WINNIPEG 41000 SQ MLS

SESSIONAL PAPER No. 25f

Monthly Discharge of Pembina River, at Neche, North Dakota, 1904–10.

[Drainage area 2,940 square miles.]

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per Square Mile	Depth in Inches on dr'n'ge area	Total in Acre-feet.
1904.						
April	3,580	217	1,920	0·653	0·56	87,600
May	3,870	1,420	2,640	0·898	1·04	162,000
June	2,530	926	1,690	0·575	0·64	101,000
July	2,690	399	839	0·285	0·33	51,600
August	420	315	385	0·131	0·15	23,700
September	315	236	302	0·103	0·11	18,000
October	275	217	235	0·080	0·09	14,400
November	217	131	183	0·062	0·06	9,440
The period	3,870	131	1,024	0·348	2·98	468,000
1905.						
March 23–21	672	530	606	0·216	0·072	10,820
April	1,372	311	549	0·196	0·219	18,510
May	1,180	218	447	0·160	0·184	27,480
June	1,180	279	485	0,173	0·193	16,600
July	399	119	206	0·074	0·085	12,670
August	137	60	97	0·035	0·040	5,964
September	119	65	93·9	0·034	0·038	5,587
October	150	70	119	0·042	0·048	7,317
November 1-26	137	91	116	0·041	0·040	5,982
The period	1,372	60	302·1	0·108	0·919	110,900
1906.						
April	1,220	193	479	0·163	0·18	28,500
May	231	175	193	0·066	0·08	11,900
June	340	193	271	0·092	0·10	16,100
July	270	119	175	0·060	0·07	10,800
August	143	119	131	0·045	0·05	8,060
September	166	136	147	0·050	0·06	8,750
October	150	136	144	0·049	0·06	8,850
November	136	82	111	0·038	0·03	4,180
The period	1,220	82	206	0·703	0·63	97,100
1907.						
April 21-30	.....	.....	860·0	0·293	0·11	17,100
May	2,190	826	1,600·0	0·544	0·63	98,400
June	805	263	507·0	0·172	0·19	30,200
July	272	76	156·0	0·053	0·06	9,590
August	80	36	54·3	0·014	0·02	3,340
September	47	23	34·8	0·012	0·01	2,070
October	66	36	55·2	0·019	0·02	3,390
November	.....	.....	38·0	0·013	0·01	2,260
December	.....	.....	19·0	0·006	0·01	1,170
The period	2,190	23	209·7	0·125	1·06	168,000
1908.						
January	.....	.....	6·0	0·002	0·002	369
February	.....	.....	3·0	0·001	0·001	173
March	.....	.....	3·0	0·001	0·001	184
April	927	.....	375·9	0·128	0·14	22,300
May	591	310	474·0	0·161	0·19	29,100
June	486	136	224·0	0·076	0·08	13,300
July	136	36	87·8	0·030	0·03	5,400
August	66	36	52·1	0·018	0·02	3,200
September	78	55	60·9	0·021	0·02	3,620
October 1-10	55	45	49·0	0·170	0·006	972
The period	927	36	133·48	0·061	0·490	78,600
1909.						
June	654	268	427·0	0·145	0·07	11,000
July	164	73	113·0	0·038	0·04	5,600
August	100	22	48·3	0·016	0·02	2,970
September	32	22	27·7	0·0094	0·01	1,650
October	73	32	45·9	0·016	0·02	2,970
November	67	38	51·9	0·018	0·009	1,440
The period	654	22	110·0	0·040	0·169	25,630
1910.						
March	685	115	349·0	0·118	0·08	11,800
April	250	147	166·0	0·056	0·06	9,880
May	164	86	120·0	0·041	0·05	7,380
June	100	7	60·4	0·021	0·02	3,590
July	100	10	31·9	0·012	0·01	2,150
August	10	3	6·87	0·0023	0·003	422
September	7	3	3·93	0·0013	0·001	234
October	10	3	6·39	0·0022	0·003	393
The period	685	3	93·41	0·0316	0·237	35,849

Note—Obtained from records of Water Resources Branch, U.S. Geological Survey.

Pembina River at La Rivière.

History.—The meter station on the Pembina river at La Rivière was established on October 3, 1912, by W. G. Worden. The operation of the station was discontinued the end of March, 1913.

Location of Section.—The station is located on the downstream side of the traffic bridge at La Rivière, half-a-mile west of the Canadian Pacific Railway station, 1 mile below the railroad bridge, and three-quarters of a mile below the dam. The initial point is marked by an arrow cut in the handrail of the bridge at the southeast corner.

Records Available.—A few gauge heights are available for the period during which the station was operated, and two discharge measurements were taken during October, 1912.

Drainage Area.—The area tributary to the Pembina river above La Rivière is 1,840 square miles.

Channel.—The river is confined to one channel at all stages; the bed of the stream is of silt and clay, and fairly permanent. The channel is straight for 250 feet above the section and 500 feet below. The banks are high and not liable to overflow.

Discharge Measurements—Discharge measurements were taken from the downstream side of the traffic bridge.

Diversions.—A dam placed in the river about three-quarters of a mile above the station forms a pond which is used by the railway as a source of water supply. During the low-water season a very large proportion of the water is used for this purpose.

Accuracy.—As only two discharge measurements have been made at the station, no estimates of daily discharge have been made.

Discharge Measurements of Pembina river at La Rivière, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Oct. 4	Worden & Lamb	1496	76	364	0·18	101·21	66
Oct. 28	G. J. Lamb	1186	75	357	0·23	101·15	82

ROSEAU RIVER.

The Roseau river is the largest tributary entering the Red river from the east within the province of Manitoba. The mouth of the Roseau is about 12 miles north of the international boundary, and it drains the territory lying to the west and south of the lake of the Woods.

The general direction followed by the Roseau is northwest, but the actual course of the river is very sinuous; about half its length lies in United States territory. The banks of the river vary from 10 to 12 feet in height, and are cut sharply down from the prairie level. The river bottom and banks are composed chiefly of heavy clay.

The drainage area is 1,987 square miles, 890 square miles being in Manitoba and 1,097 square miles in the state of Minnesota. A large part of the drainage area is under cultivation, there being little standing timber in that part within the province. What there is consists mostly of elm, ash, and oak, very little of which is of commercial size.

Considerable drainage work has been done in the basin, especially on the United States side of the line. There are no towns of any size to be found along the river, but three small villages are so located; these are Sprague, near the international boundary on the Ridgeville branch of the Canadian Northern railway; the second is Stewartburn, on the same line; and the third is

Dominion City, located at the crossing of the Emerson branch of the Canadian Pacific railway, it having a population of about two hundred.

Discharge measurements have been made at various sections on the river since the establishment of the survey in 1912. The sections were used and then abandoned in favour of more suitable ones, for various reasons, and are as follows:—

1. At Dominion City.
2. At Baskerville's farm.
3. At Mayne's farm.
4. Below Dominion City, in use at present.

The records obtained at these stations and the results follow.

Roseau River at Baskerville's Farm.

History.—A station was established by G. J. Lamb, January 13, 1913, at Mayne's farm. It superseded the station at Dominion City, and was operated until April, 1913. The object was to obtain winter records, but the records were not satisfactory, and a station was established on April 23, 1913, by Alex. Pirie, to take its place, where more reliable records could be obtained and the operation would be more economical.

Location of Section.—The station is on the downstream side of the traffic bridge at Baskerville's farm, about 9 miles above Dominion City. The initial point is marked 0+00 on the southwest corner of the bridge..

Records available.—Daily gauge height records for the open-water season of 1913 and 1914 are available, and sufficient meterings were taken to define the discharge curve from which the estimated daily discharges have been computed.

Drainage Area.—The drainage area above Baskerville's farm is 1,900 square miles, a considerable portion of which lies south of the international boundary.

Gauge.—The gauge is a 9-foot vertical staff gauge spiked to a pile 10 feet above the bridge on the left side of the river. The gauge is referred to a M.H.S. bench-mark set to an arbitrary datum.

Channel.—One channel at all stages of the river. It is straight for 900 feet above the section and 500 feet below. The bottom is hard clay and not liable to scour; the banks are high and not liable to overflow.

Discharge Measurements.—Meterings are taken from the bridge, and have been taken over a range in stage of 11 feet.

Accuracy.—Between gauge heights 83.70 and 85.00 curve very well defined, between 85.00 and 94.77 the curve is fairly well defined; beyond these limits the curve is not well defined.

Discharge Measurements of Roseau River at Baskerville's farm, 1913–14.

Date	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge
1913			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Apr 12	G. H. Burnham	1496	73	484	2·16	90·12	1,041
Apr 23	A. Pirie	1186	91	910	2·20	94·66	2,003
Apr 30	E. Bankson	1469	64	647	2·42	93·00	1,560
May 14	"	1469	64	355	1·69	88·13	600
June 28	G. Ebner	1186	50	146	0·90	85·06	131
July 31	A. Pirie	1496	52	166	1·04	85·02	171
Aug 20	C. O. Allen	1435	36	94	0·44	83·67	42
Sept 18	"	1435	47	105	0·54	83·84	57
1914							
Jan 6	E. J. Budge	1462	42	52	0·14	84·13	7[illegible]
Mar 4	W. J. Ireland	1469	31	25	0·14	84·63	4
Mar 21	T. J. Moore	1474	54	69	0·27	84·74	2[illegible]

Note.—Measurements (1) taken under ice conditions.

Daily Gauge Height and Discharge of Roseau River at Baskerville's Farm for 1913.

(Drainage area 1,900 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									92·58	1,520	86·10	264
2									91·97	1,390	85·99	250
3									91·86	1,370	85·92	242
4									91·61	1,318	85·91	241
5									91·16	1,220	85·90	240
6									90·59	1,100	86·00	252
7									90·15	1,010	85·89	239
8									89·80	933	85·91	241
9									89·41	851	86·05	258
10									89·15	796	86·09	262
11									88·86	735	86·10	264
12							90·12	1,040	88·67	696	86·12	266
13									88·39	637	86·12	266
14									88·08	572	86·19	274
15									88·11	578	86·19	274
16									88·08	572	86·09	262
17									87·75	510	85·91	241
18									87·52	469	85·89	239
19									87·36	440	85·85	234
20									87·29	428	85·75	223
21									87·23	419	85·58	205
22									87·15	406	85·41	187
23							94·66	1,950	87·01	384	85·31	177
24							94·60	1,940	86·86	363	85·21	167
25							94·81	1,980	86·81	356	85·14	160
26							94·11	1,840	86·70	340	84·90	137
27							93·58	1,730	86·56	322	84·81	129
28							93·81	1,780	86·41	303	85·51	197
29							93·51	1,710	86·36	296	85·43	189
30							93·08	1,620	86·31	290	85·68	216
31									86·17	272		

	July.		August.		September.		October.		November.		December.	
1	85·40	186	84·77	126	84·44	97	83·53	33	84·64	114		
2	85·22	168	84·63	113	84·35	89	83·52	32	84·73	122		
3	85·15	161	84·53	104	84·27	83	83·52	32	84·64	114		
4	85·20	166	84·42	95	84·20	77	83·51	31	84·52	103		
5	85·20	166	84·32	87	84·18	76	83·53	33	84·74	123		
6	85·11	157	84·21	78	84·13	72	83·60	33	84·54	107		
7	85·04	150	84·04	65	84·04	65	83·64	39	84·54	107		
8	85·08	154	84·01	63	83·93	58	83·67	41	84·61	111		
9	84·97	144	83·90	56	83·82	50	83·63	39	84·12	71		
10	84·89	136	83·80	49	84·01	63	83·64	39	83·74	45		
11	85·00	146	83·83	51	83·91	56	83·72	44	84·49	101		
12	85·09	155	83·73	45	83·84	51	83·87	54	84·43	96		
13	85·20	166	83·71	43	83·80	49	83·96	60	84·32	87		
14	85·11	157	83·66	40	83·79	48	83·92	57	84·31	86		
15	85·11	157	83·61	37	83·79	48	84·41	94	84·37	91		
16	85·21	167	83·64	39	83·79	48	84·72	121	84·40	93		
17	86·02	254	83·51	31	83·73	45	84·86	134	84·30	85		
18	85·44	190	83·51	31	83·91	56	85·02	148	84·31	86		
19	85·52	198	83·53	33	83·90	56	85·00	146	84·32	87		
20	85·53	199	83·59	36	83·91	56	84·93	140	83·97	61		
21	85·57	204	83·91	56	83·83	51	84·74	123	84·14	73		
22	85·61	208	83·75	46	83·83	51	84·52	103	83·95	59		
23	85·53	199	83·83	51	83·80	49	84·71	120	83·95	59		
24	85·51	197	83·83	51	83·83	51	84·75	125	83·93	64		
25	85·48	194	83·97	61	83·80	49	84·73	122	83·93	64		
26	85·42	188	84·18	76	83·75	46	84·54	105	84·00	63		
27	85·35	181	84·57	108	83·71	43	84·53	104	84·22	79		
28	85·25	171	84·64	114	83·63	39	84·46	98	84·13	72		
29	85·13	159	84·64	114	83·59	36	84·77	126	84·01	70		
30	85·10	156	84·59	109	83·54	33	84·15	73	84·93	70		
31	84·99	145	84·50	101			84·72	121				

Note.—Ice conditions November 29 to end of year; information insufficient to compute daily discharge.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Roseau River at Baskerville's Farm, for 1914.

[Drainage area, 1,900 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							85·38		89·47	863	87·78	515
2							86·00		89·41	851	87·84	527
3							85·77		89·30	827	88·02	561
4					84·65	4	85·80		89·23	813	88·11	578
5							85·90		89·16	798	88·23	603
6	84·13	7					85·92		89·10	786	88·32	622
7							85·90		88·98	760	88·13	582
8							85·92		88·93	750	87·06	391
9							85·98		88·87	737	87·88	534
10							86·31		88·81	725	88·02	561
11							86·57		88·78	718	87·72	505
12							86·85		88·78	718	87·66	494
13							87·06		88·70	702	87·86	531
14							87·33		88·54	668	88·13	582
15					85·11		87·34		88·38	634	88·36	630
16					85·06		87·35		88·26	609	88·54	668
17					84·90		87·80		88·04	565	88·68	698
18					84·85		88·51	662	87·82	523	88·87	738
19					85·01		88·17	590	87·64	491	88·88	740
20					84·95		87·92	542	87·50	466	88·92	748
21					84·74	20	87·04	388	87·33	435	88·92	748
22					84·73		87·56	476	87·17	409	88·86	735
23					84·90		88·29	615	87·15	406	88·78	719
24					84·76		88·52	664	87·40	448	88·58	677
25					84·70		88·80	722	87·54	473	88·40	639
26					84·69		88·97	758	87·80	520	88·19	595
27					84·64		89·12	790	87·78	515	88·07	571
28					84·71		89·20	807	87·89	536	87·96	550
29					84·72		89·42	853	88·12	580	87·67	496
30					84·80		89·48	865	88·10	576	87·43	453
31					84·99				87·84	527		

	July.		August.	
1	87·20	414	85·41	187
2	87·00	382	85·24	170
3	86·88	365	85·12	158
4	86·77	350	84·83	131
5	86·67	337	84·69	118
6	86·69	339	84·63	113
7	86·59	326	84·51	102
8	86·47	311	84·40	93
9	86·43	305	84·31	86
10	86·41	303	84·25	81
11	86·39	300	84·11	70
12	86·52	317	83·98	61
13	86·46	309		
14	86·28	286		
15	86·26	283		
16	86·15	270		
17	86·13	267		
18	86·03	255		
19	86·26	283		
20	86·30	288		
21	86·37	298		
22	86·48	312		
23	86·45	308		
24	86·39	300		
25	86·31	290		
26	86·19	274		
27	86·12	266		
28	85·95	246		
29	85·83	232		
30	85·71	219		
31	85·58	205		

Note.—Ice conditions January 1 to April 16, information insufficient to compute daily discharges.

Monthly Discharge of Roseau River at Baskerville's Farm, for the years 1913–14.

[Drainage area, 1,900 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1913.						
January			[1]20	0·011	0·013	1,230
February		0	[1]0			
March			[1]0			
April			[1]1,160	0·611	0·682	69,000
May	1,517	272	673	0·354	0·408	41,400
June	274	129	227	0·119	0·133	13,500
July	254	136	174	0·092	0·106	10,700
August	126	31	68	0·036	0·042	1,175
September	97	33	56	0·029	0·032	3,330
October	148	31	83	0·044	0·051	5,100
November	122	45	85	0·045	0·050	5,050
December			[1]40	0·021	0·024	2,460
The year	1,517	0	215	0·1362	1·541	155,945
1914.						
January			[1]6	0·003	0·004	369
February			[1]5	0·003	0·003	278
March		4	[1]25	0·013	0·015	1,540
April			570	0·300	0·335	33,900
May	863	406	626	0·329	0·379	38,500
June	748	391	600	0·316	0·353	35,700
July	414	205	298	0·157	0·181	18,300
August			[1]75	0·040	0·046	4,610
The period	863	4	276	0·145	1·316	133,197

Note.—Marked thus ([1]) estimated. Ice conditions November 29, 1913, to end of year. Ice conditions from January 1 to April 16, 1914.

Bloodvein River, Fourth Rapids.

Roseau River at Dominion City.

History.—This station on the Roseau was established by S. S. Scovil, May 21, 1912, and was operated until December 31, 1912, at which time it was abandoned for a more favourable section located at Mayne's farm.

Location of Section.—The station was located on the downstream side of the traffic bridge to the northeast of Dominion City and about five-eighths of a mile from the Canadian Pacific Railway station. The initial point of the section is marked by three 6-inch spikes driven in the guard-rail of the bridge approach at the southeast corner of the bridge.

Records available.—A gauge height record from May 20, 1912, to December 31, 1912, was kept, and a sufficient number of meterings were taken to define the discharge curve fairly well. Estimates of daily discharge have been made for the period.

Drainage Area.—The drainage area above the station is 1,940 square miles, part of which lies in United States territory. As the land is generally low-lying, considerable drainage work has been done, especially south of the international boundary.

Gauge.—A vertical staff gauge spiked to the downstream side of a pile bent 4 feet below the section, and referred to Can. Geo. S. datum. A M.H.S. bench-mark (to the same datum), marked by a spike driven into an unused pile on the south side of the river opposite station 0+30 on the section is used as a reference.

Channel.—One channel at all stages. Is straight for 50 feet above the section, and 250 below. The bend of the stream is clay, and permanent; the banks are liable to overflow at high stages.

Discharge Measurements.—Made from the downstream side of the traffic bridge.

Accuracy.—The discharge curve is well defined over the range in stage observed; a partial contraction of the channel half a mile below the station under high stages tends towards a back-water effect on the station.

Discharge Measurements of Roseau River at Dominion City, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 21	S. S. Scovil	1187	81	334	1·22	766·49	408
June 18	G. H. Burnham	1187	74	239	0·65	765·12	155
July 11	G. H. Burnham	1187	68	124	0·25	763·65	31
Aug. 7	W. G. Worden	1187	74	216	0·63	764·93	137
Aug. 24	W. G. Worden	1187	72	199	0·52	764·68	103
Oct. 19	G. J. Lamb	1187	85	553	2·16	769·55	1,195
Nov. 1	G. J. Lamb	1187	86	582	2·19	769·70	1,274

Daily Gauge Height and Discharge of Roseau River at Dominion City, for 1912.

[Drainage area, 1,940 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1											66·49	410
2											66·20	336
3											66·23	344
4											66·22	341
5											66·12	318
6											66·18	332
7											66·11	316
8											66·05	304
9											65·99	292
10											65·91	276
11											65·84	263
12											65·70	238
13											65·68	235
14											65·60	222
15											65·55	214
16											65·46	200
17											65·33	182
18											65·19	163
19											64·90	129
20									66·48	408	64·98	138
21									66·49	410	64·87	126
22									66·49	410	64·70	107
23									66·51	416	64·58	95
24									66·47	405	64·44	83
25									66·41	390	64·33	74
26									66·34	371	64·21	66
27									66·37	379	64·13	60
28									66·52	418	64·03	53
29									66·71	468	63·90	45
30									66·74	468	63·90	45
31									66·62	444		

	July.		August.		September.		October.		November.		December.	
1	63·84	41	64·44	83	64·66	103	67·13	577	69·71	1,248	66·12	
2	63·74	36	64·60	97	64·67	104	67·35	634	69·50	1,193	65·92	
3	63·72	35	64·75	113	64·72	109	67·51	676	69·30	1,141	65·43	
4	63·72	35	64·83	121	64·90	129	67·61	702	69·20	1,115	65·05	
5	63·67	33	64·86	125	64·94	133	67·73	733	68·86	1,027	65·58	
6	63·63	30	64·92	131	64·90	129	68·61	962	68·51	936	65·33	
7	63·72	35	64·93	132	64·92	131	67·97	795	68·31	884	65·52	
8	63·66	32	64·88	127	64·88	127	68·14	839	68·22	860	65·48	
9	63·78	38	64·73	110	64·87	126	68·14	839	68·13	837	65·28	
10	63·81	40	64·64	101	64·92	131	68·31	884	68·01	806	65·24	
11	63·65	31	64·53	91	64·93	132	68·51	936	67·94	787	65·07	
12	63·89	44	64·53	91	64·84	122		[1]1,000	67·81	754	64·81	
13	63·88	44	64·73	110	64·87	126		[1]1,030	67·68	720	64·61	
14	64·00	51	64·81	119	64·90	129		[1]1,060	67·50	673	64·47	
15	64·11	59	64·87	126	64·93	132		[1]1,090	67·57	691	64·40	
16	64·24	68	64·84	122	64·95	134		[1]1,120	67·90	777	64·31	
17	64·28	71	64·88	127	64·94	133		[1]1,150	68·12	834	64·26	
18	64·28	71	64·90	129	64·95	134		[1]1,180	67·41	650	64·21	
19	64·31	73	64·90	129	64·94	133	69·57	1,211	67·81	754	64·17	
20	64·36	77	64·93	132	65·05	146	69·48	1,118	67·97	795	64·16	
21	64·41	81	64·93	132	65·29	177	69·62	1,224	67·84	761	64·15	
22	64·48	86	64·86	125	65·53	211	69·78	1,266	68·57	951	64·13	
23	64·55	93	64·75	113	65·58	219	69·71	1,248	67·76	741	64·13	
24	64·61	98	64·67	104	65·61	224	69·83	1,279	67·48	668	64·13	
25	64·52	90	64·64	101	65·68	235	70·01	1,326	67·63	707	64·13	
26	64·42	82	64·61	98	65·92	278	69·90	1,297	[2]67·36	639	64·13	
27	64·34	75	64·59	96	66·14	323	69·91	1,300	[2]67·13	579	64·13	
28	64·34	75	64·62	99	66·39	384	69·90	1,297	66·94	527	65·18	
29	64·43	82	64·63	100	66·67	457	70·08	1,344	66·51	416	65·81	
30	64·39	79	64·73	110	66·94	527	70·12	1,354	66·33	369	65·71	
31	64·41	81	64·79	117			69·81	1,274			65·68	

Note.—Station commenced May 20. Ice conditions November 30 to end of year. Information insufficient to compute daily discharge. Water over gauge from October 12 to 18. Discharges marked thus (1) estimated. Gauge heights marked thus (2) interpolated.

SESSIONAL PAPER No. 25f

Monthly Discharge of Roseau River at Dominion City, for the year 1912.

[Drainage area, 1,940 square miles.]

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
May	.....	.....	[1]416	0·214	0·247	25,690
June	410	45	200	0·103	0·115	11,900
July	98	30	60	0·031	0·036	3,700
August	132	83	113	0·058	0·067	6,950
September	527	103	186	0·096	0·107	11,100
October	1,354	577	[1]1,059	0·546	0·630	65,100
November	1,248	369	795	0·410	0·457	47,300
December	.....	.....	[1]240	0·124	0·143	14,800
The period	1,354	30	384	0·198	1·802	186,450

Note.—Station commenced May 20. Ice conditions November 30 to end of year. Discharges marked thus (1) estimated.

Roseau River below Dominion City.

History.—The section at Baskerville's farm, while satisfactory, was considerably out of the route and entailed a drive of nearly 18 miles. On April 14, 1914, the above station was established by D. B. Gow to supersede it.

Location of Section.—The station below Dominion City is about 2,000 feet below the Canadian Pacific Railway bridge over the Roseau, and about 2,100 feet below the Canadian Pacific Railway dam on the river. The initial point is a nail in an 8-inch white ash tree blazed and near the top of the left bank.

Records Available.—A daily gauge height record has been kept since April 14, 1914, and sufficient meterings have been taken to define the discharge curve. Daily discharges have been computed for the station.

Drainage Area.— The drainage area is 1,940 square miles.

Gauge.—The gauge is a vertical staff fastened to a 2-inch by 4-inch scantling driven into the stream bed and braced. It is located 1,000 feet below the section and is nearer the town, on account of the winding of the river.

Channel.—There is only one channel at all stages. The bottom is fairly permanent; the banks are sloping, and not subject to overflow. The channel is straight for 350 feet above the section and for 100 feet below.

Discharge Measurements.—They are made by means of a cable carrier, the cable being stretched across the stream, and the meterings are made by suspending the meter from it. The meterings cover a range in stage of 5 feet.

Accuracy.—The discharge curve is well defined between gauge heights 87·00 and 89·00, and fairly well defined between gauge heights 89·00 and 92·70.

Discharge Measurements of Roseau River below Dominion City, 1914.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity	Gauge Height	Discharge
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
April 17	C. O. Allen	1,497	60	280	1·36	91·02	381
April 28	Alex. Pirie	1,187	64·5	423	1·96	92·69	828
May 28	Alex. Pirie	1,939	60	307	2·02	91·41	624
June 17	C. O. Allen	1,760	61	406	1·92	92·04	781
July 31	M. S. Madden	1,760	55	187	1·32	88·77	246
Aug. 14	J. A. Page	1,919	46·5	91	·72	87·04	65
Sept. 18	H. Boyd	1,919	51	114	1·03	87·59	118
Sept. 18	H. Boyd	1,919	51	114	1·01	87·62	116
Oct. 14	M. S. Madden	1,914	53	151	1·04	88·22	158
Nov. 5	M. S. Madden	1,912	58	224	1·62	90·27	363
Dec. 3	C. O. Allen	1,912	55	131	·89	88·38	[1]117
Dec. 31	M. S. Madden	1,402	42	41	·28	87·26	[1]11

[1]Measurements taken under ice conditions.

Daily Gauge Height and Discharge of Roseau River at Dominion City, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									93·13	956	91·03	610
2									93·02	938	91·12	624
3									92·82	905	91·13	626
4									92·74	892	91·38	667
5									92·56	862	91·53	692
6									92·47	848	91·62	707
7									92·33	824	91·56	697
8									92·27	815	91·34	661
9									92·22	807	91·19	636
10									92·18	799	91·29	652
11									91·99	768	90·99	603
12									91·99	768	90·89	586
13									91·89	751	91·09	619
14							90·72		91·79	735	91·41	673
15							90·83		91·67	716	91·63	709
16							91·02	608	91·52	690	91·53	692
17							91·03	610	91·32	657	92·06	780
18							91·27	650	91·06	615	92·21	805
19							92·62	872	90·83	577	92·32	822
20							90·92	591	90·67	551	92·41	838
21							90·42	509	90·39	504	92·40	836
22							90·72	558	90·33	494	92·32	822
23							91·27	650	90·33	494	92·21	805
24							91·74	727	90·34	496	91·99	768
25							92·14	793	90·59	537	91·74	727
26							92·43	841	90·79	570	91·49	685
27							92·67	881	90·89	586	91·46	681
28							92·69	883	90·99	603	91·24	645
29							92·96	928	91·39	669	91·93	758
30							93·07	947	91·37	666	90·74	562
31									91·09	619		

	July.		August.		September.		October.		November.		December.	
1	90·38	502	88·53	219	87·98	155	88·48	213	90·16	466	88·57	
2	90·22	476	88·40	203	88·13	171	88·43	207	90·19	471	88·56	117
3	90·01	442	88·20	179	88·28	189	88·33	195	90·35	497	88·58	
4	89·93	428	88·08	166	88·30	191	88·28	189	90·38	502	88·53	
5	89·84	414	87·88	144	88·18	177	88·23	183	90·27	485	88·49	
6	89·82	410	87·78	133	88·08	166	88·10	168	90·20	473		
7	89·53	362	87·68	123	88·17	176	87·98	155	90·28	486		
8	89·33	331	87·68	123	87·93	149	88·00	157	90·19	471		
9	89·39	300	[1]87·57	112	87·88	144	88·03	160	90·04	447		
10	89·37	337	[1]87·46	101	87·83	138	87·98	155	90·11	458		
11	89·28	323	[1]87·36	92	87·78	133	87·90	146	89·97	435		
12	89·48	354	[1]87·25	83	87·58	113	87·88	144	89·76	400		
13	89·33	331	[1]87·14	74	87·53	108	87·87	143	89·69	380		
14	89·18	308	87·04	65	87·63	118	88·32	193	88·19	178		
15	89·13	301	87·03	64	87·58	113	89·09	295	88·04	161		
16	89·08	293	86·88	53	87·63	118	89·39	340	89·39			
17	88·98	278	86·87	52	87·58	113	89·44	348	88·79			
18	88·91	268	86·88	53	87·73	128	89·49	356	88·59			
19	89·13	301	86·78	46	87·78	133	89·54	364	89·75			
20	89·18	308	86·87	52	87·83	138	88·59	372	90·36			
21	89·28	323	86·78	46	88·44	208	89·64	381	90·02			
22	89·63	379	86·88	53	88·63	231	89·69	388	89·51			
23	89·67	386	86·83	49	88·68	237	89·74	397	89·29			
24	89·58	370	86·88	53	88·75	247	89·75	399	89·26			
25	89·48	354	86·87	52	88·78	250	89·77	402	89·07			
26	89·38	338	86·78	46	88·83	257	89·78	403	88·96			
27	89·29	325	86·88	53	88·73	244	89·69	389	88·77			
28	89·18	308	86·93	56	88·75	247	89·79	405	88·59			
29	88·98	278	86·98	60	88·68	237	89·84	414	88·54			
30	88·83	257	87·03	64	88·58	225	89·99	438	88·53			
31	88·78	250	87·38	94			90·09	454			87·26	11

Note.—Open water conditions from April 16. All marked thus [1] interpolated. Ice conditions, November 15 to end of year; information insufficient to compute daily discharge.

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Roseau River at Dominion City, for the Year 1914.

[Drainage Area, 1,940 square miles.]

Month.	Discharge in second-feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet
April			[1]650	0·335	0·374	38,700
May	956	494	700	0·361	0·416	43,000
June	838	562	709	0·361	0·403	41,700
July	502	250	344	0·177	0·204	21,200
August	219	46	89	0·046	0·053	5,450
September	257	108	175	0·090	0·100	10,400
October	454	143	289	0·149	0·172	17,800
November	502	[1]80	[1]280	0·144	0·161	16,700
December	117	11	[1]65	0·034	0·039	4,000
The period	956	11	366	0·212	1·922	198,950

NOTE.—All marked thus [1] estimated. Ice conditions November 15 to end of year.

THE RAT RIVER.

The drainage area of the Rat river, from its source to its mouth, comprises 997 square miles. The northern boundary of this area is formed by the watersheds of the Whitemouth and Seine rivers, while its southern limits consist of the northern slope of the watershed of the Roseau river.

The west branch of the river takes its rise in the country lying to the southeast of the town of Woodridge on the Ontario branch of the Canadian Northern railway, and is confined chiefly to tp. 3, R. 11 E.P.M. The first 10 miles of its course the river has a southwesterly bearing; from this latter point it flows northwest for about 4 miles, then nearly due south for 3 miles, then north for about 6 miles. This latter point lies about 2 miles east of the town of Zhoda; from this point it flows through a swampy and marshy country due west for about 18 miles, and then in a northwesterly direction to its mouth at the Red river.

The territory drained is generally flat prairie country, except in the upper reaches, where the land is inclined to be wet and swampy. Nearly all the drainage area is under cultivation, being amongst the oldest settled land in the province.

RAT RIVER AT OTTERBURNE.

History.—The station was established by S. S. Scovil on May 23, 1912.

Location of Section.—The section is on the downstream side of the bridge which crosses the Rat at F. X. Joubert's farm, 4 miles from Otterburne by the Canadian Pacific railway, and 2 miles to St. Pierre. The initial point is marked by a spike driven in the south end of the downstream railing.

Records available.—A daily gauge-height record for the open-water periods from May 23, 1912, to date, has been kept. During the winter periods an intermittent record is available. Estimates of daily discharge have been prepared, based upon the rating curve constructed from the meter records.

Drainage Area.—The area drained is about 650 square miles. The basin lies between the Roseau on the south and the Seine and Whitemouth on the north and east.

Gauge.—The gauge is a 9-foot vertical staff nailed to a pile 16 feet from the left bank of the section. It is referred to a bench-mark set to arbitrary datum and located on the base of an ash tree 30 feet southwest from the initial point.

Channel.—Above the station it is straight for 200 feet and for 100 feet below. There is one channel at all stages. The bottom is of clay, and liable to shift.

Discharge Measurements.—They are made from the downstream side of the bridge. A range in stage of 8·4 feet has been defined on the rating curve. Under winter conditions it has not been possible to obtain a rating.

Diversions.—The Canadian Pacific railway have constructed a dam above the station and use the pond created as a source of supply. Under low-water conditions it is reported they take the whole flow of the river.

Accuracy.—From gauge height 88·30 to 92·40 the discharge curve is well defined; from 92·40 to 96·70 it is fairly well defined. Not possible to define a discharge curve for winter conditions.

Discharge Measurements of Rat River at Otterburne, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 23	S.S. Scovil	1187	20	172	1·24	91·95	213
June 18	G. H. Burnham	1187	44	86	0·99	90·13	85
July 10	G. H. Burnham	1187	34	48	0·74	89·02	35
Aug. 8	W. G. Worden	1187	47	122	1·11	91·02	135
" 24	W. G. Worden	1187	38	65	0·96	89·67	63
Oct. 20	G. J. Lamb	1187	73	436	1·31	96·06	572
" 26	H. M. Nelson	1374	63	354	1·36	95·15	482
Nov. 2	G. J. Lamb	1187	61	303	1·09	94·27	330
1913.							
Jan. 10	G. J. Lamb	1374	37	37	0·40	89·80	15[1]
April 11	G. H. Burnham	1496	82	704	1·63	.....	1,146
" 24	A. Pirie	1186	74	456	1·35	96·70	616
May 1	E. Bankson	1462	61	326	1·30	94·75	424
" 15	E. Bankson	1462	49	154	1·09	91·42	168
June 27	G. Ebner	1186	36	53	0·70	89·06	37
Aug. 1	A. Pirie	1496	35	49	0·39	88·82	19
" 22	C. O. Allen	1435	36	63	0·63	89·26	38
Sept. 17	C. O. Allen	1435	35	54	0·52	89·03	28
1914.							
Jan. 7	E. J. Budge	1462	16	12	0·12	88·98	1·4[2]
Mar. 3	W. J. Ireland	1469	31	11	0·11	89·82	1·1[2]
" 20	T. J. Moore	1374	43	12	0·16	90·93	3·2[2]
April 16	C. O. Allen	1496	50	132	0·82	92·16	109
" 29	A. Pirie	1187	53	207	1·18	92·40	244
May 29	A. Pirie	1939	43	106	0·91	90·31	96
June 18	C. O. Allen	1760	49	144	1·12	91·10	161
July 29	M. S. Madden	1760	35	55	0·48	88·80	27
Aug. 13	J. A. Page	1920	31	28	0·10	88·30	2·8
Sept. 16	H. Boyd	1919	33	38	0·32	88·73	12
Oct. 15	M. S. Madden	1911	38	61	0·54	89·27	33
Nov. 6	M. S. Madden	1912	35	58	0·73	89·02	27
Dec. 2	C. O. Allen	1912	36	35	0·30	89·34	11[2]

[1] Ice (1·4 feet thick).
[2] Measurements taken under ice conditions.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Rat River at Otterburne, for 1912.

[Drainage area, 650 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1											93·34	311
2											93·19	299
3											93·03	287
4											92·91	277
5											92·82	270
6											92·74	263
7											92·65	256
8											92·48	242
9											92·18	219
10											91·85	196
11											91·52	172
12											91·17	148
13											90·99	135
14											90·81	125
15											90·57	110
16											90·45	103
17											90·28	93
18											90·15	85
19											90·00	77
20											89·87	71
21											89·75	65
22											89·65	60
23									91·95	203	89·52	53
24									91·87	197	89·38	46
25									91·75	189	89·29	42
26									91·61	179	89·17	36
27									91·65	182	89·10	32
28									91·86	196	89·00	28
29									92·85	272	88·95	26
30									93·33	310	88·90	24
31									93·45	320		

	July.		August.		September.		October.		November.		December.	
1	88·85	22	90·94	132	90·17	86			94·35	400	91·24	
2	88·80	20	91·00	136	90·50	106			94·28	393	90·57	
3	88·79	20	91·05	140	90·78	123			94·55	418	90·56	
4	88·75	18	91·08	142	90·95	133			94·47	410	90·48	
5	88·75	18	91·14	146	91·15	147			94·39	403	90·37	
6	88·75	18	91·24	153	91·27	155			94·32	397	90·24	
7	88·79	20	91·33	159	91·34	160			94·24	390	90·12	
8	88·75	18	91·03	138	91·50	171			93·95	364	90·03	
9	89·05	30	90·57	110	91·57	176			94·08	375		
10	89·00	28	90·40	100	91·70	185			94·23	389		
11	89·09	32	90·33	96	91·70	185			94·09	376		
12	89·55	55	90·24	90	91·68	184			93·92	361		
13	90·05	80	90·20	88	91·64	181			93·75	346		
14	90·26	92	90·09	82	91·68	184			93·59	331		
15	90·45	103	89·97	76	91·70	185			93·45	320	89·85	
16	90·55	109	89·85	70	91·73	187			93·31	309		
17	90·63	114	89·78	66	91·57	176			93·17	298		
18	90·68	117	89·77	66	91·55	175			93·02	286		
19	90·65	115	89·76	65	91·60	178			92·94	279		
20	90·58	111	89·68	61	91·89	198	90·06	566	92·80	273		
21	90·40	100	89·64	59	92·14	216			92·79	267		
22	90·25	91	89·67	61	92·85	272			92·70	260	90·00	
23	90·35	97	89·70	62	93·40	316			92·64	255		
24	90·43	102	89·73	64	93·73	344			92·57	250		
25	90·52	107	89·70	62	93·85	355			92·38	234		
26	90·60	112	89·70	62	93·99	367	95·15	475	92·22	222		
27	90·68	117	89·68	61	94·15	382	94·96	456	92·09	212		
28	90·65	115	89·65	60	94·40	404	94·78	438	91·98	205		
29	90·76	122	89·74	64		411	94·59	421	91·76	189	91·13	
30	90·93	132	89·84	69		403	94·25	391	91·45	168		
31	90·87	128	90·01	78			94·25	391				

Note.—September 29 to October 26 water above gauge. Ice conditions from November 30 to end of year. Information insufficient to compute daily discharges.

Daily Gauge Height and Discharge of Rat River at Otterburne, for 1913.

[Drainage area, 650 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	89·81	.....	.....	.....	.....	.....	94·74	435	88·95	75
2	.....	.....	.....	.....	.....	.....	.....	.....	94·37	401	90·01	78
3	.....	.....	.....	.....	.....	.....	.....	.....	93·88	357	90·09	82
4	.....	.....	.....	.....	.....	.....	.....	.....	93·57	330	90·14	84
5	.....	.....	.....	.....	.....	.....	.....	.....	93·33	310	90·17	86
6	.....	.....	.....	.....	.....	.....	.....	.....	93·14	295	90·16	86
7	.....	.....	.....	.....	.....	.....	.....	.....	92·91	277	90·11	83
8	.....	.....	.....	.....	.....	.....	.....	.....	92·77	266	90·11	83
9	89·91	.....	89·79	.....	.....	.....	.....	.....	92·64	255	90·13	84
10	89·80	15	.....	.....	.....	.....	.....	.....	92·41	237	90·22	89
11	.....	.....	.....	.....	.....	.....	.....	1,146	92·10	213	90·39	99
12	89·72	.....	.....	.....	.....	.....	.....	.....	91·93	201	90·57	110
13	.....	.....	.....	.....	.....	.....	.....	.....	91·76	189	90·83	126
14	.....	.....	.....	.....	.....	.....	.....	.....	91·71	186	91·08	142
15	.....	.....	.....	.....	.....	.....	.....	.....	91·44	167	91·14	146
16	.....	.....	89·80	.....	.....	.....	.....	.....	91·35	161	90·74	120
17	.....	.....	.....	.....	.....	.....	.....	.....	91·29	156	90·17	86
18	.....	.....	.....	.....	.....	.....	.....	.....	91·18	149	89·89	72
19	89·69	.....	.....	.....	.....	.....	.....	.....	91·10	143	89·68	61
20	.....	.....	.....	.....	.....	.....	.....	.....	90·98	135	89·51	53
21	.....	.....	.....	.....	.....	.....	.....	.....	90·87	128	89·43	49
22	.....	.....	.....	.....	.....	.....	.....	.....	90·73	120	89·32	43
23	.....	.....	90·01	.....	.....	.....	97·20	682	90·59	111	89·25	40
24	.....	.....	.....	.....	.....	.....	96·76	636	90·45	103	89·18	36
25	.....	.....	.....	.....	.....	.....	96·39	599	90·31	107	89·24	39
26	89·77	.....	.....	.....	.....	.....	96·25	585	90·45	103	89·17	36
27	.....	.....	.....	.....	.....	.....	96·24	584	90·42	101	89·04	30
28	.....	.....	.....	.....	.....	.....	95·76	536	90·30	94	89·15	35
29	.....	.....	.....	.....	.....	.....	95·00	460	90·18	87	89·16	35
30	.....	.....	.....	.....	.....	.....	94·79	439	90·05	80	89·15	35
31	.....	.....	.....	.....	.....	.....	.....	.....	90·00	77	.....	.....

	July.		August.		September.		October.		November.		December.	
1	89·14	34	88·84	22	88·91	24	88·88	23	89·57	.....	.....	.....
2	89·37	46	88·77	19	88·84	22	88·85	22	89·53	.....	.....	.....
3	89·54	54	88·72	17	88·84	22	88·83	21	89·51	.....	.....	.....
4	89·94	74	88·69	16	88·81	20	88·83	21	89·50	.....	.....	.....
5	90·08	81	88·67	15	88·77	19	88·89	24	89·48	.....	.....	.....
6	90·17	86	88·63	13	88·74	18	88·84	22	89·46	.....	.....	.....
7	90·12	83	88·60	12	88·70	16	88·84	22	89·44	.....	.....	.....
8	89·98	76	88·57	11	88·67	15	88·90	24	89·43	.....	.....	.....
9	89·91	73	88·56	11	88·64	14	88·97	27	89·24	.....	.....	.....
10	89·73	64	88·57	11	88·69	15	89·04	30	89·13	.....	.....	.....
11	89·79	66	88·57	11	88·69	15	89·27	41	89·01	.....	.....	.....
12	89·83	69	88·60	12	88·69	15	89·39	47	89·24	.....	.....	.....
13	90·11	83	88·63	13	88·76	18	89·44	49	89·34	.....	.....	.....
14	90·29	93	88·66	14	88·75	18	89·61	58	89·32	.....	.....	.....
15	90·34	96	88·79	19	.....	22	89·77	66	89·30	.....	.....	.....
16	90·39	99	88·87	23	.....	26	89·98	76	89·28	.....	.....	.....
17	90·97	134	88·96	26	89·03	29	90·02	78	89·27	.....	.....	.....
18	91·03	138	89·04	30	88·97	27	90·00	77	89·26	.....	.....	.....
19	91·04	139	89·08	31	88·89	24	89·93	74	89·24	.....	.....	.....
20	91·04	139	89·10	32	88·84	22	89·78	66	89·23	.....	.....	.....
21	90·76	122	89·16	35	88·86	22	89·74	64	89·21	.....	.....	.....
22	90·19	87	89·24	39	88·88	23	89·54	54	89·19	.....	.....	.....
23	90·98	135	89·22	38	88·89	24	89·48	51	89·18	.....	.....	.....
24	90·74	120	89·20	37	88·79	20	89·54	54	89·17	.....	.....	.....
25	90·55	109	89·18	36	88·82	21	89·49	52	89·28	.....	.....	.....
26	89·34	44	89·18	36	88·82	21	89·46	50	89·33	.....	.....	.....
27	89·24	39	89·17	36	88·83	21	89·38	46	89·33	.....	.....	.....
28	89·11	33	89·16	35	88·83	21	89·37	46	89·34	.....	.....	.....
29	89·08	31	89·14	34	88·84	22	[1]89·34	44	89·36	.....	.....	.....
30	89·00	28	89·05	30	88·84	22	[1]89·32	43	89·37	.....	.....	.....
31	88·91	24	88·98	27	.....	.....	[1]89·30	42	.....	.....	.....	.....

Notes.—Ice conditions from January 1 to April 22; and from October 28 to end of year; information insufficient to compute daily discharges. Gauge heights marked thus [1] interpolated.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Rat River at Otterburne, for 1914.

[Drainage Area, 650 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Hright.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft	Feet.	Sec.-ft.
1							91·96		92·09	212	90·48	105
2							92·24		91·73	187	90·64	114
3					89·82	1	93·04		91·37	162	90·47	100
4							93·04		91·22	151	90·49	104
5							92·69		91·09	142	90·28	93
6							92·54		91·02	137	90·16	86
7	88·98	1					92·52		91·02	137	90·05	80
8							92·42		91·01	137	89·96	75
9							92·42		91·10	143	89·85	70
10							92·41		91·18	149	89·85	70
11							92·39		91·29	156	89·95	75
12							92·37		91·37	162	90·30	94
13							92·33		91·38	163	90·65	115
14							92·24		91·31	158	90·77	122
15					91·11		92·11		91·08	142	90·88	129
16							92·23		90·78	123	90·97	134
17							92·40		90·53	108		138
18							92·57		90·47	104	91·09	142
19							92·47		90·21	89	91·08	142
20					90·93	32	92·97		90·17	86	90·99	135
21							93·57		90·68	81	90·80	124
22					90·99		93·56		90·09	82	90·45	103
23							92·97	282	90·11	83	90·16	85
24					91·11		92·92	278	90·16	86	89·78	65
25							92·82	270	90·21	89	89·56	55
26							92·76	265	90·19	87	89·25	40
27							92·69	259	90·10	82	89·30	42
28							92·59	251	90·07	81	89·20	37
29					91·12		92·41	237	90·55	109	89·18	36
30							92·26	225	90·48	105	89·15	35
31									90·48	105		

	July.		August.		September.		October.		November.		December.	
1	89·15	35	88·65	14	88·91	24	88·78	19	89·08	31		
2	89·19	37	88·58	11	88·83	21	88·76	18	89·08	31	89 34	11
3	89·34	44	88·50	9	88·78	19	88·75	18	89·06	30		
4	89·38	46	88·45	8	88·76	18	88·73	17	89·04	30		
5	89·30	42	88·43	7	88·66	14	88·68	15	89·03	29		
6	89·25	40	88·39	6	88·62	13	88·66	14	89·02	29		
7	89·15	35	88·35	5	88·62	13	88·64	14	89·03	29		
8	89·09	32	88·18	2	88·62	13	88·61	13	89·04	30		
9	88·97	27	88·20	2	88·63	13	88·61	14	89·09	32		
10	88·89	24	88·22	2	88·66	14	88·69	16	89·05	30		
11	88·85	22	88·22	2	88·68	15	88·75	18	89·03	29		
12	88·87	23	88·22	2	88·65	14	88·92	25	89·00	28		
13	88·87	23	88·30	4	88·63	13	88·98	27				
14	88·95	26	88·31	4	88·64	14		34				
15	89·20	37	88·31	4	88·70	16	89·27	41	89·04			
16	89·60	57	88·31	4	88·78	19	89·59	57				
17	89·88	71	88·28	4	88·73	17	89·59	57				
18	90·21	89	88·43	7	88·77	19	89·32	53				
19	90·29	93	88·43	7	88·76	18	89·43	49				
20	90·25	91	88·43	7	88·76	18	89·39	47				
21	90·11	83	88·41	7	88·78	19	89·29	42				
22	89·96	75	88·45	8	88·82	21	89·26	40	89·03			
23	89·75	65	88·45	8	88·84	22	89·23	39				
24	89·47	51	88·44	7	88·80	20	89·21	38				
25	89·21	39	88·51	10	88·78	19	89·16	35				
26	89·15	35	88·54	10	88·78	19	89·14	34				
27	89·08	30	88·51	10	88·93	25	89·11	33				
28	89·03	29	88·58	11	88·92	25	89·12	33				
29	88·81	20	88·63	11	88·88	23	89·13	33	89·24			
30	88·73	17	88·67	15	88·85	22	89·11	34				
31	88·69	16	88·87	23			89·09	32				

Note.—Ice conditions from January 1 to April 24, and from November 12 to end of year, information insufficient to compute daily discharges.

Monthly Discharge of Rat River at Otterburne, for the years 1912–14.

[Drainage Area, 650 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
May			230[1]	0·354	0·408	14,100
June	311	24	138	0·212	0·236	8,200
July	132	18	76	0·117	0·135	4,675
August	159	59	91	0·140	0·161	5,600
September	460	86	227	0·349	0·389	13,500
October			480[1]	0·738	0·851	29,500
November	418	168	313	0·482	0·538	18,600
December			30[1]	0·046	0·053	1,840
The period	460	18	198	0·305	2·771	96,015
1913.						
January			15[1]	0·023	0·027	922
February			10[1]	0·015	0·016	555
March			10[1]	0·015	0·018	615
April			600[1]	0·923	1·030	35,700
May	435	77	193	0·297	0·342	11,900
June	146	30	74	0·114	0·127	4,400
July	139	24	81	0·125	0·144	4,980
August	39	11	24	0·037	0·043	1,480
September	29	14	21	0·032	0·036	1,250
October	78	21	46	0·071	0·082	2,825
November			30[1]	0·046	0·051	1,790
December			20[1]	0·031	0·036	1,230
The year	435	11	94	0·144	1·952	67,647
1914.						
January		1	1[1]	0·002	0·002	61
February			1[1]	0·002	0·002	56
March		1	2[1]	0·003	0·004	123
April			75[1]	0·115	0·128	4,475
May	212	81	124	0·191	0·220	7,625
June	142	35	92	0·142	0·158	5,475
July	93	16	44	0·068	0·078	2,700
August	23	2	8	0·012	0·014	492
September	25	13	18	0·028	0·031	1,070
October	57	13	31	0·048	0·055	1,910
November			25[1]	0·038	0·042	1,490
December			5[1]	0·008	0·009	307
The year	212	1	36	0·055	0·743	25,784

Note.—Marked thus (1) estimated. Ice conditions from November 30 to end of year 1912.

Ice conditions, January 1 to April 22, and from October 28 to end of year 1913.

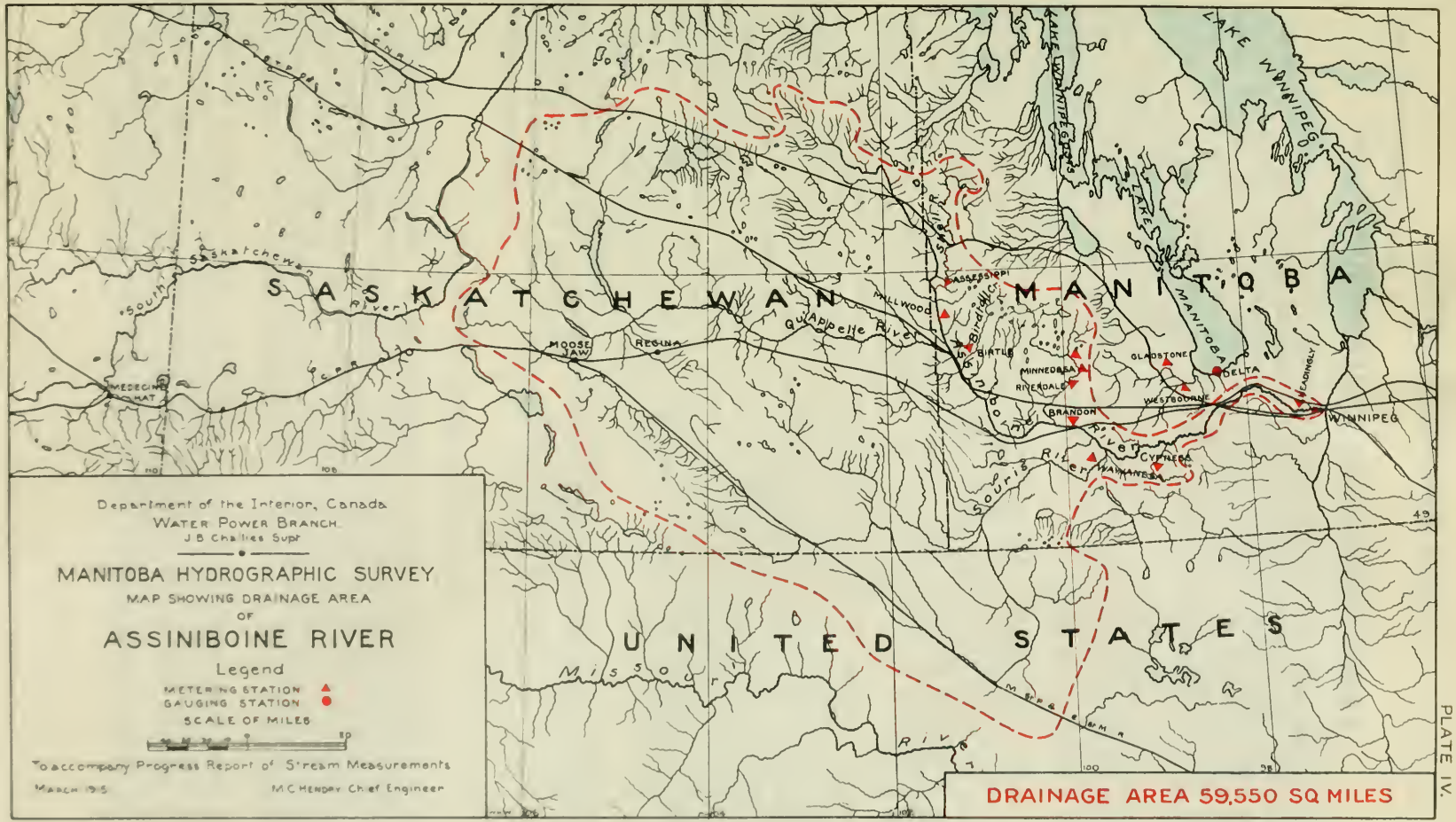

SASKATCHEWAN
MANITOBA
UNITED STATES
LAKE WINNIPEG
LAKE MANITOBA
Saskatchewan River
South Saskatchewan River
Qu'Appelle River
Assiniboine River
Souris River
Missouri River
MOOSE JAW
REGINA
MEDICINE HAT
MILLWOOD
BIRTLE
MINNEDOSA
RIVERDALE
BRANDON
GLADSTONE
DELTA
WESTBOURNE
MACDONELL
WINNIPEG
CYPRESS RIVER
WAWANESA
Department of the Interior, Canada
WATER POWER BRANCH
J.B. Challies Supt
MANITOBA HYDROGRAPHIC SURVEY
MAP SHOWING DRAINAGE AREA
OF
ASSINIBOINE RIVER
Legend
METERING STATION
GAUGING STATION
SCALE OF MILES
To accompany Progress Report of Stream Measurements
March 1915
M.C. Hendry Chief Engineer
DRAINAGE AREA 59,550 SQ. MILES

PLATE IV.

SESSIONAL PAPER No. 25f

ASSINIBOINE RIVER AND TRIBUTARIES.

Assiniboine River.—The Assiniboine river is one of the chief tributaries of the Red river, joining the latter within the city limits of Winnipeg. Its source is in the province of Saskatchewan on the southeastern slope of the Nut mountains. It flows in a southeasterly direction and crosses the Manitoba boundary in tp. 26, R. 28 W.P.M.; from that point its course is nearly due south until it reaches tp. 10, R. 25 W.P.M., where it turns and flows south and east to its junction with the Red river.

The principal tributaries of the Assiniboine are the Shell, Qu'Appelle, Little Saskatchewan, and Souris rivers. The total drainage area is 59,550 square miles, of which 8,800 square miles are in the state of North Dakota, 37,700 square miles in the province of Saskatchewan, and 13,050 square miles in the province of Manitoba.

The area drained varies between the open prairie to be found in the southwest part of the province, and the well-timbered country lying on the slopes of the Duck and Riding mountains. In the prairie country the banks are sharp cut, rising abruptly from the water's edge for a height varying between 3 or 4 feet to 25 feet. In the wooded section, or the upper part of the drainage area, the valley is well defined and narrow, the rise from the river in some places reaching an elevation of 250 feet above the water level.

In the lower part of the river basin the land is nearly all under cultivation, the soil is rich, but in the valley bottom it is subject to overflow. It flows through the most densely populated part of the province, the three largest cities, Portage la Prairie, Brandon, and Winnipeg, being built upon its banks.

This river is important as a source of water supply, and as a means of drainage and sewage disposal in a district where the natural water supply is somewhat limited. In order that a study may properly be made of its regimen and data for various purposes be gathered, several gauging stations have been established. All have not been in continuous operation, but discharge records have been obtained at the following places on the river:—1, Millwood; 2, Brandon; 3, Headingly; 4, St. James.

Tributaries.—The tributaries of the Assiniboine river in order from source to mouth are:—1, Shell river; 2, Qu'Appelle river; 3, Birdtail creek; 4, Little Saskatchewan river; 5, Souris river; 6, Cypress river.

On all of these, with the exception of the Qu'Appelle river, records of discharge are available.

Assiniboine River at Millwood.

History.—The station on the Assiniboine at Millwood was established by W. G. Worden on October 11, 1912, and has been in operation since that time.

Location of Section.—The meter section is located on the downstream side of the traffic bridge, 400 feet below the dam, one-quarter of a mile south from the town, and one-eighth of a mile below the Canadian Pacific Railway bridge. The initial point is an arrow cut and painted on the top of the wooden hand-rail of the bridge at the northeast corner on the downstream side. It is marked "0+00 I.P."

Records available.—Daily gauge height records are available for the station from October 11, 1912, to the end of 1914, except for the period February 9 to March 28, 1914. Estimates of daily discharge are available from January 27, 1913, to the end of 1914, except for the above period.

Drainage Area.—The area tributary to the Assiniboine river above the station is 7,590 square miles.

Manigotagan River, Meter Section. Outlet Moose Lake.

Gauge.—A 6-foot vertical staff enamelled gauge is fastened to a plank which is spiked to the middle crib of the bridge on the downstream side. It is referred to three bench-marks set at arbitrary datum, one of which is the head of a nail driven in the telephone post at the northwest corner of the bridge.

Channel.—For 400 feet above the section, and 200 feet below, the channel is straight. The river occupies one channel at all stages, which is divided just above the section by a central pier of the bridge. The bed of the stream is clay, sand, and gravel, and not subject to shifting. The banks are low and liable to overflow at high stages.

Discharge Measurements.—The discharge measurements are taken from the downstream side of the bridge, and cover a range in stage under open-water conditions of 8·3 feet.

Accuracy.—Under open-water conditions the discharge curve is well defined between the limits 98·91 and 107·4, beyond which it is not well defined. The discharge curve for ice conditions is fairly well defined between gauge heights 97·5 and 99·5.

DISCHARGE MEASUREMENTS of Assiniboine River at Millwood, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
Oct. 11	W. G. Worden	1497	145	881	1·85	102·29	1,628
1913.							
Jan. 27	G. J. Lamb	1374	145	254	0·68	100·49	174[1]
April 19	E. Bankson	1469	157·5	1,484	3·08	106·45	4,571
May 9	E. Bankson	1469	192	1,705	3·08	107·42	5,253
July 3	A. Pirie	1496	145	740	1·82	101·65	1,346
Aug. 6	W. J. Ireland	1469	169	1,470	2·58	105·65	3,789
Sept. 13	W. J. Ireland	1469	144	700	1·72	101·30	1,201
Oct 19	C. O. Allen	1435	144·5	537	1·18	100·30	630
Nov 20	C. O. Allen	1375	145	440	0·94	99·95	414[1]
1914							
Jan. 15	E. J. Budge	1462	163	178	0·69	100·23	123[2]
Mar. 17	C. O. Allen	1496	90	192	0·76	100·47	147[3]
April 28	M. S. Madden	1462	159	1,278	2·59	104·95	3,329
May 13	C. O. Allen	1497	159	1,367	3·05	105·61	4,171
June 10	C. O. Allen	1769	142	792	1·92	101·92	1,517
July 15	C. O. Allen	1769	142	545	0·72	99·62	391
Aug. 10	M. S. Madden	1769	156	317	0·46	99·01	145
" 31	A. Pirie	1910	141	344	0·39	98·98	133
Sept. 25	M. S. Madden	1911	156	315	0·34	98·91	116
Oct. 25	M. S. Madden	1912	158	349	0·45	99·09	158
Nov. 19	M. S. Madden	1912	149	360	0·37	99·42	134
Dec 6	T. J. Moore	1920	156	313	0·34	99·32	106[4]
" 30	C. O. Allen	1912	132	166	0·29	99·58	49[5]

[1] Measurement taken under ice conditions
[2] Ice, mean thickness 1·51 feet
[3] " " 1·71 "
[4] " " 1·55 "
[5] " " 1·8 "

Daily Gauge Height and Discharge of Assiniboine River at Millwood, for 1913.

[Drainage area, 7,590 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec. ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			100·41	64	[1]100·70	64	[1]101·05	151	108·30	6,080	104·80	3,270
2			100·40	64	100·80	70	[1]101·10	161	108·25	6,035	104·70	3,200
3			[1]100·38	64	[1]100·80	73	[1]101·20	172	107·80	5,630	104·50	3,060
4			[1]100·33	61	[1]100·80	76	[1]101·30	183	108·20	5,990	104·40	2,990
5			[1]100·32	58	[1]100·80	83	[1]101·40	207	107·70	5,545	104·40	2,990
6			[1]100·29	58	[1]100·80	83	[1]101·50	405	107·50	5,375	104·20	2,885
7			[1]100·26	56	[1]100·80	83	[1]101·70	490	107·20	5,120	104·00	2,725
8			[1]100·25	53	[1]100·80	83	[1]101·90	670	106·80	4,785	103·70	2,530
9			100·20	51	100·80	90	[1]102·10	1,020	107·40	5,293	103·40	2,340
10			[1]100·23	48	[1]100·82	90	[1]102·70	1,510	107·20	5,120	103·20	2,220
11			100·26	51	[1]100·84	94	[1]103·80	2,280	107·10	5,035	103·00	2,100
12			[1]100·29	51	[1]100·85	94	[1]105·40	3,550	107·00	4,950	102·70	1,925
13			[1]100·32	53	[1]100·87	94	107·50	5,275	106·80	4,785	102·70	1,925
14			[1]100·35	53	[1]100·89	97	106·83	4,809	106·60	4,620	102·50	1,800
15			[1]100·38	56	100·90	97	106·50	4,545	106·50	4,545	102·20	1,620
16			100·40	58	[1]100·87	97	106·50	4,545	106·40	4,465	102·10	1,565
17			[1]100·39	58	[1]100·87	101	106·58	4,609	106·20	4,305	102·00	1,510
18			[1]100·37	58	[1]100·85	101	106·42	4,481	106·00	4,145	101·90	1,455
19			[1]100·35	53	[1]100·84	101	106·50	4,545	105·90	4,070	101·70	1,345
20			[1]100·34	51	[1]100·83	101	106·83	4,809	105·80	3,995	101·60	1,290
21			[1]100·33	51	[1]100·82	105	107·83	5,657	105·70	3,920	101·50	1,235
22			[1]100·32	51	[1]100·81	109	[1]112·10	9,800	105·60	3,845	101·40	1,180
23			100·30	48	100·80	113	[1]114·10	11,800	105·50	3,770	101·30	1,125
24			[1]100·35	48	[1]100·81	113	[1]115·00	12,700	105·40	3,695	101·30	1,125
25			[1]100·40	48	[1]100·84	118	[1]114·40	12,100	105·40	3,695	101·20	1,070
26			[1]100·50	55	[1]100·87	118	[1]113·20	10,900	105·30	3,620	101·10	1,620
27	100·48	70	[1]100·55	56	[1]100·90	122	[1]112·30	10,000	105·20	3,550	101·00	970
28	[1]100·47	70	[1]100·60	58	[1]100·94	127	[1]111·60	9,300	105·20	3,550	101·00	970
29	[1]100·45	67			[1]100·97	127	[1]109·50	7,205	105·10	3,480	101·10	1,020
30	100·43	67			101·00	131	[1]108·60	6,350	105·00	3,410	101·30	1,125
31	100·42	64			[1]100·03	141			104·90	3,340		

	July.		August.		September.		October.		November		December	
1	101·40	1,180	105·60	3,845	102·17	1,607	100·34	643	100·29	620	[1]100·06	429
2	101·50	1,235	105·65	3,883	102·07	1,552	100·31	630	[1]100·26	607	[1]100·04	421
3	101·68	1,334	105·70	3,920	102·00	1,510	100·29	620	[1]100·23	594	[1]100·02	413
4	102·40	1,740	105·70	3,920	101·96	1,488	100·26	607	[1]100·20	580	[1]100·00	365
5	103·00	2,100	105·73	3,943	101·93	1,472	100·23	594	[1]100·17	567	[1] 99·98	357
6	103·80	2,595	105·70	3,920	101·87	1,439	100·20	580	[1]100·14	553	[1] 99·96	349
7	104·30	2,920	105·60	3,845	101·79	1,395	100·19	576	[1]100·11	540	[1] 99·94	304
8	104·55	3,095	105·50	3,770	101·73	1,362	100·18	571	[1]100·08	526	[1] 99·92	297
9	104·68	3,186	105·20	3,550	101·66	1,323	100·18	571	100·06	517	99·92	297
10	104·80	3,270	104·70	3,200	101·55	2,263	100·23	594	[1]100·06	517	[1] 99·92	297
11	105·00	3,410	104·00	2,725	101·46	1,213	100·26	607	[1]100·05	468	[1] 99·91	258
12	105·57	3,823	103·40	2,340	101·36	1,158	100·29	620	[1]100·05	468	[1] 99·91	258
13	105·65	3,883	103·05	2,130	101·26	1,103	100·29	620	[1]100·04	463	[1] 99·91	258
14	105·80	3,995	102·70	1,925	101·18	1,060	100·29	620	[1]100·03	459	[1] 99·90	220
15	105·83	4,017	102·40	1,740	101·10	1,020	100·30	625	[1]100·02	454	99·90	151
16	105·88	4,055	102·40	1,740	101·01	975	100·30	625	[1]100·01	450	[1] 99·90	151
17	105·92	4,085	102·48	1,784	100·91	925	100·23	634	100·00	445	[1] 99·90	151
18	105·90	4,070	102·55	1,830	100·85	895	100·32	634	[1]100·02	454	[1] 99·90	141
19	105·85	4,032	102·62	1,872	100·80	870	100·30	625	[1]100·04	463	[1] 99·90	141
20	105·88	4,055	102·69	1,914	100·73	835	100·28	616	[1]100·09	486	[1] 99·90	131
21	105·90	4,070	102·77	1,962	100·68	810	100·29	620	100·11	495	[1] 99·90	131
22	105·95	4,108	102·84	2,004	100·61	775	100·14	553	[1]100·14	508	99·90	122
23	105·93	4,093	102·91	2,046	100·56	750	100·70	820	[1]100·17	522	[1] 99·90	122
24	105·85	4,032	102·99	2,094	100·54	740	100·12	544	100·19	531	[1] 99·90	113
25	105·80	3,995	102·92	2,052	100·50	720	100·25	603	[1]100·17	522	[1] 99·90	113
26	105·75	3,958	102·79	1,979	100·49	715	100·29	620	[1]100·15	513	[1] 99·90	105
27	105·70	3,920	102·77	1,967	100·46	700	100·20	580	[1]100·13	504	[1] 99·99	105
28	105·60	3,845	102·67	1,902	100·42	680	99·96	482	[1]100·11	472	[1] 99·99	105
29	105·60	3,845	102·51	1,806	100·40	670	99·77	393	[1]100·09	441	[1] 99·90	90
30	105·60	3,845	102·39	1,734	100·37	657	100·18	571	[1]100·07	443	99·92	90
31	105·60	3,845	102·26	1,656			100·05	513			[1] 99·94	90

Note.—All marked thus [1] interpolated. From January 27 to April 12, and from November 1 to December 31 under ice cover. From April 6 to 12, and from November 1 to December 14, open-water rating table used.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Assiniboine River at Millwood, for 1914.

[Drainage area, 7,590 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1	[1] 99·96	94	[1]100·35	118	.....	.....	101·02	133	105·12	3,494	103·14	2,184
2	[1] 99·98	96	[1]100·36	118	.....	.....	100·94	125	105·10	3,480	103·02	2,112
3	[1]100·03	92	[1]100·37	111	.....	.....	100·62	99	105·08	3,466	102·84	2,004
4	[1]100·06	94	[1]100·38	111	.....	.....	100·74	108	105·02	3,424	102·54	1,824
5	100·09	89	[1]100·39	112	.....	.....	100·84	117	105·09	3,473	102·41	1,746
6	[1]100·13	92	[1]100·40	105	.....	.....	100·67	103	105·22	3,564	102·29	1,674
7	[1]100·16	94	[1]100·41	106	.....	.....	100·59	99	104·99	3,493	102·28	1,668
8	[1]100·20	97	100·42	103	.....	.....	100·50	99	105·02	3,424	102·12	1,577
9	[1]100·25	101	.....	.....	.....	.....	100·71	106	105·04	3,438	102·07	1,552
10	[1]100·30	105	.....	.....	.....	.....	100·87	119	105·82	4,010	101·91	1,461
11	[1]100·34	108	.....	.....	.....	.....	100·99	131	105·33	3,643	101·82	1,411
12	100·38	111	.....	.....	.....	.....	101·32	163	105·42	3,710	101·74	1,367
13	[1]100·32	107	.....	.....	.....	.....	101·22	153	105·60	3,845	101·60	1,290
14	[1]100·27	103	.....	.....	.....	.....	101·42	174	106·22	4,321	101·51	1,241
15	100·23	107	.....	.....	.....	.....	102·85	1,749	106·07	4,201	101·42	1,191
16	[1]100·23	107	.....	.....	.....	.....	103·51	2,100	106·27	4,361	101·20	1,070
17	[1]100·22	107	.....	.....	100·47	88	103·62	3,060	106·45	4,505	101·12	1,030
18	[1]100·21	106	.....	.....	.....	.....	104·72	3,200	105·87	4,048	100·93	935
19	100·20	105	.....	.....	.....	.....	104·52	3,074	105·70	3,920	100·87	905
20	[1]100·20	105	.....	.....	.....	.....	104·53	3,081	106·63	4,644	100·74	840
21	[1]100·20	97	.....	.....	.....	.....	105·02	3,424	106·50	4,545	100·62	780
22	[1]100·21	98	.....	.....	.....	.....	104·83	3,291	106·18	4,289	100·54	740
23	[1]100·21	98	.....	.....	.....	.....	104·74	3,228	105·82	4,010	100·47	705
24	[1]100·22	99	.....	.....	.....	.....	105·54	3,800	105·53	3,793	100·43	685
25	[1]100·22	99	.....	.....	.....	.....	104·99	3,403	105·12	3,494	100·38	661
26	[1]100·22	99	.....	.....	.....	.....	105·01	3,417	104·91	3,347	100·30	625
27	100·23	99	.....	.....	.....	.....	104·92	3,354	104·53	3,081	100·23	594
28	[1]100·25	101	.....	.....	.....	.....	104·93	3,361	104·19	2,849	100·18	571
29	[1]100·27	103	.....	.....	100·62	99	105·02	3,424	103·92	2,673	100·17	567
30	[1]100·29	104	.....	.....	[1]100·75	109	105·04	3,438	103·64	2,491	100·12	544
31	[1]100·32	107	.....	.....	[1]100·90	122	.....	.....	103·42	2,352	.....	.....

	July.		August.		September.		October.		November.		December.	
1	100·09	531	99·18	184	98·96	120	98·94	115	99·08	154	99·24	117
2	100·08	526	99·15	175	98·95	118	98·94	115	99·08	154	99·23	116
3	100·11	540	99·13	169	98·92	110	98·93	113	99·05	145	99·28	107
4	100·06	517	99·12	166	98·91	108	98·93	113	99·07	151	99·30	109
5	100·02	499	99·09	157	98·90	105	98·93	113	99·05	145	99·32	107
6	100·00	499	99·06	148	98·90	105	98·95	118	99·07	151	99·32	115
7	99·97	487	99·03	139	98·91	108	98·99	128	99·09	157	99·31	110
8	99·88	437	99·01	133	98·93	113	99·00	130	99·09	157	99·31	110
9	99·82	413	98·99	128	98·96	120	99·03	139	99·09	157	99·26	102
10	99·76	389	99·01	133	99·00	130	99·06	148	99·08	154	99·30	97
11	99·72	373	98·99	128	99·01	133	99·07	151	99·00	130	99·30	97
12	99·72	373	98·97	123	99·02	136	99·08	154	98·80	80	99·30	97
13	99·72	373	98·96	120	99·02	136	99·09	157	98·90	105	99·27	88
14	99·71	369	98·94	115	99·01	133	99·10	160	99·00	130	99·28	85
15	99·70	365	98·93	113	98·99	128	99·10	160	99·01	114	99·31	80
16	99·69	325	98·93	113	98·99	128	99·10	160	99·07	119	99·40	80
17	99·69	325	98·93	113	98·97	123	99·10	160	99·20	131	99·34	82
18	99·61	329	98·92	110	98·97	124	99·10	160	99·30	131	99·31	80
19	99·62	333	98·92	110	98·97	124	99·10	160	99·41	134	99·25	76
20	99·63	337	98·99	105	98·98	125	99·10	160	99·44	131	99·24	66
21	99·64	341	98·89	103	98·98	125	99·09	157	99·49	141	99·21	71
22	99·64	341	98·88	100	98·96	120	99·09	157	99·34	125	99·35	58
23	99·57	315	98·88	100	98·94	115	99·08	154	99·31	123	99·30	46
24	99·45	273	98·89	103	98·94	113	99·08	154	99·30	122	99·28	36
25	99·42	262	98·99	105	98·91	108	99·08	154	99·27	119	99·50	28
26	99·41	259	98·91	108	98·91	108	99·07	151	99·23	116	99·70	21
27	99·37	245	98·92	110	98·90	105	99·06	148	99·23	116	99·46	21
28	99·33	241	98·94	113	98·93	105	99·06	148	99·24	117	99·50	21
29	99·29	217	98·98	124	98·99	105	99·00	140	99·25	118	99·52	20
30	99·26	208	98·97	124	98·91	108	99·06	148	99·25	118	99·56	26
31	99·22	196	98·98	125			99·08	154			99·60	24

Note.—Ice conditions from January 1 to April 18. Open water rating table used from April 13 to 18. All marked thus (1) interpolated. From November 15 to December 31, inclusive, under ice cover.

MONTHLY DISCHARGE of Assiniboine River at Millwood, for the years 1913-14.

[Drainage area, 7,590 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1913.						
January	.....	.....	[1]70	0·009	0·010	4,300
February	64	48	55	0·007	0·007	3,050
March	141	64	100	0·013	0·015	6,150
April	[1]12,700	[1]151	[1]4,810	0·634	0·707	286,200
May	6,080	3,340	4,508	0·594	0·685	277,200
June	3,270	970	1,852	0·244	0·272	110,200
July	4,108	1,180	3,408	0·449	0·518	209,500
August	3,943	1,656	2,548	0·336	0·387	156,700
September	1,607	657	1,056	0·139	0·155	62,800
October	820	393	597	0·079	0·091	36,700
November	[1]620	[1]433	[1]506	0·067	0·075	30,100
December	[1]429	[1]90	[1]212	0·028	0·032	13,000
The year	12,700	48	1,640	0·216	2·954	1,195,900
1914.						
January	[1]111	[1]89	[1]101	0·043	0·015	6,200
February	.....	.....	[1]96	0·013	0·014	5,350
March	.....	.....	[1]97	0·012	0·014	5,600
April	3,800	[1]90	[1]1,740	0·229	0·256	103,500
May	4,649	2,352	3,655	0·481	0·554	224,760
June	2,184	544	1,185	0·156	0·174	70,500
July	540	196	362	0·048	0·055	22,200
August	184	103	126	0·017	0·020	7,750
September	156	105	118	0·016	0·018	7,000
October	160	113	144	0·019	0·022	8,850
November	157	80	131	0·017	0·019	7,800
December	117	20	74	0·010	0·012	4,600
The year	4,649	20	669	0·086	1·173	474,150

NOTE.—[1]Estimated.

ASSINIBOINE RIVER AT BRANDON.

History.—The station on the Assiniboine at Brandon was established on July 4, 1912, by G. H. Burnham, and has been operated since that date.

Location of Section.—The meter section is located on the downstream side of First Street traffic bridge, locally known as the Iron bridge, in the city of Brandon, Man. The initial point is marked on the iron railing on the downstream side of the bridge at the south end.

Records available.—Nearly continuous records of daily gauge heights are available from July 4, 1912, to the end of 1914. Estimates of daily discharge have been made for the same period.

Drainage Area.—The drainage area of the Assiniboine river above Brandon is 34,000 square miles.

Gauge.—A 9-foot vertical staff gauge is nailed to the ice-breaker, 50 feet upstream from and opposite station 1+60 on the metering section.

Channel.—For 300 feet upstream and 150 feet downstream the channel is straight. It is divided at the section into three parts by the bridge piers. The bottom is of mud and liable to shift, especially at high stages. The banks are high, but are liable to overflow at high stages.

Discharge Measurements.—The meterings are made from the downstream side of the bridge. They cover a range in stage under open-water conditions of 12·5 feet.

Accuracy.—Between gauge heights 97·5 and 104·1 the discharge curve is well defined; between 104·1 and 110·0 it is fairly well defined; above and below these limits it is not well defined for open-water conditions. Between gauge heights 96·5 and 98·0 the discharge curve for winter conditions is fairly well defined.

Discharge Measurements of Assiniboine River at Brandon, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
July 4	G. H. Burnham	1187	232	986	2·74	101·44	2,701
" 6	"	1187	230	889	2·72	101·18	2,419
" 20	"	1187	231	870	2·72	100·96	2,367
" 22	"	1187	230	857	2·62	100·80	2,246
Aug. 10	W. G. Worden	1187	229	791	2·59	100·64	2,049
" 23	Alex. Pirie	1197	225	738	2·03	99·84	1,498
Oct. 5	W. G. Worden	1497	248	1,505	3·16	103·93	4,745
" 25	G. J. Lamb	1187	231	951	2·74	101·52	2,604
1913.							
Jan. 22	G. J. Lamb	1375	148	239	1·62	99·60	[1]387
Feb. 20	Alex. Pirie	1469	167	277	1·37	99·60	[1]380
April 17	E. Bankson	1469	262	2,100	3·77	106·19	7,578
May 6	"	1469	348	3,328	3·87	110·02	12,869
June 28	Alex. Pirie	1496	205	827	2·48	100·86	2,048
Aug. 9	W. J. Ireland	1469	243	1,517	2·93	103·34	4,442
Sept. 9	"	1469	214	757	2·44	100·42	1,833
Oct. 20	"	1469	183	506	1·74	99·12	880
1914.							
Jan. 9	E. J. Budge	1462	180	490	0·50	98·85	[1]246
" 30	W. J. Ireland	1497	170	485	0·40	99·15	[1]192
Mar. 13	C. O. Allen	1496	146	601	0·69	99·95	[1]416
April 21	M. S. Madden	1462	239	1,242	2·91	102·50	3,615
May 7	C. O. Allen	1497	239	1,528	3·16	103·81	4,829
June 3	"	1760	235	1,350	3·07	102·86	4,145
July 10	"	1760	176	476	1·86	98·89	885
Aug. 4	M. S. Madden	1760	203	322	1·38	98·32	446
" 24	Alex. Pirie	1940	156	268	1·02	97·61	275
Sept. 18	M. S. Madden	1911	164	222	0·83	97·55	185
Oct. 17	"	1912	196	219	0·87	97·66	190
Nov. 10	"	1912	199	276	0·98	97·81	271
Dec. 10	T. J. Moore	1920	207	346	0·53	98·10	[1]185

[1] Measurements taken under ice conditions.

Daily Gauge Height and Discharge of Assiniboine River at Brandon, for 1912.

Drainage area, 34,500 square miles.

Day.	July.		August.		September.		October.		November		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	100·68	2,042	99·86	1,462	104·23	5,298	101·11	2,368	[1]100·96	1,430
2	.....	.....	100·73	2,080	99·91	1,497	104·17	5,232	101·05	2,320	[1]100·96	1,410
3	.....	.....	100·72	2,073	99·95	1,525	104·12	5,177	100·97	2,260	[1]100·96	1,390
4	101·30	2,520	100·64	2,012	99·92	1,504	104·00	5,045	100·90	2,208	[1]100·96	1,380
5	101·20	2,440	100·70	2,058	99·94	1,518	103·91	4,946	100·86	2,178	[1]100·96	1,369
6	101·13	2,384	100·73	2,080	99·97	1,539	103·84	4,869	100·83	2,155	[1]100·97	1,340
7	100·66	2,028	100·65	2,020	100·13	1,651	103·60	4,610	100·80	2,133	[1]100·97	1,320
8	100·74	2,088	100·56	1,953	100·42	1,854	103·47	4,480	100·77	2,110	[1]100·97	1,310
9	100·36	1,812	100·65	2,020	100·60	1,983	103·33	4,340	100·73	2,080	[1]100·97	1,299
10	100·41	1,847	100·63	2,005	100·86	2,178	103·15	4,160	100·70	2,058	[1]100·97	1,270
11	100·48	1,896	100·56	1,953	101·05	2,320	102·98	3,999	100·67	2,035	[1]100·98	1,250
12	100·54	1,938	100·56	1,953	101·37	2,576	102·78	3,809	100·65	2,020	[1]100·98	1,240
13	100·52	1,924	100·56	1,953	101·58	2,751	102·60	3,645	100·61	1,990	[1]100·98	1,220
14	100·46	1,882	100·44	1,868	102·25	3,330	102·45	3,510	100·57	1,960	[1]100·88	1,210
15	100·57	1,960	100·18	1,686	102·38	3,447	102·32	3,393	100·54	1,938	[1]100·78	1,170
16	100·68	2,042	100·21	1,728	102·43	3,492	102·20	3,285	100·52	1,924	[1]100·68	1,080
17	100·87	2,185	100·07	1,609	102·45	3,510	102·08	3,177	100·05	1,595	[1]100·58	1,020
18	101·05	2,320	99·96	1,532	102·43	3,492	102·00	3,108	100·05	1,595	[1]100·48	976
19	100·78	2,118	99·95	1,525	102·44	3,501	101·92	3,040	100·05	1,595	[1]100·38	928
20	100·78	2,118	99·98	1,546	102·44	3,501	101·83	2,963	100·04	1,588	[1]100·28	880
21	100·85	2,170	99·88	1,476	102·62	3,663	101·75	2,895	100·04	1,588	[1]100·18	830
22	100·79	2,125	99·80	1,423	103·11	4,122	101·63	2,793	99·94	1,497	[1]100·03	765
23	100·69	2,050	99·75	1,393	103·16	4,170	101·57	2,742	99·79	1,416	[1]99·98	730
24	100·60	1,983	99·70	1,358	103·24	4,250	101·51	2,708	99·79	1,416	[1]99·93	706
25	100·55	1,945	99·88	1,476	103·33	4,340	101·52	2,700	100·25	1,715	[1]99·88	670
26	100·36	1,812	99·68	1,345	103·36	4,370	101·45	2,640	101·36	1,800	[1]99·83	647
27	100·55	1,945	99·65	1,324	103·50	4,550	101·38	2,584	100·95	1,500	[1]99·78	617
28	100·46	1,882	99·55	1,260	103·65	4,660	101·33	2,544	[1]100·95	1,480	[1]99·73	588
29	100·67	2,035	99·85	1,455	103·92	4,957	101·27	2,496	[1]100·95	1,470	[1]99·68	558
30	100·66	2,028	99·78	1,280	104·09	5,144	101·22	2,456	[1]100·95	1,450	99·64	532
31	100·64	2,012	99·82	1,306			101·17	2,416			[1]99·55	488

NOTE—All marked thus (1) interpolated. Ice conditions, November 27 to end of year.

Daily Gauge Height and Discharge of Assiniboine River at Brandon, for 1913.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			[1]99·50	220	[1]99·62	380			111·47	14,887	104·30	5,378
2			[1]99·52	227	[1]99·62	380			111·47	14,887	104·22	5,287
3			[1]99·54	234	[1]99·63	385			[1]111·11	14,400	104·05	5,100
4			[1]99·56	244	[1]99·63	385			[1]110·75	13,910	103·88	4,913
5			99·58	251	99·63	385			[1]110·39	13,400	103·74	4,759
6			[1]99·58	251					110·02	12,929	103·65	4,660
7			[1]99·58	251					[1]109·85	12,700	103·45	4,460
8			[1]99·58	251					[1]109·68	12,500	103·37	4,380
9			[1]99·56	248					[1]109·51	12,200	103·31	4,320
10			[1]99·56	248					[1]109·34	12,000	103·24	4,250
11			[1]99·56	248			103·53	4,540	[1]109·17	11,800	103·17	4,180
12			[1]99·56	248			104·09	5,144	[1]109·00	11,400	103·03	4,046
13			99·56	248			104·39	5,481	[1]108·83	11,300	102·61	3,654
14			[1]99·57	252			106·26	7,854	[1]108·66	11,100	102·45	3,510
15			[1]99·57	252			106·24	7,826	[1]108·49	10,900	102·37	3,438
16			[1]99·58	255			106·33	7,948	[1]108·32	10,600	102·25	3,330
17			[1]99·58	255			106·17	7,732	[1]108·15	10,400	102·10	3,195
18			[1]99·59	259			106·15	7,705	[1]107·98	10,200	101·98	3,099
19			[1]99·59	259			106·13	7,678	[1]107·81	9,950	101·87	2,997
20			99·60	262			106·13	7,678	107·59	9,649	101·49	2,674
21			[1]99·60	299			106·21	7,786	106·42	8,069	101·44	2,632
22	99·60	387	[1]99·60	299			106·26	7,854	106·26	7,854	101·35	2,569
23			[1]99·60	336			106·31	7,921	106·04	7,556	101·27	2,496
24			[1]99·61	336			106·48	8,150	105·77	7,192	101·19	2,432
25			[1]99·61	340			106·51	8,191	105·58	6,935	101·05	2,329
26			[1]99·61	360			106·64	8,366	105·43	6,745	100·95	2,245
27	99·40		99·61	373			[1]107·60	9,550	105·28	6,557	100·87	2,185
28			[1]99·67	380			[1]108·56	11,000	104·86	6,032	100·86	2,178
29							[1]109·52	12,300	104·66	5,792	100·87	2,185
30							[1]110·48	13,600	104·44	5,538	100·89	2,200
31									104·47	5,573		

	July.		August.		September.		October.	
1	100·85	2,170	103·60	4,610	101·08	2,344	99·27	1,078
2	100·76	2,103	103·55	4,560	100·95	2,245	99·23	1,052
3	100·78	2,117	103·51	4,520	100·87	2,185	99·20	1,032
4	100·92	2,222	103·50	4,510	100·82	2,147	99·15	1,000
5	101·10	2,360	103·50	4,510	100·45	1,875	99·17	1,013
6	101·30	2,520	103·49	4,500	100·67	2,035	99·32	1,110
7	101·36	2,568	103·48	4,490	100·73	2,080	99·25	1,065
8	101·75	2,895	103·45	4,460	100·56	1,953	99·05	940
9	101·95	3,065	103·38	4,390	100·43	1,861	99·05	940
10	101·47	3,528	103·28	4,290	100·36	1,812	99·11	976
11	102·61	3,654	103·20	4,210	100·45	1,875	99·23	1,052
12	103·01	4,027	103·22	4,230	100·41	1,847	99·19	1,026
13	103·15	4,160	103·20	4,210	100·36	1,812	99·17	1,013
14	103·31	4,320	103·15	4,160	100·21	1,707	99·17	1,013
15	103·45	4,460	103·07	4,084	100·07	1,609	99·15	1,000
16	103·66	4,671	102·93	3,951	99·94	1,518	99·13	988
17	103·75	4,770	102·80	3,827	99·89	1,483	[1]99·13	988
18	103·98	5,023	102·73	3,762	99·82	1,435	[1]99·14	994
19	104·10	5,155	102·27	3,348	99·77	1,403	[1]99·15	1,000
20	104·15	5,210	101·54	2,716	99·70	1,357	99·15	1,000
21	104·20	5,265	101·41	2,608	99·64	1,318	99·14	994
22	104·25	5,320	101·46	2,649	99·50	1,227	99·15	1,000
23	104·23	5,298	101·35	2,560	99·41	1,169	99·25	1,065
24	104·18	5,243	101·27	2,496	99·40	1,162	99·30	1,097
25	104·15	5,120	101·43	2,624	99·39	1,156	99·26	1,072
26	104·10	5,155	101·53	2,708	99·39	1,156		
27	104·07	5,122	101·30	2,520	99·38	1,149		
28	103·95	4,990	101·25	2,480	99·38	1,149		
29	103·83	4,858	101·27	2,496	99·38	1,149		
30	103·75	4,770	101·21	2,448	99·35	1,130		
31	103·67	4,682	101·15	2,400				

Note.—All marked thus (1) interpolated. Data not sufficient to compute daily discharge from March 6 to April 11. Ice conditions January 1 to April 10 and November 10 to end of year.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Assiniboine River at Brandon, for 1914.

Drainage area, 34,500 square miles.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									103·46	4,470	103·19	4,200
2									103·40	4,410	102·99	4,008
3									103·32	4,330	102·87	3,894
4									103·31	4,320	102·67	3,708
5									103·50	4,510	102·49	3,546
6									103·68	4,693	102·24	3,321
7							100·27		103·86	4,891	102·19	3,276
8							100·27		104·10	5,155	101·99	3,099
9	98·85	246					100·37		104·31	5,389	101·94	3,056
10							100·37		104·49	5,596	101·77	2,912
11							100·27		104·53	5,642	101·59	2,759
12							100·27		104·55	5,665	101·45	2,640
13					99·95	416	100·27		104·59	5,711	101·29	2,512
14							100·27		104·67	5,803	101·13	2,384
15									104·63	5,757	101·05	2,320
16									104·50	5,607	100·90	2,208
17							101·17	2,416	104·58	5,700	100·82	2,148
18							101·79	2,929	104·60	5,722	100·67	2,035
19							102·05	3,150	104·60	5,722	100·58	1,968
20							102·19	3,276	104·60	5,722	100·47	1,889
21							102·34	3,411	104·62	5,745	100·31	1,777
22							102·56	3,609	104·67	5,803	100·12	1,644
23							103·07	4,084	104·65	5,780	99·98	1,546
24							103·26	4,270	104·67	5,803	99·80	1,423
25							103·36	4,370	104·65	5,780	99·91	1,497
26							103·41	4,420	104·63	5,757	99·85	1,455
27							103·45	4,460	104·49	5,596	99·43	1,182
28							103·49	4,500	104·34	5,423	99·65	1,325
29							103·52	4,530	104·05	5,100	99·65	1,325
30	99·15	192					103·54	4,550	103·82	5,847	99·20	1,033
31									103·39	4,400		

	July.		August.		September.		October.		November.		December.	
1	99·15	1,000	98·10	405	97·57	182	97·48	154	97·91	317	98·06	215
2	99·11	976	98·07	390	97·57	182	97·46	148	97·87	299	98·06	215
3	99·03	928	98·16	435	97·55	175	97·51	172	97·97	344	98·06	215
4	99·36	1,137	98·34	529	97·54	172	97·57	182	97·86	295	98·06	215
5	99·36	1,137	98·10	405	97·53	169	97·76	254	97·80	270	98·08	215
6	99·15	1,000	97·96	349	97·69	226	97·53	169	97·67	218	98·08	191
7	99·03	928	97·90	313	97·59	189	97·54	172	97·73	242	98·09	191
8	98·99	904	97·89	308	97·53	169	97·54	172	97·85	290	98·09	191
9	98·95	880	98·02	367	97·55	175	97·54	172	97·96	349	98·09	191
10	98·92	862	97·85	299	97·57	182	97·76	254	97·80	270	98·09	191
11	98·86	826	97·77	258	97·54	172	97·75	250	97·76	254	98·09	191
12	99·05	940	97·82	278	97·54	172	97·75	250	97·86	295	98·10	196
13	98·92	862	97·75	250	97·58	186	97·70	230	97·86	295	98·10	170
14	98·85	820	97·71	234	97·63	203	97·68	222	97·86	295	98·11	173
15	98·85	820	97·67	218	97·59	186	97·61	206			98·12	175
16	98·79	784	97·87	299	97·55	175	97·64	206			98·12	175
17	98·81	796	97·75	250	97·55	175	97·78	262			98·12	175
18	98·85	820	97·61	206	97·60	192	97·84	286			98·11	173
19	98·77	772	97·63	203	97·61	196	97·82	278			98·13	178
20	98·54	639	97·63	203	97·73	242	97·76	254			98·13	178
21	98·50	618	97·67	218	97·66	214	97·76	254			98·16	173
22	98·45	590	97·71	234	97·64	206	97·81	274			98·16	161
23	98·41	568	97·69	226	97·61	196	97·79	266			98·16	161
24	98·37	546	97·64	206	97·58	186	97·79	266			98·16	161
25	98·42	574	97·64	206	97·58	186	97·94	330			98·16	161
26	98·50	618	97·64	206	97·56	179	97·94	330			98·16	161
27	98·37	546	97·64	206	97·66	214	97·82	278			98·15	139
28	98·64	689	97·69	226	97·64	206	97·74	246			98·15	121
29	98·32	519	97·85	290	97·56	179	97·73	242			98·15	112
30	98·24	475	97·77	258	97·54	172	97·74	246			98·15	106
31	98·16	435	97·72	238			97·74	246			98·15	106

Note—Ice conditions January 1 to April 17; data not sufficient to compute daily discharge. Ice conditions November 15 to end of year; data not sufficient to compute daily discharge for November.

Monthly Discharge of Assiniboine River at Brandon, for the Year 1912.

Drainage area, 34,500 square miles.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
July			[1]2,050	0·059	0·068	126,100
August	2,080	1,260	1,700	0·049	0·056	104,500
September	5,150	1,470	3,100	0·090	0·100	184,500
October	5,300	2,420	3,580	0·104	0·120	220,100
November	2,370	1,450	1,840	0·053	0·059	109,500
December	1,430	488	1,020	0·030	0·035	62,700
The period	5,300	488	2,220	0·064	0·438	807,400
1913.						
January			[1]400	0·012	0·014	24,600
February	380	220	274	0·008	0·008	15,200
March			[1]250	0·007	0·008	15,400
April			[1]5,100	0·148	0·165	303,500
May	14,900	5,500	10,200	0·296	0·341	627,200
June	5,400	2,170	3,500	0·101	0·113	208,000
July	5,300	2,100	4,100	0·119	0·137	252,100
August	4,600	2,400	3,600	0·104	0·120	221,400
September	2,340	1,130	1,610	0·047	0·052	95,800
October			[1]1,030	0·030	0·035	63,300
The period	14,900	220	3,010	0·087	0·993	1,826,500
1914.						
January			[1]200	0·006	0·007	12,300
February						
March			[1]400	0·012	0·014	24,600
April			[1]3,000	0·087	0·097	178,500
May	5,850	4,320	5,350	0·155	0·179	329,000
June	4,200	1,030	2,400	0·070	0·078	142,800
July	1,140	435	774	0·022	0·025	47,600
August	529	203	280	0·008	0·009	17,200
September	242	169	189	0·005	0·006	11,200
October	330	148	235	0·007	0·008	14,500
November			[1]250	0·007	0·008	14,900
December	215	106	173	0·005	0·006	10,600
The period	5,850	106	1,200	0·035	0·437	803,200

Note—Marked thus [1] estimated. Data not sufficient to estimate discharge for November and December, 1913, and February, 1914.

Assiniboine River at Headingly.

History.—The metering station was established on April 9, 1913, by S. S. Scovil, and has been operated since that date.

Location of Section.—The meter section is located on the downstream side of the Canadian Northern Railway bridge which crosses the Assiniboine river a quarter of a mile from the Canadian Northern Railway Headingly station.

The initial point is marked on the flooring at the north end of the bridge on the downstream side, and is painted white, "Init. Pt. 0+00."

Records available.—Gauge height records are available from April 17 to November 23, 1913, and for the year 1914. Estimates of daily discharge have been prepared from April 17 to November 23, 1913, June 1 to March 1, 1914, and from April 22 to the end of 1914, except for part of November.

Drainage Area.—The area drained by the Assiniboine river above Headingly is 59,420 square miles.

Gauge.—A 9-foot vertical staff gauge is fastened to the north abutment of the bridge, and is read in summer. A winter gauge, 3-foot staff, is fastened to the ice-breaker for winter readings. Both are referred to the same arbitrary datum.

Channel.—The channel is straight both above and below the section for a considerable distance. The stream is divided into four channels by the three central piers of the bridge. The bottom of the stream is of gravel and mud, and not liable to shift. The right bank is low and wooded and liable to overflow at high stages. The left bank is high and not liable to overflow.

Discharge Measurements.—The meterings have been made from the downstream side of the bridge in the open-water season, and at a point about 200 feet downstream and from ice under winter conditions.

Accuracy.—Between gauge heights 75·5 and 80·9 the discharge curve is well defined. Under ice conditions, between gauge heights 73·8 and 76·1, the discharge curve is fairly well defined.

Discharge Measurements of Assiniboine River at Headingly, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
April 16	G. H. Burnham	1,497	317	2,543	3·02	81·73	7,673
" 22	E. Bankson	1,469	366	2,719	3·40	82·58	9,258
May 2	E. Bankson	1,469	366	2,888	3·58	82·94	10,337
" 7	G. Ebner	1,187	395	3,516	3·83	84·52	13,464
" 12	"	1,186	372	3,526	3·86	84·69	13,610
" 19	"	1,186	376	3,118	3·35	83·61	10,445
June 23	"	1,186	260	1,587	2·20	79·01	3,491
July 19	Alex. Pirie	1,496	360	1,835	2·36	79·77	4,334
Aug. 5	W. J. Ireland	1,469	302	1,977	2·41	79·90	4,759
" 14	W. J. Ireland	1,469	301	1,952	2·44	79·71	4,526
" 18	G. Ebner	1,196	261	1,871	2·32	79·77	4,276
Sept. 16	C. O. Allen	1,435	248	1,194	1·64	77·68	1,959
" 27	E. J. Budge	1,186	235	1,079	1·44	77·18	1,551
Oct. 13	Ireland and Edmondson	1,469	238	1,007	1·19	76·83	1,201
" 28	C. O. Allen	1,435	222	947	1·04	76·33	986
Nov. 25	"	1,375	222	892	0·77	76·48	[1]687
Dec. 23	"	1,375	340	705	0·66	76·42	[1]465
1914.							
Jan. 22	E. J. Budge	1,462	282	907	0·34	76·62	[1]314
Feb. 7	C. O. Allen	1,467	285	870	0·36	76·92	[1]314
" 27	W. J. Ireland	1,462	287	843	0·38	77·10	[1]324
April 3	E. B. Patterson	1,462	312	1,363	0·78	77·24	[1]1,069
" 18	D. B. Gow	1,375	361	1,535	1·38	78·38	2,118
" 23	A. Pirie	1,197	362	1,870	2·53	79·98	4 723
May 5	C. O. Allen	1,497	310	2,056	2·81	80·49	5,784
" 23	J. A. Page	1,861	320	2,203	2·83	80·83	6,234
" 25	"	1,861	313	2,117	2·91	80·89	6 161
June 1	"	1,861	323	2,123	2·78	80·64	5,902
July 21	C. O Allen	1,435	223	966	1·34	76·65	1,294
" 23	M. S. Madden	1,760	338	885	1·09	76 39	967
Aug. 4	W. J. Ireland	1,919	204	821	1·05	76·21	862
" 17	M. S. Madden	1,760	335	749	0·83	75·75	625
Sept. 29	"	1,911	334	727	0·60	75·49	436
Dec. 16	"	1,649	283	780	0·26	75·38	[1]202

[1]Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Assiniboine River at Headingly, for 1913.

[Drainage area, 59,420 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									82·88	9,900	81·23	6,842
2									83·38	10,910	81·16	6,720
3									83·08	10,300	81·00	6,440
4									83·28	10,705	80·90	6,265
5									83·78	11,740	80·79	6,072
6									84·25	12,735	80·78	6,055
7									84·75	13,824	80·68	5,880
8									84·85	14,044	80·58	5,710
9									84·77	13,868	80·48	5,545
10									84·80	13,934	80·38	5,380
11									84·85	14,044	80·28	5,220
12									84·79	13,912	80·18	5,060
13									84·69	13,692	80·00	4,781
14									84·55	13,384	79·98	4,750
15									84·25	12,735	79·88	4,600
16									84·05	12,307	79·78	4,455
17							81·38	7,105	83·90	11,992	79·68	4,310
18							82·38	8,935	83·84	11,866	79·48	4,025
19							82·48	9,125	83·69	11,551	79·38	3,885
20							82·68	9,510	83·56	11,279	79·28	3,745
21							82·63	9,413	83·38	10,910	79·18	3,610
22							82·58	9,315	83·20	10,540	79·08	3,475
23							82·58	9,315	83·07	10,280	78·98	3,345
24							82·58	9,315	82·88	9,900	78·88	3,220
25							82·63	9,413	82·68	9,510	78·78	3,100
26							82·68	9,510	82·48	9,125	78·78	3,100
27							82·73	9,608	82·18	8,555	78·68	2,985
28							82·71	9,569	81·98	8,185	78·68	2,985
29							83·28	10,705	81·78	7,820	78·53	2,815
30							82·88	9,900	81·58	7,460	78·56	2,848
31									81·38	7,105		

	July.		August.		September.		October.		November.		December.	
1	78·78	3,100	80·18	5,060	78·38	2,650	76·96	1,380	76·08	780		
2	78·58	2,870	80·10	4,936	78·43	2,705	76·86	1,305	76·18	840		
3	78·33	2,597	80·06	4,864	78·33	2,597	76·84	1,290	76·38	970		
4	78·26	2,524	79·99	4,765	78·28	2,545	76·86	1,305	77·08	1,470		
5	78·18	2,440	79·92	4,660	78·28	2,545	76·86	1,305	76·48	1,035		
6	78·18	2,440	79·88	4,600	78·25	2,513	76·76	1,231	76·73	1,210		
7	78·16	2,420	79·85	4,556	78·18	2,440	76·66	1,161	76·98	1,395		
8	78·09	2,350	79·85	4,556	78·08	2,340	76·56	1,091	77·18	1,550		
9	78·08	2,340	79·78	4,455	77·98	2,240	76·64	1,147	77·20	1,566		
10	78·18	2,440	79·77	4,441	78·18	2,440	76·76	1,231	[1]77·10	1,470		
11	78·38	2,650	79·79	4,469	78·18	2,440	76·78	1,245	[1]77·00	1,320		
12	78·58	2,870	79·83	4,527	77·96	2,221	76·88	1,320	[1]77·80	1,180		
13	78·68	2,985	79·78	4,455	77·88	2,145	76·84	1,290	[1]77·70	1,110		
14	78·88	3,220	79·72	4,368	77·88	2,145	76·76	1,231	[1]77·60	1,049		
15	79·18	3,610	79·88	4,600	77·78	2,055	76·70	1,189	[1]77·50	970		
16	79·37	3,871	79·88	4,600	77·68	1,965	76·64	1,147	76·41	910		
17	79·46	3,997	79·88	4,600	77·63	1,923	76·64	1,147	[1]76·39	900		
18	79·68	4,310	79·78	4,455	77·58	1,880	76·61	1,126	[1]76·37	895		
19	79·73	4,382	79·58	4,165	77·48	1,795	76·66	1,161	[1]76·35	885		
20	79·78	4,455	79·48	4,025	77·38	1,710	76·74	1,217	[1]76·33	870		
21	80·38	5,380	79·28	3,745	77·33	1,670	76·75	1,224	[1]77·31	830		
22	80·00	4,781	79·08	3,475	77·28	1,630	76·66	1,161	77·29	800		
23	80·10	4,936	78·88	3,220	77·26	1,614	76·58	1,105	77·28	780	76·42	465
24	80·19	5,076	78·83	3,160	77·26	1,614	76·61	1,126				
25	80·28	5,220	78·73	3,042	77·26	1,614	76·75	1,224				
26	80·28	5,220	78·53	2,815	77·18	1,550	76·66	1,161				
27	80·28	5,220	78·38	2,650	77·06	1,455	76·66	1,161				
28	80·27	5,204	78·36	2,629	77·06	1,455	76·44	1,009				
29	80·28	5,220	78·38	2,650	76·96	1,380	76·36	957				
30	80·28	5,220	78·45	2,727	76·96	1,380	76·26	892				
31	80·20	5,092	78·48	2,769			76·16	828				

Notes.—Ice conditions from January 1 to April 16; data not sufficient to compute daily discharges. All gauge heights marked thus [1] interpolated. Ice conditions from November 12 to December 31; Data not sufficient to compute daily discharges from November 21 to December 31.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Assiniboine River at Headingly, for 1914.

[Drainage Area, 59,420 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge
	Feet	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1	[1]76·50	420	[1]76·83	312	.....	.....	.....	.....	80·73	5,967	80·68	5,880
2	[1]76·50	420	76·86	312	77·12	..	77·32	..	80·68	5,880	80·48	5,545
3	[1]76·51	415	[1]76·88	312	.....	..	77·23	1,069	80·58	5,710	80·38	5,380
4	[1]76·52	415	[1]76·89	313	.....	..	77·21	..	80·57	5,694	80·18	5,060
5	[1]76·53	410	[1]76·90	313	.....	..	77·21	..	80·48	5,545	79·98	4,750
6	[1]76·53	405	[1]76·91	314	.....	..	77·21	..	80·48	5,545	79·86	4,570
7	[1]76·53	405	76·92	314	.....	..	77·20	..	80·48	5,545	79·73	4,383
8	[1]76·53	400	[1]76·92	316	.....	..	77·12	..	80·58	5,710	79·63	4,325
9	[1]76·53	390	76·92	318	77·14	..	77·12	..	80·66	5,847	79·54	4,169
10	[1]76·52	380	[1]76·95	320	.....	..	77·13	..	80·67	5,863	79·43	3,955
11	[1]76·52	375	[1]76·94	315	.....	..	77·13	..	80·69	5,897	79·29	3,759
12	76·52	370	[1]76·95	316	.....	..	77·13	..	80·89	6,090	79·18	3,610
13	[1]76·52	360	[1]76·96	317	.....	..	77·23	..	80·89	6,247	79·06	3,449
14	[1]76·52	350	[1]76·97	318	.....	..	77·37	..	80·98	6,405	78·98	3,345
15	[1]76·53	345	[1]76·98	319	.....	..	77·73	..	80·98	6,405	78·88	3,220
16	[1]76·54	343	77·00	320	77·22	..	77·92	..	81·00	6,440	78·76	3,077
17	[1]76·55	340	[1]77·00	320	.....	..	78·02	..	81·00	6,440	78·65	2,950
18	76·56	333	[1]77·00	320	.....	..	78·22	..	81·03	6,492	78·50	2,782
19	[1]76·57	330	[1]77·00	320	.....	..	79·74	..	81·06	6,545	78·39	2,661
20	76·59	325	[1]77·01	320	.....	..	80·22	..	80·98	6,405	78·35	2,618
21	[1]76·61	320	[1]77·01	321	.....	..	80·47	..	80·98	6,405	78·23	2,492
22	76·62	315	[1]77·01	321	.....	..	81·92	..	80·98	6,405	78·13	2,390
23	[1]76·64	316	77·02	321	77·92	..	79·88	4,630	80·96	6,370	78·07	2,330
24	[1]76·65	316	[1]77·04	322	.....	..	80·13	4,980	80·89	6,247	77·98	2,240
25	[1]76·67	310	[1]77·06	323	.....	..	80·08	4,935	80·89	6,247	77·88	2,145
26	76·69	305	[1]77·08	323	.....	..	80·15	5,013	80·88	6,230	77·38	1,710
27	[1]76·71	307	77·10	324	.....	..	80·29	5,236	80·88	6,230	77·08	1,470
28	[1]76·75	308	[1]77·10	324	.....	..	80·48	5,545	80·78	6,055	77·28	1,630
29	[1]76·77	310	.....	.....	.....	..	80·56	5,677	80·88	6,230	77·38	1,710
30	[1]76·79	310	.....	.....	78·73	..	80·58	5,710	80·88	6,230	77·46	1,778
31	[1]76·81	311	.....	.....	.....	.....	.....	.....	80·78	6,055	.....	.....

	July.		August.		September.		October		November		December.	
1	77·49	1,727	75·97	714	75·48	440	75·39	395	75·47	434	75·73	214
2	77·33	1,670	76·08	780	75·48	440	75·38	390	75·53	467	75·82	231
3	77·18	1,550	76·12	804	75·49	446	75·36	380	75·51	456	75·84	234
4	77·28	1,630	76·18	810	75·47	434	75·28	340	75·48	440	75·92	240
5	77·18	1,550	76·08	780	75·47	434	75·34	370	75·47	435	75·97	250
6	77·03	1,432	75·97	714	75·50	451	75·43	415	75·45	425	76·02	259
7	76·93	1,358	75·87	654	75·58	495	75·36	380	75·43	415	76·00	263
8	76·88	1,320	75·77	600	75·48	440	75·30	350	75·43	415	75·97	269
9	76·86	1,305	75·77	600	75·47	434	75·33	365	75·48	440	75·97	275
10	76·93	1,358	75·87	654	75·48	440	75·29	345	75·50	451	75·97	269
11	76·96	1,380	75·87	654	75·48	440	75·38	390	75·48	440	75·94	244
12	77·23	1,590	75·82	627	75·56	484	75·46	430	75·27	335	75·92	240
13	77·23	1,590	75·67	545	75·48	440	75·56	484	75·32	360	75·92	231
14	76·98	1,395	75·64	528	75·50	451	75·48	440	75·18	310	75·91	220
15	76·87	1,312	75·61	511	75·48	440	75·47	434	75·28	323	75·82	213
16	76·78	1,245	75·66	539	75·43	415	75·43	415	75·18		75·81	193
17	76·68	1,175	75·77	600	75·38	390	75·45	425	75·08		75·73	178
18	76·68	1,175	75·70	561	75·38	390	75·43	415			75·68	178
19	76·73	1,210	75·69	556	75·38	390	75·49	446	75·22		75·58	161
20	76·67	1,168	75·58	495	75·37	385	75·51	456			75·58	161
21	76·68	1,161	75·52	462	75·38	390	75·46	440			75·58	161
22	76·58	1,105	75·48	440	75·43	415	75·40	400			75·58	155
23	76·39	970	75·48	440	75·38	390	75·37	385			75·58	140
24	76·36	957	75·55	478	75·38	390	75·38	390	75·52		75·67	150
25	76·38	970	75·50	451	75·51	456	75·38	390	75·52		75·67	150
26	76·35	950	75·48	440	75·49	446	75·47	434	75·57		75·70	154
27	76·28	905	75·48	440	75·49	446	75·48	440	75·52		75·76	142
28	76·29	853	75·48	440	75·51	456	75·47	434	75·67		75·73	167
29	76·15	822	75·48	440	75·48	440	75·47	434	75·67		75·68	160
30	76·10	792	75·48	440	75·48	440	75·47	434	75·70		75·63	148
31	76·05	762	75·50	484			75·47	434			75·58	88

Note.—All gauge heights marked thus [1] interpolated. Ice conditions from January 1 to April 22; data not sufficient to compute daily discharges from March 1 to April 22. Ice conditions from November 14 to December 31; data not sufficient to compute daily discharges from November 16 to November 30.

MONTHLY DISCHARGE of Assiniboine River at Headingly, for the year 1913.

[Drainage Area, 59,420 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1913.						
January			500[1]	0·008	0·009	30,700
February			400[1]	0·007	0·007	22,200
March			400[1]	0·007	0·008	24,600
April			5,190[1]	0·090	0·100	308,800
May	14,000	7,100	11,200	0·189	0·218	688,700
June	6,850	2,800	4,575	0·077	0·086	272,200
July	5,400	2,340	3,825	0·064	0·074	235,200
August	5,050	2,625	4,000	0·067	0·077	246,000
September	2,700	1,380	2,020	0·034	0·038	120,200
October	1,380	828	1,170	0·019	0·022	71,900
November			800[1]	0·013	0·014	47,600
December			500[1]	0·008	0·009	30,700
The year	14,000	400	2,875	0·048	0·662	2,098,800
1914.						
January	420	305	354	0·006	0·007	21,800
February	324	212	318	0·005	0·005	17,700
March			325[1]	0·005	0·006	20,000
April			3,400[1]	0·057	0·064	202,300
May	6,550	5,550	6,100	0·103	0·119	375,100
June	5,900	1,470	3,300	0·056	0·063	196,400
July	1,730	762	1,240	0·021	0·024	76,200
August	840	440	571	0·009	0·011	35,100
September	495	385	432	0·007	0·008	25,700
October	484	340	409	0·007	0·008	25,100
November			300[1]	0·005	0·006	17,900
December	275	88	195	0·003	0·003	12,000
The year	6,550	88	1,410	0·024	0·324	1,025,300

NOTE.—All marked thus (1) estimated.

ASSINIBOINE RIVER AT ST. JAMES.

History.—The station was established by D. L. McLean on May 13, 1912. It was abandoned August 8, 1913, in favour of the station at Headingly.

Location of Section.—The meter section was located on the downstream side of the Canadian Pacific Railway foot-bridge across the Assiniboine, which is about 120 feet south of the Portage Avenue subway at the western city limits. The initial point is located on the north end of the hand-rail on the downstream side of the bridge.

Records available.—A record of daily gauge heights was obtained for the period May 14, 1912, to August 8, 1913, except during the winter season, when the readings were made twice a week. Estimates of daily discharge have been made for the period May 14 to October 31, 1912, and April 17 to August 8, 1913.

Drainage Area.—The area drained by the Assiniboine above the St. James station is 59,550 square miles.

Gauge.—A chain gauge was installed at this station. It was located on the lower chord of the bridge on the upstream side opposite station 2+60 on the metering section. The zero of the gauge was referred to a bench-mark of arbitrary datum, located on the southeast corner of the abutment at the north end of the bridge, and marked in white paint "B.M."

Channel.—The channel is divided into three sections at low water and four at high, by the bridge piers. The channel is straight for 300 feet above and

400 feet below the section. The bed is of gravel and is permanent. The banks are high and not liable to overflow.

Discharge Measurements.—The meterings were made from the downstream side of the bridge by means of a small Price meter.

Accuracy.—Between gauge heights 64·80 and 70·70 the discharge curve is fairly well defined.

DISCHARGE MEASUREMENTS of Assiniboine River at C.P.R. Bridge, St. James, Winnipeg, 1912–13.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 14	S. S. Scovil	1186	291	1,227	4·78	67·46	5,864
" 25	G. H. Burnham	1187	356	1,160	4·81	68·04	7,021
June 11	"	1187	357	1,608	4·87	68·61	7,832
" 24	"	1187	293	1,118	4·33	66·93	4,841
July 1	"	1187	291	1,087	4·07	66·60	4,425
" 8	"	1187	285	911	3·63	65·91	3,308
" 23	"	1187	285	863	3·08	65·42	2,659
Aug. 3	W. G. Worden	1187	285	799	2·78	65·16	2,221
" 27	"	1187	280	728	2·63	64·88	1,914
Sept. 24	A. Pirie	1187	290	1,102	4·04	66·46	4,450
Oct. 8	R. H. Nelson	1187	295	1,429	4·31	67·44	6,161
" 30	"	1197	285	916	3·35	65·58	3,063
Dec. 28	H. M. Nelson	1197	285	779	1·35	66·34	[1]1,052
1913.							
Jan. 17	A. Pirie	1469	263	399	1·31	65·34	[1]522
May 7	G. H. Burnham	1197	197	317	1·38	65·64	[1]437
" 3	E. Bankson	1469	360	2,242	4·49	70·68	10,056

[1] Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Assiniboine River at C.P.R. Bridge, St. James, Winnipeg, for 1912.

Drainage area, 59,550 square miles.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1											[1] 68·86	8,300
2											68·81	8,200
3											68·91	8,400
4											68·97	8,500
5											69·01	8,600
6											68·91	8,400
7											68·91	8,400
8											68·71	8,100
9											68·75	8,100
10											68·71	8,100
11											68·61	7,900
12											68·51	7,700
13											68·33	7,400
14									67·46	5,900	68·13	7,100
15									67·63	6,200	67·91	6,700
16									67·61	6,200	67·75	6,400
17									67·81	6,500	67·51	6,000
18										6,600	67·37	5,800
19									67·91	6,700	67·26	5,600
20									67·91	6,700	67·11	5,350
21									67·95	6,800	67·13	5,400
22									68·01	6,900	67·13	5,400
23									68·05	6,900	66·97	5,100
24									68·07	7,000	66·95	5,100
25									68·04	6,900	66·97	5,100
26									68·21	7,200	66·95	5,100
27									68·41	7,600	66·91	5,000
28									68·41	7,600	66·81	4,850
29									68·61	7,900	66·75	4,750
30									68·81	8,200	66·65	4,600
31									68·91	8,400		

	July.		August.		September.		October.		November.		December.	
1	66·60	4,500	65·23	2,390	64·77	1,750	67·01	5,200			67·17	
2	[1]66·49	4,350	65·23	2,390	64·67	1,620	67·15	5,400				
3	66·41	4,200	65·13	2,250	64·61	1,540	67·27	5,600	65·85			
4	66·27	4,000	65·15	2,280	[1] 64·67	1,620	67·39	5,800				
5	66·37	4,150	65·09	2,190	64·73	1,700	67·55	6,100				
6	66·23	3,950	65·25	2,420	64·63	1,560	67·61	6,200				
7	[1] 65·96	3,500	65·19	2,330	64·75	1,720	67·51	6,000				
8	65·66	3,000	65·17	2,300	64·93	1,970	[1] 67·51	6,000				
9	[1] 65·64	3,000	65·19	2,330	64·85	1,860	67·45	5,900				
10	65·58	2,900	65·21	2,360	64·79	1,780	[1] 67·27	5,600	66·31			
11	[1] 65·51	2,800	65·21	2,360	[1] 64·85	1,860	67·01	5,200				
12	[1] 65·44	2,700	65·19	2,330	64·91	1,940	66·99	5,100				
13	[1] 65·38	2,600	65·15	2,280	65·27	2,450	66·97	5,100				
14	[1] 65·31	2,500	65·17	2,300	65·47	2,740	66·79	4,850				
15	65·24	2,400	65·19	2,330	[1] 65·64	3,000	66·70	4,700			67·55	
16	[1] 65·17	2,300	65·15	2,280	65·81	3,250	66·61	4,550				
17	[1] 65·10	2,200	65·13	2,250	66·01	3,600	66·49	4,350	65·07			
18	65·01	2,080	65·07	2,160	66·11	3,750	66·37	4,150				
19	65·01	2,080	65·05	2,140	[1] 66·23	3,950	66·33	4,100				
20	65·03	2,110	64·99	2,050	[1] 66·32	4,100	66·27	4,000				
21	65·09	2,190	64·93	1,970	66·47	4,300	66·23	3,950				
22	65·21	2,360	64·85	1,860	66·41	4,200	66·21	3,900			67·07	
23	65·41	2,650	64·87	1,890	66·41	4,200	66·05	3,650				
24	65·38	2,600	65·01	2,080	66·47	4,300	65·93	3,450	68·41			
25	65·31	2,500	64·91	1,940	66·51	4,400	65·91	3,400				
26	65·39	2,600	[1] 64·84	1,850	66·57	4,500	65·89	3,400				
27	65·27	2,450	64·77	1,750	[1] 66·68	4,650	65·85	3,300			66·50	
28	65·17	2,300	64·67	1,620	66·79	4,800	[1] 65·85	3,300			66·34	1,052
29	65·15	2,280	64·71	1,670	66·81	4,850	[1] 65·85	3,300				
30	65·13	2,250	64·81	1,810	66·93	5,100	[1] 65·85	3,300				
31	65·15	2,280	64·81	1,810			[1] 65·85	3,300				

Note—All gauge heights marked thus [1] interpolated. Winter conditions from November 1 to December 31; data not sufficient to compute daily discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Assiniboine River at C.P.R. Bridge, St. James, Winnipeg, for 1913.

Drainage area, 59,550 square miles.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									70·40	10,900	[1] 68·30	7,400
2									70·69	11,400	68·24	7,300
3			65·39		65·74		67·06		70·84	11,700	68·10	7,000
4	66·12						67·24		70·93	11,800	67·91	6,700
5							67·24		71·52	12,800	67·88	6,700
6									72·27	14,100	67·80	6,500
7					65·64	437			72·46	14,400	67·59	6,200
8									72·59	14,700	67·49	6,000
9									72·68	14,800	67·32	5,700
10			65·45		65·65				72·68	14,800	67·11	5,400
11									72·64	14,800	67·18	5,500
12									72·48	14,500	67·07	5,300
13									72·38	14,300	66·91	5,000
14							74·29		72·12	13,900	66·89	5,000
15	65·23						77·37		71·80	13,300	66·89	5,000
16							76·50		71·68	13,100	66·61	4,550
17	65·44	522	65·55		65·63		72·78	15,000	71·46	12,700	66·73	4,750
18							72·78	15,000	71·23	12,400	66·64	4,600
19							72·81	15,000	71·12	12,200	66·45	4,300
20							72·45	14,400	70·85	11,700	66·34	4,100
21							72·27	14,100	70·72	11,500	66·38	4,200
22							71·58	13,000	70·53	11,200	66·21	3,900
23							71·13	12,200	70·31	10,800	66·20	3,900
24			65·71				70·90	11,800	70·06	10,400	66·07	3,700
25							70·75	11,500	69·81	9,900	66·07	3,700
26							70·61	11,300	69·62	9,600	65·88	3,400
27	65·57				65·77		70·48	11,100	69·33	9,100	65·85	3,300
28							70·44	11,000	69·10	8,700	66·02	3,600
29							70·43	11,000	68·86	8,300	65·69	3,050
30							70·44	11,000	68·58	7,800	65·69	3,050
31					65·95				68·49	7,500		

	July.		August.		September.		October		November		December	
1	65·87	3,300	67·18	5,500								
2	65·74	3,150	67·11	5,350								
3	65·53	2,850	66·81	4,850								
4	65·49	2,750	66·91	5,000								
5	65·51	2,800	66·84	4,900								
6	65·55	2,850	67·01	5,200								
7	65·42	2,650	67·22	5,500								
8	65·42	2,650	68·31	7,100								
9	65·38	2,600										
10	65·42	2,650										
11	65·66	3,050										
12	65·65	3,000										
13	65·92	3,450										
14	66·01	3,600										
15	66·29	4,050										
16	66·49	4,350										
17	66·62	4,550										
18	66·72	4,700										
19	66·75	4,750										
20	66·88	5,000										
21	66·97	5,100										
22	67·02	5,200										
23	67·12	5,350										
24	67·27	5,600										
25	67·34	5,750										
26	67·32	5,700										
27	67·28	5,650										
28	67·30	5,700										
29	67·25	5,600										
30	67·28	5,600										
31	67·21	5,500										

Note.—All gauge heights marked thus (1) interpolated. Curve not well defined above gauge height 68·70. Ice conditions from January 1 to April 16, data not sufficient, to compute discharges.

MONTHLY DISCHARGE of Assiniboine River at C.P.R. Bridge, St. James, Winnipeg, for the year 1912.

(Drainage area, 59,550 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
May	8,400	.....	[1]6,300	0·106	0·122	387,400
June	8,600	4,600	6,700	0·112	0·125	398,700
July	4,500	2,080	2,800	0·047	0·054	172,200
August	2,390	1,620	2,130	0·036	0·042	131,000
September	5,100	1,540	3,100	0·052	0·058	184,400
October	6,200	3,300	4,600	0·077	0·089	282,800
November	.....	.....	.....	.....	.....	.....
December	.....	1,052	.....	.....	.....	.....
The period	8,600	1,052	4,250	0·072	0·490	1,556,300
1913						
March	.....	437	.....	.....	.....	.....
April	15,000	.....	[1]10,000	0·168	0·187	595,000
May	14,800	7,500	11,900	0·200	0·231	731,700
June	7,400	3,050	4,950	0·083	0·093	294,550
July	5,750	2,600	4,150	0·070	0·081	255,170
August	.....	.....	[1]4,000	0·067	0·077	246,000
The period	15,000	437	7,000	0·117	0·672	2,123,220

NOTE.—All marked thus [1] estimated.

SHELL RIVER.

The Shell river is one of the largest tributaries of the Assiniboine, emptying into that river in tp. 23, R. 29, W.P.M. The source of the river is on the northwestern slope of the Duck mountains, which it parallels for a considerable distance, the course being almost due south for the entire length of the river. About 5 miles from the junction with the Assiniboine it turns sharply to th west and flows in that direction to its mouth.

The watershed drained is narrow, lying between the Swan and Assiniboine, except at the upper part, where it opens out to a width of about 35 miles, the total length of the basin being about 60 miles, though the river itself has a length of 90 miles.

In the upper waters the river flows through the Duck mountain forest reserve, a district in which valuable timber is to be found. The valley of the river is narrow and quite deep, varying between 100 and 350 feet. The valley itself is gravelly and boulder-strewn, but the land forming the upper benches and table land is good for agriculture.

At Assessippi, the only town located on the stream, a small flour mill was operated by water-power from 1884 to 1911, in which year the dam was washed out.

SHELL RIVER AT ASSESSIPPI.

History.—The first metering of the Shell at Assessippi was taken by W. J. Ireland on September 15, 1913, but the point at which the measurement was made was not considered suitable as a point for a permanent section. This point was at the bridge just below the dam. A second section was established by E. J. Budge on January 16, 1914, which was a quarter of a mile below the bridge; this latter section was afterwards abandoned for one which was located by C. O. Allen on June 9, 1914.

Location of Section.—The section finally located on the Shell River at Assessippi is 1¼ mile downstream from the Assessippi bridge, 2 miles below the mouth of Bear creek, 13½ miles from Russell, and 20 miles south of Roblin. The initial point is marked by a nail driven in the base of a blazed tree, which is on the right bank.

Records available.—Daily gauge heights have been obtained since June 9, 1914, and estimates of daily discharge for the same period have been made.

Drainage Area.—The area tributary to the Shell above the meter section is 930 square miles. It lies between the watersheds of the Valley river on the east and the Assiniboine on the west.

Gauge.—A 6-foot vertical staff gauge was placed 600 feet downstream from D. Martel's house, and about 1 mile above the meter section. The gauge is referred to a bench-mark, which is a nail driven into the foot of a blazed scrub oak tree standing 14 feet back from the gauge. The datum is arbitrary. On November 18 it was discovered that back-water effect was being caused between the gauge and the meter section by beaver dams. A new gauge was therefore established at the meter section, which was referred to a temporary bench-mark placed on the side of a 6-inch poplar tree, blazed, standing 100 feet above the meter station on the right bank.

Channel.—For 60 feet above the section and 150 feet below, the channel is straight; the bottom is of small rock and gravel, and is permanent. The banks are high and clear and are not liable to overflow. The current is swift.

Discharge Measurements.—Measurements are made by means of a cable carrier travelling on a cable stretched across the stream at the section. Sufficient measurements have been taken to define a discharge curve.

Accuracy.—The curve is well defined over a range in stage of 1·3 feet for open-water conditions. Discharge curve for winter conditions is not so well defined.

Discharge Measurements of Shell River at Assessippi Bridge, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 15	W. J. Ireland	1,469	83	93	2·30	.....	214[3]
Nov. 19	C. O. Allen	1,375	89	78	1·89	.....	149[3]
1914							
Jan. 16	E. J. Budge	1,462	31	29	1·33	.....	39[1]
Mar. 18	C. O. Allen	1,496	25	36	2·87	.....	104[2]
May 12	C. O. Allen	1,497	93	226	7·71	.....	174[3]
June 9	C. O. Allen	1,760	45	89	3·21	92·33	286[3]
July 15	C. O. Allen	1,760	36	53	2·12	91·45	112[3]
Aug. 9	M. S. Madden	1,760	33	39	1·37	91·02	54[3]
Aug. 31	A. Pirie	1,940	35	38	1·51	91·05	58[3]
Sept. 24	M. S. Madden	1,911	34	40	1·25	91·04	51[3]
Oct. 23	M. S. Madden	1,912	36	50	1·42	91·16	72[3]
Nov. 18	M. S. Madden	1,912	34	46	1·56	91·42	71[3]
Dec. 5	T. J. Moore	1,920	39	32	1·40	91·61	44[4]

Note.—(1) Below Assessippi bridge. (2) Above Assessippi bridge. (3) At Assessippi bridge. (4) Ice measurement.

Daily Gauge Height and Discharge of Shell River at Assessippi, for 1914.

Drainage area, 930 square miles.

Day.	January.		February		March		April		May		June	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1												
2												
3												
4												
5												
6												
7												
8												
9											92·32	287
10											92·26	273
11											92·19	257
12											92·11	239
13											92·04	224
14											91·99	213
15											91·99	213
16											91·94	202
17											91·92	198
18											91·88	190
19											91·84	182
20											91·82	178
21											91·78	170
22											91·76	160
23											91·74	163
24											91·71	157
25											91·68	151
26											91·66	148
27											91·64	144
28											[1]91·62	141
29											91·[illegible]	135
30											91·70	155
31												

	July		August		September		October		November		December	
1	91·69	153	91·12	65	91·02	54	91·03	55	91·14	68	91·50	47
2	91·64	144	91·11	64	91·01	53	91·03	55	91·14	68	91·57	49
3	91·62	141	91·09	62	90·99	51	91·04	56	91·14	68	91·59	43
4	91·56	130	91·07	60	90·96	48	91·06	59	91·14	68	91·63	43
5	91·56	130	91·06	59	90·96	48	91·06	59	91·14	68	91·67	44
6	91·58	133	91·04	56	91·00	52	91·07	60	91·14	68	91·67	21
7	91·54	126	91·02	54	91·04	56	91·08	61	91·14	68	91·59	15
8	91·51	121	91·01	53	91·06	59	91·12	65	91·02	54	91·63	19
9	91·48	116	91·01	53	91·10	63	91·14	68	91·09	62	91·65	17
10	91·44	109	91·00	52	91·12	65	91·16	70	91·09	62	91·67	15
11	91·44	109	91·00	52	91·10	63	91·18	72	91·09	62	91·77	15
12	91·54	126	90·99	51	91·09	62	91·22	78	91·04	56	91·87	20
13	91·46	113	90·98	50	91·07	60	91·21	76	91·02	54	91·67	10
14	91·42	106	90·96	48	91·06	59	91·19	74	90·99	51	91·57	12
15	91·44	109	90·95	47	91·05	58	91·19	74	91·14	56	91·57	12
16	91·44	109	90·94	46	91·05	58	91·20	75	91·14	56	91·67	7
17	91·42	106	90·96	48	91·04	56	91·20	75	91·29	67	91·87	4
18	91·38	100	90·95	47	91·04	56	91·20	75	91·10	71	92·27	50
19	91·36	97	90·94	46	91·04	56	91·20	75	91·40	71	92·07	50
0	91·34	95	90·93	45	91·04	56	91·19	74	91·47	69	91·57	24
21	91·32	92	90·92	44	91·04	56	91·19	74	91·47	69	91·47	20
22	91·30	89	90·98	50	91·04	56	91·18	72	91·47	69	91·67	10
23	91·27	85	90·96	48	91·03	55	91·17	71	91·45	67	91·77	3
24	91·24	81	90·95	47	91·03	55	91·17	71	91·45	67	91·77	3
25	91·24	81	90·98	50	91·03	55	91·16	70	91·47	60	91·97	2
26	91·21	76	91·01	53	91·03	55	91·15	69	91·47	60	92·07	10
27	91·18	73	91·01	53	91·03	55	91·14	68	91·49	61	92·17	43
28	91·16	70	91·04	56	91·03	55	91·14	68	91·51	54	92·67	62
29	91·17	71	91·04	56	91·03	55	91·14	68	91·53	55	92·77	67
30	91·16	70	91·04	56	91·03	55	91·14	68	91·50	53	92·77	67
31	91·14	68	91·03	55			91·14	68			92·77	62

Notes.—(1) Interpolated. Ice conditions November 15 to end of year.

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Shell River at Assessippi, for 1914.

Drainage area, 930 square miles.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per Square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1914						
June	287	135	[1]190	0·204	0·228	11,300
July	153	68	104	0·112	0·129	6,400
August	65	44	52	0·056	0·065	3,200
September	65	48	56	0·060	0·067	3,330
October	78	55	68	0·073	0·084	4,180
November	71	51	63	0·068	0·076	3,750
December	67	[2]2	28	0·030	0·035	123
The period	287	2	80	0 086	0·684	32,283

NOTE.—All marked thus (1) estimated. Ice conditions from November 15 to end of year.

BIRDTAIL CREEK.

Birdtail creek is one of the small tributaries of the Assiniboine river. It joins the latter in Indian Reserve No. 57. The source of the river is on the south slope of the Riding mountains, and the course is generally south from the headwaters to the mouth.

The upper part of the drainage area, which is 400 square miles, is very well timbered, and lumbering has been carried on in the district. Towards the mouth the land is given up to agriculture.

There was some question of a small power development on the river, so records of the discharge have been kept. These show that the power output would be very small, and subject to interruption during the winter months.

BIRDTAIL CREEK AT BIRTLE.

History.—This station was established May 14, 1914, by C. O. Allen.

Location of Section.—The meter section is located on the downstream side of the Birtle traffic bridge on the road between the Canadian Pacific Railway station and the town of Birtle, 1 mile from the Canadian Pacific railway. The initial point is painted on the hand-rail of the bridge at the left end of the downstream side.

Records available.—The estimates of daily discharge have been deduced from May 14, 1914, to November 15, 1914, covering the open-water season Daily gauge heights have been obtained from May 14 to December 5, 1914.

Drainage Area.—The drainage area is 400 square miles, extending from the Riding mountains southeast to the Assiniboine.

Gauge.—A vertical staff enamelled gauge is fastened to the floor of the bridge, and is referred to a bench-mark set to arbitrary datum. The bench-mark is on top of a bolt on the northwest corner of the bridge.

Channel.—The stream is confined to one channel at all stages, for 250 feet above and 100 feet below the section, the channel is straight. The current is fairly swift, and the banks are high and clear and not liable to overflow. The bottom of the stream is of mud and hard clay, not liable to shift.

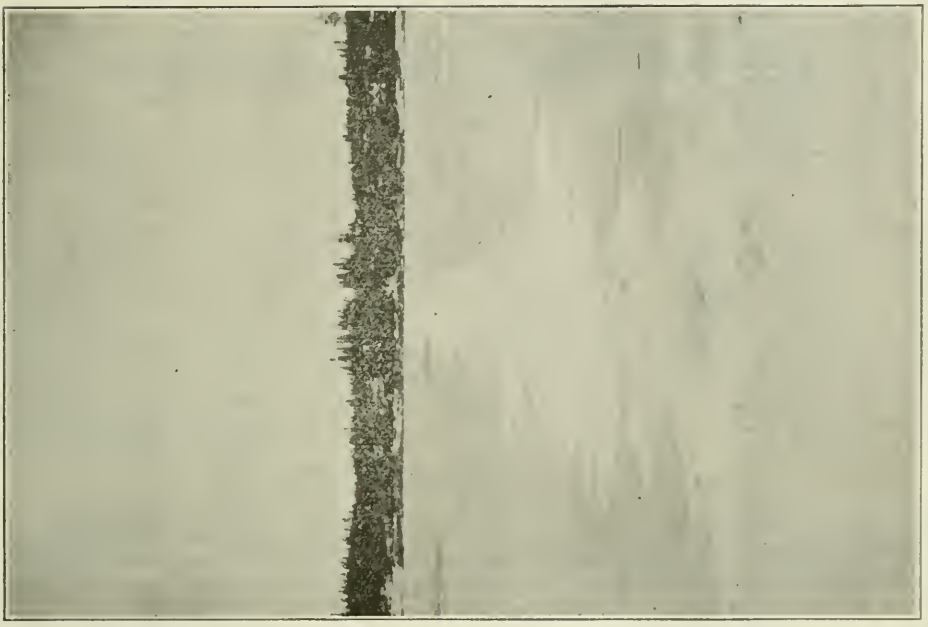
Discharge Measurements.—The measurements are taken from the downstream side of the traffic bridge under open-water conditions. For winter conditions, measurements are made from the ice.

Accuracy.—The discharge curve is only fairly well defined over a range in gauge height of 3 feet, extending from 88·5 to 91·5. Between 89·0 and 89·5 the curve is not sufficiently well defined to admit of accurate estimated discharge.

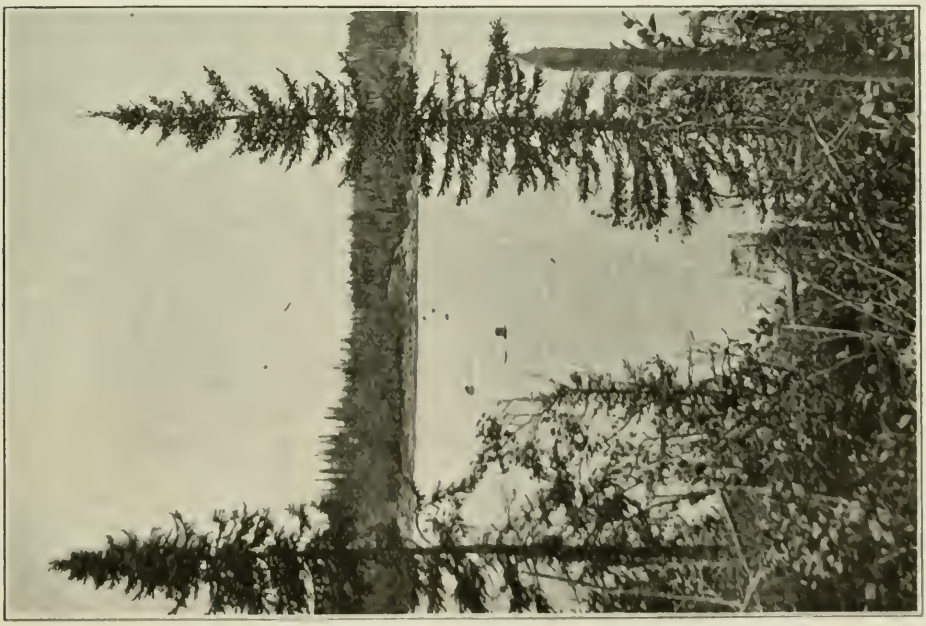
Discharge Measurements of Birdtail Creek at Birtle, for 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 14	E. J. Budge	1,462	16·0	12·1	0·25	.....	3·0 [1]
May 14	C. O. Allen	1,497	79·6	282·0	1·92	91·49	544·1
June 11	"	1,760	68·0	125·0	0·94	89·49	118·0
Aug. 11	M. S. Madden	1,760	46·5	70·0	0·02	88·50	1·4
" 29	A. Pirie	1,940	51·0	82·0	0·10	88·74	8·4
Sept. 23	M. S. Madden	1,911	52·5	91·0	0·02	88·95	0·2
Oct. 22	"	1,912	53·5	102·0	0·11	89·06	11·0
Nov. 17	"	1,912	50·0	92·0	0·16	88·96	15·2
Dec. 7	T. J. Moore	1,920	52·0	50·0	0·12	88·91	6·0 [1]

[1]Measurements taken under ice conditions.



Nelson River, Manitou Rapids. Meter section, winter conditions.



Nelson River, Manitou Rapids. Meter section, Summer conditions.

Daily Gauge Height and Discharge of Birdtail Creek at Birtle, for 1914.

[Drainage area, 400 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1											89·29	71
2											89·29	71
3											89·29	71
4											89·24	60
5											89·64	144
6											89·69	155
7											89·69	155
8											89·69	155
9											89·59	135
10											89·59	135
11											89·49	113
12											89·39	92
13											89·34	81
14									91·44	532	89·29	71
15									91·19	477	89·24	60
16									90·74	378	89·19	50
17									90·24	270	89·14	38
18									90·04	228	89·09	29
19									90·04	228	88·99	16
20									90·04	228	88·94	14
21									89·84	186	88·89	12
22									89·74	165	88·89	12
23									89·64	144	88·89	12
24									89·54	123	88·84	10
25									89·54	123	88·84	10
26									89·49	113	88·84	10
27									88·44	102	88·84	10
28									88·44	102	88·79	9
29									89·44	102	88·79	9
30									89·39	92	88·99	16
31									89·34	81		

	July.		August.		September.		October.		November.		December.	
1	89·14	38	88·54	3	88·69	6	88·79	9	89·00	16	88·90	
2	89·24	60	88·54	3	88·69	6	88·79	9	89·00	16	88·90	
3	89·14	38	88·49	3	88·69	6	88·79	9	89·00	16	88·90	
4	89·09	29	88·49	3	88·69	6	88·79	9	89·00	16	88·90	
5	88·99	16	88·49	3	88·69	6	88·84	10	88·95	14	88·90	
6	88·94	14	88·49	3	88·69	6	88·84	10	88·95	14		
7	88·89	12	88·49	3	88·74	7	88·89	12	88·95	14		
8	88·89	12	88·49	3	88·74	7	88·94	14	88·95	14		
9	88·84	10	88·44	2	88·74	7	88·99	16	88·95	14		
10	88·79	9	88·44	2	88·79	9	89·04	22	88·95	14		
11	88·84	10	88·49	3	88·79	9	89·04	22	88·95	14		
12	88·84	10	88·49	3	88·79	9	89·04	22	88·90	12		
13	88·79	9	88·49	3	88·79	9	89·04	22	88·90	12		
14	88·79	9	88·44	2	88·84	10	89·09	29	88·90	12		
15	88·79	9	88·44	2	88·84	10	89·09	29	88·90	12		
16	88·84	10	89·49	3	88·84	10	89·09	29	88·95			
17	88·89	12	89·04	22	88·79	9	89·10	31	88·98			
18	88·89	12	89·04	22	88·79	9	89·10	31	88·95			
19	88·89	12	88·99	16	88·79	9	89·10	31	88·90			
20	88·84	10	88·99	16	88·84	10	89·05	23	88·90			
21	88·79	9	88·94	14	88·89	12	89·05	23	88 90			
22	88·74	7	88·94	14	88·89	12	89·07	26	88·90			
23	88·69	6	88·89	12	88·84	10	89·00	16	88·90			
24	88·69	6	88·89	12	88·79	9	89·00	16	88·90			
25	88·69	6	88·84	10	88·74	7	89·00	16	88·90			
26	88·64	5	88·84	10	88·74	7	89·00	16	88·90			
27	88·59	4	88·84	10	88·74	7	89·00	16	88·90			
28	88·59	4	88·79	9	88·74	7	89·00	16	88·90			
29	88·54	3	88·74	7	88·84	10	89·00	16	88·90			
30	88·54	3	88·74	7	88·84	10	89·00	16	88·90			
31	88·54	3	88·69	6			89·00	16				

Note.—Ice conditions from November 16 to December 31, data not sufficient to compute daily discharges. Above gauge height 89·50 the curve is ill-defined.

MONTHLY DISCHARGE of Birdtail Creek at Birtle, for the year 1914.

[Drainage area, 400 square miles.]

Month.	Discharge in Second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1914.						
May	532	81	[1]220	0·550	0·634	13,500
June	165	9	61	0·152	0·170	3,625
July	60	3	13	0·033	0·038	799
August	22	2	7	0·018	0·021	430
September	12	6	8	0·020	0·023	476
October	31	9	19	0·048	0·055	1,170
November	.....	.....	[1]10	0·025	0·029	595
December	.....	.....	[1]5	0·013	0·015	307
The period	532	2	43	0·107	0·985	20,902

NOTE.—All marked thus ([1]) estimated.

LITTLE SASKATCHEWAN RIVER.

The source of the Little Saskatchewan river is on the southern slope of the Riding mountains. It flows in a general southeasterly direction until it reaches the town of Minnedosa in tp. 15, R. 18, W.P.M., at which point it turns and flows almost southwest to its junction with the Assiniboine river in tp. 10, R. 20, W.P.M., about 8 miles west of the city of Brandon.

The drainage area is 1,640 square miles. In the upper part of the basin there are numerous small lakes; in this section the greater part of the drainage is obtained; the largest tributary, the Rolling river, enters the Little Saskatchewan about 13 miles above Minnedosa.

In the upper waters the country is covered to a considerable extent by stands of good merchantable timber, a considerable portion of which is within the forest reserve. The rest of the country drained is very well settled, the land offering splendid opportunity for agriculture.

The river valley is well defined, lying between 100 and 300 feet below the general level of the surrounding country. It varies in width between one-quarter of a mile and 1¼ miles, the course of the river in the valley bottom being very sinuous, almost doubling its length over the total length of the drainage basin.

A number of small towns are to be found along the course of the river, as Rivers, Gautier, Rapid City, Riverdale, and Minnedosa, the latter having a population of about 1,700. There are possible power sites on the river, three of which have been developed; these are at Minnedosa, Rapid City, and the Brandon Power Company's plant, about 2 miles from the mouth of the river.

LITTLE SASKATCHEWAN RIVER AT BILBEY'S BRIDGE.

History.—The station on the Little Saskatchewan at Bilbey's bridge was established on March 18, 1914, by W. J. Ireland. Previous to the establishment of this station a section was used on the downstream side of the bridge, but was abandoned, being unsuitable.

Location of Section.—The meter section is located 400 feet downstream from Bilbey's traffic bridge. It is 12 miles northwest of Minnedosa, 5 miles west of Clan William, and 1⅛ miles downstream from the junction of the Little Saskatchewan and Rolling rivers.

Records available.—Records of daily gauge heights have been secured from April 25, 1914. Sufficient meterings have been made to define a discharge curve, and estimates of daily discharge have been prepared for the open-water season, April 25 to November 29, 1914. Under ice conditions, estimates of daily discharge, based upon discharge measurements taken during the period, have been made for the interval November 29 to December 31.

Drainage Area.—The area tributary to the Little Saskatchewan above Bilbey's bridge is 1,120 square miles.

Gauge.—A 9-foot vertical staff enamelled gauge is fastened to a pile which is 64 feet from the north end of the bridge on the downstream side. It is referred to a bench-mark set to arbitrary datum and marked by a spike driven in the sleeper at the north end of the bridge at the downstream side.

Channel.—For 500 feet above the section and 300 feet below, the channel is straight. At all stages the river is confined to one channel; the bed of the stream is of sand and gravel, and fairly permanent; the banks are low and subject to overflow at extreme stages.

Discharge Measurements.—Discharge measurements are made by means of a cable carrier which travels on a cable stretched across the river at the section. The measurements cover a range in stage of 2·5 feet.

Accuracy.—The discharge measurements taken do not define the discharge curve very well, due to difficulty in obtaining accurate soundings at the section.

DISCHARGE MEASUREMENTS of Little Saskatchewan River at Bilbey's Bridge, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
March 18	W. J. Ireland	1,462	49	204	0·31	95·45	64[1]
April 25	M. S. Madden	1,462	73	371	1·57	95·88	583
" 30	W. J. Ireland	1,375	78	187	1·66	95·25	310
May 15	C. O. Allen	1,497	79	324	2·07	96·50	671
June 5	"	1,760	76	224	1·39	95·09	310
July 14	"	1,760	76	166	0·47	94·36	78
Aug. 7	M. S. Madden	1,760	74	140	.....	94·02	1·3
" 26	A. Pirie	1,940	75	139	0·25	94·04	35
Sept. 22	M. S. Madden	1,911	76	143	0·27	93·99	36
Oct. 21	"	1,912	75	139	0·35	93·96	49
Nov. 14	"	1,912	49	179	0·19	93·96	34[1]
Dec. 3	T. J. Moore	1,920	79	60	0·33	94·02	20[1]

[1]Measurement taken under ice conditions.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Little Saskatchewan River at Bilbey's Bridge, for 1914.

[Drainage area, 1,120 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									5·19	315	5·17	310
2									5·15	304	5·11	293
3									5·11	293	5·07	282
4									5·07	282	5·07	282
5									5·85	500	5·07	282
6									6·01	545	5·07	282
7									6·06	559	5·07	282
8									6·19	595	5·05	276
9									6·31	629	5·01	265
10									6·67	730	4·97	254
11									6·92	800	4·92	240
12									6·87	786	4·87	226
13									6·77	758	4·82	212
14									6·51	685	4·77	198
15									6·49	679	4·72	184
16									6·29	623	4·67	170
17									6·22	604	4·67	170
18									6·17	590	4·65	164
19									6·07	562	4·61	153
20									5·97	534	4·57	142
21									5·92	520	4·57	142
22									5·87	506	4·55	136
23									5·79	483	4·53	130
24									5·71	461	4·51	125
25							5·89	511	5·67	450	4·47	114
26							5·88	508	5·62	436	4·45	109
27							5·84	497	5·47	394	4·42	101
28							5·58	424	5·45	388	4·39	93
29							5·42	380	5·37	366	4·37	88
30							5·27	338	5·27	338	4·35	83
31									5·22	324		

	July.		August.		September.		October.		November.		December.	
1	4·31	73	4·07	40	4·07	40	3·96	33	3·95	33	3·98	19
2	4·29	69	4·07	40	4·06	39	3·94	33	3·95	33	4·02	18
3	4·27	66	4·07	40	4·05	38	3·92	32	3·95	33	4·02	18
4	4·25	62	4·07	40	4·03	36	3·92	32	3·95	33	4·07	18
5	4·23	58	4·06	39	4·01	35	3·92	32	3·95	33	4·08	18
6	4·21	55	4·03	36	3·99	34	3·92	32	3·95	33		18
7	4·19	52	4·05	38	3·99	34	3·92	32	3·95	33		18
8	4·17	50	4·07	40	4·01	35	3·92	32	3·95	33	4·12	18
9	4·15	48	4·07	40	4·05	38	3·92	32	3·95	33		17
10	4·13	45	4·07	40	4·07	40	3·92	32	3·95	33		16
11	4·15	48	4·07	40	4·07	40	3·95	33	3·95	33	4·17	15
12	4·17	50	4·07	40	4·07	40	3·97	33	3·95	33		15
13	4·17	50	4·07	40	4·07	40	4·01	35	3·95	33		14
14	4·17	50	4·07	40	4·07	40	4·04	37	3·95	31	4·22	14
15	4·17	50	4·07	40	4·08	40	4·07	40	3·96	30		13
16	4·17	50	4·07	40	4·09	41	3·97	33	3·96	29		13
17	4·17	50	4·07	40	4·09	41	3·97	33	3·96	28	4·32	12
18	4·17	50	4·06	40	4·08	40	3·97	33	3·96	27		12
19	4·17	50	4·07	40	4·07	40	3·97	33	3·96	26		11
20	4·17	50	4·07	40	4·07	40	3·97	33	3·96	25	4·14	11
21	4·17	50	4·07	40	4·04	37	3·97	33	3·96	25		11
22	4·16	49	4·07	40	4·02	36	3·97	33	3·97	24		12
23	4·15	48	4·07	40	3·99	34	3·97	33	3·97	24		12
24	4·12	44	4·06	39	3·97	33	3·97	33	3·97	23	4·27	12
25	4·09	41	4·05	38	3·97	33	3·97	33	3·97	23		11
26	4·07	40	4·04	37	3·97	33	3·97	33	3·97	22		10
27	4·07	40	4·07	40	3·97	33	3·97	33	3·97	22		10
28	4·07	40	4·11	43	3·97	33	3·96	33	3·97	21	4·67	9
29	4·07	40	4·15	48	3·97	33	3·95	33	3·97	21		8
30	4·07	40	4·11	43	3·97	33	3·94	33	3·97	20		7
31	4·07	40	4·07	40			3·95	33				6

MONTHLY DISCHARGE of Little Saskatchewan River at Bilbey's Bridge, for the year 1914.

[Drainage area, 1,120 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	.....	.....	*850	0·680	0·840	50,578
May	800	282	517	0·462	0·532	31,800
June	310	83	193	0·172	0·192	11,500
July	73	40	50	0·046	0·053	3,075
August	48	36	40	0·035	0·041	2,460
September	41	33	36	0·032	0·035	2,150
October	40	32	33	0·027	0·032	2,030
November	33	20	28	0·025	0·028	1,670
December	19	6	13	0·011	0·013	799
The period	800	6	196	0·165	1·766	106,062

NOTE.—*Estimated.

LITTLE SASKATCHEWAN RIVER AT MINNEDOSA.

History.—A station was first established on the Little Saskatchewan at Minnedosa in October, 1912, by W. G. Worden, at the highway bridge within the town. This was abandoned, and later one was established by C. O. Allen at the power-house on July 13, 1914. This latter station is still in operation.

Location of Section.—On the upstream side of the traffic bridge crossing the Minnedosa Power Company's intake, and about three-quarters of a mile from the Canadian Pacific Railway station.

Records available.—A gauge height record was kept at the old station on the highway bridge from October 14 to November 2, 1912. A record of daily gauge heights has been kept at the head-and-tail water of the Minnedosa Power Company from June 2, 1914, to the end of the year.

Drainage Area.—The drainage area above Minnedosa is 1,200 square miles. The area is not significant in this case, as the station is only used to determine the discharge through the power plant.

Gauge.—The gauge in the head-race is a 6-foot vertical staff enamelled gauge fastened to the intake wall of the power plant on the left-hand side. The tail-race gauge is a 6-foot vertical staff enamelled gauge fastened to the side of the retaining wall in the tail-race on the right-hand side.

Channel.—The channel at the meter section is that formed by the intake for the power plant.

Discharge Measurements.—These are taken from the bridge across the intake.

Accuracy.—Owing to the fact that the discharge is controlled entirely by the operation of the power station, quite irrespective of gauge heights, no discharge curve has been constructed.

SESSIONAL PAPER No. 25f

DISCHARGE MEASUREMENTS of Little Saskatchewan River at Minnedosa, 1912-13.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Oct. 1	Worden-Lamb	1497	101	377	2·52	101·31	950
1913.							
July 13	C. O. Allen	1760	20	156	0·58	1,647·08	91
Aug. 6	M. S. Madden	1760	20	108	0·80	44·58	86
" 27	A. Pirie	1940	20	108	0·95	44·90	102
" 27	"	1940	20	108	0·91	44·90	99
Sept. 21	M. S. Madden	1912	20	129	0·76	45·86	99
Oct. 20	"	1912	20	164	0·62	47·38	102
Nov. 13	"	1912	20	169	0·54	47·83	91
Dec. 3	T. J. Moore	1920	18	105	0·92	45·23	97

LITTLE SASKATCHEWAN RIVER AT RIVERDALE.

History.—The station at Riverdale was established by G. J. Lamb on January 24, 1914, and was abandoned on the 30th of May, 1914, on account of the operation of the power plant at Minnedosa, causing extreme fluctuation in stages and rendering estimates of daily discharge based thereon unsatisfactory.

Location of Section.—The meter section was located at the traffic bridge in the N.W. ¼ sec., 14, tp. 14, R. 19, W.I.M., half a mile north of Riverdale station and one-eighth of a mile west of the Canadian Pacific Railway track. The initial point was a point painted on the handrail of the bridge at the south end on the downstream side.

Records available.—Daily gauge height records were kept from January 24, 1913, to May 30, 1914, except during the winter season, when intermittent records were kept. A number of discharge measurements were taken, and a record of the estimated daily discharge based thereon is available for the open-water season.

Drainage Area.—The area tributary to the Little Saskatchewan above Riverdale is 1,250 square miles.

Gauge.—The gauge was a 6-foot vertical staff enamelled gauge fastened to a plank driven into the bed of the river and spiked to the stringer of the pile bent under the bridge.

Channel.—The channel is straight for 200 feet above and 200 feet below the section. The bed of the stream is fairly permanent, and the banks, though fairly high, are subject to overflow for extreme stages.

Discharge Measurements.—The measurements were made from the downstream side of the traffic bridge.

Accuracy.—The discharge curve is well defined over a range in stage of about 2·5 feet. Owing to the operation of the plant at Minnedosa, considerable fluctuation was caused in the stage. The station was therefore discontinued.

DISCHARGE MEASUREMENTS of Little Saskatchewan River at Riverdale, 1913-14.

Date.	Hydrographer	Meter No.	Width.	Area of Section	Mean Velocity.	Gauge Height	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
Jan. 24	G. J. Lamb	1371	77	68	0·85	104·17	157
Feb. 18	A. Pirie	1462	65	69	0·89	104·33	61
April 16	S. S. Scovil	1469	95	318	3·03	105·15	966
May 8	E. Bunkson	1469	94	241	2·55	104·20	617
July 1	A. Pirie	1490	93	225	1·91	103·74	430
Aug. 8	W. J. Ireland	1469	87	154	1·01	103·18	168
Sept. 11	"	1469	88	134	0·67	102·84	89
Oct. 17	C. O. Allen	1435	81	118	0·71	102·88	86
Nov. 21	"	1375	82	94	0·88	102·94	83
1914							
Jan. 12	E. J. Budge	1469	41	21	0·35	102·70	17

[1]Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Little Saskatchewan River at Riverdale, for 1913.

[Drainage area, 1,250 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							4·10	552	4·80	852	3·77	413
2							4·16	577	4·70	808	3·77	413
3							4·36	661	4·96	922	3·70	384
4							4·56	746	4·36	661	3·86	451
5							4·48	712	4·95	918	3·80	426
6			4·40		4·16		4·53	733	4·43	691	3·20	180
7							4·58	755	4·20	594	3·50	300
8							4·62	773	4·20	594	3·85	447
9							4·66	790	4·11	556	3·60	342
10							4·70	808	4·10	552	3·95	489
11							6·10	1,424	4·60	764	3·10	142
12							7·50	2,040	4·30	636	3·48	292
13			4·20		4·50		6·70	1,688	4·00	510	3·30	220
14							6·00	1,380	4·00	510	3·40	260
15							5·20	1,028	4·00	510	3·30	220
16							5·42	1,125	3·90	468	3·70	384
17							5·31	1,076	3·90	468	3·40	260
18			4·33				5·10	984	3·29	216	3·47	288
19							5·71	1,252	3·29	216	3·80	426
20			4·93		4·63		5·92	1,345	3·19	176	3·30	220
21							5·61	1,208	3·90	468	3·14	157
22							5·21	1,032	3·88	459	3·62	350
23							5·51	1,164	3·78	418	3·73	397
24	3·17						5·11	988	3·80	426	3·60	342
25							5·90	1,336	3·97	497	3·23	192
26							5·10	984	3·87	455	3·45	280
27			4·44		4·95		5·70	1,248	3·80	426	3·65	363
28							5·30	1,072	3·80	426	3·60	342
29							5·20	1,028	3·80	426	3·70	384
30	2·95						4·00	510	3·80	426	3·70	384
31									3·18	172		

	July.		August.		September.		October.		November.		December.	
1	3·80	426	3·60	342	3·00	112	2·50	28	3·61			
2	3·50	300	3·40	260	2·49	27	2·60	40	3·41			
3	3·60	342	3·40	260	3·00	112	2·90	89	3·00			
4	3·46	284	3·44	276	2·69	51	2·28	11	3·10			
5	3·80	426	3·30	220	2·49	27	2·90	89	2·49		3·52	
6	3·60	342	3·20	180	2·28	11	2·80	70	3·21			
7	3·80	426	3·30	220	2·90	89	2·80	70	2·90			
8	3·47	288	3·92	476	2·70	52	2·90	89	2·90			
9	3·80	426	3·61	346	2·90	89	2·47	26	2·40			
10	3·56	325	3·83	439	2·88	85	2·90	89	3·83			
11	3·80	426	3·30	220	2·88	85	2·68	50	2·30			
12	3·48	292	3·20	180	2·24	10	2·90	89	2·90		3·04	
13	3·70	384	3·00	112	2·50	28	2·70	52	2·49			
14	3·48	292	3·20	180	2·80	70	2·90	89	3·40			
15	3·90	468	3·10	142	2·41	23	2·80	70	3·41			
16	3·29	216	3·10	142	2·45	24	2·27	11				
17	3·80	426	3·10	142	2·50	28	2·47	26				
18	3·90	468	2·89	87	2·80	70	2·80	70				
19	4·00	510	3·20	180	2·80	70	2·70	52			3·42	
20	3·90	468	3·22	188	2·45	24	2·68	50				
21	3·49	296	3·42	268	2·50	28	2·87	83	2·92			
22	3·90	468	3·83	439	2·83	76	2·68	50				
23	3·80	426	3·81	430	2·90	89	2·88	85				
24	3·66	367	3·30	220	2·80	70	2·48	26				
25	3·26	204	3·42	268	2·80	70	2·80	70				
26	3·60	342	3·10	142	2·50	28	2·28	11			3·38	
27	3·60	342	3·00	112	2·60	40	2·48	26				
28	3·85	447	2·89	87	2·60	40	2·80	70	3·10			
29	3·60	342	3·00	112	2·90	89	2·70	52				
30	3·46	284	3·40	260	2·40	20	3·00	112				
31	3·70	384	3·00	112			3·41	264				

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Little Saskatchewan River at Riverdale, for 1914.

[Drainage area, 1,250 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									3·70	384		
2									3·64	359		
3	2·18						5·73	1,261	3·58	334		
4							5·84	1,310	3·54	317		
5							5·99	1,336	3·60	342		
6			4·34		5·90		5·74	1,266	3·90	468		
7							5·52	1,169	4·20	594		
8							5·54	1,178	4·60	764		
9	0·00						5·70	1,248	4·80	852		
10	2·00	7·4					5·64	1,222	4·40	678		
11							5·50	1,160	4·14	569		
12	2·20						5·31	1,076	4·60	764		
13			4·12		5·24		5·32	1,081	4·70	808		
14							5·12	993	4·64	782		
15							5·14	1,002	4·10	552		
16	3·44						4·94	914	4·54	738		
17							4·96	922	4·52	729		
18							4·40	678	4·30	636		
19							4·00	510	4·32	644		
20					5·52		4·33	649	4·30	636		
21							4·47	707	4·20	594		
22							5·60	1,204	4·14	569		
23	4·10						4·10	552	4·10	552		
24							4·84	870	4·02	518		
25							5·50	1,160	4·00	510		
26							4·20	594	4·20	594		
27					5·22		4·18	586	4·00	510		
28							4·04	527	4·46	703		
29							4·00	510	4·30	636		
30	4·20						4·10	552	4·12	560		

Monthly Discharge of Little Saskatchewan River at Riverdale, for the years 1913-14.

[Drainage area, 1,250 square miles.]

Month.	Discharge in Second-Feet				Run-Off	
	Maximum	Minimum.	Mean	Per square mile.	Depth, in inches on Drainage area	Total in acre-feet
1913.						
January			[1]50	0·040	0·046	3,074
February			[1]60	0·048	0·050	3,332
March			[1]60	0·048	0·056	3,689
April	2,040	510	1,034	0·827	0·923	61,500
May	922	172	523	0·418	0·482	32,158
June	489	142	325	0·260	0·290	19,329
July	510	204	369	0·295	0·340	22,700
August	176	87	227	0·181	0·209	14,000
September	112	10	55	0·044	0·049	3,275
October	264	11	65	0·052	0·060	4,000
November			[1]50	0·040	0·045	2,980
December			[1]20	0·016	0·019	1,250
The period	2,040	10	287	0·189	2·569	171,307
1914						
January			[1]20	0·016	0·019	1,250
February			[1]20	0·016	0·017	1,111
March			[1]20	0·016	0·019	1,250
April	1,336	510	[1]917	0·750	0·837	55,785
May	808	317	[1]500	0·472	0·544	36,278
The period	1,336	317	[1]417	0·284	1·436	95,674

Note.—[1]Estimated.

SOURIS RIVER.

The source of the Souris river is in the province of Saskatchewan, northwest of the town of Weyburn. The course of the river from its source is generally southeast, crossing the international boundary into the state of North Dakota in tp.1 —, R. 34 —,W. 2 M. After crossing the boundary it bends northeast, re-crossing the international boundary to the east of the boundary between Saskatchewan and Manitoba, and flowing in a general northeastern direction to its junction with the Assiniboine river near the city of Brandon.

The drainage area of the Souris is very large when compared with the discharge, the basin being 22,860 square miles in extent. It will be noted by reference to the following tables that the run-off from this large area is very small.

The area drained is largely settled and under cultivation, the soil being of a gravelly nature, lightly overlaid by an alluvial deposit. The land is largely open prairie, with very little timber to be found.

In the upper part the river valley is not deep, but as the mouth is approached the depth is increased until banks of from 150 feet to 200 feet are encountered.

The district drained is about the most closely settled to be found in the province and, in consequence, where the supply of water for various purposes depends upon the river, the gathering of discharge data is important.

Souris River at Wawanesa.

History.—The station on the Souris at Wawanesa was established on October 7, 1912, by W. G. Worden.

Location of Section.—The meter section is located on the downstream side of the traffic bridge across the Souris river, one-quarter of a mile north of Wawanesa. The initial point is an arrow carved and painted on the guard-rail at the intersection of the girder and the guard-rail on the downstream side of the bridge at the south end.

Records available.—Daily gauge heights are available for the open-water seasons over the period October 7, 1912, to the end of 1914. During the winter season the gauge heights were obtained at intervals of several days. Estimates of daily discharge have been prepared for the open-water seasons during the period October 7, 1912, to the end of 1914. There was not sufficient information to estimate daily discharges during the winter season.

Drainage Area.—The drainage area of the Souris above Wawanesa is 22,500 square miles, part of which lies south of the international boundary.

Gauge.—A 6-foot vertical staff enamelled gauge is fastened to a post which is secured in the bed of the river 100 feet below the section and 12 feet from the south bank. This gauge is referred to a bench-mark set to arbitrary datum and located on a bolt-head at the southeast end of the bridge, marked W.P.S. B.M.

Channel.—For 200 feet above the section and 600 feet below, the channel is straight; the bed of the river is composed of sand and gravel and not liable to shift. The right bank of the stream is moderately high and not liable to overflow. The left bank is low, marshy, and rather thickly wooded with small trees and scrub, and is liable to overflow at high stages.

Discharge Measurements.—The meterings are taken from the downstream side of the bridge.

Accuracy.—Between gauge heights 100·7 and 102·0 the discharge curve is well defined. Between 102·0 and 104·5 the curve is fairly well defined. Beyond these limits the curve is not well defined.

SESSIONAL PAPER No. 25f

Discharge Measurements of Souris River at Wawanesa, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 7	W. G. Worden	1496	85	169	0·53	101·18	90
Oct. 26	G. J. Lamb	1186	86	162	0·55	101·17	89
1913.							
Jan. 29	G. J. Lamb	1374	22	20	0·38	101·61	8[1]
April 15	E. Bankson	1469	94	437	2·51	103·93	1,088
May 7	E. Bankson	1469	96	476	3·01	104·50	1,434
June 30	A. Pirie	1496	86	156	0·57	101·17	89
Aug. 11	W. J. Ireland	1469	85	129	0·32	100·88	42
Sept. 10	W. J. Ireland	1469	85	132	0·35	100·95	46
1914.							
Jan. 10	E. J. Budge	1462	64	35	0·12	101·00	4
April 22	M. S. Madden	1462	94	389	2·55	103·59	992
May 8	C. O. Allen	1497	93	391	2·44	103·48	954
June 4	"	1760	90	234	1·29	101·91	303
July 11	"	1760	88	200	0·97	101·49	194
Aug. 5	M. S. Madden	1760	87	163	0·70	101·32	115
" 25	A. Pirie	1940	86	149	0·54	101·21	81
Sept. 19	M. S. Madden	1911	83	134	0·31	100·94	41
Oct. 19	"	1912	82	114	0·15	100·82	17
Nov. 11	"	1912	81	107	0·10	100·74	11
Dec. 11	T. J. Moore	1920	84	48	0·09	100·87	4[1]

[1] Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Souris River at Wawanesa, for 1912.

[Drainage Area, 22,500 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									1·12	77		
2									1·21	96		
3									1·18	90		
4									1·24	103		
5									1·12	77		
6									1·08	69		
7							1·18	90	1·09	71	1·34	
8							1·18	90	1·10	73		
9							1·20	94	1·07	67		
10							1·20	94	1·11	75		
11							1·18	90	1·13	79		
12							1·18	90	1·13	79		
13							1·18	90	1·11	75		
14							1·19	92	1·10	73	1·44	
15							1·21	96	1·09	71		
16							1·17	88	1·45	154		
17							1·18	90	1·29	114		
18							1·17	88	1·18	90		
19							1·19	92	1·24	103		
20							1·17	88	1·22	98		
21							1·16	86	1·20	94	1·65	
22							1·17	88	1·32	121		
23							1·16	86	0·83	25		
24							1·14	81	1·30			
25							1·17	88	1·04			
26							1·17	88	1·34			
27							1·15	84	1·20			
28							1·15	84	1·31		1·51	
29							1·16	86	1·31			
30							1·17	88	1·31			
31							1·14	81				

Note.—Ice conditions November 23 to end of year. Data not sufficient to compute discharge.

Daily Gauge Height and Discharge of Souris River at Wawanesa, for 1913.

[Drainage Area, 22,500 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	1·65	.....	1·76	.....	.....	.....	4·57	1,485	1·97	323
2	.....	.....	.....	.....	.....	.....	.....	.....	4·58	1,490	1·90	298
3	.....	.....	.....	.....	.....	.....	.....	.....	4·59	1,495	1·86	284
4	1·49	.....	.....	.....	.....	.....	.....	.....	4·54	1,470	1·75	246
5	.....	.....	.....	.....	.....	.....	.....	.....	4·51	1,455	1·85	280
6	.....	.....	.....	.....	.....	.....	.....	.....	4·51	1,455	1·80	262
7	.....	.....	.....	.....	.....	.....	.....	.....	4·50	1,450	1·70	229
8	.....	.....	1·31	.....	1·76	.....	.....	.....	4·48	1,440	1·67	220
9	.....	.....	.....	.....	.....	.....	.....	.....	4·46	1,430	1·64	210
10	.....	.....	.....	.....	.....	.....	.....	.....	4·41	1,405	1·62	204
11	1·30	.....	.....	.....	.....	.....	.....	.....	4·35	1,375	1·55	183
12	.....	.....	.....	.....	.....	.....	.....	.....	4·27	1,335	1·53	176
13	.....	.....	.....	.....	.....	.....	.....	.....	4·20	1,300	1·50	167
14	.....	.....	.....	.....	.....	.....	.....	.....	4·11	1,255	1·50	167
15	.....	.....	1·18	.....	2·90	.....	3·92	1,160	3·97	1,185	1·50	167
16	.....	.....	.....	.....	.....	.....	3·92	1,160	3·74	1,070	1·49	164
17	.....	.....	.....	.....	.....	.....	4·03	1,215	3·53	965	1·43	148
18	1·75	.....	.....	.....	.....	.....	4·16	1,280	3·34	878	1·37	133
19	.....	.....	.....	.....	.....	.....	4·29	1,345	3·16	797	1·36	130
20	.....	.....	.....	.....	.....	.....	4·35	1,375	2·93	695	1·31	118
21	.....	.....	.....	.....	.....	.....	4·42	1,410	2·73	612	1·25	105
22	.....	.....	1·91	.....	3·29	.....	4·46	1,430	2·62	568	1·18	90
23	.....	.....	.....	.....	.....	.....	4·51	1,455	2·54	536	1·17	88
24	.....	.....	.....	.....	.....	.....	4·52	1,460	2·49	516	1·16	86
25	.....	.....	.....	.....	.....	.....	4·55	1,475	2·43	493	1·12	77
26	.....	.....	.....	.....	.....	.....	4·55	1,475	2·37	470	1·09	71
27	.....	.....	.....	.....	.....	.....	4·54	1,470	2·27	433	1·09	71
28	.....	.....	.....	.....	.....	.....	4·51	1,455	2·27	433	1·23	101
29	1·61	8	.....	.....	3·01	.....	4·51	1,455	2·22	414	1·23	101
30	.....	.....	.....	.....	.....	.....	4·51	1,455	2·13	381	1·17	88
31	.....	.....	.....	.....	.....	.....	.....	.....	2·06	356	.....	.....

	July.		August.		September.		October.		November.		December.	
1	.....	.....	0·87	31	0·92	40	0·93	41	0·86	30	.....	.....
2	1·10	73	0·87	31	0·90	36	0·93	41	0·84	26	.....	.....
3	1·09	71	0·86	30	0·92	40	0·94	43	0·88	33	.....	.....
4	1·08	69	0·86	30	0·93	41	0·93	41	0·84	26	.....	.....
5	1·06	65	0·85	28	0·93	41	0·88	33	0·83	25	.....	.....
6	1·02	58	0·85	28	0·96	47	0·86	30	0·85	28	.....	.....
7	1·02	58	0·87	31	0·95	45	0·85	28	0·85	28	.....	.....
8	0·98	50	0·85	28	0·95	45	0·88	33	0·83	25	.....	.....
9	0·97	49	0·85	28	0·92	40	0·89	34	0·82	23	.....	.....
10	0·98	50	0·87	31	0·95	45	0·96	47	0·79	19	.....	.....
11	1·02	58	0·88	33	0·95	45	0·95	45	0·83	25	.....	.....
12	1·04	62	0·88	33	0·96	47	0·95	45	0·83	25	.....	.....
13	1·05	64	0·88	33	0·95	45	0·98	50	0·83	25	.....	.....
14	1·08	69	0·88	33	0·93	41	0·96	47	0·83	25	.....	.....
15	1·03	60	0·94	43	0·93	41	0·93	41	0·83	25	.....	.....
16	1·03	60	0·87	31	0·93	41	0·90	36	0·85	28	.....	.....
17	1·02	58	0·95	45	0·94	43	0·94	43	0·88	33	.....	.....
18	0·97	49	0·94	43	0·94	43	0·92	40	0·88	33	.....	.....
19	0·95	45	1·01	56	0·96	47	0·91	38	0·89	34	.....	.....
20	0·93	41	0·94	43	0·99	52	0·90	36	0·92	40	.....	.....
21	0·92	40	1·06	65	0·95	45	0·83	25	0·86	30	.....	.....
22	0·91	38	1·06	65	0·90	36	0·88	33	0·89	34	.....	.....
23	0·90	36	1·03	60	0·95	45	0·90	36	0·89	.....	.....	.....
24	0·89	34	1·03	60	1·00	54	0·91	38	0·89	.....	.....	.....
25	0·90	36	1·02	58	0·99	52	0·92	40	0·98	.....	.....	.....
26	0·88	33	1·02	58	0·90	36	0·90	36	0·93	.....	.....	.....
27	0·87	31	1·01	56	0·96	47	0·91	38	0·92	.....	.....	.....
28	0·86	30	0·97	49	0·94	43	0·83	25	0·88	.....	.....	.....
29	0·86	30	0·94	43	0·94	43	0·86	30	0·95	.....	.....	.....
30	0·86	30	0·94	43	0·94	43	0·86	30	0·89	.....	.....	.....
31	0·86	30	0·94	43	.....	.....	0·87	31	.....	.....	.....	.....

Note.—Ice conditions January 1 to April 14; data not sufficient to compute daily discharge. Ice conditions November 22 to end of year; data not sufficient to compute daily discharge.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Souris River at Wawanesa, for 1914.

[Drainage area, 22,500 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							3·20		3·33	874	1·98	327
2							3·31		3·30	860	1·96	320
3							3·14		3·36	887	1·92	305
4							3·05		3·42	914	1·90	298
5							3·00		3·60	1,000	1·96	320
6							3·07		3·57	985	1·92	305
7							3·06		3·55	975	2·00	334
8							3·14		3·46	932	1·93	309
9	1·08	4					3·18		3·38	896	1·90	298
10							3·20		3·34	878	1·94	312
11							3·37		3·26	842	1·92	305
12							3·26		3·26	842	1·88	291
13									3·20	815	1·79	259
14							3·07		3·13	784	1·72	236
15							2·91		3·06	752	1·67	220
16							2·68	592	2·98	716	1·61	201
17							3·44	923	2·88	674	1·58	192
18							3·45	928	2·78	633	1·59	195
19							3·44	923	2·74	616	1·56	186
20							3·53	965	2·65	580	1·55	183
21							3·60	1,000	2·52	528	1·53	176
22							3·58	990	2·42	489	1·54	179
23							3·71	1,055	2·35	463	1·52	173
24							3·76	1,080	2·28	437	1·51	170
25							3·78	1,090	2·26	429	1·52	173
26							3·78	1,090	2·19	403	1·50	167
27							3·75	1,075	2·21	411	1·48	162
28							3·66	1,030	2·21	411		
29							3·58	990	2·20	407	1·48	162
30							3·48	941	2·13	381	1·52	173
31									2·04	348		

	July.		August.		September.		October.		November.		December.	
1	1·55	183	1·35	128	1·14	81	0·86	30	0·95	45	0·98	
2	1·54	179	1·35	128	1·12	77	0·84	26	0·92	40	0·98	
3	1·58	192	1·35	128	1·11	75	0·84	26	0·85	28	0·98	
4	1·62	204	1·36	130	1·10	73	0·84	26	0·81	22	0·98	
5	1·60	198	1·30	116	1·07	67	0·83	25	0·78	17	0·98	
6	1·60	198	1·32	121	1·06	65	0·82	23	0·76	14	0·97	
7	1·56	186	1·31	118	1·05	64	0·83	25	0·75	13	0·97	
8	1·54	179	1·25	105	1·05	64	0·89	34	0·74	11	0·96	
9	1·56	186	1·27	109	1·05	64	0·91	38	0·75	13	0·94	
10	1·59	195	1·25	105	1·03	60	0·91	38	0·81	22	0·87	
11	1·54	179	1·23	101	1·02	58	0·91	38	0·74	11	0·94	4
12	1·57	189	1·22	98	1·01	56	0·88	33	0·75	13	1·00	
13	1·53	176	1·22	98	1·00	54	0·89	34	0·82	24	1·03	
14	1·52	173	1·21	96	0·96	47	0·87	31	0·79	18	1·01	
15	1·50	167	1·18	90	0·98	50	0·88	33	0·90	36	1·03	
16	1·48	162	1·17	88	0·99	52	0·86	30	0·94	43	0·98	
17	1·47	159	1·14	81	0·98	50	0·85	28	0·98	50	0·98	
18	1·45	154	1·13	79	0·96	47	0·84	26	0·98	50	0·94	
19	1·48	162	1·11	75	0·95	45	0·82	23			0·99	
20	1·47	159	1·11	75	0·97	49	0·83	25			1·00	
21	1·43	148	1·11	75	1·03	60	0·85	28	0·99			
22	1·41	143	1·12	77	1·02	58	0·85	28				
23	1·39	138	1·13	79	1·00	54	0·82	23			1·17	
24	1·38	135	1·12	77	0·98	50	0·81	22			1·21	
25	1·39	138	1·19	92	0·96	47	0·80	20	1·09		1·21	
26	1·37	133	1·20	94	0·94	44	0·75	17	1·13		1·21	
27	1·36	130	1·20	94	0·92	40	0·78	17	1·09		1·14	
28	1·35	128	1·21	96	0·89	34	0·77	16	1·07		1·10	
29	1·33	123	1·20	94	0·89	34	0·81	22	1·09		1·03	
30	1·35	128			0·88	33	0·96	47			1·00	
31	1·37	133					0·96	47			0·98	

Note.—Ice conditions January 1 to April 15, data not sufficient to compute daily discharge. Ice conditions November 18 to end of year.

Monthly Discharge of Souris River at Wawanesa, for the year 1912–14.

[Drainage area, 22,500 square miles.]

Month.	Discharge in Second-Feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
October	96	81	[1]80	0·004	0·005	4,925
November	.....	.....	[1]54	0·002	0·002	3,225
December	.....	.....	.....	.....	.....	.....
The period	96	81	67	0·003	0·007	8,150
1913.						
January	.....	.....	[1] 10	0·0004	0·0005	615
February	.....	.....	.....	.....	.....	.....
March	.....	.....	.....	.....	.....	.....
April	1,475	.....	[1]966	0·043	0·048	57,500
May	1,495	356	988	0·044	0·051	60,800
June	323	71	166	0·007	0·008	9,900
July	73	30	48	0·002	0·002	2,950
August	65	28	42	0·002	0·002	2,580
September	54	36	44	0·002	0·002	2,625
October	50	25	37	0·002	0·002	2,280
November	40	.....	[1]25	0·001	0·001	1,490
December	.....	.....	[1]15	0·0007	0·0008	922
The period	1,495	8	257	0·0104	0·1173	141,662
1914.						
January	.....	.....	[1]5	0·0002	0·0002	307
February	.....	[1]0	[1]0	.....	.....	.....
March	.....	.....	.....	.....	.....	.....
April	1,090	.....	500	0·022	0·025	29,750
May	1,000	348	683	0·030	0·035	41,900
June	334	162	239	0·011	0·012	14,200
July	204	123	163	0·007	0·008	10,000
August	130	75	98	0·004	0·005	6,050
September	81	33	55	0·002	0·002	3,275
October	47	16	28	0·001	0·001	1,720
November	50	.....	[1]20	0·0009	0·001	1,190
December	.....	.....	[1]5	0·0002	0·0002	307
The period	1,090	0	163	0·0078	0·0894	108,699

Note.—Measurments marked thus [1] estimated; data not sufficient to estimate discharge for December 1912, February and March 1913 and March 1914.

CYPRESS RIVER.

The Cypress river forms a small tributary of the Assiniboine, entering the latter in Tp. 8, R. 11, W. P. M. It has a drainage area of 185 square miles, the source being on the northwestern slope of the Pembina mountains. From source to mouth its course takes the form of a large bow, bending first west then north. The country drained is all under cultivation, but was low lying and required drainage; for this purpose a ditch was cut across the loop just referred to, and at present this carries the greater part of the water flowing in the river. During the summer and winter months there is no discharge, as practically all the discharge occurs during the spring freshet and following the rain in the fall.

Cypress River at Cypress River.

History.—This station was established on October 29, 1912, by G. J. Lamb, but was discontinued on January 11, 1913.

Location of section.—The section is located on the downstream side of the traffic bridge on the east and west road, one-half mile south and one-half mile east of Cypress river, Manitoba. The initial point is an arrow curved on top of the hand-rail of the bridge at the west end on the downstream side.

Records Available.—Sufficient information is not available to admit of daily discharge estimates, but a few meterings were taken at the station.

Drainage Area.—The drainage area tributary to the Cypress river is 170 square miles above Cypress river.

Gauge.—A 6-foot vertical staff gauge was established at the station.

Channel.—The channel is straight both above and below the section for a considerable distance. The stream is confined to the channel at all stages, the bed being of a sandy nature, and permanent.

Discharge Measurements.—Discharge measurements are taken from the downstream side of the bridge.

Discharge Measurements of Cypress River at Cypress River, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 9	G. J. Lamb	1496	31	28·1	1·47	100·75	41·4
" 27	"	1186	28	15·6	0·76	101·18	12·0

PIPESTONE CREEK.

The Pipestone creek drains into Oak lake, which lies in Tp. 8, R. 25, W.P.M. It has a small drainage area which lies to the south and west of the Assiniboine river and to the north of the Souris river.

Oak lake, into which the Pipestone drains, has no visible outlet, evaporation and seepage accounts for all the inflow to the lake. The stream flows through a well cultivated district, and forms a source of water supply for domestic and farm purposes.

Pipestone Creek at Cromer.

History.—This station was established by Alex. Pirie on August 24, 1912.

Location of Section.—The meter section is located one-half mile below the Canadian Northern Railway bridge at Cromer.

Records Available.—A daily gauge height record from August 25 to October 26, 1912, has been obtained, and this, together with the discharge measurements made at the section, constitute the records for the station.

Drainage Area.—The drainage area of Pipestone creek is 1,580 square miles.

Gauge.—A vertical staff gauge was fastened to a pile at the east end of the railway bridge at Cromer.

Channel.—The stream is confined to one channel at all stages. For 100 feet above and 200 feet below the section the stream's course is straight. The bed of the stream is of gravel, the banks are high and covered with brush, but are not liable to overflow.

Discharge Measurements.—The discharge measurements are made by wading; the discharge being small it is possible to obtain the meterings by this method under nearly all stages.

Discharge Measurements of Pipestone Creek at Cromer, 1912–13.

Date.	Hydrographer.	Meter. No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec	Feet	Sec.-ft.
Aug. 24	Alex. Pirie	1197	22	15	0·54	101·51	8
1913.							
Aug. 12	W. J. Ireland	1469	32	26	0·47	101·77	12
Sept. 21	"	1469	24	15	0·81	101·55	12

TRIBUTARIES OF LAKE WINNIPEGOSIS.

General.—Practically all of the country west of lake Manitoba and between the Riding mountains and the Saskatchewan river drains directly or indirectly into lake Winnipegosis.

Three small lakes act as intermediate basins, and to these the greater part of the drainage first finds its way, being drained from them into the first named lake.

These lakes are: Red Deer lake, into which Red Deer river drains, and is then drained by the lower end of the same river into Dawson bay, an arm of lake Winnipegosis. Swan lake, drained by the Shoal river into the same bay which is the collecting basin for the Swan and Woody rivers. Lake Dauphin, drained by the Mossy river, and having as tributaries among others, the Valley and Ochre rivers. The Fork river is a tributary of the Mossy.

RED DEER RIVER.

The source of the Red Deer river is in Tp. 44, R. 19, west of the Second meridian, south of Melfort, Sask. It flows in a general easterly direction into Red Deer lake, an expanse of the river, and also drains that lake into lake Winnipeg.

The total drainage area of the Red Deer is 5,478 square miles, including Red Deer lake, which has an area of 100 square miles. The valley through which the river flows is deep and wide. In the upper portion the tributaries which head in small lakes and swamps are the Fir, Etoimami, Pipestone, and Barrier rivers, nearly all of which enter from the south.

The upper portion of the drainage area is well timbered, growths of spruce and poplar of merchantable size being found. The Red Deer Lumber Company carry on lumbering operations on the river, and operate a saw-mill on Red Deer lake, the logs being floated downstream to the mill.

The Canadian Northern railway crosses the river at Erwood, 30 miles west of the lake, and a spur line has been built in from Powell to touch the west end of the lake at Barrows.

Red Deer River at Erwood.

History.—This station was established by C. O. Allen on May 23, 1914, with the object of ascertaining the desirability of locating a meter section at this point. After two measurements were made the station was discontinued.

Location of Section.—The meter section is located on the downstream side of the Canadian Northern Railway bridge at Erwood, 10 miles east of Hudson Bay Junction. The initial point is an iron bolt marked in blue on the east end of the bridge.

Records Available.—Two discharge measurements were taken at this point.

Drainage Area.—The area tributary to the Red Deer river above the station at Erwood is 4,850 square miles.

Gauge.—A vertical staff gauge was fastened to a pile at the east end of the bridge on the downstream side.

Channel.—The channel is straight for 75 feet above the section and 150 feet below. The bed of the stream is rocky and not liable to change. The banks are high and not liable to overflow. There is a slight rapid about 1,000 feet below the station.

Discharge Measurements.—Meterings were made from the downstream side of the railroad bridge; they are two in number.

Discharge Measurements of Red Deer River at Erwood, Sask., 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 23	C. O. Allen	1497	158	1,510	2·98	71·72	4,494
June 25	"	1760	101	853	0·69	68·90	594

Red Deer River at Hudson Bay Junction.

History.—The station on the Red Deer at Hudson Bay Junction was established by G. Ebner on August 12, 1913, which replaced a station established by E. Bankson on June 4, 1913, 400 feet below the ferry.

Location of Section.—The meter section is located at the ferry crossing of the Red Deer river, 500 feet below its confluence with the Elk river, and 3½ miles south of Hudson Bay Junction on the road to the Red Deer Lumber Company's camp. The initial point is marked by a nail driven in a pile 60 feet from the water's edge on the right bank at the ferry crossing.

Records Available.—Records of daily gauge height have been obtained from July 9 to October 31, 1913, and April 30 to November 27, 1914. A few gauge heights are also available, taken during the winter seasons. Estimated daily discharge cover the period July 9 to October 31, 1913, and April 30 to November 27, 1914.

Drainage Area.—The area tributary to the Red Deer above the station at Hudson Bay Junction is 4,900 square miles.

Gauge.—The gauge is a vertical staff gauge driven in the bed of the river, and braced; it is near the right bank, and 40 feet below the section; it is referred to a bench-mark which is located on the cable tower on the south or right bank, the datum of which is arbitrary.

Channel.—The channel is straight for about 500 feet above and below the section, the river is confined to one channel at all stages, the bed of the stream is covered with boulders and not liable to shift. The banks of the river are low and wooded and liable to overflow at high stages.

Discharge Measurements.—Meterings are made from a boat by means of a small Price meter.

Accuracy.—Eleven discharge measurements define the curve fairly well between gauge heights 99·8 and 103·0. Owing to the fact that the Red Deer Lumber Company operate a number of lumber dams on the upper waters of the river, the records do not give a true idea of the natural regimen of the river.

Discharge Measurements of Red Deer River at Hudson Bay Junction, 1913-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 4	E. Bankson	1469	196	1,036	2·78	103·02	[1]2,871
July 5	G. Ebner	1196	183	927	2·53	102·91	[1]2,342
" 10	A. Pirie	1496	193	886	2·30	102·64	[1]2,034
Aug. 12	G. Ebner	1196	165	765	2·28	102·42	[2]1,747
" 30	W. J. Ireland	1469	162	693	2·05	102·12	1,420
Sept. 18	"	1469	162	566	1·36	101·43	768
Oct. 6	C. O. Allen	1435	155	528	1·03	101·12	546
Nov. 20	A. Pirie	1496	146	407	0·64	101·05	[3]261
Dec. 16	C. O. Allen	1375	153	240	0·49	100·90	[3]118
" 16	"	1375	153	240	0·49	100·90	[3]118
1914.							
Jan 22	O. Allen	1375	210	278	0·26	100·72	[3]69
Mar. 4	D. B. Gow	1374	160	96	0·33	.....	[3]32
" 28	C. O. Allen	1496	65	49	0·68	100·57	[3]33
April 30	"	1497	169	921	3·55	102·86	3,273
June 26	"	1760	155	570	1·31	101·20	750
July 31	W. J. Ireland	1919	145	384	0·30	100·20	116
Sept. 10	H. Boyd	1919	150	322	0·30	100·08	97
Oct. 2	M. S. Madden	1911	172	340	0·18	99·79	61
" 29	"	1912	110	320	0·26	100·01	82
Nov. 18	F. S. Smith	1186	164	430	0·10	100·10	[3]44

[1] Old station below Ferry.
[2] New station at Ferry from August 12 on.
[3] Ice measurement.

Daily Gauge Height and Discharge of Red Deer River near Hudson Bay Junction, for 1913.

[Drainage Area, 4,900 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	103·08	2,521	102·10	1,394	101·23	623	.....	.....	.....	.....
2	.....	.....	102·96	2,383	102·15	1,452	101·19	593	.....	.....	.....	.....
3	.....	.....	102·81	2,211	102·12	1,417	101·15	569	.....	.....	.....	.....
4	.....	.....	102·79	2,187	102·10	1,394	101·03	493	.....	.....	.....	.....
5	.....	.....	102·65	2,027	102·07	1,359	101·10	535	.....	.....	.....	.....
6	.....	.....	102·52	1,877	102·01	1,291	101·13	555	.....	.....	.....	.....
7	.....	.....	102·46	1,808	101·97	1,247	101·13	555	.....	.....	.....	.....
8	.....	.....	102·42	1,762	101·89	1,160	101·13	555	.....	.....	.....	.....
9	102·77	2,165	102·42	1,762	101·88	1,150	101·13	555	.....	.....	.....	.....
10	102·61	1,981	102·43	1,774	101·75	1,025	101·14	561	.....	.....	.....	.....
11	102·71	2,096	102·46	1,808	101·79	1,061	101·16	574	.....	.....	.....	.....
12	103·33	2,809	102·42	1,762	101·75	1,025	101·19	593	.....	.....	.....	.....
13	104·06	3,648	102·56	1,923	101·72	998	101·15	568	.....	.....	.....	.....
14	104·48	4,131	102·53	1,889	101·71	989	101·09	529	.....	.....	.....	.....
15	104·78	4,476	102·73	2,119	101·56	873	101·06	511	.....	.....	.....	.....
16	104·93	4,648	103·05	2,487	101·53	849	101·04	499	.....	.....	100·90	118
17	105·01	4,741	102·99	2,417	101·49	817	101·06	511	.....	.....	.....	.....
18	104·83	4,533	103·00	2,429	101·44	780	101·03	493	.....	.....	.....	.....
19	104·71	4,396	103·02	2,452	101·41	758	101·01	481	.....	.....	.....	.....
20	104·50	4,154	102·99	2,417	101·41	758	101·01	481	101·05	261	.....	.....
21	104·28	3,901	102·95	2,372	101·38	735	100·98	463	.....	.....	.....	.....
22	104·13	3,728	102·92	2,337	101·38	735	101·01	481	.....	.....	.....	.....
23	103·96	3,533	102·70	2,084	101·37	727	101·01	481	.....	.....	.....	.....
24	103·82	3,372	102·70	2,084	101·36	720	101·04	499	.....	.....	.....	.....
25	103·63	3,154	102·49	1,842	101·35	713	100·93	433	.....	.....	.....	.....
26	103·77	3,315	102·38	1,716	101·35	713	101·03	493	.....	.....	.....	.....
27	103·78	3,326	102·25	1,566	101·34	705	101·13	555	.....	.....	.....	.....
28	103·73	3,268	102·22	1,532	101·33	697	100·93	433	.....	.....	.....	.....
29	103·58	3,096	102·15	1,452	101·30	675	100·73	322	.....	.....	.....	.....
30	103·42	2,912	102·09	1,383	101·27	653	101·06	511	.....	.....	.....	.....
31	103·19	2,647	102·10	1,394	.....	.....	101·06	511	.....	.....	.....	.....

Note.—Ice conditions from October 30 to December 31; data not sufficient to compute daily discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Red Deer River near Hudson Bay Junction, for 1914.

[Drainage Area, 4,900 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge
	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1									102·76	2,153	102·76	2,153
2									102·66	2,038	102·61	1,981
3									102·41	1,751	102·41	1,751
4									103·11	2,556	102·36	1,693
5									103·31	2,786	102·26	1,578
6									103·11	2,556	102·21	1,521
7									103·71	3,246	102·11	1,406
8									103·86	3,418	102·16	1,463
9									104·26	3,788	102·06	1,348
10									104·26	3,878	102·06	1,348
11									104·31	3,936	101·91	1,181
12									104·26	3,878	101·81	1,089
13									103·86	3,418	101·86	1,139
14									103·71	3,246	101·71	989
15									103·66	3,188	101·61	908
16									103·41	2,991	101·43	773
17									103·36	2,843	101·51	833
18									103·21	2,671	101·57	881
19									103·06	2,498	101·43	773
20									103·01	2,441	101·36	720
21									103·81	3,361	101·46	795
22	100·72	72							104·11	3,706	101·31	683
23									104·06	3,648	101·21	608
24									104·01	3,591	101·18	587
25									103·81	3,361	101·18	587
26									103·66	3,188	101·21	608
27									103·51	3,016	101·24	630
28					100·57	33			103·41	2,991	101·11	542
29									103·16	2,613	101·06	511
30							107·86	3,270	102·91	2,326	101·04	499
31									102·81	2,211		

Note.—Ice conditions from January 1 to April 15, and from November 10 to December 31, data not sufficient to compute daily discharges.

	July.		August.		September.		October		November		December	
1	100·96	451	100·19	118	99·81	71	99·79	70	100·04	91		
2	100·91	421	100·11	102	99·81	71	99·79	70	100·04	91		
3	100·86	393	100·11	102	99·81	71	99·81	72	100·11	89		
4	100·83	377	100·09	98	99·86	73	99·89	75	100·14	86		
5	100·83	377	100·06	94	99·86	73	99·89	75	100·24	83		
6	100·79	354	100·01	87	99·96	81	99·91	79	100·31	80		
7	100·76	338	100·01	87	100·01	87	99·89	75	100·32	77		
8	100·73	322	100·01	87	100·01	87	99·89	75	100·32	74		
9	100·81	366	99·96	81	100·06	94	99·94	79	100·31	71		
10	100·76	338	99·93	78	100·04	91	99·99	84	100·24	68		
11	100·71	311	99·91	76	100·04	91	100·04	91	100·31	65		
12	100·71	311	99·89	75	100·04	91	100·04	91	100·32	62		
13	100·66	285	99·89	75	99·99	84	100·04	91	100·24	59		
14	100·66	285	99·86	73	99·99	84	100·04	91	100·24	56		
15	100·66	285	99·86	73	99·99	84	100·04	91	99·99	53		
16	100·71	311	99·84	72	99·99	84	99·99	84	99·99	50		
17	100·68	295	99·81	71	99·91	79	99·99	84	99·99	47	100·23	25
18	100·66	285	99·81	71	99·94	79	99·99	84	99·95	44		
19	100·61	261	99·79	70	99·94	79	99·99	84	99·99	44		
20	100·56	239	99·76	68	99·91	79	99·99	84	100·02	44		
21	100·51	219	99·76	68	99·94	79	99·99	84	100·02	43		
22	100·46	199	99·76	68	99·94	79	99·99	84	100·02	41		
23	100·41	179	99·76	68	99·94	79	99·99	84	99·99	41		
24	100·36	163	99·76	68	99·89	75	99·99	84	99·99	39		
25	100·36	163	99·76	68	99·89	75	99·99	84	99·99	39		
26	100·31	148	99·79	70	99·89	75	99·99	84	99·24	38		
27	100·26	135	99·74	67	99·84	72	99·99	84	99·24	37		
28	100·21	123	99·74	67	99·84	72	100·04	91				
29	100·26	135	99·76	68	99·92	77	100·01	87				
30	100·21	123	99·76	68	99·79	70	100·01	87				
31	100·19	118	99·76	68			100·02	88				

From November [illegible] to December 31, data not sufficient to [illegible] daily discharges.

MONTHLY DISCHARGE of Red Deer River near Hudson Bay Junction, for the years 1913-14.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
July	.....	.....	[1]3,480	0·710	0·819	214,000
August	2,521	1,382	2,000	0·408	0·470	122,500
September	1,452	653	962	0·196	0·219	57,200
October	623	322	517	0·106	0·122	31,800
November	.....	.....	[1]320	0·065	0·073	19,000
December	.....	.....	[1]140	0·029	0·033	8,600
The period	2,521	[1]115	1,238	0·252	1,736	453,100
1914						
January	.....	.....	[1]70	0·014	0·016	4,300
February	.....	.....	[1]50	0·010	0·010	2,780
March	.....	.....	[1]30	0·006	0·007	1,850
April	.....	.....	[1]1,800	0·367	0·410	107,100
May	3,925	1,750	3,000	0·612	0·706	184,900
June	2,150	499	1,050	0·214	0·239	62,600
July	451	118	268	0·055	0·063	16,500
August	118	67	78	0·016	0·018	4,800
September	94	70	80	0·016	0·018	4,775
October	91	70	83	0·017	0·020	5,100
November	91	.....	[1]60	0·012	0·013	3,575
December	.....	.....	[1]25	0·005	0·006	1,540
The year	3,925	[1]25	550	0·112	1·526	399,820

NOTE.—All marked thus (1) are estimated.

SWAN RIVER.

The Swan river rises on the extreme northwestern slope of the Porcupine mountains. Its course is generally south and east until it reaches a point in Tp. 34, R. 3, W.P.M., when it turns and flows almost due northeast through the valley between Porcupine and Duck mountains into Swan lake.

The valley between the two mountains is broad and deep, but nearly all the drainage entering this section of the river is from the south, most of the tributaries heading in the Duck mountains. To the north the basin is confined by the drainage area of the Woody river, which follows a parallel course to the Swan.

The banks of the valley are an alluvial deposit of clay and gravel. The river has an average width of 150 feet, the banks ranging from 10 to 50 feet in height. The upper parts of the valley are largely covered with a timber growth, but in the lower bottom lands, mixed farming is extensively followed. The valley is well settled, the town of Swan River being the principal community.

In 1909 an investigation of the power possibilities of the river was made and a site located in the vicinity of Swan River, with a view to supplying that town with power.

SWAN RIVER AT SWAN RIVER.

History.—The Swan River station was established by W. G. Worden on October 12, 1912, and has been operated since that date.

Location of Section.—The meter section is located on the down stream side of the new steel traffic bridge which spans the Swan river at the north end of the town of Swan River, Man. The initial point is marked on the top of the south abutment at the east side.

Records Available.—Records of daily gauge height are available for part of the period October 12, 1912, to the end of 1914, blanks in the records occur during the winter seasons. Estimated daily discharges are on hand for the periods October 24 to November 16, 1912, April 12 to November 8, 1913, and April 15 to November 15, 1914.

Drainage Area.—The area drained above the station of the Swan river is 1,215 square miles.

Gauge.—A 6-foot vertical staff gauge is fastened to a plank which is spiked to the centre pier of the old bridge, which is downstream from the section.

Channel.—Above the section the channel is straight for 300 feet and also for 200 feet below. The bridge is a clear span, and the river lies in one channel at all stages. The stream-bed is of clay and subject to shifting; the current is swift. The right bank is of clay, is high and not liable to overflow. The left bank is low and wooded and liable to overflow at high stages.

Discharge Measurements.—The meterings are made from the bridge, with a small Price current-meter.

Accuracy.—Between gauge heights 99·40 and 101·80 the discharge curve is well defined, between 101·80 and 104·20 it is fairly well defined.

DISCHARGE MEASUREMENTS of Swan River at Swan River, for 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 24	W. G. Worden	1,196	129	404	2·51	101·73	1,013
Dec. 11	G. J. Lamb	1,187	101	177	·72	100·61	[1]125
1913.							
Feb. 12	Alex. Pirie	1,469	105	55	1·00	100·49	[1]54
April 12	"	1,469	148			103·30	[2]4,055
" 13	"	1,186	140	782	5·27	104·14	4,115
" 13	"	1,186	140	782	5·44	104·14	4,248
June 5	E. Bankson	1,469	138	387	1·50	101·11	583
" 17	G. Ebner	1,186	133	324	1·25	100·69	402
July 8	Alex. Pirie	1,496	144	674	3·88	103·19	2,618
Aug. 13	G. Ebner	1,196	140	342	1·25	100·82	428
" 26	W. J. Ireland	1,469	178	357	1·35	101·12	490
Sept. 1	"	1,469	137	307	1·03	100·65	316
" 23	"	1,469	122	251	0·62	100·16	155
Oct. 13	C. O. Allen	1,435	123	258	0·65	100·27	167
Nov. 13	"	1,374	131	182	0·54	100·00	[1]97
Dec. 10	"	1,375	126	157	0·35	100·42	[1]55
1914.							
Jan. 16	C. O. Allen	1,375	70	104	0·31	101·36	[3]32
Feb. 3	"	1,375	70	107	0·38	101·33	[4]41
Mar. 3	D. B. Gow	1,371	93	136	0·21	100·85	[4]27
" 30	C. O. Allen	1,496	89	160	0·31	101·10	[4]50
April 27	"	1,497	150	591	3·07	102·45	1,816
May 24	"	1,197	150	503	2·07	101·63	1,044
June 7	"	1,760	129	248	0·52	100·08	128
" 29	"	1,760	127	246	0·45	100·00	113
July 30	W. J. Ireland	1,919	116	166	0·21	99·76	[5]35
Aug. 20	A. Pirie	1,940	111	167	0·06	99·39	10
Sept. 9	H. Boyd	1,919	116	174	0·21	99·66	36
Oct. 1	M. S. Madden	1,911	118	171	0·13	99·55	21
" 28	"	1,912	121	186	0·23	99·87	42
Nov. 19	F. S. Smith	1,186	121	154	0·19	100·04	[1]29
Dec. 10	C. O. Allen	1,912	117	172	0·23	100·46	[5]31

[1]Measurement taken under ice conditions [2]Float measurement [3]Ice (mean thickness 2·32') [4]Ice (mean thickness 2·05'). [5]Ice (mean thickness 1·61') [6]Ice (mean thickness 1·71') [7]Ice (mean thickness 0·6') [8]Ice (mean thickness 1·2').

Daily Gauge Height and Discharge of Swan River at Swan River, for 1912.

[Drainage area, 1,215 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									101·31	728		
2									101·08	568		
3									100·91	466		
4									100·89	455		
5									100·89	455		
6									100·90	460		
7									100·91	466		
8									100·90	460		
9									100·89	455		
10									100·89	455		
11									100·88	450	100·61	
12									100·88	450		
13									100·87	445		
14									100·87	445		
15									100·87	445		
16									100·86	440		
17												
18												
19											100·41	
20												
21												
22												
23												
24							101·74	1,070				
25							101·73	1,070				
26							101·69	1,030				
27							101·69	955			100·41	
28							101·53	896				
29							101·52	887				
30							101·46	840				
31							101·43	818				

Note.—Ice conditions from November 17 to end of year; data not sufficient to compute daily discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Swan River at Swan River, for 1913.

(Drainage area, 1,215 square miles.)

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									101·68	1,020	101·38	780
2									101·63	981	101·31	728
3									101·58	938	101·25	683
4			100·51						101·51	879	101·17	626
5							101·58		101·60	955	101·14	606
6									101·89	1,200	101·11	587
7									102·05	1,350	101·11	587
8									102·04	1,349	101·10	589
9									101·97	1,270	101·05	559
10									101·87	1,190	100·99	514
11			100·53						101·79	1,120	100·93	478
12			100·49				103·58	3,250	101·75	1,080	100·93	478
13							104·14	4,150	101·75	1,080	100·85	435
14							104·21	4,300	101·77	1,100	100·84	430
15					100·20		104·49	4,800	101·79	1,120	100·83	425
16							104·56	4,900	101·79	1,120	100·77	395
17							104·55	4,900	101·84	1,160	100·72	370
18	100·49		100·21				104·21	4,300	101·81	1,130	100·66	341
19							103·99	3,900	101·82	1,140	100·61	317
20							103·74	3,500	101·78	1,110	100·57	299
21							103·63	3,325	101·73	1,070	100·57	299
22							103·68	3,400	101·69	1,030	100·51	274
23							103·55	3,200	101·67	1,020	100·43	242
24							103·35	2,900	101·58	938	100·40	230
25							103·00	2,400	101·55	913	100·47	258
26							102·56	1,850	101·55	913	100·44	246
27							102·22	1,500	101·53	896	101·15	613
28	100·55						102·05	1,350	101·53	896	101·24	675
29							101·91	1,220	101·46	840	101·21	653
30							101·81	1,130	101·46	840	101·29	713
31									101·42	810		

	July.		August.		September.		October.		November.		December.	
1	101·57	930	101·22	660	100·69	355	100·16	153	100·32	202		
2	101·91	1,220	101·15	613	100·64	331	100·14	147	[1]100·28	189		
3	102·42	1,700	101·05	550	100·69	355	100·15	150	[1]100·23	174		
4	103·85	3,675	100·86	440	100·71	365	100·13	144	[1]100·19	162		
5	103·76	3,525	100·75	385	100·71	365	100·13	144	[1]100·14	147		
6	103·70	3,425	100·68	350	100·71	365	100·11	138	[1]100·10	135	100·30	
7	103·42	3,000	100·62	322	100·64	331	100·17	156	[1]100·05	120		
8	103·13	2,580	100·57	299	100·60	312	100·17	156	100·00	105		
9	102·86	2,210	100·59	308	100·69	355	100·19	162				
10	102·64	1,930	100·58	304	100·66	341	100·25	180			100·42	
11	102·75	2,070	100·68	350	100·63	326	100·25	180				
12	102·94	2,320	100·80	410	100·53	283	100·27	186				
13	103·15	2,600	100·83	425	100·48	262	100·28	189	100·00			
14	103·27	2,775	100·88	450	100·41	246	100·30	195			100·28	
15	103·20	2,675	101·04	544	100·38	223	100·28	189	99·93			
16	103·15	2,600	101·24	675	100·36	216	100·26	183				
17	103·05	2,475	101·37	773	100·33	206	100·27	186				
18	102·87	2,220	101·40	795	100·29	192	100·23	174				
19	102·59	1,880	101·42	810	100·28	189	100·20	165				
20	102·31	1,590	101·43	818	100·25	180	100·06	123			100·61	
21	102·09	1,380	101·48	855	100·23	174	100·08	129				
22	101·89	1,200	101·52	887	100·22	171	100·31	199	99·96			
23	101·65	998	101·41	803	100·19	162	100·26	183				
24	101·49	863	101·27	698	100·22	171	100·25	180				
25	101·36	765	101·18	632	100·26	183	100·19	162				
26	101·30	720	101·07	562	100·25	180	100·19	162				
27	101·19	639	100·92	472	100·23	174	100·13	144			101·01	
28	101·15	613	100·82	420	100·22	171	100·41	244				
29	101·15	613	100·80	410	100·21	168	100·22	171	100·18			
30	101·32	735	100·71	365	100·21	168	100·26	183				
31	101·28	705	100·61	334			100·28	189				

Note.—Ice conditions from January 1 to April 12 and from November 8 to end of year; data not sufficient to compute daily discharges. All gauge heights marked thus [1] interpolated

Daily Gauge Height and Discharge of Swan River at Swan River, for 1914.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	.....	.....	[1]100·95	.....	101·97	1,270	101·00	520
2	.....	.....	.....	.....	.....	.....	[1]100·93	.....	101·89	1,200	100·92	472
3	101·02	.....	.....	.....	.....	.....	100·90	.....	101·74	1,070	100·85	435
4	.....	.....	.....	.....	.....	.....	100·95	.....	101·71	1,050	100·80	410
5	.....	.....	.....	.....	.....	.....	101·14	.....	101·73	1,070	100·75	385
6	.....	.....	.....	.....	.....	.....	101·25	.....	102·90	2,260	100·72	370
7	.....	.....	101·16	.....	100·60	.....	101·82	.....	104·04	3,975	100·67	346
8	.....	.....	.....	.....	.....	.....	101·98	.....	103·98	3,875	100·63	326
9	.....	.....	.....	.....	.....	.....	101·63	.....	103·91	3,775	100·60	312
10	101·12	.....	.....	.....	.....	.....	101·64	.....	103·74	3,500	100·58	304
11	101·16	.....	.....	.....	.....	.....	101·44	.....	103·43	3,025	100·48	262
12	.....	.....	.....	.....	.....	.....	101·69	.....	103·07	2,500	100·42	238
13	.....	.....	.....	.....	.....	.....	102·53	.....	102·80	2,130	100·37	220
14	.....	.....	101·29	.....	100·66	.....	102·75	.....	102·53	1,810	100·31	199
15	.....	.....	.....	.....	.....	.....	102·64	1,940	102·29	1,570	100·27	186
16	101·36	.....	.....	.....	.....	.....	102·68	1,990	102·10	1,390	100·25	180
17	101·18	.....	.....	.....	.....	.....	103·15	2,600	101·93	1,240	100·22	171
18	.....	.....	.....	.....	.....	.....	103·24	2,750	101·83	1,150	100·18	159
19	.....	.....	.....	.....	.....	.....	102·65	1,930	101·71	1,050	100·15	150
20	.....	.....	.....	.....	.....	.....	102·97	2,360	101·63	981	100·10	135
21	.....	.....	100·93	.....	100·72	.....	102·79	2,120	101·60	955	100·03	114
22	.....	.....	.....	.....	.....	.....	102·65	1,950	101·08	568	100·03	114
23	.....	.....	.....	.....	.....	.....	102·56	1,850	101·74	1,070	100·05	120
24	101·14	.....	.....	.....	.....	.....	102·51	1,790	[1]101·65	998	100·03	114
25	.....	.....	.....	.....	.....	.....	102·57	1,860	101·56	921	100·00	105
26	.....	.....	.....	.....	.....	.....	102·44	1,720	101·50	870	99·97	98
27	.....	.....	.....	.....	.....	.....	102·38	1,660	101·41	803	99·98	100
28	.....	.....	100·75	.....	101·15	.....	102·28	1,560	101·36	765	100·10	135
29	.....	.....	.....	.....	.....	.....	102·14	1,430	101·26	690	99·97	98
30	.....	.....	.....	.....	.....	.....	102·05	1,350	101·17	625	99·95	94
31	101·50	.....	.....	.....	.....	.....	.....	.....	101·08	568	.....	.....

	July.		August.		September.		October.		November.		December.	
1	99·94	91	99·56	29	99·58	31	99·53	25	99·70	47	99·98	.....
2	99·92	87	99·58	31	99·58	31	99·55	28	99·71	49	100·17	.....
3	99·91	84	99·56	29	99·58	31	99·57	30	99·72	50	100·28	.....
4	99·90	82	99·56	29	99·64	39	99·58	31	99·72	50	100·30	.....
5	99·86	74	99·56	29	99·61	34	99·62	36	99·73	52	100·33	.....
6	99·85	72	99·54	26	99·64	39	99·65	40	99·78	59	100·37	.....
7	99·82	66	99·56	29	99·65	40	99·71	49	99·82	66	100·34	.....
8	99·79	60	99·54	26	99·64	39	99·67	43	99·82	66	100·32	.....
9	99·76	56	99·51	23	99·65	40	99·71	49	99·69	46	100·30	.....
10	99·76	56	99·51	23	99·65	40	99·76	56	99·73	52	100·45	.....
11	99·75	55	99·49	21	99·65	40	99·81	64	99·86	74	100·34	.....
12	99·75	55	99·47	19	99·68	44	99·81	64	100·01	108	100·36	.....
13	99·75	55	99·46	18	99·68	49	99·84	70	99·93	89	100·31	.....
14	99·73	52	99·45	17	99·65	40	99·80	62	99·93	89	100·35	.....
15	99·73	52	99·44	16	99·60	33	99·80	62	99·93	89	100·39	.....
16	99·72	50	99·44	16	99·59	32	99·79	60	99·93	.....	100·45	.....
17	99·72	50	99·43	15	99·62	36	99·77	58	99·93	.....	100·30	.....
18	99·72	50	99·42	14	99·56	29	99·76	56	99·91	.....	100·18	.....
19	99·71	49	99·39	11	99·55	28	99·75	55	99·90	.....	100·06	.....
20	99·70	47	99·41	13	99·54	26	99·74	53	99·90	.....	100·52	.....
21	99·69	46	99·45	17	99·57	30	99·74	53	99·91	.....	100·54	.....
22	99·67	43	99·45	17	99·55	28	99·75	55	99·93	.....	99·04	.....
23	99·62	36	99·47	19	99·55	28	99·75	55	100·06	.....	99·11	.....
24	99·61	34	99·48	20	99·52	24	99·75	55	99·94	.....	99·16	.....
25	99·57	30	99·48	20	99·51	23	99·73	52	99·93	.....	99·19	.....
26	99·56	29	99·47	19	99·54	26	99·70	47	100·02	.....	100·14	.....
27	99·53	25	99·55	28	99·55	28	99·69	46	100·15	.....	100·34	.....
28	99·52	24	99·55	28	99·51	23	99·68	44	100·27	.....	100·52	.....
29	99·49	21	99·57	30	99·50	22	99·69	46	99·93	.....	100·60	.....
30	99·46	18	99·58	31	99·51	23	99·69	46	99·94	.....	100·98	.....
31	99·58	31	99·58	31	.....	.....	99·69	46	.....	.....	100·70	.....

Note.—All gauge heights marked thus [1] interpolated. Ice conditions from January 1 to April 14, and from November 16 to December 31, data not sufficient to compute daily discharges.

SESSIONAL PAPER No. 25f

Monthly Discharge of Swan River at Swan River, for 1912-14.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
October			[1]945	0·778	0·897	58,100
November			[1]400	0·330	0·368	23,800
December			[1]100	0·082	0·095	6,150
The period			[1]482	0·397	1·360	88,050
1913.						
January			[1]70	0·058	0·067	4,300
February			[1]50	0·041	0·043	2,780
March			[1]50	0·041	0·047	3,075
April			[2]2,250	1·852	2·066	133,900
May	1,350	810	1,050	0·864	0·996	64,600
June	780	230	480	0·395	0·441	28,600
July	3,675	613	1,830	1.506	1·736	112,500
August	887	299	539	0·444	0·512	33,100
September	365	162	251	0·207	0·231	14,900
October	199	123	169	0·139	0·160	10,400
November			[1]100	0·082	0·092	5,950
December			[1]50	0·041	0·047	3,075
The year	3,675	[1]50	574	0·472	6·438	417,180
1914.						
January			[1]40	0·033	0·038	2,460
February			[1]40	0·033	0·034	2,220
March			[1]30	0·025	0·029	1,840
April			[1]1,200	0·988	1·102	71,400
May	3,975	568	1,570	1.293	1.491	96,500
June	520	94	229	0·188	0·210	13,600
July	91	18	51	0·042	0·048	3,125
August	31	11	22	0·018	0.021	1,350
September	44	22	32	0·026	0·029	1,900
October	70	25	50	0.041	0.047	3,075
November			[1]40	0·033	0·037	2,380
December			[1]20	0·016	0·018	1,230
The year	3,975	10	277	0,228	3.104	201,080

Note.—Marked thus ([1]) estimated.

MOSSY RIVER.

The Mossy river is the connecting link between lake Dauphin and lake Winnipegosis, draining the former into the latter. It heads in the extreme northern end of lake Dauphin and flows generally north for a distance of about 21 miles to the mouth.

The Fork and Fishing rivers are tributaries that have their sources on the eastern slope of the Duck mountains. All the drainage basin of the Mossy, with the exception of that supplied by these rivers, is gathered by the rivers tributary to lake Dauphin. These are the Valley, Turtle, Ochre, Wilson, and Vermilion rivers. The upper part of the basin is well timbered, while the lower part is prairie country, and used extensively for mixed farming.

The banks of the Mossy vary between 5 and 15 feet in height and are of clay overlying a bed of gravel. The river varies in width from 120 to 200 feet, and has been considerably improved by dredging.

The country adjacent to the river is very well settled, especially on the west side. The town of Winnipegosis, with a population of 600 people, is situated at the mouth of the river, and the town of Dauphin is the chief centre in the district.

In 1908 the Department of Public Works made a survey of the river with a view of lowering lake Dauphin. In connection with this project, dredging operations were carried on in the river between 1908 and 1912. A water-power project has been looked into on the river near Winnipegosis, and a reconnaissance survey for this purpose was made by a field party of the Manitoba Hydrographic Survey, in the summer of 1913.

Mossy River at Lacey's Farm.

History.—The station on the Mossy river at Lacey's Farm was established by A. Pirie on July 14, 1913, and was operated until August 10, 1914.

Location of Section.—The meter section is located in the NW. $\frac{1}{4}$ of sec. 6 Tp. 29, R. 18, W.P.M. It is one-quarter of a mile below the mouth of Fishing river, and three-quarters of a mile below F. B. Lacey's farm. The initial point is a nail driven in the side of a 5-inch oak tree which is on the right hand side of the river and is blazed on the river side and marked "I.P."

Records Available.—Daily gauge height records have been obtained for the period July 14, 1913, to August 10, 1914. Estimates of daily discharge have been compiled for the same period.

Drainage Area.—The area drained by the Mossy river above this station includes lake Dauphin and the drainage areas of the streams flowing into that lake. It is 3,950 square miles.

Gauge.—The gauge is a 6-foot vertical staff enamelled gauge which is fastened to a timber driven into the bed of the stream and braced. It is placed on the right bank, and is referred to a bench-mark, which is a nail driven into the stump of a 12-in poplar, which is blazed on two sides and is 25 feet north of the initial point.

Channel.—The channel is straight for 1,800 feet above and 600 feet below the station. There are rapids both above and below the section, the latter being about 1,500 feet distant. The river occupies but one channel at all stages, the bed of the stream is of gravel and not subject to erosion. The current is swift and the banks are high and not subject to overflow.

Discharge Measurements.—The meterings are made by means of a boat and cable stretched across the river.

Accuracy.—The discharge curve is fairly well defined over a range in gauge height between 87·00 and 89·8.

Discharge Measurements of Mossy River below Fishing River, 1913–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
July 14	A. Pirie	1496	132	592	2·80	89·80	1,658
Aug. 11	D. B. Gow	1187	128	485	2·64	88·97	1,280
" 19	D. B. Gow	1187	140	651	1·83	88·77	[1]1,191
" 23	W. J. Ireland	1469	116	452	2·54	88·82	1,151
Nov. 11	C. O. Allen	1374	103	289	2·33	87·73	673
Dec. 18	C. O. Allen	1375	99	309	2·03	87·46	627
1914.							
Jan. 13	C. O. Allen	1375	100	299	1·80	87·56	540
Mar. 21	C. O. Allen	1496	89	283	1·65	87·03	467
April 23	C. O. Allen	1497	92	285	1·89	87·11	540
May 27	C. O. Allen	1497	110	341	2·14	87·84	727
July 1	C. O. Allen	1760	98	303	1·97	87·37	598

[1] Two miles below regular station.

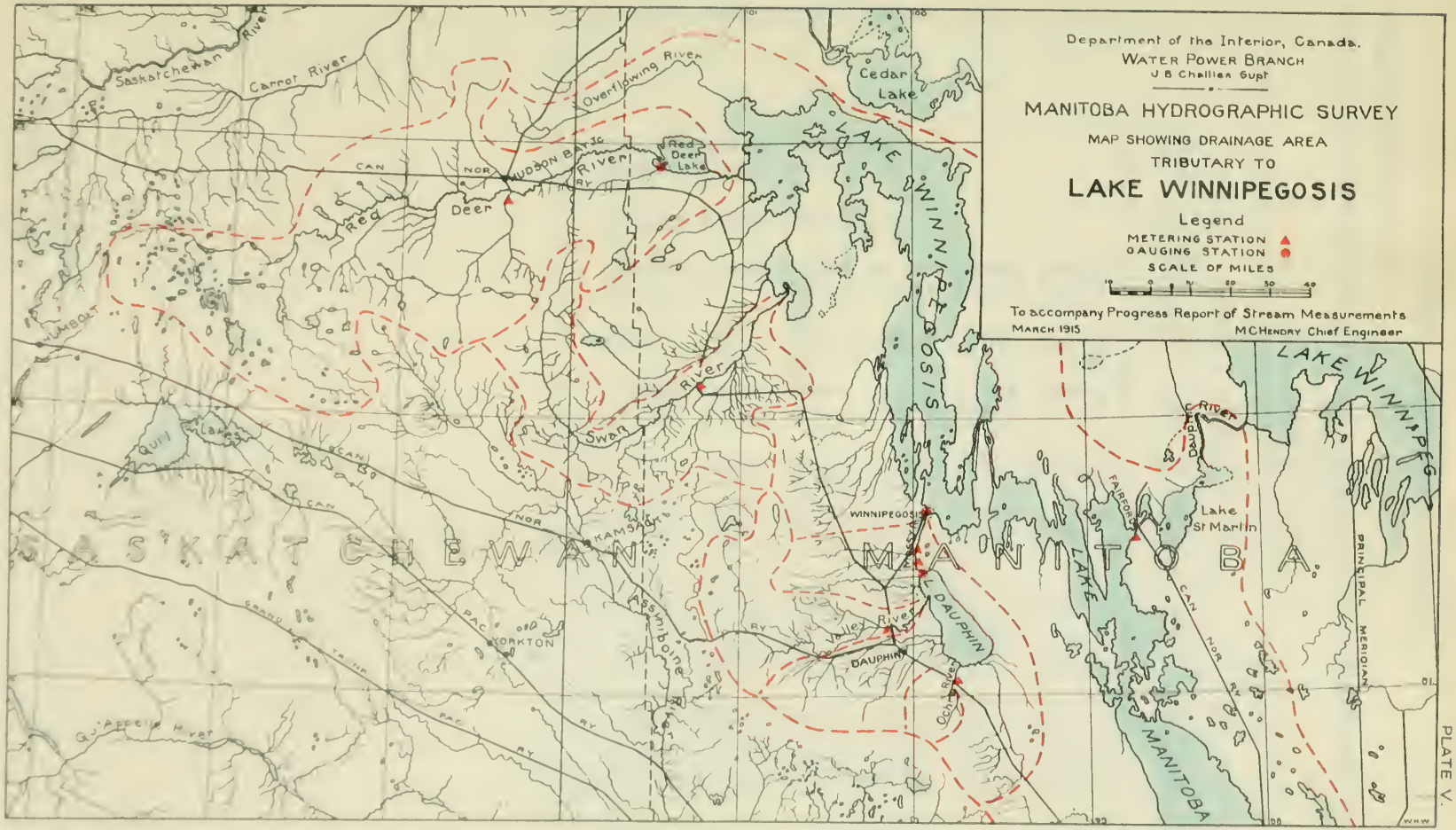

Department of the Interior, Canada.
WATER POWER BRANCH
J B Challies Supt
MANITOBA HYDROGRAPHIC SURVEY
MAP SHOWING DRAINAGE AREA
TRIBUTARY TO
LAKE WINNIPEGOSIS
Legend
METERING STATION
GAUGING STATION
SCALE OF MILES
To accompany Progress Report of Stream Measurements
MARCH 1915
M C HENDRY Chief Engineer
Saskatchewan River
Carrot River
Overflowing River
Cedar Lake
Red Deer Lake
Red Deer River
HUDSON BAY Jc
CAN NOR RY
LAKE WINNIPEGOSIS
Swan River
Gull Lake
SASKATCHEWAN
MANITOBA
WINNIPEGOSIS
KAMSACK
Assiniboine R
PAC RY
YORKTON
Valley River
DAUPHIN
Lake St Martin
LAKE WINNIPEG
PRINCIPAL MERIDIAN
MANITOBA
Qu'Appelle River

PLATE V.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Mossy River below Fishing River, for 1913.

[Drainage area, 3,950 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.
1	.....	.....	89·34	1,430	88·67	1,090	88·19	868	87·24	536	[1]87·65	660
2	.....	.....	89·34	1,430	88·67	1,090	88·19	868	87·27	544	[1]87·65	660
3	.....	.....	89·34	1,430	88·64	1,080	88·14	847	87·49	607	87·66	664
4	.....	.....	89·44	1,480	88·64	1,080	88·01	792	87·49	607	[1]87·66	664
5	.....	.....	89·24	1,380	88·64	1,080	88·04	805	87·49	607	[1]87·66	664
6	.....	.....	89·24	1,380	88·65	1,080	88·04	805	87·49	607	[1]87·66	664
7	.....	.....	89·14	1,330	88·64	1,080	87·99	784	87·54	623	[1]87·66	664
8	.....	.....	89·04	1,280	88·64	1,080	87·99	784	87·54	623	[1]87·66	664
9	.....	.....	89·04	1,280	88·44	978	87·99	784	[1]87·60	642	[1]87·66	664
10	.....	.....	88·94	1,230	88·34	933	87·44	592	[1]87·67	667	87·66	664
11	.....	.....	88·94	1,230	88·34	933	87·74	692	87·73	689	[1]87·66	664
12	.....	.....	88·94	1,230	88·35	938	87·79	710	[1]87·73	689	[1]87·66	664
13	.....	.....	88·94	1,230	88·37	947	87·78	707	[1]87·72	685	87·66	664
14	89·84	1,680	88·94	1,230	88·39	955	87·73	689	[1]87·70	678	[1]87·69	674
15	89·74	1,630	88·84	1,180	88·34	933	87·77	703	[1]87·70	678	[1]87·72	685
16	89·74	1,630	88·84	1,180	88·33	929	87·77	703	[1]87·70	678	[1]87·75	696
17	89·64	1,580	88·81	1,160	88·24	889	87·84	728	[1]87·69	674	87·78	707
18	89·64	1,580	88·80	1,160	88·29	911	87·84	728	[1]87·69	674	[1]87·76	700
19	89·64	1,580	88·77	1,140	86·77	433	87·84	728	[1]87·68	671	[1]87·75	696
20	89·54	1,530	88·81	1,160	87·29	549	87·84	728	87·68	671	87·73	689
21	89·54	1,530	88·80	1,160	88·04	805	87·79	710	[1]87·68	671	[1]87·70	678
22	89·44	1,480	88·81	1,160	88·14	847	87·84	728	[1]87·68	671	[1]87·68	671
23	89·44	1,480	88·81	1,160	88·34	933	87·84	728	87·68	671	[1]87·65	660
24	89·44	1,480	88·79	1,150	88·34	933	87·84	728	[1]87·67	667	87·63	653
25	89·44	1,480	88·79	1,150	88·24	889	87·84	728	[1]87·66	664	[1]87·63	653
26	89·44	1,480	88·79	1,150	88·19	868	87·84	728	[1]87·64	656	[1]87·63	653
27	89·34	1,430	88·79	1,150	88·21	876	87·04	487	87·63	653	87·63	653
28	89·34	1,430	88·77	1,140	88·14	847	87·04	487	[1]87·63	653	[1]87·58	636
29	89·54	1,530	88·77	1,140	88·14	847	87·24	536	[1]87·64	656	[1]87·53	620
30	89·34	1,430	88·77	1,140	88·14	847	87·27	544	[1]87·64	656	[1]87·48	604
31	89·34	1,430	88·64	1,080	.....	.....	87·27	544	..	....	[1]87·44	592

Note.—Discharge curve not well defined above gauge height 89·00. Gauge heights marked thus [1] interpolated.

Daily Gauge Height and Discharge of Mossy River below Fishing River, for 1914.

[Drainage area, 3,950 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	[1]87·40	580	[1]87·45	595	[1]87·26	541	87·11	503	87·07	493	88·22	881
2	87·38	574	[1]87·43	589	[1]87·23	533	87·09	498	87·09	498	88·24	889
3	[1]87·36	569	87·41	583	87·19	522	87·09	498	87·09	498	88·24	889
4	[1]87·35	566	[1]87·41	583	[1]87·20	525	87·12	505	87·09	498	88·25	893
5	[1]87·34	563	[1]87·41	583	[1]87·22	530	87·01	480	87·10	500	88·39	955
6	87·33	560	[1]87·41	583	87·24	536	86·99	476	87·10	500	88·38	951
7	[1]87·33	560	87·41	583	[1]87·24	536	86·99	476	87·17	518	88·14	847
8	[1]87·33	560	[1]87·43	589	[1]87·24	536	86·94	465	87·30	552	88·09	826
9	87·33	560	[1]87·45	595	[1]87·24	536	86·92	460	87·39	577	88·09	826
10	[1]87·40	580	87·46	598	87·24	536	86·94	465	87·39	577	88·04	805
11	[1]87·47	601	[1]87·48	604	[1]87·23	533	86·99	476	87·40	580	87·87	739
12	87·53	620	[1]87·50	610	[1]87·22	530	86·99	476	87·49	607	87·79	710
13	[1]87·53	620	[1]87·53	620	[1]87·20	525	87·04	487	87·54	623	87·79	710
14	[1]87·52	616	87·56	629	87·19	522	87·09	498	87·51	613	87·75	696
15	[1]87·51	613	[1]87·44	592	[1]87·17	517	87·10	500	87·69	674	87·75	695
16	87·51	613	[1]87·32	558	[1]87·15	513	87·10	500	87·89	746	87·69	674
17	[1]87·50	610	87·19	522	[1]87·13	508	87·10	500	87·89	746	87·69	674
18	[1]87·48	604	[1]87·19	522	[1]87·10	500	87·10	500	87·89	746	87·49	607
19	[1]87·47	601	[1]87·19	522	[1]87·08	496	87·09	498	87·89	746	87·54	623
20	87·46	598	[1]87·19	522	[1]87·05	489	87·09	498	87·79	710	87·49	607
21	[1]87·45	595	[1]87·19	522	87·03	485	87·09	498	87·89	746	87·50	610
22	[1]87·44	592	[1]87·20	525	[1]87·05	489	87·04	487	87·89	746	87·49	607
23	[1]87·42	586	[1]87·22	530	[1]87·07	493	87·04	487	88·09	826	87·49	607
24	87·41	583	87·24	536	87·09	498	87·09	498	88·09	826	87·44	592
25	[1]87·43	589	[1]87·25	539	[1]87·09	498	87·09	498	88·08	822	87·47	601
26	[1]87·46	598	[1]87·27	544	[1]87·09	498	87·09	498	87·89	746	87·44	592
27	[1]87·48	604	[1]87·28	547	[1]87·09	498	87·09	498	88·84	1,175	87·44	592
28	87·51	613	87·29	549	87·09	498	87·04	487	88·47	992	87·44	592
29	[1]87·49	607	.....	.....	[1]87·09	498	87·04	487	88·39	955	87·39	577
30	[1]87·48	604	.....	.....	[1]87·10	500	87·07	493	88·20	872	87·37	572
31	87·46	598	.....	.....	[1]87·10	500	.....	.....	88·21	876	.....	.....

	July.		August.	
	Feet.	Sec.-ft.	Feet.	Sec-ft..
1	87·33	560	87·08	496
2	87·33	560	87·08	496
3	87·33	560	87·04	487
4	87·29	549	87·06	491
5	87·29	549	86·89	454
6	87·31	555	87·04	487
7	87·32	558	87·05	489
8	87·29	549	86·99	476
9	87·29	549	87·04	487
10	87·29	549	87·04	487
11	87·30	552	.....	.....
12	87·29	549	.....	.....
13	87·27	544	.....	.....
14	87·29	544	.....	.....
15	87·29	549	.....	.....
16	86·70	420	.....	.....
17	87·09	498	.....	.....
18	87·14	510	.....	.....
19	87·14	510	.....	.....
20	87·09	498	.....	.....
21	87·09	498	.....	.....
22	87·09	498	.....	.....
23	87·09	498	.....	.....
24	87·10	500	.....	.....
25	87·10	500	.....	.....
26	87·09	498	.....	.....
27	87·07	493	.....	.....
28	87·08	496	.....	.....
29	87·07	493	.....	.....
30	87·07	493	.....	.....
31	87·07	493	.....	.....

Note.—Data insufficient to estimate mean discharge for August. Gauge heights marked thus (1) interpolated.

MONTHLY DISCHARGE of Mossy River below Fishing River, for the year 1913.

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
July			[1]1,520	0·385	0·444	93,500
August	1,480	1,080	1,230	0·311	0·359	75,600
September	1,090	433	923	0·234	0·261	54,900
October	868	487	709	0·180	0·208	43,600
November	689	536	649	0·164	0·183	38,600
December	707	592	663	0·168	0·194	40,800
The period	1,480	433	949	0·240	1·649	347,000
January	620	560	[1]592	0·150	0·173	36,400
February	629	522	[1]567	0·144	0·150	31,500
March	541	455	[1]513	0·130	0·150	31,500
April	505	460	490	0·124	0·138	29,200
May	1,175	493	696	0·176	0·203	42,800
June	955	572	715	0·181	0·202	42,500
July	560	420	522	0·132	0·152	32,100
The period	1,175	420	585	0·148	1·168	246,000

NOTE.—Discharges marked thus ([1]) estimated.

MOSSY RIVER AT WILSON'S FARM.

History.—This station was established on July 28, 1914, by W. J. Ireland and superseded the one at Lacey's farm, owing to the difficulty in securing a gauge reader at that point.

Location of section.—The meter section is located on Wilson's farm, 2½ miles northeast of Fork river. It is marked by a blazed poplar tree which stands on the left bank just below the metering section. The initial point is located by a nail driven in the post supporting the cable of the section on the left hand bank.

Records Available.—Daily gauge height records have been kept from July 3, 1914, to the end of the same year. Estimates of daily discharge have been computed for the period July 3 to November 16, 1914. There is not sufficient data to compute the discharge under ice conditions which obtain for the remainder of the year.

Drainage Area.—The drainage area is 3,950 square miles.

Gauge.—The gauge is a 6-foot vertical staff enamelled gauge fastened to a plank driven in the bed of the stream and braced to the left shore, it is 800 feet below the metering station and just inside of the boundary fence of the section.

Channel.—The channel is straight for 150 feet above and 300 feet below the section. The river is confined to a single channel under all stages. The bed of the river is of gravel and permanent. The banks are high and covered with scrub but not liable to overflow.

Discharge Measurements.—Meterings are made by means of a cable carrier running on a cable stretched across the river.

Accuracy.—The discharge curve is fairly well defined over the range in stage covered by the meterings.

Discharge Measurements of Mossy River below Fork River, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 28	W. J. Ireland	1,919	97	379	1·34	92·01	507
August 19	Alex. Pirie	1,940	88	309	1·04	91·28	322
Sept. 7	H. Boyd	1,919	88	292	0·96	91·19	281
Oct. 3	M. S. Madden	1,911	86	281	0·78	90·85	219
Oct. 31	M. S. Madden	1,912	86	289	0·81	90·94	235
Nov. 23	F. S. Smith	1,186	88	247	0·62	91·05	[1]151
Dec. 9	C. O. Allen	1,912	88	264	0·66	91·16	[1]177

[1]Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Mossy River below Fork River, for 1914.

[Drainage Area, 3,950 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	91·71	425	91·11	267	91·14	274	90·89	226	91·41	.....
2	.....	.....	91·72	428	90·74	201	90·82	214	91·42	344	91·39	.....
3	92·06	523	91·61	397	90·77	206	90·85	220	90·72	198	91·41	.....
4	92·14	545	91·68	416	91·20	287	90·72	198	90·72	198	91·41	.....
5	92·22	568	91·43	346	91·30	312	91·14	274	90·91	230	91·41	.....
6	92·15	548	91·22	292	91·22	292	90·98	242	91·18	283	91·41	.....
7	92·13	542	91·67	414	91·12	269	91·02	250	90·28	138	91·36	.....
8	92·53	654	91·63	402	91·23	295	90·96	239	90·92	232	91·30	.....
9	92·00	506	91·42	344	91·66	411	90·94	235	91·06	257	91·12	.....
10	92·02	512	91·23	295	91·24	297	90·75	203	90·81	213	91·45	.....
11	92·03	514	91·47	358	91·18	283	90·39	151	90·93	233	91·42	.....
12	91·80	450	91·54	377	91·19	285	90·85	220	91·61	397	91·46	.....
13	91·82	456	91·14	274	92·17	554	91·02	250	91·33	320	90·89	.....
14	91·99	503	91·27	305	91·62	400	91·17	280	91·41	341	91·03	.....
15	92·01	509	91·69	419	91·24	297	91·00	246	91·40	388	91·27	.....
16	91·75	436	91·32	317	91·06	257	91·27	305	91·40	388	91·36	.....
17	91·63	402	91·33	320	91·03	252	91·25	300	91·27	..	91·29	.....
18	91·92	484	91·30	312	91·23	294	91·23	295	91·18	...	91·41	.....
19	91·95	492	91·32	317	91·33	320	91·00	246	91·20	..	91·49	.....
20	91·94	489	91·30	312	91·07	259	91·08	261	91·06	...	91·61	.....
21	92·06	523	91·28	307	90·71	197	90·97	241	91·07	..	91·61	.....
22	91·81	453	91·32	317	90·51	167	91·01	248	91·03	...	91·49	.....
23	91·88	472	91·17	280	90·05	112	90·94	235	91·05	..	91·61	.....
24	91·97	498	91·23	295	90·78	208	90·83	216	91·08	....	91·60	.....
25	91·82	456	91·22	292	91·14	274	90·89	226	90·12	....	91·59	.....
26	91·78	444	91·21	290	91·00	246	90·60	180	90·16	.....	91·59	.....
27	91·88	472	91·41	341	91·07	259	90·94	235	91·24	.....	91·56	.....
28	92·12	540	91·69	419	90·99	244	90·89	226	91·30	..	91·58	.....
29	91·95	492	91·26	302	90·92	232	90·98	242	91·40	...	91·54	.....
30	91·65	408	91·22	292	91·12	269	90·94	235	91·41	.....	91·53	.....
31	91·77	442	91·02	250	.....	.....	90·91	235	...	...	91·54	.....

Note.—Ice conditions from November 16 to end of year, data insufficient to compute daily discharges.

MONTHLY DISCHARGE of Mossy River below Fork River, for the year 1914.

[Drainage Area 3,950 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
July	[1]654	[1]402	[1]494	0·125	0·135	28,400
August	428	250	337	0·085	0·098	20,700
September	554	112	275	0·070	0·078	16,400
October	305	180	239	0·061	0·070	14,700
November	.....	.....	[1]220	0·056	0·063	13,100
December	.....	.....	[1]170	0·043	0·050	10,500
The period	654	112	289	0·073	0·494	103,800

NOTE.—Marked thus ([1]) estimated. Ice conditions from November 16 to end of year.

FORK RIVER.

Fork River is a tributary of the Mossy, and joins the latter just below the town of Fork River in Tp. 29, R. 18, W. P. M. The source of the river is on the eastern slope of the Duck mountains. It flows almost due east to its junction with the Mossy.

The total drainage area is about 210 square miles, the country drained being partially settled and partially wooded especially in the head waters. The banks are well defined and not subject to overflow, in places reaching a height of 20 to 30 feet.

FORK RIVER AT FORK RIVER.

History.—The station on the Fork river at Fork River was established on July 15, 1913, by Alex. Pirie.

Location of Section.—The section is located on the downstream side of the traffic bridge which crosses the Fork river in the town of the same name. The initial point is marked on the hand-rail at the south end of the bridge on the downstream side.

Records Available.—Three discharge measurements were taken at this point.

Drainage Area.—The area tributary to the Fork river above the station is 200 square miles.

Gauge.—No gauge was installed at this point, but the stage of the water was referred to a temporary bench-mark, consisting of a bolt on the downstream side of the traffic bridge at the east end.

Channel.—The river is confined to one channel at all stages. It is straight for 300 feet above and 150 feet below the section. The bed of the stream is of gravel and clay, and is permanent. The banks are high and not liable to overflow.

Discharge Measurements.—Three discharge measurements have been taken at this site, the measurements being made from the downstream side of the bridge.

Discharge Measurements of Fork River at Fork River, 1913-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
July 15	A. Pirie	1,496	68	293	3·69	W. L. 91·625	1,081
1914.							
April 24	C. O. Allen	1,497	59	117	1·07	−0·4[1]	125
May 27	C. O. Allen	1,497	59	105	0·67	−14·9[2]	70

[1]Below top of pile L. bank.
[2]Below top of rail of bridge.

Valley River.

The Valley river is a tributary of lake Dauphin; it rises on the western slope of the Duck mountains, flows south along the foot of the western slope of these mountains, then turns east and flows between the Duck and Riding mountains and continues this generally easterly course to its mouth. There are two tributaries to the Valley which are of fair size, these are Short creek, which rises on the slope of Riding mountains, and the Drifting river, which joins the Valley 3 miles west of Valley River station on the Canadian Northern Railway.

The valley between the Riding and Duck mountains, through which the river flows and from which it takes its name, is about 100 feet deep and from 700 to 2,500 feet wide. The river at ordinary summer stages has a width of between 100 and 200 feet. The river-bed is composed of gravel and boulders, the banks being of clay which overlies a gravel and boulder bed.

The upper part of the drainage area is practically all within the Duck Mountain forest reserve, where considerable stands of spruce, jack pine, and poplar are to be found. In the immediate vicinity of the river little clearing has been done, though in the lower part of the valley, and somewhat back from the river, farming is carried on to a considerable extent.

VALLEY RIVER AT VALLEY RIVER.

History.—This station was established on October 25, 1912, by W. G. Worden, and has been in operation since that time.

Location of Section.—The metering section is located on the downstream side of the Canadian Northern Railway bridge, crossing the Valley river 1,500 feet north of the railroad station in that town, and 150 feet upstream from the traffic bridge. The initial point is an arrow carved and painted on the downstream side of the bridge at the south end.

Records Available.—Records of daily gauge heights have been secured for the greater part of the period October 25, 1912, to the end of 1914. Estimates of daily discharge have been computed for the following periods: October 25 to November 17, 1912; April 4 to November 16, 1913; and April 25 to November 16, 1914. There is not sufficient information to arrive at estimates of daily discharge under winter conditions.

Drainage Area.—The area tributary to the Valley river above the station is 1,028 square miles.

Gauge.—A 12-foot vertical staff enamelled gauge is fastened to a 2-inch by 4-inch scantling which is spiked to the bridge abutment, 246 feet from the initial point on the metering section. The zero of the gauge is referred to a bench-

mark set to arbitrary datum and located on the top of a bolt on the northwest side of the traffic bridge just below the Canadian Northern Railway bridge.

Channel.—During low stages the water is confined to one channel, but under high-water conditions there are two. The channel is straight for 400 feet above and 600 feet below the section. The bed of the stream is of gravel and sand, and permanent. The right bank is low, wooded, and liable to overflow. The left bank is high and not liable to overflow.

Discharge Measurements.—Meterings are taken from the downstream side of the bridge and cover a range in gauge height of 6·6 feet.

Accuracy.—The discharge curve is well defined between gauge heights 99·5 and 101·7, between gauge heights 101·7 and 105·0 the discharge curve is not well defined.

DISCHARGE MEASUREMENTS of Valley River at Valley River, 1912-14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 25	W. G. Worden	1,196	57	157	2·04	101·64	321
1913							
Feb. 13	A. Pirie	1,462	45	80	0·25	101·30	20
Apr. 14	A. Pirie	1,186	157	609	3·78	104·87	2,300
Apr. 14	A. Pirie	1,186	157	608	4·10	104·87	2,244
Apr. 14	A. Pirie	1,186	154	586	3·71	104·73	2,182
June 6	E. Bankson	1,469	56	147	2·01	101·50	296
June 17	G. Ebner	1,186	54	127	1·48	101·13	188
July 7	A. Pirie	1,496	193	778	3·86	106·10	3,006
July 11	A. Pirie	1,496	119	525	4·11	104·65	2,163
Aug. 14	G. Ebner	1,196	53	128	1·64	101·10	209
Aug. 22	W. J. Ireland	1,469	60	163	2·46	101·69	399
Sept. 17	W. J. Ireland	1,469	52	99	1·09	100·51	107
Oct. 14	C. O. Allen	1,435	51	85	0·82	100·32	69
Nov. 14	C. O. Allen	1,374	49	69	0·47	100·01	32[1]
Dec. 20	C. O. Allen	1,375	51	46	0·26	99·95	12[2]
1914							
Jan. 15	C. O. Allen	1,375	30	8	0·42	100·14	[2]4
Mar. 2	D. B. Gow		No flow.				[2]0
Mar. 31	C. O. Allen	1,496	29	9	0·33	100·35	[2]3
Apr. 25	C. O. Allen	1,497	54	155	2·36	101·59	367
Apr. 25	C. O. Allen	1,497	54	155	2·39	101·57	372
Apr. 25	C. O. Allen	1,497	54	155	2·41	101·56	375
May 26	C. O. Allen	1,497	58	170	2·25	101·52	392
July 3	C. O. Allen	1,760	51	114	1·30	100·72	148
July 29	W. J. Ireland	1,919	45	60	0·39	99·78	23
Aug. 19	A. Pirie	1,940	51	58	0·16	99·54	9
Sept. 8	H. Boyd	1,919	42	42	0·29	99·64	12
Oct. 3	M. S. Madden	1,911	43	53	0·15	99·53	8
Oct. 31	M. S. Madden	1,912	46	60	0·26	99·68	16
Nov. 21	F. S. Smith	1,186	36	32	0·34	99·61	[2]11
Dec. 8	C. O. Allen	1,912	41	36	0·24	99·49	[2]9

[1]Open water at section.
[2]Mensurement taken under ice conditions.

Daily Gauge Height and Discharge of Valley River at Valley River, for 1912.

[Drainage area, 1,028 square miles.]

Day.	October.		November.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec-ft.	Feet.	Sec.-ft.
1	.....	.....	1·29	262
2	.....	.....	1·24	248
3	.....	.....	1·20	236
4	.....	.....	1·31	268
5	.....	.....	1·36	285
6	.....	.....	1·34	278
7	.....	.....	1·24	248
8	.....	.....	1·20	236
9	.....	.....	1·17	228
10	.....	.....	1·06	201
11	.....	.....	1·11	213
12	.....	.....	1·21	239
13	.....	.....	1·17	228
14	.....	.....	1·11	213
15	.....	.....	1·04	196
16	.....	.....	0·98	183
17	.....	.....	0·88	162
18	.....	.....	0·84	.....
19	.....	.....	0·84	.....
20	.....	.....	0·87	.....
21	.....	.....	1·02	.....
22	.....	.....	1·06	.....
23	.....	.....	1·03	.....
24	.....	.....	0·96	.....
25	1·64	400	0·93	.....
26	1·63	395	0·89	.....
27	1·58	371	0·79	.....
28	1·49	332	0·83	.....
29	1·42	306	0·82	.....
30	1·39	295	0·79	.....
31	1·37	288	.....	.....

Note.—Ice conditions November 17 to end of year; data insufficient to compute discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Valley River at Valley River, for 1913.

[Drainage area, 1,028 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1									2·61	965	1·01	189
2									2·41	847	1·01	189
3							2·24		2·44	865	1·01	189
4							4·02	1,800	2·37	823	1·15	223
5							4·72	2,210	2·41	847	1·51	340
6					1·31		5·00	2,380	2·31	788	1·63	395
7							4·84	2,280	2·73	1,040	1·53	349
8							4·11	1,850	2·73	1,040	0·94	174
9							3·22	1,330	2·76	1,050	0·94	174
10							3·14	1,280	2·63	977	0·94	174
11							4·47	2,060	2·64	983	1·74	453
12							4·27	1,940	2·50	900	1·63	395
13			1·30	20			5·70	2,890	2·16	699	1·51	340
14					1·31		4·71	2,200	2·36	817	1·43	309
15							4·61	2,150	2·41	847	1·21	239
16							4·37	2,000	2·41	847	1·21	239
17							4·41	2,030	2·44	865	1·13	218
18							4·12	1,860	2·23	741	1·28	259
19							4·31	1,970	2·59	953	1·03	194
20							4·21	1,910	2·30	782	1·00	187
21					1·31		4·01	1,790	2·20	723	0·94	174
22							3·88	1,710	1·31	268	0·90	166
23							3·77	1,650	1·11	213	0·88	162
24							3·41	1,440	1·01	189	1·43	309
25							3·01	1,200	1·01	189	1·41	302
26							2·61	965	1·01	189	1·20	236
27			1·32		1·31		2·21	729	1·01	189	1·20	236
28							1·81	493	1·01	189	1·33	275
29							2·63	977	1·01	189	1·38	291
30							2·51	906	1·01	189	1·30	265
31									1·01	189		

	July.		August.		September.		October.		November.		December.	
1	101·44	313	101·81	493	100·75	137	100·25	63	100·23	61		
2	1·71	436	1·91	552	0·58	108	0·24	62	0·27	65		
3	1·81	493	1·61	385	0·50	109	0·24	62	0·15	52	100·25	
4	3·61	1,560	1·61	385	0·59	109	0·22	59	0·20	57		
5	6·89	3,500	1·41	302	0·57	106	0·20	57	0·20	57		
6	6·57	3,300	1·61	385	1·37	288	0·22	59	0·20	57		
7	6·10	3,025	1·51	340	1·12	215	0·20	57	0·18	55		
8	4·91	2,320	1·46	321	0·97	181	0·19	56	0·15	52		
9	4·31	1,970	1·31	268	0·90	166	0·17	54	0·13	50		
10	4·21	1,910	1·21	239	0·82	150	0·24	62	0·11	48	0·35	
11	4·65	2,170	1·11	213	0·78	142	0·28	67	0·09	46		
12	5·31	2,560	1·06	201	0·61	113	0·25	63	0·06	43		
13	7·01	3,550	1·01	189	99·81	21	0·30	69	0·04	42		
14	6·90	3,500	0·92	170	100·69	111	0·32	72	0·01	39		
15	5·65	2,750	0·92	170	0·60	111	0·39	81	0·05	43		
16	4·41	2,030	0·92	170	0·54	102	0·33	73	0·03	41		
17	4·01	1,790	1·00	187	0·50	96	0·33	73			0·35	
18	3·51	1,500	0·91	168	0·49	95	0·33	73				
19	3·11	1,260	1·81	493	0·46	90	0·38	79	99·95			
20	2·81	1,080	1·76	461	0·41	83	0·33	73			99 95	12
21	2·51	906	1·71	436	0·30	69	0·30	69				
22	2·26	758	1·69	425	0·25	63	0·41	83				
23	2·01	611	1·52	345	0·21	58	0·39	81				
24	2·71	436	1·40	298	0·30	69	0·45	89				
25	2·51	340	1·30	265	0·29	68	0·39	81				
26	1·31	268	1·20	236	0·28	67	0·26	64				
27	1·11	213	0·90	166	0·29	68	0·12	49	99 95			
28	0·01	168	99·85	27	0·29	68	99·93	30				
29	0·71	130	101·13	218	0·30	69	100·10	47				
30	0·51	98	0·92	170	0·30	69	0·20	57				
31	0·31	70	0·85	156			0·21	58				

NOTE.—Ice conditions January 1 to April 1, and November 16 to end of year; data insufficient to compute daily discharge. Open water rating curve not defined between gauge heights 101·7 and 104·6. Gauge heights marked thus (1) interpolated.

Daily Gauge Height and Discharge of Valley River at Valley River, for 1914.

[Drainage area, 1,028 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									1·54	354	1·24	248
2						0			1·24	248	1·04	196
3									1·24	248	0·94	174
4									1·59	376	3·94	1,750
5									1·94	570	2·64	983
6									2·84	1,100	2·34	806
7									3·79	1,660	2·04	629
8									4·74	2,220	1·74	453
9									4·94	2,340	1·64	400
10									4·84	2,280	1·44	313
11									4·79	2,250	1·34	278
12									4·74	2,220	1·24	248
13									4·14	1,870	1·14	220
14									3·84	1,690	1·04	196
15	0·14	4							3·64	1,570	0·94	174
16									3·49	1,480	0·84	154
17									3·34	1,490	0·74	135
18									2·94	1,160	0·64	118
19									2·84	1,100	0·64	118
20									2·44	865	0·54	102
21									2·74	1,040	0·54	102
22									2·54	924	0·54	102
23									2·34	806	0·49	95
24									2·24	747	0·44	88
25							1·54	354	1·74	453	0·44	88
26							1·64	400	1·39	295	0·39	81
27							2·14	688	1·84	511	0·34	74
28							1·14	688	2·04	629	0·34	74
29							1·04	629	2·04	629	0·34	74
30							1·69	425	1·94	570	0·29	68
31					0·35	3			1·94	570		

	July.		August.		September.		October.		November.		December.	
1	101·04	196	99·90	30	99·56	10	99·40	5	99·78	22	99·49	
2	0·94	174	99·80	23	99·80	23	99·45	7	99·70	17	99·54	
3	0·64	118	99·70	17	99·80	23	99·52	9	99·70	17	99·39	
4	0·54	102	99·60	12	99·75	20	99·55	10	99·70	17	99·49	
5	0·44	88	99·60	12	99·70	17	99·60	12	99·70	17	99·59	
6	0·64	118	99·50	8	99·65	15	99·57	11	99·72	18	99·64	
7	0·34	74	99·50	8	99·60	12	99·55	10	99·72	18	99·54	
8	0·24	62	99·90	30	99·65	15	99·63	14	99·80	23	99·49	
9	0·14	51	99·90	30	99·70	17	99·70	17	99·80	23	99·49	
10	0·04	42	99·80	23	99·90	30	99·75	20	99·78	22	99·49	
11	0·04	42	99·70	17	100·10	47	99·80	23	99·75	20	99·49	
12	0·14	51	99·60	12	99·93	32	99·85	27	99·70	17	99·29	
13	0·14	51	99·60	12	99·80	23	99·94	33	99·72	18	99·29	
14	0·04	42	99·50	8	99·73	19	99·92	32	99·75	20	99·29	
15	99·94	33	99·40	5	99·70	17	99·92	32	99·78	22	99·19	
16	100·64	118	99·40	5	99·65	15	99·90	30	99·80	23	98·99	
17	0·84	154	99·40	5	99·60	12	99·90	30	99·80		98·99	
18	0·44	88	99·40	5	99·60	12	99·88	29	99·80		99·04	
19	0·34	74	99·54	10	99·65	15	99·85	27	99·80		99·09	
20	0·24	62	99·50	8	99·63	14	99·83	25	99·80			
21	0·14	51	99·43	6	99·60	12	99·85	27	99·60			
22	0·04	42	99·40	5	99·55	10	99·90	30	99·70			
23	99·99	37	99·40	5	99·53	9	99·80	23	99·49			
24	99·94	33	99·35	4	99·50	8	99·78	22	99·49			
25	99·84	26	99·30	3	99·50	8	99·76	21	99·54			
26	99·84	26	99·70	17	99·50	8	99·75	20	99·51			
27	99·74	19	99·65	15	99·48	7	99·73	19	99·54			
28	99·64	14	99·57	11	99·45	7	99·70	17	99·61			
29	100·10	47	99·55	10	99·43	6	99·70	17	99·62			
30	99·90	30	99·50	8	99·40	5	99·70	17	99·61			
31	100·00	38	99·40	5			99·69	17				

Note.—Ice conditions January 1 to April 22, and Nov 16 to end of year; Data insufficient to compute daily discharge. Open water rating curve not defined between gauge heights 101·7 and 104·6.

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Valley River at Valley River, for the years 1912–14.

[Drainage area, 1,028 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
October			[1]340	0·331	0·382	20,900
November			[1]200	0·194	0·216	11,900
December						
The period			[1]270	0·262	0·598	32,800
1913.						
February			[1]20	0·019	0·020	1,110
March						
April	2,890	493	[1]1,600	1·556	1·736	95,200
May	1,050	189	658	0·640	0·738	40,500
June	453	162	255	0·248	0·277	15,200
July	3,550	70	1,450	1·411	1·627	89,200
August	352	27	285	0·277	0·319	17,500
September	288	24	107	0·104	0·116	6,400
October	89	30	65	0·063	0·073	4,000
November			[1]40	0·039	0·044	2,380
December			[1]40	0·039	0·045	615
The period	3,550	[1]10	452	0·440	4·995	272,105
1914.						
January			[1]4	0·004	0·005	246
February			[1]0			
March			[1]2	0·002	0·002	123
April			[1]185	0·180	0·201	11,000
May	2,340	248	1,080	1·051	1·212	66,400
June	1,750	68	285	0·277	0·309	17,000
July	196	14	68	0·066	0·076	4,180
August	30	3	12	0·012	0·014	738
September	47	5	16	0·016	0·018	952
October	33	5	20	0·019	0·022	1,230
November			[1]12	0·012	0·013	714
December			[1]8	0·008	0·009	492
The year	2,340	[1]0	141	0·159	1·881	103,075

NOTE.—Discharges marked thus [1]) estimated; Data insufficient to estimate discharge for December, 1912, January and March, 1913.

OCHRE RIVER.

The Ochre river is a small tributary of lake Dauphin. It rises on the northeastern slope of Riding mountain, and flows northeast to the lake, its mouth being in Tp. 20, R. 17, west of the First meridian. The total drainage area of the river is approximately 270 square miles, of which 250 square miles lies above the metering station at Ochre river.

OCHRE RIVER AT OCHRE RIVER.

History.—This station was established by W. G. Worden on October 8, 1912, and has been operated since that date.

Location of Section.—The metering section on the Ochre river is located on the downstream side of the traffic bridge, which is one-quarter of a mile north of the railway station and one-quarter of a mile below the Canadian Northern Railway bridge. The initial point is marked on the guard rail 7 feet from the south end on the downstream side.

Records Available.—Records of daily gauge height have been obtained for the period October 18, 1912, to the 1st of December, 1914, with omissions during the winter periods. Estimates of daily discharge have been obtained for the same period.

Drainage Area.—The drainage area of the Ochre river above Ochre river is 250 square miles.

Gauge.—A 9-foot vertical staff enamelled gauge is fastened to a timber which is spiked to a pile of the bridge at the south end on the downstream side. This gauge is referred to a bench-mark set at arbitrary datum, and which is the head of a nail driven into a 12-inch poplar stump opposite station 1+55, and is blazed on two sides.

Channel.—The channel just above the section is divided by a pile bent which supports the bridge. For 50 feet above and 300 feet below the station the channel is straight. The bed of the stream is of sand and gravel with a vegetable growth. The banks are low and wooded and liable to overflow at high stages.

Discharge Measurements.—The discharge measurements are taken from the downstream side of the bridge under open-water conditions. During the winter season they are made from the ice.

Accuracy.—Between gauge heights 99·5 and 101·3 the curve is well defined, between 101·3 and 107·3 the curve is not well defined. Under ice conditions a fairly well defined curve for the range in gauge height 99·2 to 100·4 has been obtained.

Discharge Measurements of Ochre River at Ochre River, 1912–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 18	W. G. Worden	1,196	38	61	2·67	101·22	162
1913.							
Feb. 14	A. Pirie	1,462	29	16	1·30	100·90	21[1]
April 15	"	1,186	139	501	2·54	107·31	1,274
" 15	"	1,186	105	398	2·87	106·14	1,143
" 15	"	1,186	99	340	2·81	105·52	956
June 18	G. Ebner	1,186	29	31	1·24	100·38	39
July 5	A. Pirie	1,496	71	70	2·38	101·15	165
Aug. 15	G. Ebner	1,196	21	14	0·77	99·94	10
Oct. 15	C. O. Allen	1,435	34	22	1·00	99·98	22
1914.							
Jan. 10	C. O. Allen	1,375	39	4	0·70	100·80	3[1]
April 1	"	1,496	38	10	0·72	104·05	7[1]
" 21	"	1,497	75	65	2·91	103·97	189[1]
May 29	"	1,497	35	40	1·61	100·28	65
June 30	"	1,760	30	19	1·12	99·95	21
Aug. 1	W. J. Ireland	1,920	20	10	1·33	99·58	3
Sept. 12	H. Boyd	1,920	21	11	1·38	99·68	4
Oct. 5	M. S. Madden	1,911	28	16	1·12	99·63	18
Oct. 30	"	1,912	16	18	1·35	99·73	6[2]
Nov. 20	F. S. Smith	1,186	18	6	1·63	99·88	4[3]

[1]Measurement taken under ice conditions.
[2]200 feet above regular station.
[3]Measurement taken under ice conditions—130 feet below regular station.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Ochre River at Ochre River, for 1912.

[Drainage area, 250 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									1·17	159	0·75	102
2									1·21	164		
3									1·22	166		
4									1·19	162		
5									1·15	156		
6									1,09	148		
7									1·06	143	0·90	95
8									1·05	142		
9									1·04	141		
10									1·04	141		
11									1·06	143		
12									1·06	143		
13									1·06	143		
14									1·06	143		
15									1·06	143	1·01	95
16									1·05	142	1·01	95
17									1·03	139	1·01	95
18							1·26	171	1·03	139		
19							1·43	196	1·03	139		
20							1,38	188	1·01	136		
21							1·28	174	0·95	128	1·01	95
22							1·21	164	0·90	121		
23							1·16	157	0·90	121		
24							1·12	152	0·85	115		
25							1·04	141	0·83	112		
26							1·00	135	0·80	108		
27							1·00	135	0·75	102		
28							1·00	135	0·75	102	1·10	95
29							1·00	135	0·75	102		
30							1·04	141	0·75	102		
31							1·13	153				

Daily Gauge Height and Discharge of Ochre River at Ochre River, for 1913.

[Drainage area, 250 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					0·90	3	1·00	10	0·80	108	0·68	93
2							1·10	50	0·80	108	0·68	93
3							1·30	100	0·80	108	0·68	93
4	1·10	81					1·50	210	0·80	108	0·54	76
5							1·80	230	0·80	108	0·54	76
6							2·50	360	0·80	108	0·68	93
7							2·50	364	0·80	108	0·68	93
8					0·90	2	2·30	332	0·72	98	0·70	95
9							2·10	300	0·70	95	0·70	95
10							1·75	244	0·68	93	0·40	59
11	1·10	81					1·50	206	0·69	94	0·38	57
12							2·30	332	0·70	95	0·34	52
13							3·60	554	0·80	108	0·40	59
14			0·90	21			5·40	903	0·79	107	0·40	59
15							5·40	903	0·79	107	0·38	57
16							5·35	893	0·80	108	0·38	57
17							4·37	698	0·80	108	0·38	57
18	1·10	81					3·67	567	0·80	108	0·40	59
19					0·90	1	3·01	448	0·79	107	0·40	59
20							2·60	380	0·90	121	0·30	48
21							2·29	330	0·80	108	0·30	48
22			0·90	20			2·09	298	0·80	108	0·30	48
23							1·85	260	0·80	108	0·30	48
24							1·62	224	0·78	105	1·20	163
25	1·10	70					1·40	191	0·78	105	1·30	177
26							1·15	156	0·79	107	1·00	135
27					0·90	1	1·00	135	0·80	108	1·00	135
28							1·00	135	0·80	108	0·80	108
29							1·11	150	0·80	108	0·70	95
30							1·80	108	0·80	108	0·70	95
31									0·80	108		

	July.		August.		September.		October.		November.		December.	
1	100·80	108	100·10	28	99·77	8	99·84	11	99·80	9		
2	0·80	108	0·10	28	99·77	8	99·84	11	99·90	14		
3	1·10	149	0·00	20	99·80	9	99·80	9	99·90	14		
4	1·10	149	0·00	20	99·82	10	99·75	7	100·00	20		
5	0·90	121	0·00	20	99·80	9	99·80	9	0·00	20		
6	0·90	121	0·00	20	99·80	9	99·80	9	0·00	20		
7	0·80	108	0·00	20	99·77	8	99·82	10	0·00	20		
8	0·70	95	0·00	20	99·75	7	99·84	11	0·00	20		
9	0·60	83	0·00	20	99·75	7	99·90	14	0·00	20		
10	0·60	83	0·00	20	99·75	7	99·92	15	99·90	14		
11	1·10	149	0·00	20	99·73	6	100·00	20	99·90	14		
12	1·60	221	0·00	20	99·73	6	0·00	20	99·90	14		
13	2·70	396	0·00	20	99·73	6	0·00	20	99·90	14		
14	2·00	284	0·00	20	99·73	6	99·96	18	100·00	20		
15	1·50	206	99·94	16	99·73	6	0·00	20	0·00	20		
16	1·10	149	99·98	19	99·73	6	99·84	11	0·00	17		
17	0·70	95	99·96	18	99·73	6	99·80	9	0·00	14		
18	0·70	95	99·96	18	99·73	6	99·80	9	0·00	14		
19	0·70	95	100·00	20	99·70	5	99·90	14	0·00	14		
20	0·70	95	0·10	28	99·70	5	99·90	14	0·00	14		
21	0·60	83	0·10	28	99·70	5	99·90	14	0·00	12		
22	0·30	48	0·00	20	99·70	5	100·00	20	0·00	9		
23	0·30	48	99·96	18	99·73	6	0·00	20	0·00	9		
24	0·30	48	99·94	16	99·75	7	99·90	14	0·00	9		
25	0·20	37	99·92	15	99·75	7	99·90	14	0·00	9		
26	0·20	37	99·92	15	99·73	6	100·00	20	0·00	8		
27	0·20	37	99·92	15	99·82	10	0·00	20	0·00	8		
28	0·20	37	99·87	13	99·80	9	99·90	14	0·00	8		
29	0·10	28	99·85	12	99·84	11	99·80	9	0·00	8		
30	0·10	28	99·84	11	99·84	11	99·80	9	0·00	7		
31	0·10	28	99·80	9			99·80	9				

Note.—Ice conditions January 1 to April 6 and November 16 to end of year.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Ochre River at Ochre River, for 1914.

[Drainage area, 250 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	.....	.....	104·50	7	102·60	380	100·13	31
2	.....	.....	.....	.....	.....	.....	4·70	7	2·40	348	0·13	31
3	.....	.....	.....	.....	.....	.....	4·50	7	0·50	71	0·10	28
4	.....	.....	.....	.....	.....	.....	4·50	7	0·10	28	0·10	28
5	.....	.....	.....	.....	.....	.....	4·50	7	1·10	149	0·10	28
6	.....	.....	.....	.....	.....	.....	4·40	6	6·30	1,091	0·10	28
7	.....	.....	.....	.....	.....	.....	4·20	6	6·20	1,070	0·10	28
8	.....	.....	.....	.....	.....	.....	3·90	6	6·30	1,091	0·10	28
9	.....	.....	.....	.....	.....	.....	4·10	6	3·40	518	0·10	28
10	100·80	3	.....	.....	.....	.....	4·20	7	2·40	348	0·00	20
11	.....	.....	.....	.....	.....	.....	4·20	7	1·80	252	0·00	20
12	.....	.....	.....	.....	.....	.....	4·20	7	1·40	191	0·00	20
13	.....	.....	.....	.....	.....	.....	4·20	7	1·20	163	0·00	20
14	.....	.....	.....	.....	.....	.....	4·20	7	0·90	121	99·90	14
15	.....	.....	.....	.....	.....	.....	4·20	40	0·80	108	99·88	13
16	.....	.....	.....	.....	.....	.....	4·60	70	0·70	95	99·87	13
17	.....	.....	.....	.....	.....	.....	5·30	90	0·70	95	99·87	13
18	.....	.....	.....	.....	.....	.....	4·60	120	0·70	95	99·87	13
19	.....	.....	.....	.....	.....	.....	4·00	140	0·70	95	99·79	9
20	.....	.....	.....	.....	.....	.....	3·90	160	0·70	95	99·78	8
21	.....	.....	.....	.....	.....	.....	3·96	189	0·60	83	99·78	8
22	.....	.....	.....	.....	.....	.....	3·60	240	0·60	83	99·77	8
23	.....	.....	.....	.....	.....	.....	3·20	340	0·60	83	99·75	7
24	.....	.....	.....	.....	.....	.....	3·10	464	0·50	71	99·74	7
25	.....	.....	.....	.....	.....	.....	3·10	464	0·40	59	99·70	5
26	.....	.....	.....	.....	.....	.....	3·00	446	0·40	59	99·70	5
27	.....	.....	.....	.....	.....	.....	2·70	396	0·40	59	99·70	5
28	.....	.....	.....	.....	.....	.....	2·70	396	0·40	59	99·68	5
29	.....	.....	.....	.....	.....	.....	2·90	429	0·28	46	99·67	4
30	.....	.....	.....	.....	.....	.....	2·90	429	0·28	46	100·35	53
31	.....	.....	.....	.....	.....	.....	.....	.....	0·27	45	.....	.....

	July.		August.		September.		October.		November.		December.	
1	100·15	32	99·58	3	99·53	2	99·62	3	99·73	6	99·88	2
2	100·04	23	99·55	2	99·53	2	99·62	3	99·73	6	99·88	2
3	100·04	23	99·54	2	99·51	2	99·62	3	99·75	7	99·88	1
4	100·04	23	99·53	2	99·51	2	99·66	4	99·75	7	99·88	1
5	99·94	16	99·47	2	99·53	2	99·72	6	99·78	8	99·88	1
6	99·94	16	99·47	2	99·63	4	99·73	6	99·78	8	.....	.....
7	100·04	23	99·46	2	99·71	5	99·73	6	99·78	8	.....	.....
8	99·94	16	99·46	2	99·71	5	99·75	7	99·78	8	.....	.....
9	99·84	11	99·45	2	99·71	5	99·83	11	99·78	8	.....	.....
10	99·84	11	99·45	2	99·72	6	99·92	15	99·77	8	.....	.....
11	99·74	7	99·45	2	99·73	6	100·04	23	99·78	8	.....	.....
12	100·00	20	99·45	2	99·65	4	100·02	22	99·78	8	.....	.....
13	100·15	32	99·45	2	99·64	4	99·98	19	99·78	8	.....	.....
14	100·04	23	99·45	2	99·64	4	99·96	18	99·78	8	.....	.....
15	99·94	16	99·45	2	99·63	4	99·83	11	99·83	11	.....	.....
16	99·94	16	99·43	1	99·61	3	99·81	9	99·88	9	.....	.....
17	99·91	16	99·43	1	99·60	3	99·81	9	99·91	7	.....	.....
18	99·94	16	99·43	1	99·58	3	99·79	9	99·93	5	.....	.....
19	99·94	16	99·43	1	99·58	3	99·78	8	99·93	5	.....	.....
20	99·94	16	99·43	1	99·55	2	99·77	8	99·88	4	.....	.....
21	99·81	11	99·43	1	99·55	2	99·77	8	99·88	3	.....	.....
22	99·84	11	99·43	1	99·58	3	99·75	7	99·88	3	.....	.....
23	99·81	11	99·43	1	99·61	3	99·74	7	99·94	2	.....	.....
24	99·64	4	99·43	1	99·61	3	99·73	6	99·98	3	.....	.....
25	99·54	2	99·43	1	99·60	3	99·73	6	100·01	3	.....	.....
26	99·63	4	99·55	2	99·60	3	99·73	6	100·04	3	.....	.....
27	99·63	4	99·55	2	99·63	4	99·71	6	100·02	2	.....	.....
28	99·63	4	99·55	2	99·65	4	99·76	7	99·93	2	.....	.....
29	99·63	4	99·55	2	99·63	4	99·73	6	99·93	2	.....	.....
30	99·63	4	99·53	2	99·61	3	99·73	6	99·88	2	.....	.....
31	99·63	4	99·53	2	.....	.....	99·73	6	.....	.....	.....	.....

Note.—Ice conditions January 1 to April 23, and November 15 to end of year.

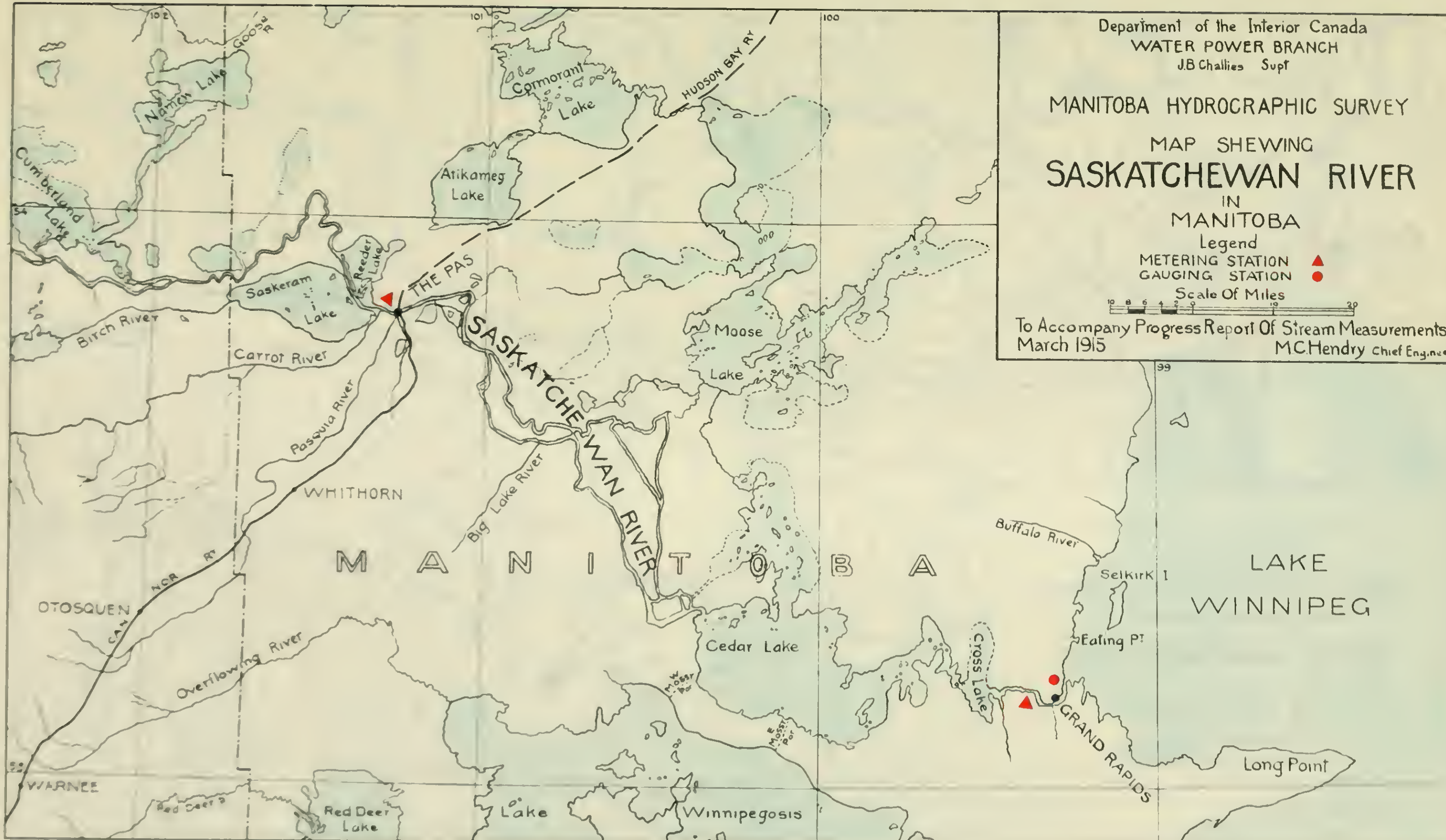
Monthly Discharge of Ochre River at Ochre River, for the years 1912–14.

[Drainage Area, 250 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1912.						
October	.....	.....	[1]155	0·620	0·715	9,531
November	166	102	135	0·540	0·602	8,033
December	.....	.....	[1]95	0·380	0·438	5,841
The period	166	[1]95	127	0·513	1·732	23,097
1913.						
January	.....	.....	77[1]	0·308	0·355	4,735
February	.....	.....	32[1]	0·128	0·133	1,777
March	.....	.....	2[1]	0·008	0·009	123
April	903	10	335	1·344	1·500	19,993
May	121	93	106	0·424	0·489	6,518
June	177	48	83	0·332	0·370	4,939
July	396	28	109	0·436	0·503	6,702
August	28	9	19	0·076	0·088	1,168
September	11	5	7	0·028	0·031	417
October	20	7	14	0·056	0·065	861
November	20	7	14	0·056	0·062	833
December	.....	.....	5[1]	0·020	0·023	307
The year	903	1[1]	67	0·268	3·628	48,373
1914.						
January	.....	.....	2[1]	0·008	0·009	223
February	.....	.....	0[1]	.....	.....	.....
March	.....	.....	1[1]	0·004	0·005	61
April	464	6	150	0·600	0·669	8,926
May	1,091	28	229	0·916	1·056	14,081
June	31	4	17	0·068	0·076	1,012
July	32	2	14	0·056	0·065	861
August	3	1	2	0·008	0·009	123
September	6	2	3	0·012	0·014	179
October	23	3	9	0·036	0·042	553
November	11[1]	2[1]	6[1]	0·024	0·027	357
December	.....	.....	1[1]	0·004	0·005	61
The year	1,091	0[1]	40	0·158	1·977	26,337

Note.—[1] Estimated.

Ice conditions from December 3 to end of year 1912; and from January 1 to April 6, and November 16 to end of year 1913; and January 1 to April 23, and November 16 to end of year 1914.


Department of the Interior Canada
WATER POWER BRANCH
J.B Challies Supt
MANITOBA HYDROGRAPHIC SURVEY
MAP SHEWING
SASKATCHEWAN RIVER
IN
MANITOBA
Legend
METERING STATION
GAUGING STATION
Scale Of Miles
To Accompany Progress Report Of Stream Measurements
March 1915
M.C.Hendry Chief Engineer
SASKATCHEWAN RIVER
THE PAS
HUDSON BAY RY
MANITOBA
LAKE WINNIPEG
GRAND RAPIDS
Cross Lake
Cedar Lake
Moose Lake
Cormorant Lake
Atikameg Lake
Saskeram Lake
Reeder Lake
Cumberland Lake
Namew Lake
Birch River
Carrot River
Pasquia River
Big Lake River
Buffalo River
Overflowing River
WHITHORN
OTOSQUEN
WARNEE
Red Deer Lake
Lake Winnipegosis
Selkirk I
Eating Pt
Long Point

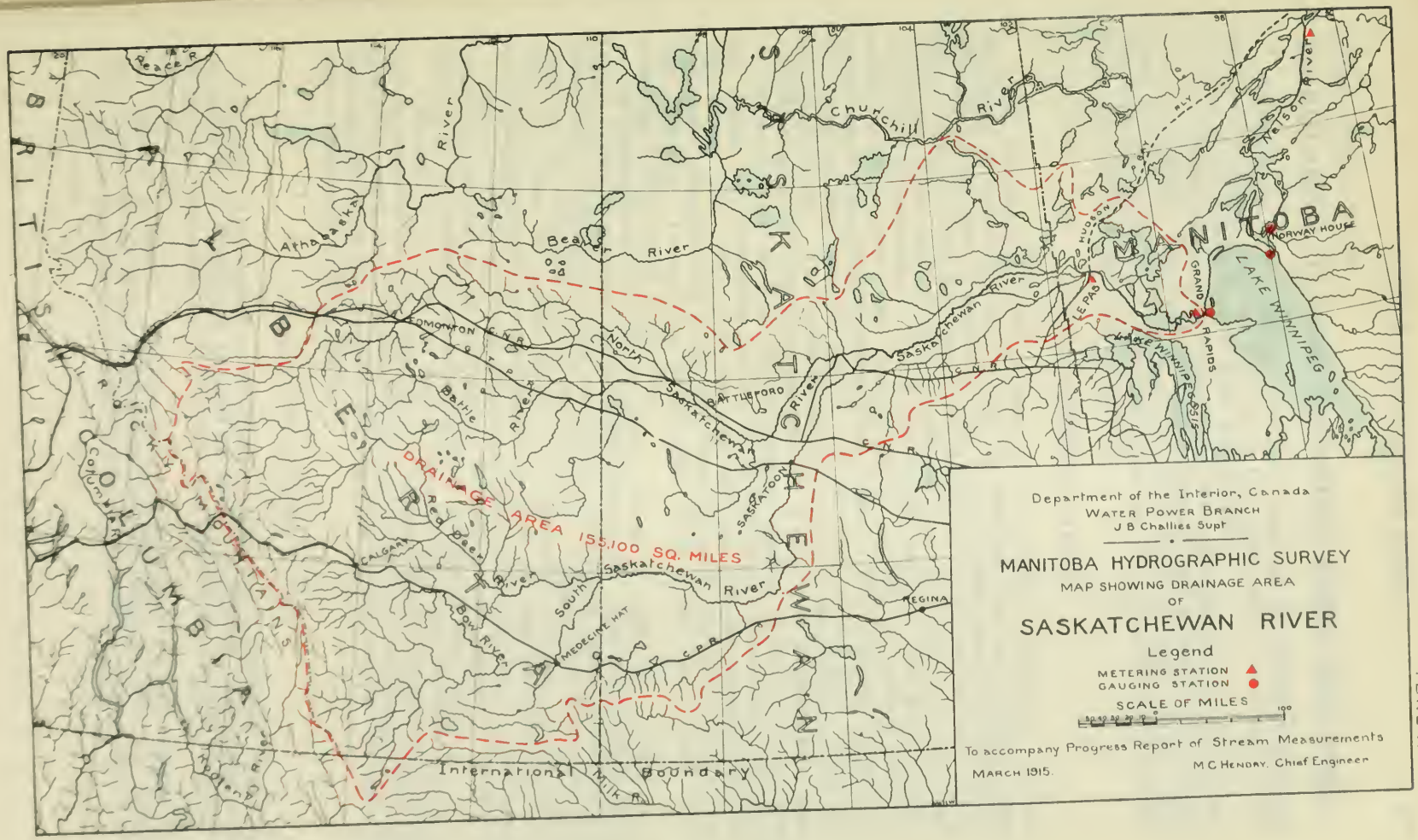

BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
Peace R.
Athabaska
River
Beaver River
Churchill River
Nelson River
HUDSON BAY
NORWAY HOUSE
LAKE WINNIPEG
GRAND RAPIDS
LAKE WINNIPEGOSIS
Saskatchewan River
EDMONTON
C.N.R.
North Saskatchewan River
BATTLEFORD
C.P.R.
Battle River
SASKATOON
Red Deer River
CALGARY
South Saskatchewan River
MEDICINE HAT
REGINA
Bow River
Columbia Mountains
Rocky Mountains
DRAINAGE AREA 155,100 SQ. MILES
International Boundary
Milk R.
Department of the Interior, Canada
WATER POWER BRANCH
J B Challies Supt
MANITOBA HYDROGRAPHIC SURVEY
MAP SHOWING DRAINAGE AREA
OF
SASKATCHEWAN RIVER
Legend
METERING STATION
GAUGING STATION
SCALE OF MILES
To accompany Progress Report of Stream Measurements
MARCH 1915.
M C HENDRY, Chief Engineer

PLATE VII.

SESSIONAL PAPER No. 25f

TRIBUTARIES OF LAKE WINNIPEG FROM THE WEST.

General.—The rivers coming under this head are the Saskatchewan and the Fairford, though they are included in that part known for administration purposes as the District West of Lake Winnipegosis.

The Saskatchewan is very important from a navigation, reclamation, and power standpoint. The Fairford is also important, and to some extent for the above reasons. Its chief importance is that it forms the only outlet of lake Manitoba and through it all the other lakes, lake Winnipegosis, lake Dauphin, Swan lake, and Red Deer lake are drained.

SASKATCHEWAN RIVER.

The Saskatchewan river is one of the principal tributaries of lake Winnipeg; it flows into that lake near the northern end, and drains a large territory to the west of the lake. The total drainage area is 155,000 square miles, extending from the summit of the Rocky mountains eastward to lake Winnipeg. There are two main branches of the river, known as the north and South Saskatchewan. The North branch heads in the North Rockies southwest of Edmonton, and flows generally east to its junction with the South branch about 50 miles east of Prince Albert. The tributaries entering the river from the north are small, as the northern limit of the basin follows the river itself closely. The South branch is formed by the junction of the Bow and Old Man rivers, and below the junction of these two the Red Deer enters.

In the province of Manitoba the country adjacent to the river is low lying and swampy, a considerable portion of the land being liable to flooding during high water. Near the mouth the river enlarges into two lake-like expanses known as Cedar lake and Cross lake, from the latter lake the river flows into lake Winnipeg. Cross Lake rapids, Red Rock rapids, and Grand rapids occurring in this stretch of the river.

In Manitoba the river has an average width of 1,000 feet, though above Grand Rapids a minimum width of 500 feet occurs. The river bottom above Cedar lake is composed of clay and gravel; below that point limestone ridges occur and the bottom is covered with boulders. Valuable timber is to be found along the river at various points, but, generally speaking, as the lake is approached the growth becomes stunted, being for the most part second-growth.

Above Grand rapids the river is navigable at certain stages, and steamers have been operated as far upstream as Edmonton. At present all navigation below Pas is confined to gasoline launches and similar small craft.

Considerable work in the way of reconnaissance and detailed surveys for various purposes has been done by the Dominion Water Power Branch in this part of the river, and in order to further the work, two metering stations have been established by the Manitoba Hydrographic Survey, one at Pas and the other at the head of Grand rapids.

Saskatchewan River at Pas.

History.—The station on the Saskatchewan river at Pas was first established by W. G. Worden on October 21, 1912. On May 27, 1913, a new section at Pas was established by E. Bankson, and this station has been in operation since that date.

Location of section.—The first station was located about a quarter of a mile below the site of the Hudson Bay Railway bridge at Pas. On May 27, 1913, this section was moved upstream to the downstream side of the Hudson

Bay Railway bridge at Pas. The initial point is located on the hand-rail near the south end of the bridge on the downstream side, and is vertically above the river face of the south abutment. It is painted white and marked "0+00 I.P."

Records Available.—Records of daily gauge height were kept at various intervals from the early part of 1911 till the end of 1914. From October 21, 1912, to the end of 1914, the gauge heights are rather more continuous. Estimates of daily discharge have been computed for the periods covered by daily gauge heights from October 21, 1912, to the end of 1914.

Drainage Area.—The drainage area tributary to the Saskatchewan above Pas comprises the greater portion of Western Canada lying between parallels 49 and 54 north latitude and between the Rocky mountains and lake Winnipeg. The total area is 149,500 square miles.

Gauge.—A 9-foot vertical staff enamelled gauge has been fastened to the downstream side of the first pier from the south bank and 10 feet above the metering section. The gauge is referred to Department Public Works, No. 79, which is a cross on a copper plug set on the west side of the south abutment of the Hudson Bay Railway bridge, and is about 3 feet from the ground level. It is marked D.P.W. B.M. No. 79.

Channel.—The river is divided by the bridge piers into six channels at low water and eight channels at high water. For 1,300 feet above and 2,700 feet below the section the channel is straight. The bed of the river is covered with gravel and small boulders but at the section the stream bottom is somewhat shifting. The right bank is high and not liable to overflow, the left bank is low and liable to overflow at high stages.

Discharge Measurements.—The discharge measurements were taken from a boat on the first section established. Since May, 1913, the meterings have been taken from the downstream side of the Hudson Bay Railway bridge.

Accuracy.—The discharge curve for the station is well defined between gauge heights 818·5 and 822·7, between 822·7 and 828·0 the discharge curve exhibits all the characteristics which are peculiar to certain large rivers, in that the discharge for the same gauge height varies according as the river is on a rising or a falling stage. Above gauge height 827·0 and below 818·5 the discharge curve is fairly well defined.

SESSIONAL PAPER No. 25f

Discharge Measurements of Saskatchewan River at Pas, 1912–13–14.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 21-22	W. G. Worden	1,196	914	18,093	2·16	23·94	39,046
Dec. 14	G. J. Lamb	1,187	834	12,848	0·68	18·56	8,772[1]
1913.							
Feb. 8—9	A. Pirie	1,469	771	9,563	0·53	15·97	5,165[1]
April 9	"	1,186	775	10,548	0·72	17·52	7,562[1]
May 31	E. Bankson	1,469	761	14,233	3·25	24·50	46,389
June 4	G. Ebner	1,186	750	13,331	3·31	24·41	44,124
" 10	"	1,186	750	13,899	3·38	24·83	46,979
" 12	"	1,186	760	14,041	3·51	25·18	49,285
" 14	"	1,186	739	14,197	3·63	25·39	51,534
July 10	"	1,196	758	15,445	3·69	27·02	56,886
" 12	"	1,196	760	15,587	3·70	27·19	57,743
" 15	"	1,196	756	15,848	3·79	27·41	60,114
" 18	"	1,196	756	16,000	3·93	27·62	62,883
" 21	"	1,196	880	16,066	3·97	27·80	63,900
" 23	"	1,196	779	16,107	3·86	27·84	62,120
" 25	"	1,196	756	16,309	3·93	27·95	64,199
" 28	"	1,196	770	16,342	3·91	28·00	63,869
" 30	"	1,196	756	16,332	3·85	27·98	63,025
Aug. 1	"	1,196	756	16,311	3·82	27·89	62,385
" 4	"	1,196	756	16,146	3·84	27·69	62,029
" 6	"	1,196	756	16,043	3·75	27·54	60,357
" 28	W. J. Ireland	1,469	774	15,229	3·62	26·45	55,101
Sept. 20	"	1,196	729	13,422	3·03	24·02	40,707
Oct. 9	C. O. Allen	1,435	648	11,040	2·48	21·11	27,378
" 23	"	1,435	648	11,171	2·13	21·39	23,794
Nov. 18	A. Pirie	1,496	830	12,938	0·92	18·74	11,890
Dec. 13	C. O. Allen	1,375	836	11,186	0·74	17·16	8,277[1]
" 13	"	1,375	836	11,186	0·74	17·16	8,277[1]
" 14	"	1,375	836	11,186	0·72	17·13	8,054[1]
1914.							
Jan. 20	C. O. Allen	1,375	790	9,647	0·60	16·04	5,788[1]
" 20	"	1,375	800	9,642	0·55	16·03	5,303[1]
Mar. 6	D. B. Gow	1,374	780	8,339	0·51		4,253[1]
" 26	C. O. Allen	1,496	760	9,007	0·54	16·09	4,965[1]
May 21	"	1,496	759	16,121	2·72	23·83	43,930
June 5	F. S. Smith	1,375	764	15,903	2·55	23·76	40,552
" 8	"	1,375	760	15,797	2·66	23·72	41,982
" 9	"	1,375	858	15,700	2·67	23·63	41,903
" 10	"	1,375	758	15,586	2·63	23·58	41,032
" 11	"	1,375	758	15,726	2·58	23·54	40,572
" 12	"	1,375	758	15,648	2·62	23·49	41,044
" 13	"	1,375	755	15,473	2·58	23·39	39,960
" 15	"	1,375	755	15,482	2·60	23·35	40,272
" 16	"	1,375	764	16,005	2·86	24·05	45,754
" 17	"	1,375	764	16,231	2·91	24·35	47,232
" 18	"	1,375	768	16,461	2·91	24·61	47,910
July 8	"	1,186	780	18,039	3·25	26·84	58,672
" 9	"	1,186	780	18,039	3·33	26·84	60,071
" 10	"	1,186	780	18,103	3·34	26·92	60,523
" 11	"	1,186	780	18,124	3·28	26·94	59,596
" 13	"	1,186	780	18,164	3·33	27·00	60,401
" 15	"	1,186	780	18,157	3·23	26·99	58,750
" 17	"	1,186	780	17,926	3·22	26·95	57,841
" 18	"	1,186	780	17,912	3·23	26·93	58,064
" 21	"	1,186	780	17,932	3·26	26·96	58,806
" 22	"	1,186	780	17,943	3·25	26·96	58,304
" 23	"	1,186	770	17,888	3·22	26·90	57,628
" 24	"	1,186	780	17,805	3·20	26·83	57,205
" 25	"	1,186	780	17,858	3·22	26·86	57,507
" 27	"	1,186	780	17,837	3·19	26·82	57,032
" 29	"	1,186	780	17,795	3·20	26·71	56,978
" 30	"	1,186	779	17,724	3·22	26·63	57,152
" 31	"	1,186	778	17,652	3·15	26·53	55,617
Aug. 1	"	1,186	777	17,566	3·12	26·41	54,957
" 3	"	1,186	773	17,363	3·07	26·16	53,246
" 4	"	1,186	773	17,180	3·00	26·01	51,477
" 6	"	1,186	771	16,892	2·89	25·83	48,945
" 7	"	1,186	769	16,750	2·86	25·45	47,915
" 8	"	1,186	764	16,618	2·86	25·18	47,609
" 10	"	1,186	763	16,456	2·84	24·98	46,733
" 12	"	1,186	759	16,221	2·74	24·58	44,549
" 13	"	1,186	757	15,945	2·71	24·22	43,489
" 14	"	1,186	755	15,838	2·68	24·07	42,567
" 15	"	1,186	753	15,614	2·62	23·80	40,911

Note:—Add 800·00 to all gauge heights to reduce to datum of station.
[1]Measurements taken under ice conditions.

Discharge Measurements of Saskatchewan River at Pas, 1914. *Concluded.*

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
" 17	F. S. Smith	1,186	752	15,346	2·58	23·44	39,625
" 18	"	1,186	751	15,186	2·48	23·23	37,644
" 19	"	1,186	749	15,021	2·46	23·01	36,969
" 20	"	1,186	747	14,857	2·43	22·78	36,161
" 21	"	1,186	746	14,728	2·32	22·61	34,202
" 22	"	1,186	744	14,575	2·33	22·38	34,055
" 25	"	1,186	742	14,139	2·23	21·79	31,653
" 26	"	1,186	741	13,989	2·15	21·58	30,020
" 27	"	1,186	739	13,842	2·08	21·35	28,843
" 28	"	1,186	738	13,620	2·10	21·13	28,623
" 31	"	1,186	736	13,402	2·05	20·85	27,564
Sept. 1	"	1,186	736	13,402	2·06	20·83	27,650
" 2	"	1,186	736	13,312	2·04	20·79	27,218
" 3	"	1,186	736	13,329	2·05	20·76	27,315
" 4	"	1,186	734	13,255	2·03	20·62	26,946
" 7	"	1,186	741	13,423	2·04	20·84	27,375
" 9	"	1,186	739	13,079	2·00	20·63	26,202
" 10	"	1,186	738	13,091	2·01	20·55	26,330
" 11	"	1,186	735	13,047	1·99	20·48	26,055
" 12	"	1,186	735	13,010	2·02	20·44	26,286
" 14	"	1,186	738	13,092	1·99	20·57	26,170
" 15	"	1,186	733	12,825	1·88	20·18	24,199
Sept. 17	"	1,186	732	12,715	1·86	20·02	23,656
" 18	"	1,186	732	12,715	1·90	20·03	24,257
" 19	"	1,186	733	12,825	1·95	20·18	25,032
" 21	"	1,186	732	12,715	1·87	20·06	23,850
" 23	"	1,186	733	12,734	1·91	20·01	24,319
" 24	"	1,186	733	12,769	1·89	20·03	23,975
" 25	"	1,186	733	12,734	1·85	19·98	23,662
" 26	"	1,186	733	12,662	1·80	19·91	22,906
" 28	"	1,186	728	12,403	1·80	19·67	22,384
" 29	"	1,186	728	12,431	1·84	19·56	22,928
" 30	"	1,186	726	12,284	1·77	19·42	21,789
Oct. 1	"	1,186	725	12,246	1·80	19·34	21,998
" 2	"	1,186	725	12,211	1·73	19·29	21,087
" 5	"	1,186	734	12,326	1·78	19·44	21,974
" 7	"	1,186	729	11,987	1·68	19·02	20,110
" 8	"	1,186	726	11,838	1·62	18·79	19,192
" 10	"	1,186	726	11,909	1·61	18·88	19,181
" 12	"	1,186	726	11,810	1·67	18·90	19,777
" 13	"	1,186	726	11,837	1·60	18·76	18,922
" 14	"	1,186	724	11,691	1·59	18·58	18,577
" 15	"	1,186	724	11,692	1·60	18·60	18,716
" 16	"	1,186	724	11,717	1·66	18·65	19,396
" 19	"	1,186	727	11,890	1·67	18·84	19,849
" 20	"	1,186	728	11,896	1·67	18·84	19,778
" 21	"	1,186	728	11,967	1·70	18·92	20,365
" 23	"	1,186	732	12,235	1·84	19·29	22,462
" 23	"	1,186	732	12,264	1·82	19·34	22,181
" 24	"	1,186	732	12,243	1·79	19·31	21,914
" 26	"	1,186	732	12,340	1·84	19·42	22,671
" 27	"	1,186	732	12,264	1·81	19·32	22,175
" 28	"	1,186	730	12,187	1·79	19·24	21,746
" 29	"	1,186	732	12,173	1·78	19·37	21,631
" 30	"	1,186	732	12,335	1·78	19·43	21,807
" 31	"	1,186	732	12,335	1·78	19·45	21,961
Nov. 3	"	1,186	735	12,685	1·91	19·96	24,291
" 5	"	1,186	737	12,783	1·90	20·16	24,280
" 6	"	1,186	737	12,875	1·93	20·20	24,916
" 7	"	1,186	735	12,914	1·95	20·27	25,295
" 9	"	1,186	737	12,730	1·90	20·04	24,265
" 10	"	1,186	735	12,650	1·92	19·93	24,348

[1] Measurements taken under ice conditions.

Note.—Add 800·00 to all gauge heights to reduce to datum of station.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Saskatchewan River at Pas, for 1913.

[Drainage Area, 149,500 square miles.]

Day.	February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							27·34	60,100	24·49	45,000
2							27·34	60,100	24·44	44,700
3							27·34	60,100	24·34	44,200
4							27·24	59,600	24·44	44,700
5							27·28	59,800	24·39	44,500
6							27·29	59,800	24·34	44,200
7							27·24	59 600	24·34	44,200
8							27·44	60,600	24·54	45,300
9	15·97	5,100			17·52	7,550	27·64	61,700	24·64	45,800
10							27·84	62,700	24·84	46,800
11							26·24	54,300	24·84	46,800
12							26·34	54,800	25·04	47,900
13					22·24	33,100	26·54	55,900	25·24	49,000
14					22·34	33,600	26·64	56,400	25·39	49,800
15					22·44	34,100	26·74	56,900	25·44	50,000
16					24·29	43,900	26·54	55,900	25·54	50,600
17					25·24	49,000	26·34	54,800	25·64	51,100
18					25·94	52,700	25·24	49,000	25·74	51,600
19					26·24	54,300	25·29	49,200	25·94	52,700
20					27 24	59,600	25·27	49,100	26·04	53,200
21					26·69	56,600	25·34	49,500	26·04	53,200
22					26·54	55,900	25·24	49,000	26·04	53,200
23					26·64	56,400	25·04	47,900	26·94	58,000
24					26·74	56,900	24·64	45,800	26·84	57,400
25					26·94	58,000	24·54	45,300	26·74	56,900
26					27·04	58,500	24·59	45,500	26·64	56,400
27					27·24	59,600	24·54	45,300	26·54	55,900
28					27·24	59,600	24·44	44,700	26·54	55,900
29					27·39	60,400	24·54	45,300	26·54	55,900
30					27·37	60,200	24·54	45,300	26·54	55,900
31							24·54	45,300		

	July.		August.		September.		October.		November.		December.	
1	26·54	55,900	27·89	63,000	26·39	55,100	21·97	31,600				
2	26·54	55,900	27·84	62,700	26·28	54,500	21·88	31,200				
3	26·64	56,400	27·74	62,200	26·14	53,700	21·79	30,700				
4	26·74	56,900	27·69	61,900	26·04	53,200	21·70	30,200				
5	26·84	57,400	27·64	61,700	25·94	52,700	21·61	29,700				
6	26·84	57,400	27·54	61,200	25·60	52,500	21·52	29,200				
7	26·89	57,700	27·54	61,200	25·90	52,500	21·43	28,800				
8	26·87	57,600	27·44	60,600	25·74	51,600	21·34	28,300				
9	26·94	58,000	27·34	60,100	25·54	50,600	21·16	27,300				
10	26·94	58,000	27·24	59,600	25·30	49,300	20·99	26,400				
11	27·04	58,500	27·29	59,900	25·24	49,000	20·99	26,400				
12	27·14	59,000	27·29	59,900	25·04	47,900	20·84	24,500				
13	27 44	60,600	27·04	58,500	24 94	47,400	20·74	25,100			17·16	8,300
14	27·34	60,100	26·94	58,000	24·79	46,600	20·46	23,400			17 13	8,050
15	27·44	60,600	26·94	58,000	24·64	45,800	20·24	22,500				
16	27·44	60,600	26·94	58,000	24·34	44,200						
17	27·54	61,200	26·84	57,400	24·24	43,500						
18	27 64	61,700	26·74	56,900	24·08	42,800			18 74	11,900		
19	27·64	61,700	26·64	56,400	24·14	43,100						
20	27·74	62,200	26·54	55,900	24 09	42,900						
21	27 84	62,700	26·44	55,300	23 58	40,200						
22	27 84	62,700	26·44	55,300	23·46	39,500						
24	27·84	62,700	26·39	55,100	23 38	39,100	21 39	24,800				
24	27 81	62,700	26 44	55,300	23 29	38,600						
25	27 94	63,300	26 44	55,300	23·18	38,000						
26	27·99	63,500	26·44	55,300	22·85	36,300						
27	27·99	63,500	26·44	55,300	22 78	35,900						
28	27·99	63,500	26 47	55,500	22·24	33,100						
29	28·04	63,800	26 44	55,300	22 15	32,600						
30	27·94	63,300	26·44	55,300	22 06	32,100						
31	27 94	63,300	26 34	54,800								

Daily Gauge Height and Discharge of Saskatchewan River at Pas, for 1914.

[Drainage Area, 149,500 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	.....	.....	.....	.....	25·94	53,400	23·91	41,900
2	.....	.....	.....	.....	.....	.....	16·34	.....	26·44	56,300	23·92	41,900
3	.....	.....	.....	.....	.....	.....	.....	.....	26·74	58,100	23·92	41,900
4	.....	.....	.....	.....	.....	.....	.....	.....	25·44	50,500	23·91	41,900
5	.....	.....	.....	.....	.....	.....	16·44	.....	25·14	48,800	23·76	41,000
6	.....	.....	.....	.....	.....	4,300	.....	.....	24·74	46,500	23·80	41,300
7	.....	.....	.....	.....	.....	.....	.....	.....	24·64	45,900	23·81	41,300
8	.....	.....	.....	.....	.....	.....	.....	.....	24·44	44,800	23·72	40,800
9	.....	.....	.....	.....	.....	.....	16·44	.....	24·34	44,200	23·69	40,700
10	.....	.....	.....	.....	.....	.....	.....	.....	24·29	44,000	23·54	39,900
11	.....	.....	.....	.....	.....	.....	.....	.....	24·24	43,700	23·54	39,900
12	.....	.....	.....	.....	.....	.....	16·94	.....	24·19	43,400	23·44	39,300
13	.....	.....	.....	.....	.....	.....	.....	.....	24·14	43,100	23·34	38,800
14	.....	.....	.....	.....	.....	.....	.....	.....	24·09	42,900	23·34	38,800
15	.....	.....	.....	.....	.....	.....	.....	.....	24·05	42,600	23·54	39,900
16	.....	.....	.....	.....	.....	.....	17·34	.....	24·01	42,400	24·24	43,700
17	.....	.....	.....	.....	.....	.....	.....	.....	23·97	42,200	24·39	44,500
18	.....	.....	.....	.....	.....	.....	18·14	17,000	23·93	42,000	24·64	45,900
19	.....	.....	.....	.....	.....	.....	.....	.....	23·89	41,800	24·84	47,100
20	16·04	5,800	.....	.....	.....	.....	.....	.....	23·86	41,600	24·99	47,900
21	.....	.....	.....	.....	.....	.....	.....	.....	23·84	41,500	25·19	49,100
22	.....	.....	.....	.....	.....	.....	20·64	26,600	23·82	41,400	25·24	49,400
23	.....	.....	.....	.....	.....	.....	.....	.....	23·76	41,000	25·34	50,000
24	.....	.....	.....	.....	.....	.....	.....	.....	23·92	41,900	25·39	50,200
25	.....	.....	.....	.....	.....	.....	22·14	32,900	23·91	41,900	25·54	51,100
26	.....	.....	.....	.....	16·09	4,900	.....	.....	23·93	42,000	25·64	51,700
27	.....	.....	.....	.....	.....	.....	.....	.....	23·92	41,900	25·54	51,100
28	.....	.....	.....	.....	.....	.....	25·14	48,800	23·92	41,900	25·74	52,300
29	.....	.....	.....	.....	.....	.....	.....	.....	23·93	42,000	26·04	54,000
30	.....	.....	.....	.....	.....	.....	25·64	51,700	23·91	41,900	26·14	54,600
31	.....	.....	.....	.....	.....	.....	.....	.....	23·92	41,900	.....	.....

	July.		August.		September.		October.		November.		December.	
1	26·19	54,900	26·34	55,700	20·84	27,400	19·84	23,500	19·61	22,600	17·93	9,450
2	26·34	55,700	26·24	55,200	20·79	27,200	19·79	23,300	19·74	23,100	17·80	9,250
3	26·54	56,900	26·14	54,600	20·69	26,800	19·54	22,300	19·99	24,000	17·66	9,100
4	26·74	58,100	25·24	49,400	20·59	26,400	19·34	21,500	20·12	24,500	17·64	9,000
5	26·84	58,700	25·39	50,200	20·64	26,600	19·44	21,900	20·16	24,700	17·62	8,950
6	26·84	58,700	25·24	49,400	20·79	27,200	19·39	21,700	20·20	24,900	17·67	9,050
7	26·94	59,300	25·44	50,500	20·84	27,400	18·98	20,100	20·29	25,200	17·73	9,150
8	26·89	59,000	25·34	50,000	20·69	26,800	19·19	20,900	20·28	25,200	17·78	9,100
9	26·84	58,700	25·24	49,400	20·59	26,400	19·04	20,400	20·03	24,200	17·82	9,300
10	26·84	58,700	24·94	47,700	20·49	26,000	18·94	20,000	19·92	23,800	17·76	9,150
11	26·89	59,000	24·60	45,700	20·44	25,800	18·84	19,600	19·68	22,800	17·69	9,100
12	26·94	59,300	24·54	45,400	20·64	26,600	18·79	19,400	18·71	13,900	17·72	9,100
13	26·94	59,300	24·14	43,100	20·54	26,200	18·69	19,000	18·75	13,900	17·75	9,150
14	26·94	59,300	24·02	42,500	20·58	26,400	18·54	18,500	20·19	13,900	17·78	9,250
15	26·99	59,600	23·74	40,900	20·24	25,000	18·59	18,600	20·76	13,900	17·80	9,250
16	26·94	59,300	23·59	40,100	19·84	23,500	18·59	18,600	20·60	13,900	17·84	9,350
17	26·89	59,000	23·34	38,800	20·04	24,200	18·74	19,200	20·46	13,900	17·79	9,250
18	26·89	59,000	23·14	37,800	20·04	24,200	18·74	19,200	20·65	13,900	17·88	9,450
19	26·84	58,700	22·94	36,800	20·04	24,200	18·74	19,200	19·67	13,900	17·84	9,350
20	26·94	59,300	22·64	35,300	20·04	24,200	18·84	19,600	19·50	13,700	17·74	9,150
21	26·84	58,700	22·44	34,300	20·04	24,200	18·92	19,900	19·32	13,300	17·69	9,100
22	26·79	58,400	22·24	33,400	20·04	24,200	18·95	20,000	19·25	12,400	17·61	8,900
23	26·84	58,700	22·09	32,700	19·99	24,000	19·33	21,500	19·20	12,300	17·40	8,600
24	26·84	58,700	21·84	31,600	19·94	23,800	19·29	21,300	19·05	11,900	17·18	8,250
25	26·84	58,700	21·64	30,800	19·84	23,500	19·35	21,500	18·88	11,700	16·84	7,750
26	26·84	58,700	21·41	29,900	19·84	23,500	19·44	21,900	18·78	11,500	16·64	7,450
27	26·79	58,400	21·24	29,100	19·94	23,800	19·30	21,400	18·69	11,300	16·64	7,450
28	26·64	57,500	21·09	28,500	19·84	23,500	19·24	21,100	18·55	10,500	16·49	7,250
29	26·74	58,100	21·04	28,300	19·84	23,500	19·37	21,600	18·15	10,000	16·34	7,000
30	26·59	57,200	20·94	27,200	19·94	23,800	19·42	21,800	18·05	9,600	16·24	6,900
31	26·49	56,600	20·84	27,400	.....	.....	19·45	21,900	.....	.....	15·59	6,550

MONTHLY DISCHARGE of Saskatchewan River at Pas, for the years 1913-14.

[Drainage Area, 149,500 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in acre feet.
1913.						
January	.....	.....	[1]5,500	0·037	0·043	338,200
February	.....	.....	[1]5,500	0·037	0·039	305,500
March	.....	.....	[1]6,500	0·043	0·050	399,700
April	.....	.....	[1]34,200	0·229	0·256	2,035,000
May	62,700	45,300	53,800	0·355	0·409	3,270,400
June	58,000	44,200	50,400	0·337	0·376	2,995,500
July	63,800	55,900	60,400	0·404	0·466	3,714,100
August	63,000	54,800	58,100	0·388	0·448	3,571,100
September	55,100	32,100	44,800	0·300	0·335	2,665,800
October	.....	.....	[1]25,000	0·170	0·196	1,537,200
November	.....	.....	[1]14,000	0·094	0·105	833,100
December	.....	.....	[1]8,000	0·054	0·062	491,900
The year	.....	.....	30,516	0·204	2·785	22,157,500
1914.						
January	.....	.....	[1]6,000	0·040	0·046	368,900
February	.....	.....	[1]5,000	0·034	0·035	277,700
March	.....	.....	[1]4,500	0·030	0·035	276,700
April	.....	.....	[1]25,000	0·167	0·186	1,487,600
May	58,100	41,100	44,400	0·297	0·342	2,730,000
June	54,600	38,800	45,100	0·301	0·336	2,681,200
July	59,600	54,900	58,394	0·391	0·451	3,592,100
August	55,700	27,400	40,400	0·270	0·311	2,484,100
September	27,400	23,500	25,210	0·169	0·189	1,501,300
October	23,500	18,500	20,658	0·138	0·159	1,270,300
November	25,200	9,600	17,200	0·115	0·128	1,023,500
December	9,450	6,550	8,700	0·058	0·067	534,900
The year	.....	.....	25,047	0·167	2·285	18,228,300

NOTE.—[1]Estimated.

SASKATCHEWAN RIVER AT THE HEAD OF GRAND RAPIDS.

History.—This station was established by E. B. Patterson on July 31, 1912, and has been in continuous operation since that date.

Location of Section.—The meter section on the South Saskatchewan river at the head of Grand rapids is located 640 feet below the Hudson's Bay Company's wharf, situated at the upper end of their tramway and 3,200 feet above the head of Grand rapids. The initial point is a hub at the top of the left bank. It is referenced to the end of a traverse line running from the Hudson's Bay Company's tramway.

Records Available.—Records of daily gauge height extend over the period August 3, 1912, to November 6, 1913, during the openwater season. From November 7, 1913, to September 5, 1914, a record of continuous gauge heights has been taken. Estimates of daily discharge have been prepared for the following periods: August 1 to November 30, 1912; May 19 to November 11, 1913; and April 23 to September 5, 1914. Difficulty has been experienced in securing gauge height records during the winter months.

Drainage Area.—The drainage area of the Saskatchewan river above the head of Grand rapids is 155,100 square miles.

Gauge.—A 9-foot vertical staff enamelled gauge has been placed at the end of the section and fastened to a crib which acts as a retaining wall for the bank. Prior to this gauge being placed, one was secured to the dock of the Hudson's Bay Company, about 500 feet above the section, and it is to this gauge that the records given are referred.

Channel.—For 800 feet above and 500 feet below the section the channel is straight. The hydraulic gradient for this section is quite perceptible. The river is confined to one channel at all stages, the bed of the stream is of sand and gravel and fairly permanent. The banks are high, covered with scrub, and are not liable to overflow.

Discharge Measurements.—Discharge measurements are made from a 20-foot skiff which is located on the section by means of a tagged line stretched across the river.

Accuracy.—The discharge curve is only fairly well defined between the extreme limits of gauge heights, which are 786·0 to 789·4. Owing to the hydraulic gradient the section may be considered an open-water one, as very little ice forms at this point during the winter season.

DISCHARGE MEASUREMENTS of Saskatchewan River at Grand Rapids, 1912-13.

Date.	Hydrographer.	Meter No	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 8	E. B. Patterson	285	1,055	15,061	3·47	788·18	52,262
Sept. 18	"	3	1,056	15,853	4·01	788·96	63,570
" 23	"	3	1,058	15,957	3·98	789·06	63,510
1913.							
Aug. 27	A. Pirie	1,496	1,054	15,422	3·71	788·33	57,206
" 29	"	1,497	1,054	15,485	3·57	788·38	55,266
" 30	"	1,497	1,054	15,427	3·55	788·31	54,718
Nov. 10	"	1,496	1,016	11,872	1·66	786·01	19,727
" 11	"	1,496	1,012	11,963	1·71	785·97	20,548

DAILY GAUGE HEIGHT AND DISCHARGE of Saskatchewan River at Head Grand Rapids, for 1912.

[Drainage Area, 155,100 square miles.]

Day.	July.		August.		September.		October.		November.		December.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	17·84	47,600	8·79	61,900	18·99	64,800	17·25	38,800	.....	.....
2	.....	.....	17·86	47,900	8·84	62,600	19·00	65,000	17·24	38,600	.....	.....
3	.....	.....	7·88	48,200	8·80	62,000	19·00	65,000	17·23	38,500	.....	.....
4	.....	.....	17·90	48,500	8·74	61,100	19·01	65,100	7·23	38,500	.....	.....
5	.....	.....	7·93	49,000	8·77	61,600	19·01	65,100	17·15	37,200	.....	.....
6	.....	.....	8·00	50,000	8·89	63,400	19·02	65,300	17·07	36,000	.....	.....
7	.....	.....	8·04	50,600	9·11	66,700	9·02	65,300	16·99	34,900	.....	.....
8	.....	.....	8·13	52,000	19·09	66,400	19·10	66,500	16·91	33,600	.....	.....
9	.....	.....	8·21	53,200	19·07	66,100	19·18	67,700	16·83	32,400	.....	.....
10	.....	.....	18·13	52,000	9·06	65,900	19·26	68,900	16·75	31,300	.....	.....
11	.....	.....	18·05	50,800	8·99	64,900	19·34	70,200	6·67	30,000	.....	.....
12	.....	.....	17·97	49,600	8·99	64,900	19·42	71,300	16·60	29,000	.....	.....
13	.....	.....	17·89	48,400	9·07	66,100	19·50	72,500	16·53	28,000	.....	.....
14	.....	.....	7·82	47,300	8·96	64,400	9·60	74,000	16·47	27,000	.....	.....
15	.....	.....	17·82	47,300	8·98	64,700	19·59	73,800	16·41	26,200	.....	.....
16	.....	.....	17·82	47,300	8·99	64,900	19·58	73,700	16·35	25,200	.....	.....
17	.....	.....	17·83	47,500	8·94	64,100	19·57	73,500	6·28	24,200	.....	.....
18	.....	.....	17·83	47,500	8·96	64,400	19·56	73,400	16·28	24,200	.....	.....
19	.....	.....	7·83	47,500	8·98	64,700	19·54	73,100	16·27	24,100	.....	.....
20	.....	.....	17·81	47,200	9·01	65,100	19·52	72,800	16·27	24,100	.....	.....
21	.....	.....	17·80	47,000	8·99	64,900	9·50	72,500	16·26	23,900	.....	.....
22	.....	.....	7·79	46,900	9·01	65,100	19·18	67,700	16·25	23,700	.....	.....
23	.....	.....	18·03	50,500	9·10	66,500	18·87	63,100	16·24	23,600	.....	.....
24	.....	.....	18·27	54,100	9·06	65,900	18·56	58,400	16·23	23,400	.....	.....
25	.....	.....	18·51	57,700	8·96	64,100	18·25	53,700	6·22	23,300	.....	.....
26	.....	.....	8·74	61,100	18·97	64,500	17·94	49,100	16·03	20,500	.....	.....
27	.....	.....	18·75	61,300	18·97	64,500	17·63	44,500	15·84	17,600	.....	.....
28	.....	.....	18·76	61,400	18·98	64,700	7·29	39,400	15·65	14,800	.....	.....
29	.....	.....	18·77	61,600	18·98	64,700	17·28	39,200	5·45	11,700	.....	.....
30	.....	.....	18·78	61,700	18·99	64,800	17·27	39,100	15·45	11,700	.....	.....
31	.....	.....	18·79	61,900	.....	.....	17·26	38,900	.....	.....	.....	.....

NOTE.—Gauge heights marked thus (1) interpolated.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Saskatchewan River at Head Grand Rapids, for 1913.

[Drainage Area, 155,100 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·90	48,500
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·89	48,300
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·86	47,900
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·83	48,400
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·80	47,000
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·77	46,600
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·74	46,100
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·71	45,700
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7·69	45,400
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,300
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,400
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,300
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,400
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,300
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,400
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7·69	45,300
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,400
18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,300
19	.....	.....	.....	.....	.....	.....	.....	.....	6·99	34,900	17·69	45,400
20	.....	.....	.....	.....	.....	.....	.....	.....	17·13	37,600	17·69	45,300
21	.....	.....	.....	.....	.....	.....	.....	.....	17·27	39,100	17·69	45,400
22	.....	.....	.....	.....	.....	.....	.....	.....	17·41	41,200	17·69	45,300
23	.....	.....	.....	.....	.....	.....	.....	.....	17·55	43,300	7·69	45,400
24	.....	.....	.....	.....	.....	.....	.....	.....	17·69	45,300	17·69	45,300
25	.....	.....	.....	.....	.....	.....	.....	.....	17·83	47,400	17·69	45,400
26	.....	.....	.....	.....	.....	.....	.....	.....	7·99	49,900	17·69	45,300
27	.....	.....	.....	.....	.....	.....	.....	.....	17·98	49,700	7·69	45,400
28	.....	.....	.....	.....	.....	.....	.....	.....	17·96	49,400	7·69	45,300
29	.....	.....	.....	.....	.....	.....	.....	.....	17·95	49,200	7·69	45,400
30	.....	.....	.....	.....	.....	.....	.....	.....	17·93	48,900	7·69	45,300
31	.....	.....	.....	.....	.....	.....	.....	.....	17·92	48,800	.....	.....

	July.		August.		September.		October.		November		December	
1	17·72	45,800	18·34	55,100	18·33	55,000	17·32	39,800	16·37	25,300	4·51	
2	17·75	46,200	18·32	54,800	8·19	52,800	17·29	39,400	16·33	25,000	4·48	
3	17·78	46,700	18·31	54,600	18·16	52,400	17·26	38,900	15·29	24,300	4·53	
4	17·81	47,100	8·29	54,400	18·13	52,000	17·23	38,400	16·24	23,600	4·44	
5	17·84	47,600	18·31	54,600	18·10	51,500	17·20	38,000	15·19	22,900	4·41	
6	17·87	48,000	18·32	54,800	18·07	51,100	17·17	37,500	16·15	22,300	4·46	
7	7·89	48,400	18·34	55,100	18·04	50,700	17·14	37,100	16·08	21,200	4·51	
8	17·87	48,100	18·35	55,200	18·01	50,200	17·11	33,600	6·06	20,980	5·53	
9	17·86	47,900	18·37	55,500	17·98	49,700	17·08	36,200	6·25	23,800	5·14	
10	17·84	47,700	18·38	55,700	17·95	49,300	17·05	35,700	5·95	19,200	4·91	
11	17·83	47,500	8·39	55,900	17·92	48,800	17·03	35,500	5·96	19,400	4·97	
12	17·82	47,300	18·38	55,700	17·89	48,400	17·01	35,200	5·01		4·56	
13	17·81	47,100	18·37	55,500	17·86	47,900	6·99	34,800	5·06		4·74	
14	7·79	46,900	18·35	55,200	17·83	47,600	6·97	34,600	4·95		4·60	
15	17·86	47,900	18·34	55,100	17·80	47,000	6·95	34,400	4·78		4·61	
16	17·93	49,000	18·32	54,800	17·77	46,500	16·92	33,800	4·76		4·62	
17	18·00	50,000	18·31	54,600	17·74	46,100	16·89	33,300	4·81		4·68	
18	18·07	51,100	8·29	54,400	17·71	45,700	16·85	32,700	5·04		4·71	
19	18·14	52,100	18·31	54,600	17·68	45,200	16·82	32,300	4·64		5·34	
20	18·21	53,200	18·33	55,000	17·65	44·700	16·78	31,700	4·62		5·64	
21	8·29	54,300	18·35	55,200	17·62	44,300	16·75	31,200	4·58		5·56	
22	18·31	54,600	18·37	55,500	17·59	44,000	16·71	30,700	4·54		5·74	
23	18·32	54,800	18·39	55,800	17·56	43,400	16·68	30,200	4·57		5·65	
24	18·34	55,100	18·41	56,200	17·53	42,900	16·64	29,600	4·61		5·70	
25	18·35	55·200	18·43	56,400	17·50	42,500	16·61	29,200	4·58		6·51	
26	18·37	55,500	8·45	56,800	17·47	42,000	16·57	28,500	5·41		6·80	
27	18·38	55,700	8·34	54,900	17·44	41,600	16·54	28,100	4·64		6·67	
28	8·39	55,900	18·35	55,300	17·41	41,200	16·50	27,500	4·56		6·91	
29	18·38	55,700	8·38	55,700	17·38	40,700	16·47	27,100	4·54		6·85	
30	18·37	55,500	8·34	54,700	17·35	40,200	16·44	26,600	4·58		7·06	
31	18·35	55,200	18·37	55,500			16·40	26,000			7·16	

Note.—Ice conditions from November 12 to end of year, data insufficient to compute daily discharge. Gauge heights marked (thus (1)) interpolated.

Daily Gauge Height and Discharge of Saskatchewan River at Head Grand Rapids, for 1914.

[Drainage Area, 155,100 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	7·04	.....	7·60	.....	7·64	.....	7·74	.....	7·88	48,200	6·80	32,000
2	7·08	.....	7·56	.....	7·71	.....	7·71	.....	7·85	47,800	6·84	32,600
3	7·01	.....	7·62	.....	7·67	.....	7·78	.....	7·90	48,500	6·81	32,200
4	7·11	.....	7·58	.....	7·74	.....	7·81	.....	7·48	42,200	6·66	29,900
5	7·31	.....	7·67	.....	7·78	.....	7·76	.....	6·95	34,200	6·55	28,300
6	7·34	.....	7·71	.....	7·71	.....	7·68	.....	6·41	26,200	6·60	29,000
7	7·31	.....	7·64	.....	7·74	.....	7·74	.....	6·44	26,600	6·81	32,200
8	7·33	.....	7·56	.....	7·68	.....	7·81	.....	6·40	26,000	6·84	32,600
9	7·61	.....	7·70	.....	7·73	.....	7·76	.....	6·33	24,900	6·88	33,200
10	7·64	.....	7·62	.....	7·78	.....	7·73	.....	6·31	24,700	6·92	33,800
11	7·62	.....	7·56	.....	7·74	.....	7·74	.....	6·49	27,300	7·04	35,600
12	7·65	.....	7·51	.....	7·81	.....	7·71	.....	6·63	29,500	7·10	36,500
13	7·68	.....	7·54	.....	7·76	.....	7·76	.....	6·44	26,600	7·06	35,900
14	7·60	.....	7·52	.....	7·82	.....	7·70	.....	6·48	27,200	6·81	32,200
15	7·56	.....	7·58	.....	7·73	.....	7·78	.....	6·51	27,700	6·86	32,900
16	7·64	.....	7·55	.....	7·71	.....	7·98	.....	6·54	28,100	6·92	33,800
17	7·56	.....	7·60	.....	7·74	.....	7·93	.....	6·52	27,800	6·88	33,200
18	7·58	.....	7·68	.....	7·70	.....	7·82	.....	6·50	27,500	6·81	32,100
19	7·44	.....	7·64	.....	7·78	.....	7·78	.....	6·37	25,600	6·69	30,400
20	7·51	.....	7·55	.....	7·68	.....	7·74	.....	7·05	35,700	6·84	32,600
21	7·54	.....	7·60	.....	7·81	.....	7·88	.....	7·01	35,200	6·78	31,700
22	7·48	.....	7·71	.....	7·70	.....	7·71	.....	6·99	34,800	6·81	32,100
23	7·64	.....	7·66	.....	7·74	.....	7·84	47,600	7·04	35,600	6·79	31,900
24	7·61	.....	7·70	.....	7·78	.....	7·80	47,000	7·21	38,200	6·84	32,600
25	7·67	.....	7·71	.....	7·71	.....	7·76	46,400	6·60	29,000	6·87	33,000
26	7·62	.....	7·76	.....	7·66	.....	7·78	46,700	6·67	30,000	6·82	32,300
27	7·54	.....	7·80	.....	7·70	.....	7·81	47,200	6·84	32,600	6·90	33,500
28	7·44	.....	7·74	.....	7·75	.....	7·80	47,000	6·87	33,000	6·84	32,600
29	7·58	.....	.....	.....	7·68	.....	7·75	46,200	6·81	32,200	6·91	33,600
30	7·65	.....	.....	.....	7·71	.....	7·82	47,300	6·88	33,200	7·04	35,600
31[3]	7·71	.....	.....	.....	7·80	.....	.....	.....	6·85	32,700	.....	.....

3 Note.—Ice conditions from January 1 to April 24, data insufficient to compute daily discharges.

	July.		August.		September.		October.		November.		December.	
1	7·06	35,900	7·84	47,600	6·38	25,700	.....	.....	.....	.....	.....	.....
2	7·22	38,300	7·79	46,900	6·32	24,800	.....	.....	.....	.....	.....	.....
3	7·15	37,200	7·86	47,900	6·34	25,100	.....	.....	.....	.....	.....	.....
4	7·01	35,200	7·74	46,100	6·30	24,500	.....	.....	.....	.....	.....	.....
5	7·08	36,200	8·31	54,600	6·22	23,300	.....	.....	.....	.....	.....	.....
6	7·65	44,700	8·04	50,600	.....	.....	.....	.....	.....	.....	.....	.....
7	7·41	41,200	7·82	47,300	.....	.....	.....	.....	.....	.....	.....	.....
8	7·18	37,700	7·71	45,700	.....	.....	.....	.....	.....	.....	.....	.....
9	7·54	43,100	7·66	44,900	.....	.....	.....	.....	.....	.....	.....	.....
10	7·51	42,600	7·70	45,500	.....	.....	.....	.....	.....	.....	.....	.....
11	7·48	42,200	7·54	43,100	.....	.....	.....	.....	.....	.....	.....	.....
12	7·52	42,800	7·56	43,400	.....	.....	.....	.....	.....	.....	.....	.....
13	7·44	41,600	7·80	47,000	.....	.....	.....	.....	.....	.....	.....	.....
14	7·48	42,200	7·74	46,100	.....	.....	.....	.....	.....	.....	.....	.....
15	7·76	46,400	7·60	44,000	.....	.....	.....	.....	.....	.....	.....	.....
16	7·68	45,200	7·62	44,300	.....	.....	.....	.....	.....	.....	.....	.....
17	7·74	46,100	7·40	41,000	.....	.....	.....	.....	.....	.....	.....	.....
18	7·68	45,200	7·33	40,000	.....	.....	.....	.....	.....	.....	.....	.....
19	7·56	43,400	7·30	39,500	.....	.....	.....	.....	.....	.....	.....	.....
20	7·44	41,600	7·32	39,800	.....	.....	.....	.....	.....	.....	.....	.....
21	7·36	40,400	7·24	38,600	.....	.....	.....	.....	.....	.....	.....	.....
22	7·38	40,700	7·18	37,700	.....	.....	.....	.....	.....	.....	.....	.....
23	7·43	41,400	7·03	35,400	.....	.....	.....	.....	.....	.....	.....	.....
24	7·55	43,300	6·91	33,700	.....	.....	.....	.....	.....	.....	.....	.....
25	7·63	44,500	6·84	32,600	.....	.....	.....	.....	.....	.....	.....	.....
26	7·44	41,600	6·81	32,100	.....	.....	.....	.....	.....	.....	.....	.....
27	7·46	41,900	6·83	32,500	.....	.....	.....	.....	.....	.....	.....	.....
28	7·44	41,600	6·75	31,200	.....	.....	.....	.....	.....	.....	.....	.....
29	7·81	47,100	6·71	30,700	.....	.....	.....	.....	.....	.....	.....	.....
30	7·88	48,200	6·49	27,300	.....	.....	.....	.....	.....	.....	.....	.....
31	7·86	47,900	6·44	26,600	.....	.....	.....	.....	.....	.....	.....	.....

MONTHLY DISCHARGE of Saskatchewan River near Head of Grand Rapids, for the years 1912-14.

[Drainage Area, 155,100 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in acre feet.
1912.						
August	61,900	46,900	51,800	0·334	0·385	3,185,100
September	66,700	61,100	64,500	0·416	0·464	3,838,600
October	74,000	38,900	63,000	0·406	0·468	3,873,700
November	38,800	11,700	27,200	0·175	0·195	1,618,500
December	.....	.....	.....	.....	.....	.....
The period	74,000	11,700	51,600	0·333	1·512	12,515,300
1913.						
May	.....	.....	[1]44,900	0·289	0·333	2,760,800
June	48,500	45,300	45,900	0·296	0·330	2,730,000
July	55,900	45,800	50,700	0·327	0·377	3,117,400
August	56,800	54,400	55,200	0·356	0·410	3,394,100
September	55,000	40,200	46,800	0,302	0·337	2,784,800
October	39,800	26,000	33,100	0·213	0·246	2,035,200
November	.....	.....	[1]20,000	0·129	0·144	1,190,100
December	.....	.....	[1]12,000	0·008	0·010	737,900
The period	56,800	26,000	38,600	0·240	2·187	18,750,300
1914.						
May	48,500	24,700	32,200	0·207	0·239	1,979,900
June	36,500	28,500	32,700	0·211	0·235	1,945,800
July	48,200	35,200	42,200	0·272	0·314	2,594,800
August	54,600	26,600	40,800	0·263	0·303	2,508,700
The period	54,600	24,700	37,000	0,238	1·091	9,029,200

NOTE.—[1]Estimated.

FAIRFORD RIVER.

The Fairford river forms the outlet of lake Manitoba. It empties into lake St. Martin, which in turn is drained by the Dauphin river. The Fairford river is quite short, a lake-like expanse known as lake Pinemuta occurring between lake Manitoba and lake St. Martin.

Lake Manitoba, which has an area of 1,711 square miles, forms the basin into which drains practically all the territory lying between the Assiniboine and the Saskatchewan rivers and east of the Riding, Duck, and Porcupine mountains. The soil is generally clay, and suitable to agriculture. A considerable proportion of the area is timbered, and in certain sections rock outcrops occur. Numerous lakes are also to be found; among these are lake Winnipegosis, lake Dauphin, Red Deer lake, Swan lake, and many other varying in size from mere ponds to lakes of the size mentioned.

The banks of the Fairford river vary from 3 to 10 feet in height. At the upper or lake Manitoba end they are well defined, gradually flattening out below Fairford until they open out into wide low-lying marshy ground in the vicinity of lake Pinemuta. Below this lake they are somewhat higher, but again change until they merge with the low swampy shores of lake St. Martin.

The Fairford river varies in width from 500 to 900 feet and at two points, one about one-half mile below the outlet of lake Manitoba, flows over a low limestone ridge or bar.

Some surveys of the river have been made by the Department of Public Works with a view to improving it for navigation purposes. In addition to this a water-power reconnaissance survey was made in 1913 by the Manitoba Hydrographic Survey.

Fairford River at Fairford.

History.—This station was established by G. H. Burnham on June 27, 1912, and has been in continuous operation since that date.

Location of Section.—The metering section is located on the downstream side of the Canadian Northern Railway bridge which crosses the Fairford river at Fairford and is 2½ miles below lake Manitoba. The initial point is located on the north abutment of the bridge on the downstream side.

Records Available.—Records of daily gauge height have been obtained from June 27, 1912, to the end of December, 1914. A number of meterings have been taken during the same period. Owing to the change in slope due to rising and falling of lake Manitoba, caused by the wind, it has not been possible to define a discharge curve for the station.

Drainage Area.—The area tributary to the Fairford river above this station includes the total drainage area of lake Manitoba and lake Winnipegosis, and is 31,900 square miles.

Gauge.—A 6-foot vertical staff enamelled gauge is fastened to the first bridge pier from the left bank and is referred to Canadian Northern Railway datum.

Channel.—The channel is straight for 400 feet above and 500 feet below the section. It is divided by the fifteen bridge piers into sixteen sections at all stages. In 1914 the bridge was replaced by a steel structure resting upon the piers which divide the channel into four sections, the old pile bents being removed. The bed of the stream is gravel, and not subject to shifting. The banks are high though subject to overflow at high stages.

Discharge Measurements.—The meterings are made from the downstream side of the Canadian Northern Railway bridge, the station being an open-water station the year round.

Accuracy.—Owing to the wind effect on lake Manitoba, and the consequent range in stage and its effect upon the slope of the river, it has not been possible to obtain a discharge curve for this section.

Discharge Measurements of Fairford River at Fairford, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 28	G. H. Burnham	1,187	220	1,919	4·08	347·82	7,849
July 31	"	1,187	185	1,716	4·01	347·48	6,897
Aug. 29	Alex. Pirie	1,197	185	1,720	4·88	347·60	8,341
Oct. 11	R. H. Nelson	1,187	182	1,616	4·39	347·52	7,083
Dec. 6	G. J. Lamb	1,187	232	1,966	4·52	349·60	8,886
1913.							
April 24	E. Bankson	1,469	204	1,572	4·68	347·33	7,345
May 15	G. Ebner	1,186	320	1,647	4·57	347·56	7,527
Aug. 14	C. O. Allen	285	253	1,824	4·10	347·50	7,475
Oct. 30	"	1,435	210	1,886	3·01	347·40	5,681
1914.							
Jan. 6	C. O. Allen	1,375	277	1,917	3·19	347·52	6,129
" 28	E. J. Budge	1,469	301	1,886	3·16	347·67	5,953
Mar. 31	D. B. Gow	1,374	266	1,866	2·88	347·12	5,359
April 20	"	1,374	246	1,831	3·18	347·02	5,822
Aug. 6	J. A. Page	1,919	215	1,696	3·28	346·87	5,559
" 7	"	1,919	244	1,740	2·94	346·80	5,115
" 8	"	1,919	246	1,848	3·48	347·16	6,432
" 10	"	1,919	241	1,714	2·87	346·63	4,916
Sept. 15	M. S. Madden	1,911	288	1,917	3·16	347·07	6,059
Dec. 19	"	1,469	273	1,710	2·09	346·50	3,647
" 21	"	1,469	273	1,740	1·95	346·56	3,412

SESSIONAL PAPER No. 25f

TRIBUTARIES OF LAKE WINNIPEG FROM THE EAST.

General.—The rivers of importance entering lake Winnipeg from the east are: Brokenhead, Winnipeg, Manigotagan, Bloodvein, Pigeon, Berens. They drain the territory to the west of the watershed of the Great lakes and Hudson bay. Practically all of this country is unsurveyed, so that it is not possible to delimit accurately their actual drainage basins. Practically all the drainage area lies in the Laurentian formation, small lakes and ponds abound, and a considerable portion of the surface is covered by muskeg. The rivers are generally in the nature of a series of pools or small lake-like expanses, connected by short narrow channels which are interrupted by falls and rapids. Small stands of merchantable timber are to be found throughout the district, being composed of spruce, jack pine, poplar, and birch.

Of the above rivers the Winnipeg is dealt with separately, and of the remainder, continuous records of discharge are available for the Brokenhead and Manigotagan; for the Berens and Pigeon rivers, individual meterings have been obtained.

BROKENHEAD RIVER.

The drainage basin of the Brokenhead river is in the narrow strip of country between the basin of the Winnipeg and Whitemouth rivers on the east, and the Red river on the west. It flows northwesterly and empties into lake Winnipeg.

The drainage area is 910 square miles, the basin being 22 miles in width at the widest point, and approximately 75 miles long. The greater portion is low lying and swampy, though at the lower end part has been placed under cultivation by the aid of drainage work. The whole area is capable of being placed in a producing state if drainage methods are employed.

The banks are low, and the stream-bed is of clay with boulders occurring in some sections.

Brokenhead River at Sinnot.

History.—The station on the Brokenhead at Sinnot was established by G. H. Burnham on May 30, 1912.

Location of Section.—The section is located on the downstream side of the traffic bridge, and is 900 feet northeast of the Canadian Pacific Railway station at Sinnot. The initial point is marked by a group of nails driven into the floor of the bridge on the downstream side, and vertically above the face of the south abutment.

Records Available.—Records of daily gauge height have been secured for the periods June 8 to November 30, 1912, April 29 to November 30, 1913, and April 13 to December 31, 1914. A number of meterings have also been secured and estimates of daily discharge have been prepared for the above periods.

Drainage Area.—The drainage area tributary to the Brokenhead above Sinnot is 530 square miles.

Gauge.—A vertical staff enamelled gauge is fastened to a pile of the bridge opposite station 12·5 on the meter section. The gauge is referred to a bench-mark, consisting of a nail driven into the blazed face of a tree and refereneed, 59 feet southwest from the initial point.

Channel.—For 300 feet above and 300 feet below the meter section the channel is straight. The river is confined to one channel at all stages, but is divided into four sections by the three pile bents supporting the bridge. The bed of the stream is of gravel and boulders and permanent. The banks are fairly high and comparatively free from overflow.

Discharge Measurements.—The discharge measurements are made from the downstream side of the traffic bridge.

Accuracy.—For the open-water season the discharge curve is well defined between gauge heights 91·2 and 92·5, between gauge heights 92·5 and 94·2 the curve is fairly well defined. For winter conditions a fairly well defined curve has been obtained for the range in gauge height 89·8 to 91·0.

DISCHARGE MEASUREMENTS of Brokenhead River near Sinnot, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 30	G. H. Burnham	1,187	88	382	1·74	94·14	665
June 20	"	1,187	88	198	0·95	92·29	188
July 15	"	1,187	88	201	0·86	92·16	173
Aug. 9	W. G. Worden	1,187	86	136	0·42	91·56	58
Sept. 3	"	1,187	87	166	0·52	91·89	86
Oct. 15	R. H. Nelson	1,187	76	341	1·39	93·53	474
1913.							
April 19	A. Pirie	1,186	89	298	150	93·32	447
May 9.	G. Ebner	1,186	85	228	116	92·48	264
Aug. 15	W. J. Ireland	1,469	83	224	98	92·57	219
Sept. 27	C. O. Allen	1,435	80	155	56	91·72	87
1914.							
Jan. 20	E. J. Budge	1,462	41	.....	.....	92·07	[1] .....
Mar. 17	W. J. Ireland	1,462	.....	.....	.....	.....	[1] .....
May 21	A. Pirie	1,939	83	203	0·96	29·26	195
July 27	M. S. Madden	1,760	88	350	1·33	93·49	473
Aug. 18	J. A. Page	1,920	76	110	0·46	91·16	51
Sept. 4	H. Boyd	1,919	81	140	0·49	91·43	69
Oct. 7	M. S. Madden	1,911	81	157	0·57	91·65	90
Nov. 3	M. S. Madden	1,912	84·5	210	0·95	92·32	200
Dec. 1	C. O. Allen	1,912	70	99	0·43	91·63	[2] 42
Dec. 28	M. S. Madden	1,462	70	59	0·20	91·00	[2] 12

[1] No. flow.
[2] Measurements taken under ice conditions.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Brokenhead River near Sinnot, for 1912.

[Drainage Area, 530 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1												
2												
3												
4												
5												
6												
7												
8											3·87	575
9											3·75	546
10											3·58	505
11											3·40	462
12											3·23	421
13											3·08	385
14											2·95	354
15											2·81	320
16											2·67	287
17											2·59	268
18											2·49	244
19											2·41	224
20											2·33	205
21											2·15	163
22											2·14	160
23											2·03	138
24											1·94	122
25											1·70	90
26											1·74	95
27											1·64	84
28											1·55	76
29											1·36	63
30											1·35	62
31												

	July.		August.		September.		October.		November.		December.	
1	1·27	58	2·04	139	1·75	96	4·36	692	3·05	378		
2	1·20	54	1·94	122	1·82	105	4·30	678	3·14	400		
3	1·15	52	1·84	108	1·86	110	4·20	654	3·14	400	2·07	
4	1·09	50	1·76	97	2·26	188	4·07	623	3·05	378		
5	1·05	49	1·66	86	2·25	186	3·95	594	3·01	368		
6	1·06	49	1·66	86	2·19	172	3·90	582	2·95	354		
7	1·09	50	1·63	83	2·15	162	3·86	572	2·94	352		
8	1·18	53	1·58	78	2·18	169	3·85	570	2·95	354		
9	1·15	52	1·56	77	2·25	186	3·83	565	2·95	354		
10	1·26	57	1·56	77	2·20	174	3·78	553	3·03	373	1·25	
11	1·30	59	1·55	76	2·19	172	3·75	546	3·05	378		
12	2·95	354	1·54	75	2·18	169	3·74	544	3·03	373		
13	2·49	244	1·56	77	2·19	172	3·67	527	2·98	361		
14	2·10	151	1·55	76	2·87	335	3·64	520	2·95	354		
15	2·18	169	1·50	72	3·01	368	3·55	498	2·93	349		
16	2·07	145	1·46	69	3·19	412	3·50	486	2·89	340		
17	2·20	174	1·43	67	3·46	476	3·44	472	2·84	328	1·05	
18	2·09	149	1·40	65	3·34	448	3·35	450	2·80	318		
19	2·03	138	1·35	62	3·54	496	3·32	443	2·75	306		
20	1·98	129	1·33	61	3·63	517	3·25	426	2·73	301		
21	1·90	116	1·30	59	4·33	685	3·17	407	2·55	258		
22	1·87	111	1·25	56	4·35	690	3·06	380	2·43	229		
23	1·89	115	1·25	56	4·45	714	3·04	376	2·15	163		
24	1·40	151	1·35	62	4·62	755	2·99	364	2·25	186	0·95	
25	1·09	149	1·34	61	4·62	755	2·94	352	2·04	174		
26	2·05	142	1·36	63	4·64	760	2·89	340	2·95	174		
27	2·26	182	1·40	65	4·63	757	2·84	328	2·85	160		
28	2·36	212	1·47	70	4·55	738	2·80	318	2·84	150		
29	2·31	200	1·54	75	4·50	726	2·75	306	2·80	150		
30	2·19	172	2·33	205	4·45	741	2·75	306	2·75	132		
31	2·14	160	1·75	96			2·85	340			0·85	

Note.—Ice cover November 24 to end of year, data insufficient to compute discharge for December.

Daily Gauge Height and Discharge of Brokenhead River near Sinnot, for 1913.

[Drainage area, 530 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									2·99	364	1·84	108
2									2·92	347	1·87	112
3									2·87	335	1·84	108
4									2·83	325	1·82	105
5									2·75	306	1·79	101
6									2·74	304	2·04	140
7									2·64	280	2·18	169
8									2·59	268	2·24	184
9									2·50	246	2·07	145
10									2·44	232	2·03	138
11									2·42	227	1·92	119
12									2·42	227	1·79	101
13									2·41	224	1·72	92
14									2·41	224	1·69	89
15									2·37	215	1·64	84
16									2·34	208	1·58	78
17									2·30	198	1·54	75
18									2·28	193	1·44	68
19									2·23	181	1·40	65
20									2·18	169	1·24	56
21									2·14	160	1·14	52
22									2·09	149	1·34	61
23									2·08	147	1·28	58
24									2·04	140	1·20	54
25									2·02	136	1·14	52
26									1·99	130	1·13	51
27									1·94	122	1·04	48
28									1·93	121	1·24	56
29							3·14	400	1·90	116	2·52	251
30							3·06	380	1·87	112	3·14	400
31									1·85	109		

	July.		August.		September.		October.		November.	
1	3·29	436	1·03	48	2·83	325	1·57	78	1·85	109
2	3·34	448	1·01	47	2·80	318	1·52	74	1·84	108
3	3·32	444	0·94	46	2·69	292	1·50	72	1·82	105
4	3·14	400	0·93	46	2·60	270	1·47	70	1·82	105
5	3·02	371	0·91	45	2·34	208	1·42	66	1·81	103
6	2·79	316	0·90	45	2·24	184	1·40	65	1·80	102
7	2·64	280	0·87	44	2·24	184	1·42	66	1·80	102
8	2·54	256	0·84	44	2·14	160	1·52	74	1·78	100
9	2·24	184	0·82	43	2·13	158	1·67	87	1·77	98
10	2·12	156	0·94	46	2·18	169	1·78	100	1·77	98
11	2·29	196	0·93	46	2·34	208	1·97	127	1·75	96
12	2·28	193	0·88	45	2·38	217	2·12	156	1·74	95
13	2·34	208	0·84	44	2·43	229	2·22	179	1·74	95
14	2·44	232	0·83	44	2·39	220	2·32	203	1·73	90
15	2·31	200	1·88	113	2·34	208	2·32	203	1·72	90
16	2·24	184	2·84	328	2·30	198	2·27	191	1·72	90
17	2·22	179	2·99	364	2·24	184	2·22	179	1·70	90
18	2·18	169	3·04	376	2·17	167	2·20	174	1·68	85
19	2·04	140	3·09	388	2·04	140	2·12	156	1·67	85
20	1·89	115	3·04	376	1·94	122	2·10	151	1·66	80
21	1·80	102	2·94	352	1·94	122	2·06	143	1·64	75
22	1·74	95	2·88	337	1·92	119	2·02	136	1·62	70
23	1·64	84	2·87	335	1·87	112	1·96	126	1·60	70
24	1·62	82	2·87	335	1·84	108	1·92	119	1·59	70
25	1·52	74	2·86	332	1·79	101	1·90	116	1·57	65
26	1·43	67	2·85	330	1·77	98	1·90	116	1·56	65
27	1·34	61	2·84	328	1·72	92	1·89	115	1·55	65
28	1·24	56	2·83	325	1·68	88	1·88	113	1·53	60
29	1·14	52	2·82	323	1·65	85	1·88	113	1·52	60
30	1·09	50	2·84	328	1·62	82	1·87	112	1·52	60
31	1·04	48	2·84	328			1·86	110		

Note.—Ice conditions January 1 to April 27, and November 10 to end of year; data insufficient to compute discharge for December. River frozen to bottom, January 14.


Department of the Interior Canada
Water Power Branch
J.B. Challies Supt.
Manitoba Hydrographic Survey
Plan Showing
Rivers Tributary To Lake Winnipeg
East Shore
Legend
Metering Station
Gauging Station
Scale In Miles
To Accompany Progress Report Of Stream Measurements
March 1915.
M.C. Hendry Chief Engineer
Hudson Bay Ry
Split L
Grass R
Nelson R
Wintering L.
Sipiwesk L.
Oxford L
Pipestone L
Molson L
God's Lake
Goose L
Island River
Island Lake
Lost Lake
Sandy L
East R
Norway House
McLaughlin R
Gunisao R
Gunisao L.
Belanger R
Big Black R
Poplar R
Leaf R
Deer L
Etomami R
Berens R
Fishing L
Pigeon R
Moose L
Family L
Bloodvein R
Goose L
Berens R
Birch L
Fisher R
Trout L
Manigotagan R
Black R
Manitou R
Lac Seul
English R
Winnipeg River
Winnipeg
Kenora
Red R
Whitemouth R
Lake Winnipeg
Manitoba
Ontario
C.P.R.
G.T.P.R.
C.N.R.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Brokenhead River near Sinnot, for 1914.

[Drainage area, 530 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	.....	.....	.....	.....	.....	.....	2·66	284	2·46	236
2	.....	.....	.....	.....	.....	.....	3·87	.....	2·59	268	2·36	212
3	.....	.....	.....	.....	.....	.....	4·02	.....	2·58	265	3·26	428
4	.....	.....	.....	.....	.....	.....	3·97	.....	2·57	263	3·76	548
5	.....	.....	.....	.....	.....	.....	3·87	.....	2·57	263	3·86	572
6	.....	.....	.....	.....	.....	.....	3·87	.....	2·72	299	3·90	582
7	.....	.....	.....	.....	.....	.....	.....	.....	2·79	316	3·94	592
8	.....	.....	.....	.....	.....	.....	.....	.....	2·82	323	3·95	594
9	.....	.....	.....	.....	.....	.....	.....	.....	2·78	313	4·00	606
10	.....	.....	.....	.....	.....	.....	.....	.....	2·67	287	5·26	908
11	.....	.....	.....	.....	.....	.....	.....	.....	2·65	282	4·79	796
12	.....	.....	.....	.....	.....	.....	3·92	.....	2·62	275	4·66	764
13	.....	.....	.....	.....	.....	.....	4·07	40	2·57	263	4·39	699
14	.....	.....	.....	.....	.....	.....	4·12	80	2·43	229	4·36	693
15	.....	.....	.....	.....	.....	.....	4·17	120	2·37	215	4·16	644
16	.....	.....	.....	.....	.....	.....	4·25	160	2·29	196	3·95	594
17	.....	.....	.....	.....	.....	.....	4·30	200	2·27	191	3·68	529
18	.....	.....	.....	.....	.....	.....	4·32	240	2·29	196	3·65	522
19	.....	.....	.....	.....	.....	.....	4·37	280	2·25	186	3·37	455
20	2·07	.....	.....	.....	.....	.....	4·47	320	2·27	191	3·29	435
21	.....	.....	.....	.....	.....	.....	4·55	360	2·96	188	3·16	404
22	.....	.....	.....	.....	.....	.....	4·92	400	2·22	180	3·07	383
23	.....	.....	.....	.....	.....	.....	3·37	455	2·16	165	2·96	356
24	.....	.....	.....	.....	.....	.....	3·07	383	2·07	145	2·84	328
25	.....	.....	.....	.....	.....	.....	3·02	371	2·11	153	2·70	294
26	.....	.....	.....	.....	.....	.....	2·97	359	2·36	212	2·61	272
27	.....	.....	.....	.....	.....	.....	2·95	354	2·46	236	2·46	236
28	.....	.....	.....	.....	.....	.....	2·87	335	2·44	232	2·36	212
29	.....	.....	.....	.....	.....	.....	2·79	316	2·46	236	2·26	188
30	.....	.....	.....	.....	.....	.....	2·72	299	2·47	239	2·17	167
31	.....	.....	.....	.....	.....	.....	.....	.....	2·51	248	.....	.....

	July.		August.		September.		October.		November.		December.	
1	2·05	142	2·58	258	1·62	82	1·74	95	2·34	208	1·61	41
2	1·96	126	2·36	212	1·55	76	1·69	89	2·32	203	1·63	44
3	1·91	118	2·22	179	1·53	74	1·64	84	2·33	205	1·63	44
4	1·85	109	2·07	145	1·44	68	1·62	82	2·28	193	1·64	44
5	1·76	97	1·99	130	1·39	64	1·60	80	2·25	186	1·65	44
6	1·69	89	1·87	112	1·42	66	1·62	82	2·20	174	1·67	41
7	1·65	85	1·76	97	1·34	61	1·64	84	2·15	163	1·68	41
8	1·56	77	1·68	88	1·33	61	1·72	92	2·09	149	1·69	41
9	1·45	69	1·58	78	1·44	68	1·74	95	2·06	143	1·68	41
10	1·41	68	1·49	71	1·40	65	1·79	101	2·04	140	1·64	38
11	1·36	63	1·41	66	1·40	65	2·14	160	2·01	134	1·63	38
12	1·86	110	1·30	59	1·41	66	2·49	244	2·05	141	1·56	33
13	3·96	596	1·26	57	1·42	66	2·82	323	2·15	163	1·55	33
14	3·83	565	1·25	57	1·43	67	2·99	364	2·24	184	1·45	28
15	4·75	786	1·24	56	1·41	68	3·04	376	2·45	234	1·43	28
16	5·36	932	1·21	55	1·51	75	2·99	364	2·35	210	1·37	26
17	5·76	1,028	1·20	54	1·62	82	2·94	352	2·34	208	1·34	24
18	5·82	1,043	1·18	53	1·64	84	2·93	349	2·33	205	1·30	22
19	5·56	980	1·16	52	1·72	92	2·92	347	2·09	132	1·27	20
20	5·41	941	1·15	52	1·64	84	2·90	342	1·95	109	1·25	20
21	5·19	892	1·14	52	1·62	82	2·79	316	1·85	96	1·23	20
22	5·08	865	1·14	52	1·74	95	2·76	308	1·75	76	1·20	18
23	4·76	788	1·23	56	1·76	97	2·72	299	1·71	72	1·17	17
24	4·41	704	1·19	54	1·87	112	2·64	280	1·70	65	1·15	17
25	4·14	640	1·23	56	1·99	131	2·59	268	1·68	65	1·10	15
26	3·81	560	1·36	63	2·02	136	2·55	258	1·65	62	1·08	15
27	3·61	512	1·44	68	1·94	122	2·53	253	1·65	54	1·05	14
28	3·35	450	1·33	74	1·89	115	2·51	248	1·61	52	1·05	14
29	3·11	392	1·65	85	1·81	108	2·48	241	1·65	40	1·02	13
30	2·87	335	1·64	84	1·80	102	2·44	229	1·63	44	0·98	11
31	2·71	296	1·63	84	.....	.....	2·42	227	.....	.....	0·94	13

Note.—Ice conditions, January 1 to April 23, and November 18 to end of year.

MONTHLY DISCHARGE of Brokenhead River near Sinnot, for a period of the year 1914.

[Drainage area, 530 square miles.]

MONTH.	DISCHARGE IN SECOND FEET.				RUN-OFF.	
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage Area.	Total in acre feet.
1912.						
June		62[1]	260[1]	0·490	0·547	15,471
July	354	49	127	0·240	0·277	7,809
August	205	56	81	0·153	0·176	4,980
September	760	96	414	0·781	0·871	24,635
October	692	306	478	0·902	1·040	29,391
November	400	132[1]	300[1]	0·566	0·632	17,851
December						
The period	760	49	277	0·522	3·543	100,137
1913.						
May	364	109	210	0·396	0·457	12,900
June	400	48	107	0·202	0·225	6,350
July	448	48	189	0·357	0·412	11,600
August	388	43	201	0·379	0·437	12,400
September	325	82	172	0·325	0·363	10,200
October	203	65	122	0·230	0·265	7,525
November	109	60[1]	86[1]	0·162	0·181	5,100
December						
The period	448	43	155	0·293	2·340	66,100
1914.						
April	455	0	267[1]	0·504	0·562	15,900
May	323	145	237	0·447	0·515	14,630
June	908	167	475	0·896	1·000	28,300
July	1,043	63	467	0·881	1·016	28,700
August	258	52	86	0·162	0·186	5,275
September	136	61	85	0·160	0·179	5,050
October	376	80	227	0·428	0·494	14,000
November	234	44	137	0·258	0·288	8,150
December	44[1]	13	28	0·053	0·061	1,720
The period	1,043	0	223	0·421	4·301	121,695

[1] Estimated.

NOTE.—Data insufficient to compute discharge, etc., for December, 1912, and for January to April inclusive, and December, 1913.

MANIGOTAGAN RIVER.

The Manigotagan river, also known as the Bad Throat river, empties into lake Winnipeg from the east, about 50 miles north of Fort Alexander. The drainage area is approximately 300 square miles, though it cannot be definitely determined, as the river lies almost entirely in unsurveyed territory. The general course of the river from source to mouth is northwest. There are a number of lake-like expanses in the river between Long lake and Turtle lake, these are known as Caribou, Musk Rat, Moose, and Bull Frog lakes.

At the mouth of the river the land is adapted to agriculture, being good clay land. Above Wood falls the country changes and rock outcrops occur; these form barriers across the river, causing falls or rapids; between these, the banks vary between high and rocky, to low, bordering on muskegs.

The river above Wood falls for a distance of 25 miles has an average width of 175 feet, above this point it is a series of small lake-like expanses or pools of several hundred feet in width, joined by narrow stretches, which in the majority of cases are broken by falls or rapids.

The entire drainage area is more or less covered with timber growth; this is not of merchantable size and is of inferior quality, consisting of spruce, scrub

oak, birch, and poplar. In the upper part a fringe of good spruce timber is to be found bordering the lakes.

In 1913 a reconnaissance survey of the power possibilities of the river was made by a party sent out by the Manitoba Hydrographic Survey.

Manigotagan River at Wood Falls.

History.—The station on the Manigotagan was established on December 21, 1912, by G. J. Lamb, and has been operated since that date.

Location of section.—The meter section is located 200 feet above the first falls known as Wood falls; it is about 1 mile northeast of the Manigotagan post office, and 3 miles from the large island at the mouth of the river. The initial point is marked by a spike driven into a 12-inch tree, which is blazed and stands near the water's edge on the left bank.

Records Available.—A record of daily gauge height has been secured for the periods April 19 to October 31, 1913, and April 18 to November 15, 1914. Estimates of daily discharge have been computed for the same period.

Drainage Area.—The drainage area tributary to the Manigotagan above the section is 375 square miles.

Gauge.—Two gauges are in operation at this point, the first is a 3-foot vertical staff enamelled gauge fastened to a 2-by 4-inch scantling, which is driven into the river-bed 135 feet below the meter section, and in a small bay near the right bank above the falls. The second is a 3-foot vertical staff enamelled gauge fastened to a 2- by 4-inch scantling which is secured to the perpendicular rock face on the right shore 100 feet below and facing Wood falls. Both gauges are referred to a bench-mark which is located on a horizontal ledge of rock 10 feet from the gauge below the falls, and is marked by means of paint on the rock face, W.P.S. B.M.

Channel.—The river occupies one channel at all stages; it is straight for 300 feet above and 100 feet below the section. The banks are high and wooded and not liable to overflow.

Discharge Measurements.—Discharge measurements have been taken at this point by means of a canoe which is kept on the section with the aid of a tagged line stretched across the river.

Accuracy.—On account of the small number of discharge measurements taken at this point the discharge curve is not well defined.

Discharge Measurements of Manigotagan River above Wood Falls, 1912-14.

Date.	Hydrographer.	Meter No.	Width	Area of Section.	Mean Velocity	Gauge Height	Discharge
1912.			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
Dec. 28	G. J. Lamb	1,375	125	884	1·62	729·64	144[1]
1913							
May 26	D. B. Gow	1,435	100	460	1·02	730·79	469
" 31	"	1,435	89	293	1·45	730·69	423
Aug. 23	A. Pirie	1,496	75	310	0·31	729·43	93
Oct. 9	"	1,496	66	72	0·91	729·03	65
1914.							
Feb. 21	C. O. Allen	1,496	50	136	0·28	728·97	39[1]

Note—[1]Measurement taken under ice conditions.

Daily Gauge Height and Discharge of Manigotagan River above Wood Falls, for 1913.

[Drainage area 375 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge.	Gauge Height.	Discharge	Gauge Height.	Discharge.	Gauge Height	Discharge	Gauge Height	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	.....	29·64	.....	29·59	.....	.....	.....	30·39	292	30·69	424
2	.....	.....	.....	.....	.....	.....	.....	.....	30·39	292	30·68	420
3	.....	.....	.....	.....	.....	.....	.....	.....	30·46	322	30·69	424
4	29·69	.....	.....	.....	.....	.....	.....	.....	30·49	336	30·69	424
5	.....	.....	.....	.....	.....	.....	29·69	.....	30·53	353	30·79	468
6	.....	.....	.....	.....	.....	.....	.....	.....	30·59	380	30·59	380
7	.....	.....	.....	.....	.....	.....	.....	.....	30·61	388	30·59	380
8	.....	.....	29·64	.....	29·69	.....	.....	.....	30·59	380	30·59	380
9	.....	.....	.....	.....	.....	.....	.....	.....	30·65	406	30·49	336
10	.....	.....	.....	.....	.....	.....	.....	.....	30·69	424	30·49	336
11	29·69	.....	.....	.....	.....	.....	.....	.....	30·69	424	30·49	336
12	.....	.....	.....	.....	.....	.....	29·49	.....	30·77	459	30·44	314
13	.....	.....	.....	.....	.....	.....	.....	.....	30·79	468	30·42	305
14	.....	.....	.....	.....	.....	.....	.....	.....	30·79	468	30·39	292
15	.....	.....	29·64	.....	29·69	.....	.....	.....	30·79	468	30·39	292
16	.....	.....	.....	.....	.....	.....	.....	.....	30·69	424	30·38	287
17	.....	.....	.....	.....	.....	.....	.....	.....	30·79	468	30·38	287
18	29·64	.....	.....	.....	.....	.....	.....	.....	30·79	468	30·39	292
19	.....	.....	.....	.....	.....	.....	30·29	249	30·81	476	30·49	336
20	.....	.....	.....	.....	.....	.....	30·24	233	30·81	476	30·19	217
21	.....	.....	.....	.....	.....	.....	30·22	226	30·79	468	30·29	249
22	.....	.....	29·59	.....	29·69	.....	30·19	217	30·79	468	30·29	249
23	.....	.....	.....	.....	.....	.....	30·19	217	30·79	468	30·19	217
24	.....	.....	.....	.....	.....	.....	30·19	217	30·79	468	30·39	292
25	29·64	.....	.....	.....	.....	.....	30·19	217	30·79	468	30·29	249
26	.....	.....	.....	.....	.....	.....	30·19	217	30·79	468	30·29	249
27	.....	.....	.....	.....	.....	.....	30·27	242	30·79	468	30·19	217
28	.....	.....	.....	.....	.....	.....	30·29	249	30·77	459	30·29	249
29	.....	.....	.....	.....	.....	.....	30·29	249	30·69	424	30·19	217
30	.....	.....	.....	.....	29·69	.....	30·29	249	30·79	468	30·19	217
31	.....	.....	.....	.....	.....	.....	.....	.....	30·69	424	.....	.....

	July.		August.		September.		October.		November.		December.	
1	30·49	336	29·59	110	29·38	88	29·25	78	29·06	.....	.....	.....
2	30·09	191	29·59	110	29·58	110	29·55	106	.....	.....	.....	.....
3	30·19	217	29·49	99	29·35	86	29·55	106	.....	.....	.....	.....
4	30·19	217	29·49	99	29·35	86	29·16	72	.....	.....	.....	.....
5	30·09	191	29·69	122	29·35	86	29·29	80	.....	.....	.....	.....
6	30·09	191	29·59	110	29·38	88	29·56	107	.....	.....	29·08	.....
7	29·99	169	29·59	110	29·37	87	29·05	66	.....	.....	.....	.....
8	30·49	336	29·49	99	29·37	87	29·59	110	29·01	.....	.....	.....
9	29·99	169	29·49	99	29·35	86	29·05	66	.....	.....	.....	.....
10	29·89	151	29·09	68	29·15	71	29·54	104	.....	.....	.....	.....
11	29·99	169	29·39	89	29·15	71	29·29	78	.....	.....	.....	.....
12	29·99	169	29·49	99	29·33	84	29·25	78	.....	.....	.....	.....
13	29·99	169	29·49	99	29·37	87	29·03	65	.....	.....	28·98	.....
14	30·09	191	29·59	110	29·45	95	29·08	67	.....	.....	.....	.....
15	29·89	151	29·49	99	29·53	103	29·05	66	29·08	.....	.....	.....
16	29·89	151	[1]29·49	99	29·25	78	29·25	78	.....	.....	.....	.....
17	29·89	151	[1]29·49	99	29·23	76	29·58	109	.....	.....	.....	.....
18	30·19	217	[1]29·45	95	29·25	78	29·37	87	.....	.....	.....	.....
19	29·79	136	[1]29·45	95	29·55	106	29·54	104	.....	.....	.....	.....
20	29·79	136	[1]29·45	95	29·43	93	29·46	96	.....	.....	29·08	.....
21	29·89	151	[1]29·45	95	29·25	78	29·45	95	.....	.....	.....	.....
22	29·89	151	[1]29·45	95	29·15	71	29·03	65	28·98	.....	.....	.....
23	29·79	136	29·43	93	29·16	72	29·57	108	.....	.....	.....	.....
24	29·69	122	29·43	93	29·18	73	29·59	110	.....	.....	.....	.....
25	29·79	136	29·45	95	29·17	72	29·36	86	.....	.....	.....	.....
26	29·79	136	29·33	84	29·27	79	29·28	80	.....	.....	.....	.....
27	29·79	136	29·35	86	29·03	65	29·11	70	.....	.....	.....	.....
28	29·79	136	29·35	86	28·55	48	29·28	80	.....	.....	.....	.....
29	29·79	136	29·35	86	28·95	61	[1]29·34	85	29·08	.....	.....	.....
30	29·89	151	29·36	86	29·05	66	[1]29·28	80	.....	.....	.....	.....
31	29·79	136	29·35	86	.....	.....	[1]29·24	77	.....	.....	.....	.....

Note.—All gauge heights marked thus ([1]) interpolated. Ice conditions January 1 to April 19, and November 28 to end of year. Data insufficient to estimate discharges.

SESSIONAL PAPER No. 25f

Daily Gauge Height and Discharge of Manigotagan River above Wood Falls, for 1914.

[Drainage area, 375 square miles.]

Day.	January.		February.		March.		April.		May.		June.	
	Gauge Height.	Discharge	Gauge Height	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1									29·58	109	30·33	265
2									29·63	115	30·38	287
3	29·08								29·73	127	30·38	287
4							28·63		29·73	127	30·43	309
5							28·63		29·78	134	30·43	309
6							28·68		29·88	150	30·38	287
7			29·05		28·63		28·68		30·13	201	30·43	309
8							28·68		30·18	215	30·43	309
9							28·73		30·33	265	30·38	287
10	29·03						28·73		30·33	265	30·53	353
11							28·78		30·23	230	30·53	353
12							28·83		30·13	201	30·53	353
13							28·88		30·03	178	30·53	353
14			29·08		28·63		28·88		29·93	158	30·43	309
15							28·93		29·83	142	30·33	265
16							28·98		29·73	127	30·33	265
17	29·05						29·23		29·78	134	30·43	309
18							29·53	103	29·83	142	30·53	353
19							29·58	109	29·83	142	30·13	201
20							29·58	109	29·98	167	30·33	265
21			29·63	39	28·63		29·48	98	29·98	167	30·53	353
22							29·48	98	30·03	178	30·63	397
23							29·38	88	30·08	189	30·73	441
24	29·08						29·43	93	30·13	201	30·83	485
25							29·43	93	30·28	246	30·93	529
26							29·43	93	30·13	201	30·83	485
27							29·48	98	30·13	201	30·63	397
28			29·63		28·63		29·53	103	30·24	230	30·63	397
29							29·53	103	30·23	230	30·63	397
30							29·53	103	30·28	246	30·73	441
31	29·05								30·33	265		

	July.		August.		September.		October		November.		December.	
1	30·83	485	30·13	201	29·53	103	29·63	115	30·18	215		
2	30·83	485	30·03	178	29·48	98	29·63	115	30·18	215		
3	30·93	529	30·03	178	29·48	98	29·73	127	30·18	215		
4	30·93	529	29·93	158	29·48	98	29·73	127	30·18	215		
5	30·93	529	29·93	158	29·48	98	29·83	142	30·13	201	30·03	
6	31·03	573	29·93	158	29·48	98	29·88	150	30·13	201		
7	31·03	573	29·88	150	29·48	98	29·93	158	30·13	201		
8	31·13	617	29·88	150	29·43	93	29·98	167	30·13	201		
9	31·13	617	29·88	150	29·43	93	30·03	178	30·13	201		
10	31·13	617	29·88	150	29·43	93	30·13	201	30·13	201		
11	31·03	573	29·88	150	29·43	93	30·23	230	30·13	201		
12	31·03	573	29·83	142	29·43	93	30·33	265	30·08	189	30·13	
13	30·83	485	29·83	142	29·43	93	30·43	309	30·08	189	30·13	
14	30·83	485	29·83	142	29·43	93	30·53	353	30·08	189	30·13	
15	30·83	485	29·78	134	29·43	93	30·58	375	30·03	178	30·13	
16	30·73	441	29·78	134	29·43	93	30·58	375	30·03		30·13	
17	30·73	441	29·78	134	29·38	88	30·58	375	30·03		30·13	
18	30·78	463	29·78	134	29·38	88	30·48	331	30·03		30·13	
19	30·78	463	29·78	134	29·38	88	30·48	331	30·03		30·13	
20	30·63	397	29·73	127	29·38	88	30·38	287	30·03		30·13	
21	30·43	309	29·73	127	29·43	93	30·38	287	30·03		30·13	
22	30·43	309	29·73	127	29·43	93	30·38	287			30·13	
23	30·33	265	29·73	127	29·43	93	30·33	265			30·13	
24	30·33	265	29·68	121	29·48	98	30·33	265			30·13	
25	30·43	265	29·68	121	29·48	98	30·28	246			30·13	
26	30·33	265	29·68	121	29·48	98	30·28	246			30·13	
27	30·23	240	29·64	115	29·48	98	30·23	240			30·13	
28	30·23	240	29·64	115	29·53	103	30·23	240	30·03		30·13	
29	30·23	240	29·64	115	29·53	103	30·18	215			30·13	
30	30·13	201	29·58	109	29·58	109	30·18	215			30·13	
31	30·13	201	29·58	109			30·18	215			30·13	

Note.—Ice conditions January 1 to April 18, and November 15 to end of year. Data insufficient to compute daily discharges.

MONTHLY DISCHARGE of Manigotagan River above Wood Falls, for the years 1913-14.

[Drainage area, 375 square miles.]

Month.	Discharge in Second-Feet.				Run-Off.	
	Minimum.	Maximum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.
1913.						
January			[1]130	0·347	0·400	8,000
April	249		[1]200	0·533	0·595	11,900
May	476	292	427	1·138	1·312	26,300
June	468	217	311	0·829	0·925	18,500
July	336	122	172	0·458	0·528	10,600
August	122	68	96	0·256	0·295	5,900
September	110	48	81	0·216	0·241	4,820
October	110	65	86	0·279	0·322	5,300
The period	476	48	188	0·507	4·618	91,320
1914						
February			[1]40	0·107	0·112	2,220
March			[1]40	0·107	0·123	2,460
April			[1]80	0·213	0·238	4,750
May	265	109	183	0·488	0·563	11,300
June	529	201	345	0·920	1·026	20,500
July	617	201	424	1·131	1·304	26,100
August	201	109	139	0·371	0·428	8,550
September	109	88	96	0·256	0·286	5,700
October	375	115	239	0·637	0·734	14,700
November			[1]120	0·320	0·357	7,150
December			[1]90	0·240	0·277	5,550
The period	617	39	163	0·435	5·448	108,980

NOTE.—Data insufficient to estimate discharge for February, March, November and December, 1913, and January, 1914. All marked thus [1] Estimated.

BERENS RIVER.

The Berens river enters lake Winnipeg from the east, about 140 miles north of Fort Alexander. It is the most important tributary of the lake entering from the east, with the exception of the Winnipeg river. It has a drainage area estimated to be 7,800 square miles, and a length of approximately 300 miles. The headwaters lie near the height of land which forms the south and west limits of the Severn and Albany drainage basins. Many lakes are to be found in the district, though their areas are not well defined, as they are in unsurveyed territory.

The country drained is typical of the Laurentian formation, abounding in muskegs and swamps, and the rock frequently outcrops. These rock outcrops form barriers across the river and are the reason for the numerous falls and rapids to be found on the river. Some 52 falls and rapids occur between the first fall, 5 miles from the mouth, and Family lake, and these vary in height or drop between 3 or 4 feet and 40 feet.

Family lake also forms the source of the Pigeon river, which parallels the course of the Berens and empties into lake Winnipeg a few miles south of the mouth of the former river.

The Berens river was examined by a party sent out by the Manitoba Hydrographic Survey to determine its power possibilities. This survey revealed the fact that there are a number of feasible sites on the river.

The country is not heavily timbered, but is covered with a growth of small spruce, poplar, birch, and scrub oak. There is little merchantable timber to be found along the river.

SESSIONAL PAPER No. 25f

DISCHARGE MEASUREMENTS of Berens River above Little Grand Rapids, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 1	D. B. Gow	1,911	230	3,972	1·76	1006·93	7,001
July 9	"	1,911	227	3,990	1·82	1007·09	7,262
Aug. 28	"	1,435	216	3,711	0·85	1004·85	3,168

DISCHARGE MEASUREMENTS of Berens River below First Falls, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Feb. 28	C. O. Allen	1,469	116	535	0·99	.....	530
June 13	D. B. Gow	1,911	120	1,173	0·96	717·50	1,126
July 27	"	1,435	126	1,291	1·70	718·55	2,190
Sept. 8	"	1,435	122	1,181	0·98	717·50	1,160

DISCHARGE MEASUREMENTS of Etomami River near Berens River, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 2	A. Pirie	1,497	36	150	0·80	94·94	119

NELSON RIVER.

General.—The Nelson river forms the outlet of lake Winnipeg flowing through the central portion of northern Manitoba and emptying into Hudson bay at Port Nelson. The Nelson river discharges all the water collected by lake Winnipeg from an immense drainage area, and forms one of the principal systems of the North American continent, the basin comprising an area of 450,000 square miles.

The territory drained varies from the open prairie forming the great central plain to the rugged and magnificent country found in the Rockies; between these extremes of physical characteristics all gradations may be found in the basin. The vegetation to be found covers as wide a range.

The western part of the drainage area is practically devoid of lakes, but in the south and eastern sections are to be found some of the largest fresh-water bodies on the continent. These lakes are so situated in relation to the Nelson river that the maximum natural storage effect is exerted upon the flow of that river; in consequence, the maximum discharge may be expected to approximate closely the mean discharge.

The river has a length of 130 miles, and in this distance the drop aggregates 712 feet. The potential power possibilities of the river are therefore apparent. In the upper reaches the river has the appearance of a chain of lakes connected by short stretches of river which are interrupted by falls and rapids. These characteristics which hold for the upper 250 miles of river gradually change as the

mouth is approached, the drop in the river not being as distinct but more in the nature of swifts and flat rapids, though the banks become high as the bay is approached.

The first expanse below the lake Winnipeg outlet is known as Playgreen lake, below which there are two channels known as East and West rivers. Sea falls is to be found on East river, and the latter then expands into Pipestone lake. The junction of these two branches occurs in Cross lake. Below that point are Sipiwesk, Split lake, and Gull lake. The rapids and falls in order are Ebb and Flow rapids, Whitemud falls, Bladder rapids, Over the Hill, Red Rock, and Chain of Rocks rapids; Manitou or Devil's rapids, Grand rapids, Chain of Islands rapids, all being above Split lake. Below Split lake are Gull, Kettle, Long Spruce, and Limestone rapids.

The country adjacent to the Nelson river is practically unsettled, though on account of the building of the Hudson Bay railway there has been considerable activity along the river. The timber growth is scattered, including spruce, birch, and poplar, and it is claimed that the clay soil to be found is very fertile.

A reconnaissance survey of the river was made by the late William Ogilvie in 1910 for the Dominion Water Power Branch; also, discharge measurements were obtained. After gathering miscellaneous records in 1912-13, a metering station was established in 1914 by the Manitoba Hydrographic Survey above Manitou rapids, and this has been operated since that time.

Nelson River at Manitou Rapids.

History.—This station was established by G. J. Lamb on July 18, 1914.

Location of Section.—The meter section is located at a point $3\frac{1}{2}$ miles upstream from Manitou Landing, and 4 miles above the Shell rapids. The initial point is marked on a sloping face of rock northeast of the gauge and is a wooden plug driven in a $1\frac{1}{2}$-inch hole drilled in the rock.

Records Available.—Records of daily gauge height were secured from July 2 to October 14, 1914, and a number of discharge measurements were taken over the same period.

Drainage Area.—The drainage area tributary to the Nelson river is 450,000 square miles, of which 24,000 square miles lies below Manitou rapids. The river drains lake Winnipeg into Hudson Bay. Practically all Canadian territory lying south of latitude 53 and between the summit of the Rockies and lake Superior is tributary to this river.

Gauge.—The gauge is a vertical staff enamelled gauge fastened to a 6-inch spruce post driven in the bed of the river, and braced; it is further strengthened by being weighted with large boulders. The gauge is referred to a bench-mark which is marked by a triangle painted in red on the face of the rock near the initial point and marked "M.H.S. B.M." The datum of the bench-mark is an assumed elevation.

Channel.—For 1,500 feet above the section, and 8,000 feet below, the channel is straight. The river is confined to one channel at all stages, and has a depth on the section varying between 20 and 69 feet. The bed of the stream is of gravel and boulders and not liable to shift. The current is swift and the banks are high and wooded and not liable to overflow.

Discharge Measurements.—The meterings are made from a canoe held on the section by means of a stay line stretched across the river and supported on floats.

Accuracy.—No daily discharge estimates have been arrived at from the gauge heights and discharge measurements, as it has been found impossible to define a regular rating curve on account of the varying slope in the river due to the prevalence of high winds.

SESSIONAL PAPER No. 25f

DISCHARGE MEASUREMENTS of Nelson River at Manitou Rapids, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 18	G. J. Lamb	1861	918	34,490	3·01	93·13	103,736
" 25	"	1861	916	33,464	2·60	92·87	87,088
Aug. 3	"	1861	916	34,719	2·71	92·89	94,084
" 4	"	1861	916	34,755	2·65	92·84	92,083
" 4	"	1861	916	34,755	2·72	92·84	94,508
" 7	"	1861	916	34,665	2·77	92·79	96,179
" 8	"	1861	915	34,573	2·78	92·74	96,228
" 10	"	1861	916	34,665	2·74	92·80	95,043
" 11	"	1861	916	34,665	2·72	92·80	94,206
" 15	"	1861	915	34,723	2·65	92·69	91,928
" 17	"	1861	916	34,723	2·67	92·71	92·775
" 21	"	1861	912	34,628	2·74	92·59	94,861
" 24	"	1861	913	34,449	2·58	92·41	88,931
" 24	"	1861	913	34,442	2·67	92·44	91,985
Sept. 5	"	1861	909	34,083	2·57	92·04	87,542
" 7	"	1861	908	34,253	2·63	92·21	89,956
" 7	"	1861	908	34,253	2·68	92·20	91,806
" 24	"	1861	908	34,253	2·65	92·21	90,857

MISCELLANEOUS METERINGS.

In a number of cases where stations were established, after one or several meterings were taken, it was found that the location was unfavourable, either on account of the difficulty in obtaining an observer for the daily gauge heights or on account of the physical features obtaining at the station preventing accurate records being taken.

In other cases, sufficient information was not obtained to properly define a discharge curve, though the records would indicate that a curve may be defined by fuller information. In this case the gauge heights are on file, and when the necessary additional data are secured, estimates of daily discharge will be made.

Records are published under the heading "Miscellaneous Meterings," where discharges obtained under above conditions may be of some immediate value.

DISCHARGE MEASUREMENTS of Rainy Lake Feeders; Miscellaneous Meterings, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section	Mean Veloc'y.	Gauge Height	Discharge	Remarks
1912.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.	
Aug. 10	W. H. Richardson	1,374	10	8	0·13		1·0	Small creek, Hale bay.
" 11	"	1,374	13	7	1·00		7·1	Pipestone river
" 13	"	1,374				No	flow.	Rat river.
" 14	"	1,374	210	3,518	0·45		1,592·1	Seine river.
" 15	"	1,374	2	1·6	2·17		3·2	Creek No. 1 in Seine bay.
" 15	"	1,374						Creek No. 2 in Seine bay.
" 17	"					No	flow.	Rocky Inlet creek.
" 20	"	1,374	135	1,016	0·21		216·4	Big Canoe river.
" 21	"	1,374	8	8	0·81		6·8	Little Canoe river.
" 22	"	1,374	143	1,224	0·67		815·5	Manitou river.
" 24	"	1,374	9	5	0·20		1·0	Ash river.
" 25	"	1,374	2	0·5	1·0		0·5	Small creek in Ash bay.
" 25	"				Est'd.		0·5	Small creek in Alexandria bay.
" 26	"	1,374	43	77	2·64		202·8	North-west Bay river.
" 27	"	1,374	8	10	1·09		11·0	White Fish creek.
" 22	"	1,374	3	2	0·28		0·6	Brownlee's creek.
" 28	"	1,374	8	2	0·25		0·4	Small creek nr. Brownlee's
" 28	"	1,374	7	2	3·20		7·0	(N.W. bay) Lost creek.
" 29	"	1,374	13	6	0·13		0·7	Outlet of Wegg lake.
" 29	"				Estd		0·5	Creek in Brown's inlet.
" 30	"	1,374	4	2·1	0·80		0·1	Grassy Narrows creek.
" 31	"	1,374	3	2·2	1·50		0·2	Wasaw creek.
Sept. 1	"	1,374	12	21	0·25		5·4	Frog creek.
" 5	"	1,374	10	9	0·08		0·7	Cranberry river.
" 6	"	1,374	4	4·3	0·14		5·9	Small creek Last bay.
" 7	"	1,374	7	9·4	0·21		0·8	Big Island river.

Discharge Measurements of Middle Lake Outlet River at Darlington Bay, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 29	S. S. Scovil	1,375	20	30	3·03		89
Aug. 28	W. G. Worden	1,187	19	29	1·94		57

Discharge Measurements of Winnipeg at Throat Rapids, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 9	S. C. O'Grady	1,196	96	424	1·26	1,035·80	534

Discharge Measurements of Winnipeg River at Foot of Dalles, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 10	S. C. O'Grady	1,196	255	6,912	1·88	34·25	12,972

Discharge Measurements of English River at First Falls above Mouth, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20	S. C. O'Grady	1,469	246	9,643	0·86	993·71	8,274

Discharge Measurements of Tye Creek below Slave Falls, Winnipeg River, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 5	E. B. Patterson	1,197	61	128	0·56	901·68	71
" 9	W. H. Richardson	1,197	61	128	0·58	901·76	74

SESSIONAL PAPER No. 25f

Discharge Measurements of Whiteshell River at Jessie Lake, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
July 4	E. B. Patterson	1,197	164	948	0·3 6	899·64	366
" 5	E. B. Patterson	1,197	164	949	0·328	899·64	311
" 9	W. H. Richardson	1,197	164	978	0·372	899·88	364

Discharge Measurements of Bird River at Lac du Bonnet, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 8	R. H. Nelson	1,435	118	1,435	0·26	820·77	96·70

Note.—Measurement taken under ice conditions.

Discharge Measurements of Roseau River near Mayne's Farm (Dominion City), 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 13	G. J. Lamb	1,374	56	25	0·93	102·78	24

Discharge Measurements of Morris River at Morris, Man., 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 3	W. G. Worden	1,496	58	197	1·37	102·00	270

Discharge Measurements of La Salle River at La Salle, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 2	Worden & Lamb	1,496	53	151	0·451	1·29	68

Discharge Measurements of Seine River at St. Anne des Chenes, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 4	Alex. Pirie	1,186	74	397	0·71	97·31	282

Discharge Measurements of Little Saskatchewan River, 5 miles above Minnedosa, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 30	W. J. Ireland	1,497	69	33	0·81	.....	27
Mar. 8	W. J. Ireland	1,469	23	38	0·91	.....	34

Note.—Measurements taken under ice conditions.

Discharge Measurements of Red Deer River below Red Deer Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 24	C. O. Allen	1,375	315	1,152	0·33	91·05	380

Note.—Measurement taken under ice conditions.

Discharge Measurements of Mossy River at Cameron's Bridge, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 21	E. Bankson	1,469	193	722	2·04	95·48	1,474

Discharge Measurements of Squirrel River at Austin, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 21	Pirie-Ebner	1,496	6	0·2	1·38	85·23	2·7

SESSIONAL PAPER No. 25f

Discharge Measurements of Whitemud River at Gladstone, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Jan. 18	E. J. Budge	1,462	29	41	0·10	.....	5·0

Note.—Measurement taken under ice conditions.

Discharge Measurements of Whitemud River at Westbourne, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean. Velocity.	Gauge Height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 15	W. G. Worden	1,496	.....	599	0·38	101·60	226

Discharge Measurements of Shoal River at Swan Lake, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet. W. L.	Sec.-ft.
Jan. 30	C. O. Allen	1,375	209	406	0·74	92·05	292

Note.—Measurement taken under ice conditions.

Discharge Measurements of Jack River at Norway House, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 20	A. Pirie and F. Allen	1,496	141	1,975	0·72	94·27	1,415

Discharge Measurements of Pigeon River, Miscellaneous Sections, 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section	Mean Veloc'y	Gauge Height	Discharge	Remarks.
1914.			Feet	Sq ft	Ft per sec	Feet.	Sec ft	
Mar. 1	C. O. Allen	1,496	70	645	1·49		960	Above 1st Falls
July 4	D. B. Gow	1,911	374	3,403	1·51	985 11	4,698	Above Shing Falls
Aug. 17	"	1,435	378	3,010	1·26	984·50	3,630	"
" 29	"	1,435	370	2·871	1·02	984·02	2·939	"
" 7	"	1,435	257	1,216	0·96	816·50	1,148	1,200 feet above 8th Rapids

Discharge Measurements of Pigeon River below Sturgeon Falls, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 1	D. B. Gow	1,435	236	4,301	1·10	729·30	4,717
Sept. 4	"	1,435	229	4,144	0·67	.....	2,771

Discharge Measurements of Bloodvein River at Miscellaneous Sections, 1914

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean. Veloe'y.	Gauge Height	Dis-charge.	Remarks.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
Mar. 7	C. O. Allen	1,496	48	256	1·25	.....	321	At First (Eagle) Falls.
Sept. 24	D. B. Gow	1,435	68	664	0·83	716·02	554	Above First Rapids, 9 miles from mouth.
" 25	"	1,435	18	50	0·86	.....	43	Little Bloodvein river 200 feet above mouth.
Oct. 1	"	1,435	34	99	0·49	881·91	49	N. branch above 15th Falls.
" 13	"	1,435	197	689	1·57	.....	1,077	Above 20th Falls.
" 15	"	1,435	62	997	1·44	.....	1,435	8 miles from mouth.

Discharge Measurements of Eating Point Creek West Shore Lake Winnipeg, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 2	A. Pirie	1,496	36	116	0·53	93·12	62

Discharge Measurements of Sturgeon-Gill Creek near Grand Rapids, Lake Winnipeg, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 5	A. Pirie	1,496	41	68	0·76	93·81	51

Discharge Measurements of Waterhen River at Waterhen, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 26	D. B. Gow	1,187	440	3,038	2·79	.....	8,476

SESSIONAL PAPER No. 25f

Discharge Measurements of West Branch of Nelson River near Wishky Jack Portage, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 25	Pirie-Allen	1,497	1,235	26,050	1·79	97·61	46,549

Discharge Measurements of East Creek, Nelson River at Manitou Rapids, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 1	C. J. Lamb		26	24	0·50	98·48	12

Discharge Measurements of West Creek, Nelson River at Manitou Rapids, 1914.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1914.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 11	G. J. Lamb		10	4	1·81	97·20	6

Discharge Measurements of Armstrong River near Nelson River, Camp No. 23, Hudson Bay Railway, 1914.

Date.	Hydrographer.	Meter No.	Width	Area of Section.	Mean Velocity	Gauge Height	Discharge
1914.			Feet	Sq. ft	Ft. per sec.	Feet	Sec.-ft
Aug. 12	G. J. Lamb.	1,462	43	114	0·62	99 21	71

Discharge Measurements of Nelson (East Branch) River at Sea Falls, South Channel, 1913.

Date.	Hydrographer	Meter No	Width	Area of Section	Mean Velocity	Gauge Height	Discharge
1913.			Feet	Sq. ft.	Ft. per sec	Feet	Sec. ft
Sept. 16	A. Pirie and F. Allen	1,496	7,089	23,266	0·67	91 89	15,501

DISCHARGE MEASUREMENTS of Nelson (East Branch) River at Sea Falls, North Channel, 1913.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 16	A. Pirie and F. Allen.....	1,496	385	7,068	0·60	91·90	4,213

PROGRESS REPORT

OF

THE MANITOBA HYDROGRAPHIC SURVEY

FOR

1912-13-14

PART III

GAZETTEER OF LAKES AND RIVERS

PART III.

HYDROGRAPH GAZETTEER OF LAKES AND RIVERS IN THE PROVINCE OF MANITOBA.

This list of lakes and rivers cannot be considered complete, but is compiled from all available sources of information, such as Government maps and surveys, local knowledge, etc. Most of the names are those adopted by the Geographic Board of Canada, others being merely local names. The areas of the different lakes and drainage areas of the streams have been given as far as possible, but owing to the fact that a great many of them lie in wholly unsurveyed territory, the figures can only be considered approximate, but are based upon the best maps available.

Antler Creek.—Tributary of the Souris, rises in the vicinity of Manor and flows southeasterly, joining the Souris in Tp. 2, R. 27, W.P.M.

Armit River.—Flows into Red Deer lake. Has its source in a small lake in Tp. 42, R. 30, W.P.M.

Assiniboine River.—Has its source in the province of Saskatchewan in the southeasterly slopes of Nut mountain adjacent to the headwaters of the Red Deer river. From here the river flows in a southwesterly direction until it crosses the boundary between Saskatchewan and Manitoba, where it bends southward and follows this direction until approximately in the latitude of Brandon, where it assumes an easterly bearing, and this general direction is followed to a point where it joins the Red river in the city of Winnipeg.

The total drainage basin of the Assiniboine covers an area of 59,550 square miles. Of this area approximately 8,800 square miles lie in the state of North Dakota, 37,700 miles in the province of Saskatchewan, and 13,050 miles in the province of Manitoba.

The principal tributaries of the river are the Qu'Appelle, the Souris, the Shell, and the Little Saskatchewan.

The drainage entering the river in the lower hundred miles of its course is very slight, as the basin is confined between the watersheds of the Red river and lake Manitoba.

Above the city of Brandon a large increase of the incoming drainage is noticed, and in its upper course the river is continually fed by springs, and streams draining the numerous small lakes with which the upper basin is dotted.

Athapapuskow Lake.—Has an area of 107 square miles. The waters of this lake discharge into Goose lake, and through the Goose river into Namew lake, an expanse of the Saskatchewan river.

Atikameg Lake or Clearwater Lake.—Lies in Tps. 58 and 59, R. 24 and 25, W.P.M. It has an area of 96 square miles. It drains through Cormorant lake and Moose lake into the Saskatchewan river.

Beaver Creek.—Flows into lake Winnipeg from the east in Tp. 34, R. 5, E.P.M.

Beaverhill Lake.—Is an expanse of Island Lake river, which drains Island lake into God's lake, forming a part of the Hay river drainage system. It has an area of approximately 77 square miles.

Belanger river.—Flows east, emptying into lake Winnipeg south of Spider island.

Berens River.—Has its source on the height of land between the great lakes and Hudson bay, drains Snake lake, Rocky Island lake, Fishing lake, and

Family lake, flows into lake Winnipeg from the east. Mouth in Tp. 39, R. 3, E.P.M. Has power possibilities. No determination has been made of the size of the drainage area, the territory being unsurveyed.

Big Black River.—Flows west emptying into lake Winnipeg near the north end.

Big Grass River.—Flows easterly into Big Grass marsh, joining the latter in Tp. 17, R. 11, W.P.M.

Birch Lake.—In Tp. 13, R. 14, E.P.M. forms part of the drainage system of the Whiteshell river.

Birch River.—Tributary of the Whitemouth, rises in a small lake in sec. 3, Tp. 7, R. 14, E.P.M., and flows northwesterly, joining the Whitemouth in sec. 10, Tp. 10, R. 12, E.P.M.

Birch River.—Rises in Swan lake and flows northeasterly, emptying into Saskeram lake, which lies just to the west of the junction of the Carrot and the Saskatchewan rivers.

Birdtail Creek.—Tributary of the Assiniboine, rises on the southwestern slope of the Riding mountains and flows southwesterly into the Assiniboine in Tp. 15, R. 27, W.P.M.

Black River.—Flows into lake Winnipeg from the east in Indian reserve No. 9 or Tp. 22, R. 9, E.P.M.

Bloodvein River.—Flows into lake Winnipeg from the east, mouth in Tp. 32, R. 6, E.P.M. It drains territory that is almost entirely unsurveyed, so that its drainage area is indeterminate.

Bosshill Creek.—Flows easterly through Virden and empties into the Assiniboine in Tp. 10, R. 25, W.P.M.

Brokenhead River.—Drains into lake Winnipeg in Tp. 16, R. 6, E.P.M. The drainage area above Sinnot is 530 square miles.

Burntwood Lake.—Forms one of the sources of the Burntwood river. It belongs to the Nelson River drainage basin, and has an area of 67 square miles.

Burntwood River.—Is a tributary of the Nelson. It joins the latter in Split lake. It rises in Reed lake which lies almost due north of Pas, and drains that lake, Limestone Point lake, Burntwood lake, Three Point lake, Footprint lake, Wuskwatin lake and Pipe lake. There are power possibilities on this river.

Butnau Lake.—Discharges through the Butnau river into the Nelson river. It has a drainage area of 5·4 square miles.

Butnau River.—A small tributary of the Nelson, which flows into the latter from the east, about midway between Gull and Kettle rapids. Moose Nose lake and Butnau lake are drained by it.

Carrot River.—A tributary of the Saskatchewan. It has its source in a number of small streams south of the Saskatchewan, and flows northeasterly emptying into that river 2 miles west of Pas.

Catfish Creek.—Drains large swamp lying between the Brokenhead river and Lac du Bonnet, flows northerly into Traverse bay in Indian Reserve No. 3.

Catfish Creek.—Flows into lake Winnipeg at Catfish point in Tp. 36, R. 4 E.P.M.

Cedar Lake.—Is an expanse of the Saskatchewan river, just above Grand Rapids. It has an area of 340 square miles. It forms a natural regulating basin for the Saskatchewan river, its influence upon the discharge of that river being quite marked especially during high and low stages.

Child's Lake.—Lies in Tps. 30 and 31, R. 26, W.P.M. It forms the headwaters of the Shell river. The area of the lake is 5 square miles.

Churchill River.—Is one of the largest rivers in the province. It flows in a general northeasterly direction and empties into Hudson bay at Fort Churchill. The country drained by the Churchill lies generally north of latitude 55 and

south of latitude 59; to the west the territory extends to 112 west longitude, being approximately 114,000 square miles in extent. Contained in this territory there are a number of large lakes. Owing to the fact that practically all of the territory drained is in unsurveyed territory, a more definite description of the drainage area is not possible. The larger of the lakes drained by this river are: Lac le Ronge, at an elevation of 1,225 feet above sea-level; Reindeer lake, which is drained into the Churchill by the Reindeer river, lies at elevation 1,150; Wollaston lake is on the height of land between the Arctic drainage area and the Hudson bay, at an elevation of 1,300 feet, the best available maps indicate that the waters of this lake flow both to the Arctic and to the Hudson bay; and Isle la Cross at an elevation of 1,330 feet above sea-level. Going down the stream the other lakes drained are: Cold lake, Grenville lake, Southern Indian lake, and Northern Indian lake. In addition to these there are a great many others, but since they are more in the nature of expanses of the river they are not individually named.

Clear Creek.—Tributary of the Minnedosa river, it drains Clear lake and flows westerly joining the Minnedosa in Tp. 20, R. 20, W.P.M.

Clear Lake.—In Tps. 19 and 20, R. 18 and 19, W.P.M., has an area of 14 square miles, and forms one of the sources of the Little Saskatchewan. It is being utilized as a storage basin in connection with the regulation of flow on the Little Saskatchewan.

Clearwater River.—Is a tributary of the Nelson, draining Clearwater lake. It flows due west joining the Nelson below Whitewater falls.

Clearwater Lake.—Drains through Touchwood lake into God's lake. It has an area of 23 square miles and belongs to the Hay River drainage system.

Cook Creek.—Tributary of the Red river, flows northwesterly and joins the Red below Selkirk.

Cormorant Lake.—Is skirted by the Hudson Bay railway. It has an area of 135 square miles, and drains through Moose lake into the Saskatchewan river.

Cranberry Lake.—Lies just about on the height of land between the Nelson and Saskatchewan drainage basins. It is not certain from the maps which way the waters flow, as in some cases it is shown flowing towards the Nelson through the Grass river and in others through Athapapuskow lake and Goose lake into Cumberland lake, an expanse of the Saskatchewan river. The area is 19 square miles.

Cross Lake.—Lies in Tps. 10 and 11, R. 16 and 17, E.P.M., drains through Whiteshell river into the Winnipeg river below Slave falls. It has an area of 2·9 square miles.

Cross Lake.—Has an area of 9 square miles. It forms an enlargement of the Saskatchewan river and lies about 12 miles due west of lake Winnipeg on that river. The effect of this lake, together with that of Cedar lake, is quite marked upon the high and low stages of the river.

Cross Lake.—Is an expanse of the Nelson river, and it is in this lake that the waters of the east and the west branches below the outlet of lake Winnipeg are joined. The river flows from it in four distinct channels, and it is upon this that the Ebb and Flow, Whitemud, and Bladder rapids are to be found. It has an area of 20·1 square miles.

Crow Duck Lake.—Lies in Tps. 13 and 14, R. 17, E.P.M., and drains through Crow Duck river into the Winnipeg below the mouth of the English river. It has an area of 19·9 square miles.

Cypress River.—Tributary of the Assiniboine, flows west and northeast, joining the Assiniboine in Tp. 8, R. 9, W.P.M.

Dauphin River.—Drains lake St. Martin, flowing north and east into Sturgeon bay, an arm of lake Winnipeg, in Tp. 34, R. 5, W.P.M. Owing to the

regulating effect of the lakes above there are considerable power possibilities on this river.

Dauphin Lake.—Lies in Tps. 24, 25, 26, 27, and 28, R. 16, 17, and 18, W.P.M. It has an area of 197 square miles, and lies at an elevation of 860 feet above sea-level. A number of streams which have their source in the Riding and Duck mountains drain into this lake, viz., Turtle, Ochre, Vermilion, Wilson, Valley, and others. It is drained by the Mossy river, which flows into lake Winnipegosis at Winnipegosis.

Deer River.—Tributary of the Hayes river.

Deer Horn Creek.—Tributary of the Assiniboine, flows southeasterly and empties into the Assiniboine in Tp. 18, R. 29, W.P.M.

Devil's Creek.—Tributary of the Red river, flows northwesterly and empties into the Red river in sec. 34, Tp. 15, R. 5, E.P.M.

Dog Creek.—Drains Dog lake into lake Manitoba, flowing through Tps. 22 and 23, R. 9, W.P.M., or the Dog Creek Indian Reserve No. 46.

Dog Lake.—Lies in Tps. 23 and 24, R. 7, 8, and 9, W.P.M. It has an area of 61 square miles and lies at elevation 815 above sea level. It drains through Dog creek into lake Manitoba.

Drifting River.—Tributary of the Valley river, joining that river in Tp. 26, R. 20, W.P.M.

Ebb and Flow Lake.—Lies in Tps. 23 and 24, R. 11 and 12, W.P.M. It has an area of 37·5 square miles, and drains through a short channel into lake Manitoba.

Edward's Creek.—A tributary of the Vermilion river.

Elbow Lake.—A small lake in the Grass River drainage basin. It has an area of 4 square miles.

Eagle Lake.—Lies on the interprovincial boundary between Ontario and Manitoba. It forms a source of the Berens and Pigeon rivers. As a possible storage basin for these rivers it is of importance, the area being 30·5 square miles.

Etawnei Lake.—Forms the source of the Pocokatakuskow river. The area of the lake is 666 square miles.

Etomami River.—Branch of the Berens river.

Fairford River.—Joins lake Manitoba and lake St. Martin, draining the former. and flows through Tp. 30, R. 9, W.P.M. This river has considerable power possibilities. The drainage area is 31,500 square miles.

Falcon River.—Drains Falcon lake and flows into Indian bay, Shoal lake, in Indian Reserve No. 40.

Falcon Lake.—Forms the headwaters of the Falcon river, and therefore part of the Lake of the Woods system; it is in Tp. 8, R. 16 and 17, E.P.M. The area of the lake is 7·8 square miles.

Family Lake.—Lies in Tps. 33 and 34, R. 14 and 15, E.P.M. It has an area of 37 square miles and forms the connecting link between the Berens and Pigeon rivers, to both of which rivers its waters are added.

Favell River.—Tributary of the Swan river, rises on the northern slope of the Duck mountain, and flows north joining the Swan river in Tp. 37, R. 25, W.P.M.

File River.—Drains File lake and Loonhead lake into Burntwood lake. It forms part of the Burntwood drainage system.

Fisher River.—Rises in Tp. 24, R. 2 and 3, W.P.M., flows northeast into Fisher bay, an arm of lake Winnipeg, in Indian Reserve No. 44.

Fishing Creek.—Tributary of the Mossy, joining the latter at Oak Brae.

Fishing Lake.—Lies in Tp. 36, R. 15, E.P.M. It has an area of 14 square miles, and forms part of the drainage system of the Berens river, for which reason it is valuable from the standpoint of storage possibilities.

Fork River.—A tributary of the Mossy river, joins the latter in Tp. 29, R. 19, W.P.M.

Footprint Lake.—A tributary of the Burntwood river, which enters into Nelson and Split lake. The area is 12·5 square miles.

Fox River.—Tributary of the Hayes river, rises to the east of Split lake. It drains Bear, Backbone, Little Fox, and Fox lakes. The Leaf river is a tributary.

Gainsborough Creek.—Tributary of the Souris, flows south through the town of Gainsborough, and then east, joining the Souris in Tp. 2, R. 27, W.P.M. The greater part of its drainage area is in Saskatchewan.

God's River.—Flows northeasterly, draining God's lake, and emptying into the Shamattawa river, a main tributary of the Hayes river. It lies in latitude 54°30′ to 56° and longitude 92°30′ to 94°30′.

God's Lake.—Is drained by God's river, a tributary of the Hayes river. The area is approximately 370 square miles.

Goose River.—Joins Goose lake and Namew lake, part of the drainage system which finds its outlet in Cumberland lake, an enlargement of the Saskatchewan. Other lakes drained by it are Cranberry lake and Athapapuskow lake.

Granville Lake.—Is an expanse of the Churchill river, and lies just below Granville falls. It has an area of 146 square miles.

Grass River.—Drains Reed lake into Wekusko lake, Wekusko lake into Setting lake, and Setting lake into Point lake; it forms part of the Nelson River drainage system. The fall between Reed lake to Point lake is 320 feet (barometric), and, in consequence, power prospects are to be expected.

Gunisao River.—Rises in Gunisao lake. It forms the southern branch of the McLaughlin river, which flows northwesterly, emptying into the Nelson within the boundary of Indian Reserve 17, about 5 miles south of Norway House.

Hay River.—Flows into Shoal lake in Indian Reserve 37 A.

Hayes River.—Is one of the largest in the northern part of the province. Its general course is northeasterly, and it rises on the height of land about 40 miles northeast of Norway House, in Molson lake. It also drains Touchwood lake, Clearwater lake, Rat lake, Windy lake, Oxford lake, and Knee lake, all of which might be termed enlargements or expanses of the river. The main tributaries of the river are the Shamattawa river and the Fox river. The total drainage area is approximately 36,250 square miles. Having a drop of 900 feet from source to mouth, there are power possibilities on the river. The mouth is in latitude 57° north, longitude 92°·30′ west, and empties into the Hudson bay.

Hill Lake.—Is drained by Minago river into Cross lake on the Nelson river, and forming part of that drainage system. The area of the lake is 16 square miles.

Icelandic River.—Rises in small lake in Tp. 23, R. 1, W.P.M., flows easterly into lake Winnipeg in Tp. 23, R. 4, E.P.M.

Inland Lake.—In Tp. 38, R. 16, W.P.M. It has an area of 12·5 square miles.

Insect River.—Is a branch of North Duck river; it flows northeast, emptying into lake Winnipegosis at Duck bay.

Island Lake.—At an elevation of 900 feet above sea-level. It discharges into Island river, a tributary of the Hayes river. Its area is 520 square miles.

Island Lake River.—Lies due east of Norway House. It joins Island lake and Beaverhill lake, draining the former into the latter, and is part of the drainage system of the Hayes river. There are a number of falls and rapids on this stream, and, with Island lake above, there appears to be an opportunity for water-power development.

Jackson Creek.—Tributary of the Souris, rises near Merryfield and flows south, joining the Souris in Tp. 4, R. 26, W.P.M.

Jackfish Creek.—Flows into Traverse bay, lake Winnipeg, in Tp. 19, R. 2, E.P.M.

Jessica Lake.—Lies in Tp. 12, R. 15 and 16, E.P.M., drains through the Whiteshell into the Winnipeg river. The area is 3 square miles.

Kississing River.—A tributary of the Churchill river, flows out of Kississing lake northward.

Kississing Lake, or Cold Lake.—Drains through Kississing river into the Churchill river. The area is 102 square miles.

Kiskitto Lake.—Is an arm-like expanse of the Nelson river, and lies above Netchanais rapids. It has an area of 58 square miles.

Kiskittogisu Lake.—Is an arm-like expanse of the Nelson river, lying above Netchanais rapids. It has an area of 95 square miles.

Knee Lake.—Lies below Oxford lake and forms an expanse of the Hayes river. The area of the lake is approximately 100 square miles.

Lac du Bonnet.—Lies in Tps. 15 and 16, R. 11, 12, and 13, E.P.M.; it forms part and is an enlargement of the Winnipeg river. It has an area of 32·7 square miles, and has an important bearing upon power production of the river owing to its possible regulating effect on that river in connection with power development.

Lake of the Woods.—Touches Manitoba at the southeastern corner of the province; it forms the largest lake in the Winnipeg river drainage basin and is very important as a regulation basin for the run-off of that river. It has an area of 1,500 square miles, part of which lies in United States territory. The lake of the Woods lies at an elevation of 1,060 feet above sea-level.

Landing Lake.—Empties through a small river into the Nelson river, just above Whitewater falls. It has an area of 31 square miles.

Limestone River.—Tributary of the Nelson, joining the latter at the head of Limestone rapids, flows due east draining Clearwater lake.

Limestone Point Lake.—Is drained by the File river into Burntwood lake, one of the sources of the Burntwood river. The area of the lake is approximately 10 square miles.

Little Saskatchewan (*also called Minnedosa River*).—Tributary of the Assiniboine, rises on the southern slope of Riding mountain, and has as its source a number of small lakes; it flows south and joins the Assiniboine river in Tp. 10, R. 20, W.P.M. The total drainage area of this river is 1,500 square miles.

Little Souris River.—Rises near Hayfield and flows easterly into the Assiniboine in Tp. 9, R. 17, W.P.M.

Little Swan River.—Tributary of the Red Deer river, flows north and joins the Red Deer in Tp. 44, R. 3, W.2.M.

Long Lake.—Is in Tp. 19, R. 19, W.P.M., and forms one of the sources of the Little Saskatchewan river. It has an area of 2·8 square miles.

Long River.—Has its source in Montana, tributary of the Pembina, flows northwesterly through Tps. 1 and 2, R. 12, W.P.M., and joins the Pembina in Tp. 3, R. 12, W.P.M.

Loon Creek.—Flows into lake Winnipeg from the east, mouth in Indian Reserve No. 11, Tp. 29, R. 7, E.P.M.

Manigotagan River.—Drains Muskrat, Long and Caribou lakes, flows into the Winnipeg river from the east in Tp. 25, R. 9, E.P.M. Has power possibilities. The drainage area has not been estimated, as all the territory drained is unsurveyed.

Manitoba Lake.—Lies at an elevation of approximately 810 feet above sea-level, has an area of 1,711 square miles. It lies immediately north of the town of Portage la Prairie and forms one of the links in a chain of rivers and lakes which add their waters to lake Winnipeg through the Dauphin river. The following lakes drain into lake Manitoba: Dog lake, Ebb and Flow lake,

Waterhen lake, and the Fairford river forms the outlet, connecting with lake St. Martin which lies to the northeast.

Mantagao River.—Rises in North Birch lake and flows north into Sturgeon bay, an arm of lake Winnipeg, in Tp. 33, R. 3, W.P.M.

Maskawa River.—Flows into Winnipeg river above Pine falls in Tp. 18, R. 10, E.P.M.

McLaughlin River.—Flows west and northwest, emptying into the east channel of the Nelson river about 5 miles south of Norway House.

Minago River.—Drains Hill lake, and several small lakes above, into Drunken lake, which is in turn an arm of Cross lake, an enlargement of the Nelson river.

Mitishto River.—Flows north into Grass river; is part of the Nelson River drainage basin.

Molson Lake.—Lies to the northwest of Norway House, and it forms the headwaters of the Hayes river. It has an area of 51 square miles.

Moose Lake.—Lies to the north of Cedar lake. It has an area of approximately 500 square miles. Atikameg lake and Cormorant lake, which lie to the north and west, drain through Moose lake into the Saskatchewan river.

Moose Nose Lake.—On the line of the Hudson Bay railway, the waters drain into the Nelson through Butnau river. The area is 8·5 square miles.

Morris River.—Tributary of the Red, flows easterly and enters the Red at Morris, Tp. 1, R. 1, E.P.M. It drains part of the low-lying ground between Pembina mountains and the Red river.

Mossy River.—Drains lake Dauphin into lake Winnipegosis, flows north and enters into the latter at Winnipegosis in Tp. 31, R. 18, W.P.M. The drainage area above Winnipegosis is 3,950 square miles.

Muhigan River.—Drains Waskik lake and Lilly lake into Duck lake, part of the Nelson river drainage.

Muskrat Lake.—Lies in Tp. 22, R. 14, E.P.M.; it has an area of approximately 8·4 square miles, and forms the headwaters of the Manigotagan river. It is therefore valuable from a storage standpoint.

Nelson River.—Forms the outlet of lake Winnipeg, discharging the waters of that lake into Hudson bay. It forms one of the large drainage systems of the North American continent, practically all of the drainage between the Great Lakes and the Rocky mountains and north of the international boundary as far as the 54th parallel of latitude being tributary to it. Among the rivers which belong to this drainage area and are themselves of considerable magnitude are: the Saskatchewan, having two branches known as the North and South branches, the Winnipeg, of which the English river is a tributary, the Red and the Dauphin. Numerous other rivers of less magnitude are to be found in the basin. The range of physical features which may be found in this drainage basin is great, varying from the rugged country of the Rocky mountains to the comparatively level central plane known as the prairie.

Owing to the large amount of lake area to be found in the drainage basin, the variation between high and low discharge may be expected to be small. This is undoubtedly true, though since records have been obtained the variation has proved to be greater than was anticipated.

The total drainage area tributary to the Nelson is 45,000 square miles; between lake Winnipeg and the mouth the fall is approximately 700 feet in a length of about 430 miles. In this distance a number of lake-like expanses occur, as Playgreen lake, Little Playgreen lake, Pipestone lake, Cross lake, Sipiwesk lake, and Split lake.

Throughout the whole length of the river, numerous rapids occur, and with the high minimum discharge of the river the power possibilities are considerable. Owing to the proximity of the Hudson Bay railway, these have become

of more than passing value, though up to the present time the remoteness of the different sites has rendered their development unfeasible.

North Birch Lake.—Is in Tp. 27, R. 4, W.P.M. It has an area of 3·3 square miles, and forms the source of the Mantagao river, which flows into the south end of Sturgeon bay.

North Duck River.—Rises on the eastern slope of the Duck mountain and flows east and north into lake Winnipegosis at Duck bay.

Northern Indians Lake.—An expanse of the Churchill river. It is the lowest of the chain of lakes drained by that river. The area is approximately 170 square miles.

Oak Creek.—Tributary of the Souris, flows northerly and westerly emptying into the latter in Tp. 8, R. 16, W.P.M.

Oak Lake.—Forms the catch basin for Pipestone creek, which lies in Tp. 8, R. 25, E.P.M. Its area is 7·3 square miles.

Oak River.—Tributary of the Assiniboine, flows southerly and empties into the Assiniboine in Indian Reserve No. 58.

Ochre River.—Flows northeasterly into lake Dauphin, emptying into the latter in Tp. 24, R. 17, W.P.M. It has a drainage area of 250 square miles.

Oiseau Lake.—Lies in Tps. 19, and 20, R. 15, E.P.M., part of the drainage system of the Oiseau river. It has an area of 21 square miles.

Oiseau or Bird River.—Drains Oiseau lake and Snowshoe lake, flows into Lac du Bonnet in Tp. 17, R. 13, E.P.M.

Overflowing River.—Drains into Dawson bay, lake Winnipegosis.

Oxford Lake.—An expanse of the Hayes river. It lies in unsurveyed territory, the area being approximately 95 square miles.

Partridge Crop Lake.—An expanse of the Grass river, part of the Nelson river drainage system. It has an area of 23 square miles.

Pasquia River.—A tributary of the Saskatchewan. It rises in Tp. 49, R. 2, W. 2 M., and flows northeasterly, joining the Saskatchewan river at Pas.

Pelican Lake.—In Tps .4 and 5, R. 16, W.P.M. It forms part of the drainage system of the Pembina river, and has an area of approximately 10 square miles.

Pelican Lake.—In Tp. 41, R. 21, W.P.M. Water from Pelican lake flows through a small stream into an arm of lake Winnipeg, known as Pelican bay. The area of this lake is 27 square miles.

Pembina River.—Rises in the northeastern slope of the Turtle mountains, flows easterly, draining Rock lake and Swan lake, then southeasterly, crossing the international boundary in sec. 4, Tp. 1, R. 6, W.P.M.; then flows easterly through Minnesota, joining the Red river about 4 miles south of the international boundary. It has a drainage area of 1,840 square miles, part of which is in United States territory.

Pickerel Lake.—In Tps. 41 and 42, R. 15, W.P.M. Flows into lake Winnipegosis. The area of the lake is approximately 12·5 square miles.

Pigeon River.—Rises in Pigeon lake, and also drains Family lake; flows into lake Winnipeg from the east in Tp. 38, R. 3, W.P.M. Has power possibilities. The country drained is pratically unsurveyed, so no estimate has been made of the size of the drainage area.

Pine River.—Rises on the eastern slope of the Duck mountain, and flows northeasterly into lake Winnipegosis, emptying into that lake in Indian Reserve No. 66.

Pink Lake.—An expanse of the Grass river.

Pine Root River.—Joins Wabishkok lake and Athapapuskow lake, a part of the Saskatchewan drainage system.

Pipe Lake.—Is a tributary of the Burntwood river above Manaxo falls. It has an area of about 13 square miles.

Pipestone Creek.—Flows southeasterly and empties into Oak lake in Tp. 8, R. 25, W.P.M.

Pipestone Lake.—Is an expanse of the east branch of the Nelson river. The waters of this lake discharge into Cross lake. It has an area of 32 square miles.

Playgreen Lake.—Is an expanse of the Nelson river, just below the outlet from lake Winnipeg. The area is 144 square miles.

Plum Creek.—Tributary of the Souris, drains Lizard and Plum lakes, empties into the Souris in Tp. 7, R. 21, W.P.M.

Poplar River.—Flows into lake Winnipeg from the east, draining Thunder lake; enters lake Winnipeg in about Tp. 46, R. 2, E.P.M.

Portage Creek.—Flows northerly into lake Manitoba joining the latter two miles east of Delta.

Qu'Appelle River.—Tributary of the Assiniboine, flows easterly and empties into the Assiniboine in Tp. 17, R. 28, W.P.M. It has a drainage area of 18,357 square miles and forms one of the main tributaries of the latter stream.

Rat Creek.—Tributary of Squirrel creek, joining the latter in Tp. 14, R. 19, W.P.M.

Rat River.—Tributary of the Red, rises to the west of Whitemouth lake, flows westerly for approximately 50 miles, and then northwesterly, joining the Red river about 2 miles north of Ste. Agathe. Above the metering station at Joubert's farm the drainage area is 820 square miles.

Red River.—Rises to the south of the international boundary, and flows almost due north into lake Winnipeg. Two of the main tributaries of this river are the Pembina and the Assiniboine, the latter adding its waters to the Red within the city limits of Winnipeg. The drainage area is 116,347 square miles, 42,547 square miles of which are in United States territory.

Red Deer Lake.—Lies in Tps. 45 and 46, R. 27 and 28, W.P.M. It has an area of 95 square miles, and forms an expansion of the Red Deer River, which drains into Dawson bay, an arm of lake Winnipegosis.

Red Deer River.—Flows easterly into Red Deer lake, joining the latter in Tp. 46, R. 28, W.P.M. The drainage area above the metering station at Erwood, on the Canadian Northern railway, is 4,900 square miles.

Reed Lake.—Forms part of the drainage basin of the Grass river. It is interesting from the fact that there may be power possibilities on the Grass river in close proximity to the Hudson Bay railway. The area is approximately 71 square miles.

Reindeer Lake.—Discharges into the Churchill river through Reindeer river, forming one of the chief sources of the former. The area of the lake is approximately 2,173 square miles.

Rice River.—Tributary of the Red Deer, rises in two small lakes in Tp. 23, R. 28, W.P.M.

Rice River.—Flows into lake Winnipeg from the east, mouth in Tp. 27, R. 8, E.P.M.

Rock Lake.—Lies in Tp. 3, R. 13 and 14, W.P.M. It forms an enlargement of the Pembina river, and has an area of 5·9 square miles.

Roaring River.—Rises on the northwestern slope of the Duck mountain, and flows west and northeast into Swan river, joining the latter in Tp. 37, R. 25, W.P.M.

Rocky Island Lake.—Lies on the interprovincial boundary in Tp. 34. It has an area of 7 square miles, and forms the connecting link between the Berens and Pigeon rivers, to both of which rivers its waters are added.

Rolling River.—Tributary of the Minnedosa, drains Otter lake and flows south into Minnedosa river in Tp. 16, R. 19, W.P.M.

Roseau River.—Rises to the south of Whitemouth lake, flows southerly across the international boundary into Minnesota, drains Roseau lake and then flows northwesterly, re-crossing the international boundary in sec. 6, Tp. 1,

R. 8, E.P.M., then generally westerly, joining the Red opposite Letellier. It has a drainage area of approximately 1,950 square miles.

Sale River.—Tributary of the Red, flows southeasterly, joining the Red near St. Norbert.

Salt Creek.—A tributary of the Vermilion river.

Sandy Lake.—Is in Tp. 18, R. 20, W.P.M. It has an area of 2·25 square miles, and forms one of the sources of the Little Saskatchewan river.

Sandy River.—Flows into lake Winnipeg from the east, Tp. 23, R. 8, E.P.M.

Saskeram Lake.—Lies to the west of Pas. It has an area of 98·5 square miles.

Seine River.—Tributary of the Red, flows northwesterly, and joins the Red within the city limits of St. Boniface.

Setting Lake.—An expanse of Grass river. Interesting in view of the possible power possibilities of that stream. The area is approximately 64 square miles.

Saskatchewan River.—Is one of the most important rivers entering the province of Manitoba; it forms one of the chief tributaries of lake Winnipeg, and has a drainage area which extends from that lake westward to the summit of the Rocky mountains. There are two main branches of this river, known as the North and South branches. There are a number of streams of importance which form the South branch; of these may be mentioned the Bow river, the Old Man, the Belly, the St. Mary's, and the Red Deer. The North branch, while subdivided into a number of streams and of practically the same length as the South branch, has not as many streams of importance entering it; of those that add their waters to this branch, however, the ones of importance are the Clearwater and the Battle. The total drainage area of the Saskatchewan is 155,000 square miles.

Setting River.—Flows into Setting lake from the west.

Shamattawa River.—In latitude 56°, longitude 92°30′ flows northwesterly into the Hayes river, of which it forms one of the main tributaries; God's river and its tributary drainage flowing into the Shamattawa.

Shell River.—Tributary of the Assiniboine, rises on the western slope of the Duck mountain, with its headwaters in Child's lake, and flows south and empties into the Assiniboine in Tp. 23, R. 29, W.P.M. The drainage area above Assessippi is 930 square miles.

Shoal Lake.—Is connected to the lake of the Woods by a narrow channel and may be considered as an arm of that lake, since it lies at the same elevation as the lake of the Woods. It is the source of the Greater Winnipeg water supply and has an area of 107 square miles.

Shoal Lake.—Lies in Tps. 15 to 19, R. 1 and 2, W.P.M. It has an area of 87·5 square miles. This lake has neither tributary nor outlet.

Shoal River.—Drains Swan lake into lake Winnipegosis, entering the latter in Tp. 43, R. 23, W.P.M.

Siegner Lake.—Lies in Tp. 15, R. 15, E.P.M., has an area of approximately 5·2 square miles.

Singoosk Lake.—Lies in Tp. 31, R. 24, W.P.M. Forms the headwaters of the Valley river. It has an area of 5·5 square miles.

Sipiwesk Lake.—An expanse of the Nelson river below Chain of Rock rapids. The area is approximately 171 square miles.

Sisipuk Lake.—An expanse of the Churchill river, just above Bloodstone falls.

Skunk Creek.—Tributary of the Assiniboine, flows west and empties into the Assiniboine in Tp. 21, R. 29, W.P.M.

Smith Creek.—Tributary of the Assiniboine, flows south and east, and empties into the Assiniboine in Tp. 21, R. 29, W.P.M.

Smoking Tent River.—Tributary of the Red Deer, flows north into Red Deer, joining the latter in Tp. 45, R. 1, W.2.M.

Snowflake Brook.—Rises in Rush lake, Minnesota, and flows north, joining the Pembina in Tp. 1, R. 9, W.P.M.

Snowshoe Lake.—Lies in Tps. 21 and 22, R. 17, E.P.M. It forms part of the drainage system of the Oiseau river. The area is 22·6 square miles.

Souris River.—Tributary of the Assiniboine, joins the latter in Tp. 8, R. 16, W.P.M. It has a drainage area of 22,500 square miles, of which 8,840 square miles lies in United States territory. The flow varies between 4 and 1,434 c.f.s., as recorded at the metering station at Wawanesa about 6 miles from the mouth.

South Duck River.—Rises on the eastern slope of the Duck mountain, and flows east and north into lake Winnipegosis at Duck bay.

Southern Indians Lake.—A large expanse of the Churchill river, which lies just above Missi falls. It has an area of approximately 760 square miles.

Spence Lake.—Discharges into lake Manitoba. It lies in Tps. 29 and 30, R. 16, W.P.M., and has an area of 4 square miles.

Split Lake.—An expanse of the Nelson river below Cross lake on the same river. The area is 173 square miles.

Squirrel Creek.—A tributary of the Whitemud river, flows northeasterly joining the Whitemud in Tp. 13, R. 9, W.P.M.

St. Martin Lake.—Forms the last expanse in the chain of lakes which drain into lake Winnipeg. It has flowing into it the Fairford river, which drains lake Manitoba and is, in turn, drained by the Dauphin river directly into Sturgeon bay, an arm of lake Winnipeg. It has an area of 139 square miles.

Steep Rock River.—Has its source in two small lakes on the northeastern slope of Porcupine mountains; flows northeasterly into Dawson bay, lake Winnipegosis.

Stony Creek.—Tributary of Willow Creek, joining the latter 1 mile southeast of Neepawa.

Swan River.—Rises on the western slope of the Porcupine mountain, flows south and crosses the second meridian in Tp. 34, and then northeasterly into Swan lake, emptying into the latter in Tp. 40, R. 23, W.P.M. The drainage area above the metering station at Swan river on the Canadian Northern railway is 1,400 square miles.

Swan Lake.—Lies in Tps. 39, 40, and 41, R. 22, 23, and 24, W.P.M. It has an area of 119 square miles, and forms the basin into which two rivers, the Woody and the Swan, which have their source on Porcupine mountain, drain. It is drained by the Shell river into Dawson bay, an arm of lake Winnipegosis.

Swan Lake.—In Tps. 4 and 5, R. 11, W.P.M. It is an enlargement of the Pembina, and has an area of 4·7 square miles.

Three Point Lake.—On the Burntwood river, being an expanse of that stream. It belongs to the Nelson River drainage area, and is 13·3 square miles in extent.

Thunder Lake.—Lies in Tp. 43, R. 5 and 6, E.P.M.; is an enlargement of the Poplar river. It has an area of approximately 21 square miles.

Touchwood Lake.—Drains into God's lake, forming part of the Hayes river drainage system. It has an area of approximately 28 square miles.

Turtle River.—Flows northerly into lake Dauphin, joining the latter in Tp. 24, R. 16, W.P.M.

Valley River.—Rises in Singoosk lake on the western slope of the Duck mountain; flows south and northeast, emptying into lake Dauphin in Tp. 27, R. 18, W.P.M. The drainage area above the Canadian Northern Railway crossing, at which point there is a metering station, is 1,040 square miles.

Vermilion River.—Rises on the northeastern slope of the Riding mountain, and flows northeasterly into lake Dauphin, joining the latter in Tp. 25, R. 17, W.P.M.

Wanipigow River.—Flows into lake Winnipeg from the east in Tp. 26, R. 9, E.P.M.

Waterhen Lake.—Forms an expanse in the drainage system of the Waterhen river, which is the connecting stream between lake Winnipegosis and lake Manitoba. It lies in Tps. 35, 36, and 37, R. 15 and 16, W.P.M. It has an area of 75 square miles.

Wekusko Lake.—A lake draining into Grass river, interesting from a standpoint of power possibilities on that stream. The lake has an area of 130 square miles.

West Hawk Lake.—In Tp. 9, R. 17, E.P.M., has an area of about 5·8 square miles, and forms part of the system with Cross lake and lake Jessica, which finally drains into the Winnipeg river through the Whiteshell river.

Whirlpool River.—A branch of the Rolling river, flows south and joins the latter in Tp. 18, R. 18, W.P.M.

Whitemouth Lake.—Lies in Tp. 3, R. 13, and 14 E.P.M. It has an area of 26·3 square miles and forms the headwaters of the Whitemouth river.

Whitemouth River.—Tributary of the Winnipeg, rises in Whitemouth lake, flows northerly and empties into the Winnipeg in sec. 34, Tp. 13, R. 11, E.P.M. Above the Whitemouth traffic bridge the area drained is 1,400 square miles.

Whitemud River.—Tributary of the Pembina, joining the latter in Tp. 3, R. 15, W.P.M.; rises on the northeasterly slope of Turtle mountain.

Whitemud River.—Flows easterly and northerly into lake Manitoba, joining the latter in Tp. 15, R. 9, W.P.M.

Whiteshell Lake.—Forms the headwaters of the Whiteshell river; it lies in Tp. 13, R. 16, E.P.M., and is drained by the Whiteshell river into the Winnipeg river. The area of the lake is 5 square miles.

Whitewater Lake.—Lies in Tps. 3 and 4, R. 21 and 22, W.P.M. It has an area of 29·8 square miles, and is fed by a number of small streams which have their source on the northern slope of Turtle mountain. This lake is of interest from a standpoint that it has no visible outlet.

Willow Creek.—Tributary of the Whitemud river, flows northerly and easterly, joining the latter in Tp. 14, R. 13, W.P.M.

Wilson River.—Rises on the northern slope of Riding mountain and flows north and east into lake Dauphin in Tp. 25, R. 17, W.P.M.

Winnipeg Lake.—Lies wholly within the province of Manitoba and occupies a considerable portion of the southern area of the province. It is one of the largest fresh-water lakes on the continent, having a superficial area of 9,414 square miles. It is 260 miles from end to end, and has an average width of about 40 miles. Lake Winnipeg forms what may be called the catching basin or regulation basin, for a large part of the drainage coming from that part of Western Canada lying between the summit of the Rockies and the Great Lakes, and between the international boundary and the 54th parallel of latitude. The Winnipeg river and the Red river add their waters to the southern part of the lake. On the eastern shore a number of streams of somewhat small size drain into it. On the west, about midway between the north and south extremities of the lake, the drainage to the west of the lake lying within the province of Manitoba and part of the eastern portion of Saskatchewan flows in through the Dauphin river. At the northwestern corner of the lake, the Saskatchewan empties in, draining perhaps the largest area of any of the several rivers which form part of the drainage system. At the northern end of the lake the Nelson river, which is the only river flowing from the lake, has its source. It will be seen from this brief description what an important bearing lake Winnipeg has upon the flow of the Nelson river.

Winnipeg River.—Which has as its source the lake of the Woods and contributary drainage, is among the most notable rivers on the continent in

regard to its potential power possibilities. The total drainage area of the Winnipeg river is 53,500 square miles. Of this, 49,100 lies above the mouth of the English river, one of the main tributaries, the latter having a drainage area of 21,600 square miles. The total fall of the Winnipeg river between the lake of the Woods outlet and lake Winnipeg is approximately 350 feet. Of this, approximately 320 feet is capable of development. The number of lakes within the upper drainage area, some 111, varying in size from 2 to 1,500 square miles, have a noticeable natural regulating effect upon the discharge of the river, the minimum flow being approximately 12,000 c.f.s. By means of storage on the lake of the Woods, this may be increaseed to 20,000 c.f.s., giving very complete regulation of the river.

Winnipegosis Lake.—Is connected to lake Manitoba by the Waterhen river through which stream it drains into the latter lake. It has an area of 1,995 square miles, and lies at an elevation of approximately 828 feet above sea-level. A number of streams and lakes which have their source in the Riding, Duck, and Porcupine mountains in the western part of the province, drain into a basin which is formed by it.

Wintering Lake.—Is an expanse of the Grass river, and lies just to the west of the Hudson Bay railway. It has an area of approximately 33 square miles.

Witchai Lake.—An expanse of the Grass river. It discharges through Grass river into the Nelson. The area of the lake is approximately 13 square miles.

Woody River.—Rises in a small lake in Tp. 38, R. 31, W.P.M., flows southeast and then northeast into Swan lake in Tp. 41, R. 24, W.P.M.

Wuskwatin Lake.—An expanse of the Burntwood river, forming part of the Hayes River drainage system. The area of the lake is approximately 16 square miles.

INDEX.

A.

PAGE.

Acre foot 12

Acknowledgements 27

Antler Creek.
Gazetteer 259

Armit River.
Gazetteer 259

Armstrong River.
Discharge Measurement 255

Ash River (Rainy Lake)
Discharge Measurement 249

Assiniboine River and tributaries 161

Assiniboine River District 10

Assiniboine River (Brandon).
Daily Gauge Height and Discharge 167
Description of station 166
Discharge Measurements 167
Monthly discharge 170
Gazetteer 259

Assiniboine River (Headingly).
Daily gauge heights and discharge 172
Description of station 170
Discharge Measurements 171
Monthly Discharge 174

Assiniboine River (C.P.R., St. James).
Daily gauge height and discharge 176
Description of station 174
Discharge measurements 175
Monthly discharge 178

Assiniboine River (Millwood).
Daily gauge height and discharge 164
Description of station 161
Discharge measurements 163
Monthly discharge 166

Athapapuskow Lake
Gazetteer 259

Atikameg Lake (or Clearwater Lake).
Gazetteer 259

B

Bazin Formula 15

Bearer Creek.
Gazetteer 259

Beaverhill Lake.
Gazetteer 259

Belanger River
Gazetteer 259

Berens River
Gazetteer 259

Berens River. 246

Berens River (First Falls)
Discharge measurements 247

Berens River (Little Grand Rapids
Discharge measurements 247

Big Black River
Gazetteer 261

PAGE.

Big Canoe River (Rainy Lake).
Discharge measurements ... 249

Big Grass River.
Gazetteer ... 260

Big Island River (Rainy Lake).
Discharge measurements ... 260

Birch Lake.
Gazetteer ... 260

Birch River.
Gazetteer ... 260

Birch River.
Gazetteer ... 260

Bird River (Lac du Bonnet).
Discharge measurements ... 251

Birdtail Creek ... 181

Birdtail Creek (Birtle).
Daily gauge height and discharge ... 184
Description of station ... 181
Discharge measurements ... 182
Monthly discharge ... 185
Gazetteer ... 260

Black River.
Gazetteer ... 260

Bloodvein River.
Discharge measurements ... 254
Gazetteer ... 260

Boat Stations ... 25

Bosshill Creek.
Gazetteer ... 260

Bolster method of correcting discharge ... 26

Bridge Stations (for metering) ... 24

Brokenhead River ... 237

Brokenhead River (Sinnot).
Daily gauge height and discharge ... 239
Description of station ... 237
Discharge measurements ... 238
Monthly discharge ... 242
Gazetteer ... 260

Brownlee's Creek (Rainy Lake).
Discharge measurements ... 249

Burntwood Lake.
Gazetteer ... 260

Burntwood River
Gazetter ... 260

Butnau Lake.
Gazetteer ... 260

Butnau River.
Gazetteer ... 260

C.

Cable Stations (for metering) ... 24

Cable Carrier Stations (for metering) ... 25

Carrot River.
Gazetteer ... 260

Catfish Creek
Gazetteer ... 260

Catfish Creek.
Gazetteer ... 260

Cedar Lake.
Gazetteer ... 260

Chezy formula ... 15

Chemical method of determining discharge ... 17

PAGE.

Child's Lake.
Gazetteer.. 260

Churchill River.
Gazetteer.. 260

Clear Creek.
Gazetteer.. 261

Clear Lake
Gazetteer.. 261

Clearwater Lake.
Gazetteer.. 261

Clearwater River.
Gazetteer.. 261

Cook Creek.
Gazetteer.. 261

Convenient equivalents.. 14

Cormorant Lake.
Gazetteer.. 261

Cranberry River, (Rainy Lake).
Discharge measurement.. 249

Cranberry Lake.
Gazetteer.. 261

Cross Lake.
Gazetteer.. 261

Cross Lake.
Gazetteer.. 261

Cross Lake.
Gazetteer.. 261

Crow Duck Lake.
Gazetteer.. 261

Current Meter—Determination of velocity by.. 19

Cypress River.. 196

Cypress River (Cypress River).
Description of station.. 197
Discharge measurements.. 197
Gazetteer.. 261

D.

Data, explanation of.. 27
" preparation of.. 25

Dauphin Lake.
Gazetteer.. 262

Dauphin River.
Gazetteer.. 261

Deer River.
Gazetteer.. 262

Deer Horn Creek.
Gazetteer.. 262

Definitions and terms.. 12

Devil's Creek.
Gazetteer.. 262

Discharge—Methods of determining.. 14

Districts.. 5

Dog Creek.
Gazetteer.. 262

Dog Lake.
Gazetteer.. 262

Drifting River.
Gazetteer.. 262

E.

Eagle Lake.
Gazetteer.. 262

PAGE.

Eating Point Creek.
Discharge measurements ... 254

Ebb and Flow Lake.
Gazetteer ... 262

Edwards Creek.
Gazetteer ... 262

Elbow Lake.
Gazetteer ... 262

English River.
Discharge measurements ... 250

Etawnei Lake.
Gazetteer ... 262

Etomami River.
Discharge measurements ... 247
Gazetteer ... 262

Equivelants, convenient ... 14

Explanation of Data ... 27

F.

Fairford River ... 235

Fairford River (Fairford).
Description of station ... 235
Discharge measurements ... 236
Gazetteer ... 262

Falcon Lake.
Gazetteer ... 262

Falcon River.
Gazetteer ... 262

Family Lake.
Gazetteer ... 262

Farrell River.
Gazetteer ... 262

File River.
Gazetteer ... 262

Fisher River.
Gazetteer ... 262

Fishing Creek.
Gazetteer ... 262

Fishing Lake.
Gazetteer ... 262

Float method of determining velocity ... 18

Fork River ... 213

Fork River (Fork River).
Description of station ... 213
Discharge measurements ... 214
Gazetteer ... 263

Footprint Lake.
Gazetteer ... 263

Fox River.
Gazetteer ... 263

Francis formula ... 16

Frog Creek (Rainy Lake).
Discharge measurement ... 249

G.

Gainsborough Creek.
Gazetteer ... 363

God's Lake.
Gazetteer ... 263

God's River.
Gazetteer ... 263

SESSIONAL PAPER No. 25f

PAGE.

Goose River.
Gazetteer ... 263

Granville Lake.
Gazetteer ... 263

Grass River.
Gazetteer ... 263

Grassy Narrows Creek (Rainy Lake).
Discharge measurement ... 249

Gunisao River.
Gazetteer ... 263

H.

Hale Bay (Rainy Lake).
Discharge measurement ... 249

Hay River.
Gazetteer ... 263

Hayes River.
Gazetteer ... 263

Hill Lake.
Gazetteer ... 263

Hydrographic data ... 29

Hydrographic Gazetteer of Lakes and Rivers in the Province of Manitoba ... 259

I.

Icelandic River.
Gazetteer ... 263

Inland Lake.
Gazetteer ... 263

Insect River.
Gazetteer ... 263

International Joint Commission ... 8

Integration method of determining velocity ... 22

Introduction ... 3

Island Lake.
Gazetteer ... 263

Island Lake River.
Gazetteer ... 263

J.

Jack River at Norway House.
Discharge measurements ... 253

Jackfish Creek.
Gazetteer ... 264

Jackson Creek.
Gazetteer ... 263

Jessica Lake.
Gazetteer ... 264

K.

Kettle Falls (International Channel).
Daily gauge height and discharge ... 36
Description of station ... 35
Discharge measurements ... 35

Kettle Falls (Canadian Channel).
Daily gauge height and discharge ... 34
Description of station ... 33
Discharge measurements ... 33

Kettle Falls (Combined Channels).
Daily gauge height and discharge ... 37
Monthly discharge ... 38

Kississing Lake (or Cold Lake).
Gazetteer ...

PAGE.

Kississing River.
Gazetteer ... 264

Kiskitto Lake.
Gazetteer ... 264

Kiskittogisu Lake.
Gazetteer ... 264

Knee Lake.
Gazetteer ... 264

Kutter's formula ... 15

L.

Lac du Bonnet.
Gazetter ... 264

Lake of the Woods tributaries and outlets ... 31

Lake of the Woods District ... 46

Lake of the Woods.
Gazetteer ... 264

Lake of the Woods Outlets (Kenora Power House).
Daily gauge height and discharge ... 49
Description of station ... 46
Discharge measurements ... 47
Monthly discharge ... 57

Lake of the Woods Outlets (Middle Lake).
Discharge measurements ... 250

Lake of the Woods Outlet (C.P.R. Culvert).
Description of station ... 76
Discharge measurements ... 77

Lake of the Woods Outlets (K.L. & M. Co. Millrace).
Daily gauge height and discharge ... 74
Description of station ... 73
Discharge measurements ... 73
Monthly discharge ... 76

Lake of the Woods Outlets (Millrace "A").
Description of station ... 65
Discharge measurements ... 65

Lake of the Woods Outlets (Millrace "C").
Description of station ... 70
Discharge measurements ... 71

Lake of the Woods Outlets (Norman Bridge).
Daily gauge height and discharge ... 63
Description of station ... 59
Discharge measurements ... 60
Monthly discharge ... 65

Lake of the Woods Outlets (North Tunnel Island).
Daily gauge height and discharge ... 83
Description of station ... 78
Discharge measurements ... 79
Monthly discharge ... 87

Lake of the Woods Outlets (War Eagle Lake).
Description of station ... 77
Discharge measurements ... 78

Lake of the Woods Outlets (Combined discharge) ... 88

Landing Lake.
Gazetteer ... 264

La Salle River.
Discharge measurements ... 251

Limestone River.
Gazetteer ... 264

Limestone Point Lake.
Gazetteer ... 264

Little Canoe River (Rainy Lake).
Discharge measurement ... 249

Little Saskatchewan River ... 185

PAGE.

Little Saskatchewan River also called Minnedosa River.
Gazetteer ... 264

Little Saskatchewan River (Bilbey's Bridge).
Daily gauge height and discharge ... 187
Description of station ... 185
Discharge measurements ... 186
Monthly discharge ... 188

Little Saskatchewan River (Five miles above Minnedosa).
Discharge measurements ... 252

Little Saskatchewan River (Minnedosa.)
Description of station ... 188
Discharge measuremeats ... 189

Little Saskatchewan River (Riverdale).
Daily gauge height and discharge ... 190
Description of station ... 189
Discharge measuremeats ... 189
Monthly discharge ... 191

Little Souris River.
Gazetteer ... 264

Little Swan River.
Gazetteer ... 264

Long Lake.
Gazetteer ... 264

Long River.
Gazetteer ... 264

Loon Creek.
Gazetteer ... 264

Lost Creek (Rainy Lake).
Discharge measurement ... 249

M.

Manigotagan River ... 242

Manigotagan River (Wood Falls).
Daily gauge height and discharge ... 244
Description of station ... 243
Discharge measurements ... 243
Monthly discharge ... 246
Gazetteer ... 264

Manitoba Lake.
Gazetteer ... 264

Manitou River (Rainy Lake).
Discharge measurement ... 249

Mantagas River ... 265

Maskawa River ... 265

McLaughlin River
Gazetteer ... 265

Measurements, winter ... 22

Methods of determining discharge ... 14

Mean Velocity—Method of determining ... 18

Metering stations ... 24

Mile foot ... 12

Minago River.
Gazetteer ... 265

Mitishto River
Gazetteer ... 265

Molson Lake
Gazetteer ... 265

Moose Lake.
Gazetteer ... 264

Moose Nose Lake.
Gazetteer ... 265

Morris River at Morris
Discharge measurements ... 241
Gazetteer ... 265

PAGE.

Mossy River. 207

Mossy River (Cameron's Bridge).
Discharge Measurement 252

Mossy River.
Gazetteer 265

Mossy River (Lacey's Farm).
Daily gauge height and discharge 209
Description of station 208
Discharge measurements 208
Monthly discharge 212

Mossy River (Wilson's Farm).
Daily gauge height and discharge 212
Description of station 211
Discharge measurements 212
Monthly Discharge 211

Muhigan River.
Gazetteer 265

Muskrat Lake.
Gazetteer 265

N.

Nelson River 247

Nelson River 11
Gazetteer 265

Nelson River, East Branch (Sea Falls). North and South Channels.
Discharge measurements 255

Nelson River, West Branch (Whiskey Jack Portage).
Discharge measurements 255

Nelson River (Manitou Rapids).
Description of station 248
Discharge measurements 249

Nelson River (West Creek, Manitou Rapids).
Discharge measurement 255

Nelson River (East Creek, Manitou Rapids).
Discharge measurement 255

North Birch Lake.
Gazetteer 266

North Duck River.
Gazetteer 266

North Indian Lake.
Gazetteer 266

North-west Bay River (Rainy Lake).
Discharge measurement 249

O.

Oak Creek.
Gazetteer 266

Oak Lake.
Gazetteer 266

Oak River.
Gazetteer 266

Ochre River 219

Ochre River (Ochre River).
Daily gauge height and discharge 221
Description of station 219
Discharge measurements 220
Monthly discharge 224
Gazetteer 266

Oiseau Lake.
Gazetteer 266

Oiseau or Bird River.
Gazetteer 266

One point method of determining velocity 20

Organization and Scope of Survey 4

PAGE.

Overflowing River.
Gazetteer ... 266

Oxford Lake.
Gazetteer ... 266

P.

Partridge Crop Lake.
Gazetteer ... 266

Pasquia River.
Gazetteer ... 266

Pelican Lake.
Gazetteer ... 266

Pelican Lake.
Gazetteer ... 266

Pembina River ... 144

Pembina River (La Riviere).
Discharge measurements ... 146
Gazetteer ... 266

Pembina River (Neche, N.D.).
Monthly discharge 1903–1910 ... 144

Pickerel Lake.
Gazetteer ... 266

Pigeon River (Sturgeon Falls).
Discharge measurements ... 254

Pigeon River (Miscellaneous sections).
Discharge measurements ... 253

Pigeon River.
Gazetteer ... 266

Pinawa Channel (Above Control Dam.)
Description of station ... 122
Discharge measurements ... 123

Pinawa Channel (Below Control Dam.)
Daily gauge height and discharge ... 118
Description of station ... 116
Discharge measurements ... 117
Monthly discharge ... 122

Pinawa Channel, Winnipeg Street Ry. Power House.
Description of Station ... 123
Discharge Measurements ... 124
Daily gauge height and discharge ... 127

Pine River.
Gazetteer ... 266

Pine Root River.
Gazetteer ... 266

Pink Lake.
Gazetteer ... 266

Pipe Lake.
Gazetteer ... 266

Pipestone Creek ... 197

Pipestone Creek (Cromer).
Description of station ... 197
Discharge measurements ... 198

Pipestone Creek.
Gazetteer ... 266

Pipestone River (Rainy Lake).
Discharge measurement ... 249

Pipestone Lake.
Gazetteer ... 267

Playgreen Lake.
Gazetteer ... 267

Plum Creek.
Gazetteer ... 267

Poplar River.
Gazetteer ... 267

PAGE.

Portage Creek.
Gazetteer ... 267

Preparation of Data ... 25

Price Meter ... 19

Progress report ... 3

Q.

Qu'Appelle River.
Gazetteer ... 267

R.

Rainfall—Annual ... 3

Rainy Lake feeders (Miscellaneous meterings) ... 249

Rainy River ... 31

Rainy River (Beaudette).
Description of station ... 45
Discharge measurements ... 46

Rainy River (Emo).
Description of station ... 45
Discharge measurements ... 45

Rainy River (Fort Francis).
Daily gauge height and discharge ... 39
Description of station ... 38
Monthly Discharge ... 44

Rat Creek.
Gazetteer ... 267

Rat River (Rainy Lake).
Discharge measurement ... 249

Rat River ... 155

Rat River (Otterburne).
Daily gauge height and discharge ... 157
Description of station ... 155
Discharge measurements ... 156
Monthly discharge ... 160
Gazetteer ... 267

Recommendations and Summary ... 28

Red River and tributaries ... 135
Red River ... 135
Description of Station ... 136

Red River District ... 9

Red River.
Gazetteer ... 267

Red River (Two miles below Emerson).
Description of station ... 141
Discharge measurements ... 142

Red River (Elm Park).
Description of station ... 142
Discharge measurements ... 143

Red River (Emerson).
Daily gauge height and discharge ... 138
Description of station ... 136
Discharge measurements ... 137
Monthly discharge ... 141

Red River (Redwood Bridge).
Description of station ... 143
Discharge measurements ... 144

Red Deer Lake.
Gazetteer ... 267

Red Deer River ... 198

Red Deer River.
Gazetteer ... 267

Red Deer River (Below Red Deer Lake).
Discharge measurement ... 252

PAGE.

Red Deer River (Erwood).
Description of station ... 198
Discharge measurements ... 199

Red Deer River (Hudson Bay Junction).
Daily gauge height and discharge ... 200
Description of station ... 199
Discharge measurements ... 200
Monthly discharge ... 202

Reed Lake.
Gazetteer ... 267

Reindeer Lake.
Gazetteer ... 257

Rice River.
Gazetteer ... 267

Roaring River.
Gazetteer ... 267

Rock Lake.
Gazetteer ... 267

Rocky Inlet Creek (Rainy Lake).
Discharge measurement ... 249

Rocky Island Lake.
Gazetteer ... 267

Rolling River.
Gazetteer ... 267

Roseau River ... 146

Roseau River.
Gazetteer ... 267

Roseau River (Baskerville's Farm).
Daily gauge height and discharge ... 149
Description of station ... 147
Discharge measurements ... 147
Monthly discharge ... 150

Roseau River (Below Dominion City).
Daily gauge height and discharge ... 154
Description of station ... 153
Discharge measurements ... 153
Monthly discharge ... 155

Roseau River (Dominion City).
Daily gauge height and discharge ... 152
Description of station ... 151
Discharge measurements ... 151
Monthly discharge ... 155

Roseau River (Mayne's Farm).
Discharge measurement ... 253

S

Sale River
Gazetteer ... 268

Salt Creek.
Gazetteer ... 268

Sandy Lake.
Gazetteer ... 268

Sandy River.
Gazetteer ... 268

Saskatchewan River ... 229

Saskatchewan River.
Gazetteer ... 268

Saskatchewan River (Pas).
Daily gauge height and discharge ... 229
Description of station ... 228
Discharge measurements ... 227
Monthly discharge ... 231

Saskatchewan River (Grand Rapids)
Daily gauge height and discharge ... 232
Description of station ... 231
Discharge measurements ... 231
Monthly discharge ... 233

PAGE.

Saskeram Lake.
Gazetteer ... 268

Second-foot ... 12

Second-foot per square mile ... 12

Seine River (Rainy Lake).
Discharge measurement ... 249

Seine River (Ste. Anne des Chenes.)
Discharge measurements ... 252
Gazetteer ... 268

Setting Lake.
Gazetteer ... 268

Setting River.
Gazetteer ... 268

Shamattawa River.
Gazetteer ... 268

Shell River ... 178

Shell River.
Gazetteer ... 268

Shell River (Assessippi).
Daily gauge height and discharge ... 180
Description of station ... 178
Discharge measurements ... 179
Monthly Discharge ... 181

Shoal Lake.
Gazetteer ... 268

Shoal Lake.
Gazetteer ... 268

Shoal River (Swan Lake).
Discharge measurements ... 253
Gazetteer ... 268

Siegner Lake.
Gazetteer ... 268

Singoosk Lake.
Gazetteer ... 268

Sipiwesk Lake.
Gazetteer ... 268

Sisipuk Lake.
Gazetteer ... 268

Skunk Creek.
Gazetteer ... 268

Slope Method of determining discharge ... 15

Small Creek (Rainy Lake, Alexandria Bay).
Discharge measurements ... 249

Small Creek (Rainy Lake, Brownlees N. W. Bay).
Discharge measurement ... 249

Small Creek (Rainy Lake, Lost Bay).
Discharge measurement ... 249

Small Creeks Nos. 1 and 2 (Rainy Lake, Seine Bay).
Discharge measurements ... 249

Smith Creek.
Gazetteer ... 268

Smoking Tent River.
Gazetteer ... 269

Snowflake Brook.
Gazetteer ... 269

Snowshoe Lake.
Gazetteer ... 269

Souris River ... 192

Souris River.
Gazetteer ... 269

PAGE.

Souris River (Wawanesa).
Daily gauge height and discharge ... 193
Description of station ... 192
Discharge measurements ... 193
Monthly discharge ... 196

South Duck River.
Gazetteer ... 269

Southern Indian Lake.
Gazetteer ... 269

Spence Lake.
Gazetteer ... 269

Split Lake.
Gazetteer ... 269

Squirrel Creek.
Gazetteer ... 269

Squirrel River (Austin).
Discharge measurements ... 252

Steep Rock River.
Gazetteer ... 269

St. Martin Lake.
Gazetteer ... 269

Stony Creek.
Gazetteer ... 269

Stout method of correcting gauge heights ... 26

Sturgeon Gill Creek.
Discharge measurement ... 254

Summary and recommendations ... 28

Swan River ... 202

Swan River.
Gazetteer ... 269

Swan River (Swan River).
Daily gauge height and discharge ... 204
Description of station ... 202
Discharge measurements ... 203
Monthly discharge ... 207

Swan Lake.
Gazetteer ... 269

T.

Terms and definitions ... 12

Three Point Lake.
Gazetteer ... 269

Three Point Method for determining velocity ... 20

Thunder Lake.
Gazetteer ... 269

Touchwood Lake.
Gazetteer ... 269

Turtle River
Gazetteer ... 269

Two Point Method for determining velocity ... 20

Tye Creek (below Shave Falls)
Discharge measurements ... 250

V.

Valley River ... 214

Valley River.
Gazetteer ... 269

Valley River (Valley River)
Daily gauge height and discharge ... 216
Description of station ... 214
Discharge measurements ... 215
Monthly discharge ... 219

PAGE.

Velocity, mean, methods of determining 18

Velocity Method of determining discharge 17

Vermilion River.
Gazetteer 269

Vertical Velocity Curves (determining velocity) 20

W.

Wading stations (for metering) 25

Wanipigow River.
Gazetteer 270

Wasaw Creek (Rainy Lake).
Discharge measurement 249

Waterhen Lake.
Gazetteer 270

Waterhen River at Waterhen.
Discharge measurements 254

Wegg Lake (Rainy Lake).
Discharge measurement 249

Weir Method of determining discharge 16

Wekusko Lake.
Gazetteer 270

West Hawk Lake.
Gazetteer 270

Whirlpool River.
Gazetteer 270

White Fish Creek (Rainy Lake).
Discharge measurement 249

Whitemouth Lake.
Gazetteer 270

Whitemouth River 130

Whitemouth River.
Gazetteer 270

Whitemouth River (Whitemouth).
Daily gauge height and discharge 132
Description of station 130
Discharge measurements 131
Monthly discharge 135

Whitemud River.
Gazetteer 270

Whitemud River....
Gazetteer 270

Whitemud River (Gladstone).
Discharge measurements 253

Whitemud River (Westbourne).
Discharge measurements 253

Whiteshell Lake at Jessie Lake.
Gazetteer 270

Whiteshell River at Jessie Lake.
Discharge measurements 251

Whitewater Lake.
Gazetteer 270

Willow Creek.
Gazetteer 270

Wilson River.
Gazetteer 270

Winnipeg Lake.
Tributaries on East 11, 237
Tributaries on West 225
Gazetteer 270

SESSIONAL PAPER No. 25f

PAGE.

Winnipeg River and tributaries ... 8, 91

Winnipeg River.
Gazetteer ... 270

Winnipeg River (below Lake of the Woods outlets).
Combined daily discharge ... 88
Monthly discharge at Lake of the Woods Outlets ... 91

Winnipeg River (Dalles).
Discharge measurements ... 250

Winnipeg River (Head of Grand du Bonnet).
Description of station ... 129
Discharge measurements ... 130

Winnipeg River (Minaki).
Description of station ... 93
Discharge measurements ... 94

Winnipeg River (Otter Falls).
Daily gauge height and discharge ... 110
Discharge measurements } ... 109
Monthly discharge ... { Years 1907-1911 ... 114

Winnipeg River (Slave Falls).
Daily gauge height and discharge, 1911-1914 ... 104
Description of station ... 101
Discharge measurements 1911-1914 ... 102
Monthly discharge 1911-1914 ... 108

Winnipeg River (Throat Rapids).
Discharge measurements ... 250

Winnipeg River, Whitedog Falls, North and South Channels ... 94
Daily gauge height and discharge, North Channel ... 96
Discharge measurements North Channel ... 95
Monthly discharge, North Channel ... 98
Description of station, South Channel ... 94
Daily gauge height and discharge, South Channel ... 99
Discharge measurements, South Channel ... 99
Monthly discharge, South Channel ... 101
" " Combined Channels ... 98

Winter Measurements ... 22

Wintering Lake.
Gazetteer ... 271

Witchai Lake.
Gazetteer ... 271

Woody River.
Gazetteer ... 271

Wuskwatin Lake.
Gazetteer ... 271

ANNUAL REPORT

OF THE

CHIEF MEDICAL OFFICER

OF THE

DEPARTMENT OF THE INTERIOR

BY

PETER H. BRYCE, M.A., M.D.

Being for the Year 1914-15

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA

PRINTED BY J. DE L. TACHÉ, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY.

1916.

[No. 25g—1916.]

OTTAWA, July 14, 1915.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I beg herewith to present for your consideration my eleventh annual report on the medical inspection of immigrants, it being for the fiscal year 1914-15.

As two-thirds of the year have been marked by the Great War, affecting especially those countries from which immigration has hitherto come to Canada, the total immigration has been greatly reduced in consequence; but the total for the year is beyond what might naturally have been expected. The relative proportion of immigrants belonging to the three chief classes of past years has been notably altered, as seen in the following table:—

TABLE I.—Showing Immigrants by National Groups.

—	Great Britain.	United States.	Other Countries.
1913-14	142,622 : 37%	107,530 : 27%	134,726 : 35%
1914-15	43,276 : 29%	59,779 : 41%	41,734 : 30%

This altered proportion affects to some extent the percentage of persons detained or deported, as will be seen by comparison in a later table; while the interning by the military authorities of certain nationalities of foreign immigrants will still further modify former comparative figures. Naturally with a lessened immigration there has been no extension of facilities at the seaports for immigration work; while that which has been carried on was of an essentially routine character. Similarly no special consideration has been given to suggestions for following the methods instituted by the Commonwealth of Australia for the examination and certifying of immigrants in Great Britain prior to taking passage. A brief reference to the method may be of interest. In the pamphlet "The Medical Examination of Intending Immigrants to Australia," W. Perrin Norris, M.D., D.P.H. Chief Medical Officer attached to the Commonwealth Medical Bureau in London, England, states:—

> "In order to prevent, or at least minimize the risk of such hardships and disappointments in the course of Australian immigration, and at the same time to ensure, as far as possible, the exclusion of those persons who are, under the Commonwealth Act, defined as 'Prohibited Immigrants,' the Act provides, *inter alia*, for a preliminary medical examination of all intending immigrants, that is, all persons from abroad who are going to Australia to settle there. This requirement applies to all passengers, irrespective of class. It is further required that this examination shall be made by approved medical referees, for whose appointment the Act provides.
>
> "The Commonwealth Medical Bureau, attached to the High Commissioner's Office in London, is constituted under the Act, and its primary function is to control the system of medical examination and certification, and to organize and direct the service of medical referees."

The work is carried on under the Commonwealth Immigration Act, 1912, and, as stated in the pamphlet, has as one of its objects to prevent hardship to intending immigrants, who otherwise might, as has been the case elsewhere, be turned back on account of disease or defect, discovered on arrival at some port of entry many thousand miles away. It is further pointed out that in this examination it is very desirable to aim at uniformity in the work so that "the danger of an intending immigrant being classed by one examiner as fit and by another as unfit for certification may be obviated." The pamphlet further sets forth the instructions to the medical examiners or referees. Through the courtesy of Dr. Norris I am informed that the system as arranged for, includes 1,500 approved medical referees or examiners distributed throughout the United Kingdom, and that most of them, having an approved deputy, are so located that most intending immigrants will not travel more than five miles for examination and many not more than two miles. The provisions of the Immigration Act are similar to those of the United States and of Canada and special forms are made for assisted and ordinary emigrants. There is a special blank form to be signed in the presence of the medical referee by: (*a*) single persons over 16 years of age; (*b*) the head of a family who reports on all members of family under 16 years

The form for assisted immigrants shows that the examination and certification, which includes the fees paid to medical examiners for the medical examination and certification of all intending immigrants are: 5 shillings for each adult over 16 years of age; 3 shillings for each child in a family of immigrants. Except where the certificate is refused, when the Commonwealth pays for the examination, the Government pays 3 shillings and the applicant 2 shillings; and for those under 16 years, 2 shillings and 1 shilling, respectively. The applicant pays his fee to the medical examiners at the time examination is made. The arrangements made, mostly with the medical officers of health throughout Great Britain to act as examiners, seem admirably adapted to secure good results in the way of a standardized examination and a selected lot of emigrants. As illustrated, however, in my last annual report, the method is so much more expensive than that proposed by me in former reports in which the medical officers of the steamship companies would be bonused for doing thorough work during the passage to Canada, that we can afford to watch the effects of the operation of the new method before making any change which would involve so serious an expenditure as that of the Australian system.

Whatever the cause, the past year has seen the total deportations from Canada notably increased. This is illustrated by the following table:—

TABLE II.—Giving Total Immigrants and Deportations during Three Years.

Year.	Total Immigrants.	Total Deportations.	Rate per 1,000.
1912-13	402,432	1,281	3·1 per 1,000
1913-14	384,878	1,834	4·8 per 1,000
1914-15	144,789	1,734	12·0 per 1,000

As bearing upon the causes of deportation, reference may be made to the number of immigrants destined to and deported from different provinces, as seen in the following tables:—

TABLE III.—Giving Immigration with Destination by Provinces.

—	Alberta.	British Columbia.	Man.	Maritime Prov.	Ontario.	Quebec.	Sask.	Yukon.
1912-13.....	48,073	57,892	43,813	19,806	122,798	64,835	45,147	68
1913-14.....	43,741	37,572	41,640	16,730	123,792	80,368	40,999	36
1914-15.....	18,243	10,127	13,196	11,104	44,873	31,053	14,173	

The only notable differences between the number of immigrants by provinces for 1912-13 and 1913-14 is seen in British Columbia and Quebec. Thus the total dropped by over 20,000 from 57,892 in British Columbia, but increased in Quebec by over 15,000. Except the Maritime, all the provinces fell off greatly in 1914-15. The relation of this decrease to deportations is seen by comparing the above with the following table:—

TABLE IV.—Showing Deportations by Provinces.

—	Alberta.	British Columbia.	Man.	Maritime Prov.	Ontario.	Quebec.	Sask.	Yukon
1912-13.....	131	204	250	45	419	208	44	
1913-14.....	164	287	334	45	574	371	59	
1914-15.....	224	228	159	55	543	397	85	3

Thus Alberta, with a decrease of immigrants of 25,498 from 43,741 in 1913-14, had an increase of deportations of 60 for the same period. Similarly, Ontario, with a decrease of 78,919 immigrants from 123,792 in 1913-14, had 574 deportations as compared with 543 in 1914-15.

It thus becomes abundantly apparent that deportations become closely associated with economic and industrial conditions, and while loss of employment does notably tend to induce a general physical declension, yet the most notable increase is in public charges as seen in the following figures:—

TABLE V.—Deportations as Public Charges, Vagrancy and Criminality.

—	Public Charges.	Vagrancy.	Criminality.
1912-13.....	392	107	334
1913-14.....	715	97	376
1914-15.....	789	77	404

It is important to note how few of the unemployed class were deported under the technical charge of vagrancy. It has already been mentioned that the proportion of immigrants by nationality groups has been notably altered by the war. This naturally affects the number of deportations in such groups.

In the comparison by racial groups it was pointed out in last year's Report that the British in the larger groups showed as usual by far the largest proportion of deportations, the Americans next, the Slavic next and the Italians last. Thus there were:—

TABLE VI.—Showing Deportations by Nationalities Compared by Years.

—	Total Immigrants. 1913-14.	1913-14. Deported.	Total Immigrants. 1914-15.	1914-15. Deported.
British	142,622	1 in 149	43,276	1 in 49
Americans	107,530	1 in 265	59,779	1 in 129
Slavic	65,857	1 in 275	20,246	1 in 140
Italian	24,722	1 in 706	6,228	1 in 47

We may assume that the immigrants of the different nationalities were each of the same quality in the different years, yet whereas only 1 in every 706 Italians was deported in 1913-14, as high a number as 1 in every 47 was deported in 1914-15. These, as a class, have for ten years past illustrated their steady independence by seldom being found in the charity wards of hospitals or in refuges, having apparently always been able through their industry and frugality to pay their way; but being mostly unskilled labourers, they have suffered most serious privations this year owing to a lack of railway construction and town building, and have been forced to apply for assistance to return to Italy. But the effect of the financial depression is also seen in the American and Slavic groups as well as in the British, the Slavic groups being less marked, however, owing perhaps to interned Austrians, Hungarians, and Galicians being unable to return to their homes.

The total number of deportations, as already mentioned, is 1,734, or only 100 less than in 1913-14; but when those deported as public charges, vagrants, criminals, and immoral are eliminated, this number is reduced to 414.

INSANITY AND FEEBLE-MINDEDNESS.

As in recent past years, the only two diseases which have been important as causes of deportation are insanity and tuberculosis.

The following table gives the total deportations on account of insanity:—

TABLE VII.—Giving Deportations due to Insanity.

Disease.	1912-13.	1913-14.	1914-15.
Total	220	207	144
Ratio per 1,000	0·54	0·51	1·00

Compared with previous years, the number of insane deportations has still further increased, it being exactly 1 per 1,000 during 1914-15, as compared with 0·54 in 1912-13 and 0·51 in 1913-14. While it is fair to assume that activity on the part of hospital and municipal authorities in reporting such cases to the department becomes greater year by year, yet it is difficult to explain this notable increase of nearly double the ratio in any other way than by the cumulative effects of unemployment and the depressing conditions on individuals, perhaps of foreign nationality, due to the war.

It cannot, however, be overlooked that only five persons were rejected at the seaports on account of insanity, as compared with fifteen in the previous year, or rather less proportionately than in 1913-14. Incidentally, too, the clause of the Immigration Act providing for deportation within three years after arrival serves to somewhat increase the number. The fact of this notable increase is not only an unpleasant one, but it becomes still more serious since we must conclude that there is similarly an increased number of immigrants who are on the border line of insanity. Comparing the rate per 1,000 with that of the admissions in the last census year to Ontario hospitals for the insane, we find that the rate for the province is two persons admitted per 1,000, as compared with one in immigrants.

The abnormally rapid growth of cities as compared with rural districts in Canada, due to immigration, has brought into prominence the existence of a number of feeble-minded persons in our population, some of whom are immigrants. The study of this class has been especially advanced in Ontario, where in addition to the "Neglected Children's Branch" of the Government service there has recently been appointed a provincial inspector of auxiliary classes in the public schools. Added to this, the Toronto General hospital has a special clinic for feeble-minded.

Through the great kindness of Dr. C. K. Clark, Dean of Toronto University Medical Faculty and Superintendent of Toronto General hospital, the following list of patients examined in the feeble-minded clinic of the hospital, by nationalities and by whom referred, has been supplied:—

TABLE VIII.—Giving Number, Nationality and Source of Feeble-minded Persons First Examined at Feeble-minded Clinic, Toronto General Hospital, from July 1, 1914, to July 1, 1915.

Canadian	203
English	100
Scotch	17
Russian	10
American	7
Irish	6
Jamaican	3
Polish	2
Italian	2
Austrian	2
Greek	1
Icelandic	1
South African	1
Unknown	61
Total	425

Patients referred by Juvenile Court	168
" " Public Health Department	40
" " Doctors	43
" " Social Health Department	35
" " Homes and other Institutions	32
" " Wards and Clinics	28
" " Public Schools	14
" " Friends	62
" " Ministers	2
Total	425

The total cases examined during the year, including those seen first in the previous year, were 618.

The following illustration of physical and mental defects in the poorer class is taken from our medical officer's report at the port of New York.

In all, 11,778 immigrants destined for Canada arrived at that port, of whom 264 were deported. Of these, 101 were rejected for medical reasons.

TABLE IX.—Showing Immigrants Rejected at New York for Medical Causes.

Blind	1	Poor physical development	22
Feeble-minded	10	Hernia	10
Defective speech	1	Disease of nervous system	1
Defective vision	4	Senility	2
Deformed chest, spine and joints.	3	Weak abdominal walls	9
Trachoma	20	Heart disease	8

The total feeble-minded rejected at New York was 10 out of 54 at all ports, although the total immigrants was but one-twelfth of the total. It seems apparent that quite diverse views may be held by medical inspectors at the different ports of entry as to what constitutes feeble-mindedness; but that some defective persons have been admitted to Canada who subsequently came to the notice of the Department is proved through the report of the Toronto General Hospital. That others admitted on limited time permits continue to be what they were on arrival is gathered from my investigations of several individual cases.

TABLE X.—Showing Conditions of Feeble-minded Admitted to Canada under Limited Permits.

Name.	Age.	Nationality.	Date of Arrival.	Date of Examination.	Diagnosis.	Remarks.
L. H ..	16	English.....	Sept. 22, 1913.	Jan. 23, 1915.	Mentally deficient.	When Binet Simon Test was applied the mental age was 5 years. Family wish to return to England. Family industrious and worthy.
W. G..	15	"	Aug. 3, 1913.	April 30, 1915.	Feeble-minded....	Stable type mentally slow.
E. M...	30	" ...	——— 1911.	May 1, 1915.	....	Deaf at 15 mos. speaks by lip imitation, mother and family especially worthy. Admission recommended.
T. A...	8	"	——— 1913.	Dec. 22, 1914.	Optic neuritis with thyroid deficiency.	Family industrious.
F. L...	15	Hebrew	——— 1910.	Jan. 23, 1915.	Idiot.....	A hopeless ament. Is now in Orillia Asylum. Family industrious and progressive.
D. H...	26	English.....	.. ..	....	Feeble-minded....	Stable type, can take care of himself. Family good.
E. B...	.....	Scotch.....	.....	March, 1915.	Feeble-minded of microcephalic type.	Feeble-minded of stable type, well behaved but not orderly in habits. Industrious and responsible family.
M. N...	64	"	July, 1913.	Mar. 23, 1913.	Pre-senility mental passivity.	Pre-senility stable type, delicate. Unusually worthy relatives.
A. C...	12	Hebrew	May, 1914.	Feb. 5, 1915.	Micro-cephalic idiot.	Boy strong in body but of type with little hope of improvement. Indifferent type of family.
G. S. N.	.....	Scotch.....	——— 1912.	.....	Feeble-minded....	Has musical talent, stable type. Is in Orillia Asylum. Educated type of family.
N. L...	8	English.....	July, 1912.	Jan., 1915.	Imbecile	Mental age of 4. Unstable type. Worthy artisan family.

These subsequent investigations of persons and their surroundings admitted on permit is of much interest and very well illustrate the complex nature of the work of medical inspection in relation to the wider aspects of immigration. Canada desires

effective workers, and the Immigration Act is intended to be protective but not obstructive to immigration. A glance at the reports on these several cases shows that with one or two exceptions the country is distinctly benefited by the presence of the families of these persons, who under a strict application of the law would in practice have been excluded on account of a single member belonging to a prohibited class. As regards the inferences to be drawn regarding the other members of a family having one mental defective, it is proper that the practical view, if held, should be expressed that clear distinctions should be drawn between what are cases of *primary amentia* or mental deficiency and *secondary amentia*. As Dr. Tredgold, Medical Expert to the Royal Commission on the Feeble-minded, London, remarks:—

> Under normal conditions the brain of the child grows with extreme rapidity during the first few years of life. This is in consequence of its inherent capacity for growth plus the stimulation of sensory impressions, and the presence of an adequate quality and quantity of blood. Thus, inherent capacity may be normal, but the necessary stimulation of food so deficient that the gradual unfolding of the mental faculties does not take place or so tardily that some degree of backwardness is the result. Cases of this kind in which development is delayed are extremely common.

To these nutritional influences must be added the results of some particular disease, affecting brain tissue as well as the special senses and general nutrition. Some one or more of such influences seem to have been operative in most of these families whose other members were deemed normal at the seaports. Clearly, however, extreme care should be exercised in order that one may be sure that hereditary neuropathic influences, as alcohol, tuberculosis, syphilis, consanguinity, etc., are not the underlying basis of the mental deficiency. It would appear, therefore, almost essential in all families wishing to emigrate to Canada, as from Great Britain, which have some member mentally deficient, that a thorough investigation by a special officer should be made, ensuring that no insanity has existed within five years and that there does not exist any definite evidence of a family history distinctly indicative of a tendency to *primary amentia* or hereditary mental deficiency. Dr. Tredgold lays down the following satisfactory guides to forming a judgment, viz.:—

> First—If both parents are healthy and free from neuropathic taint, their offspring is healthy.
>
> Second—If one or both parents, though free from neuropathic taint, suffers from alcoholism, severe tuberculosis, or syphilis, the nervous system of the offspring tends to be unstable.
>
> Third—That the mating persons of neurotic taint tends to produce an accentuation of the neurosis.
>
> Fourth—That the mating of two mentally defective individuals yields offspring who are all defective.

While it may be said that with so many tainted persons in our population such a precaution is gratuitous and impertinent, yet it must be evident that the Immigration Act places its officers in the position of officials, as in Great Britain under the Mental Deficiency Act, where they are empowered and required to limit the increase of such a neuropathic population in Canada, by preventing the admission of such families. If, however, such were examined and prevented, on the one hand, from entering Canada it is clearly proper, on the other, in a case of *secondary amentia* in a healthy family where the misfortune of sickness may have been the cause, while the defective person may be placed under control in some proper institution whether in Great Britain or after arrival in Canada, that the benefits of new opportunities in

Canada for personal and family advancement, financially and socially, should not be withheld from worthy families, at least of British descent. It logically follows, however, that the department may clearly make it a primary requisite of admission to Canada that the incoming families become fully responsible for the maintenance, in such institutions as are approved of by the department, of their defective members, both in the interests of the individual, of the family and of the community.

TUBERCULOSIS.

The deportations from this disease, like those from insanity, continue to increase, and presumably for the same reasons. There were 82 in 144,789 immigrants in 1914-15, or 1 in every 1,785, as compared with 139 in 384,878 in 1913-14, or 1 in 2,769. While it may be true that the type of person who comes to Canada may belong especially to that stratum of society in which this disease especially prevails, yet, as has been remarked in previous reports, the disease, by virtue of its slow advance and varied type, makes its detection without careful physical examination quite impossible. That its progress depends largely on the constitution, personal habits and occupation of the person affected is generally recognized, and that during the lack of employment persons should have broken down with this disease and become public charges is only to be expected. While much care should be taken by medical officers, both on shipboard and at all ports of entry, to examine and detain for observation and examination persons presenting obvious anaemia and lack of vigour, yet it cannot be forgotten that the exposure to the wind and weather on shipboard often tends to give a false appearance of health, even, to such persons. When, however, the results of observation by physicians in charge of tuberculosis sanatoria are tabulated, it is found that even in private medical practice comparatively few cases of the disease are reported by the ordinary practitioner before being notably advanced. The result of ten years of observation of the disease raises the question again as to whether a certificate of freedom from this disease, personally and in the family of intending immigrants for several years prior to the time of emigrating, might not fairly be asked by certifying medical officers before their steamship passage is taken. Until, however, immigration to Canada again booms it is probable that the present rule by which public authorities are called upon to report cases of the disease when found and have become a charge upon the public, will prove in practice adequate for dealing with these interesting but unfortunate sufferers from the most widespread of all diseases.

TABLE XI.—Showing the Diseases for which Immigrants were Detained at the Ports of Quebec, Halifax, St. John, North Sydney, Vancouver, Victoria, New York, Portland, Boston and Baltimore during the Fiscal Year:—

Cause.	No. Detained.	Released.	Rejected.	Died.	Remaining.
1. Contagious diseases—					
Measles	8	8			
Fever	1	1			
Tonsilitis	2	2			
2. General diseases—					
Laryngitis	3	3			
Rheumatism	4	2	2		
Tuberculosis	11	4	7		
Adenitis	12		12		
Anaemia	1	1			
Alcoholism	1	1			
Cellulitis	1	1			
Sclerosis	1		1		
Potts disease	1	1			
Haematocele	1		1		

TABLE XI.—Showing the Diseases for which Immigrants were Detained, etc.—*Con.*

Cause.	No. Detained.	Released.	Rejected.	Died.	Remaining.
3. Eye diseases—					
Cataract	5	1	1		
Conjunctivitis	100	99	1		
Obs. of eyes	36	36			
Trachoma	151	14	137		
Defective sight	4	1	3		
Exophthalmia	1		1		
Keratitis	1	1			
4. Nervous diseases—					
Mental observation	67	67			
Epilepsy	3	2	1		
Feeble-minded	51	1	50		
Melancholia	1		1		
Imbecility	6	2	4		
Insanity	5		5		
Neurasthenia	1		1		
Paralysis	1		1		
5. Circulatory system—					
Goitre	4	4			
Heart disease	13	2	11		
Jaundice	1	1			
Endocarditis	4	3	1		
Varicose veins	1		1		
6. Respiratory system—					
Pneumonia	8	5	1	2	
Asthma	1			1	
Bronchitis	5	4	1		
Conjestion of lungs	1	1			
7. Digestive system—					
Appendicitis	1	1			
Hernia	13		13		
8. Genito-urinary system—					
Diabetes	1	1			
Confinement	1	1			
Gonorrhoea	3	1	2		
Syphilis	4	1	3		
Nephritis	1		1		
Inflammation of bladder	1				1
Pregnancy	1		1		
9. The Skin—					
Disease of skin	4	4			
Scabies	32	31			1
Favus	1		1		
Psoriasis	2	1	1		
Impetigo	8	8			
Eczema	3	3			
Tinea	4		4		
Sycosis	5		5		
10. Malformation and diseases of old age and infancy—					
Deafness	4	4			
Deaf and dumb	1		1		
Curvature of spine	2		2		
Club foot	1	1			
Senility	4	3	1		
11. Accidents—					
Fracture	2	2			
Loss of foot	1	1			
Broken leg	1				1
12. Ill-defined causes—					
General obs	220	217		3	
Poor physique	41	3		38	
Abscess	11	9		2	
High temperature	2	2			
Inflammation	2			2	
Ostitis	1	1			

The total detentions on account of disease were 896, as compared with 1,941 in 1913-14, or just half the number.

Class 1.—There was a remarkable freedom from contagious diseases during the year, there being but 11 cases of all kinds and but 8 cases of measles, as compared with 68 last year.

Class 2.—This class of general diseases was also marked by very few detentions, there being but 36 in all, and only 11 detained on account of tuberculosis.

Class 3.—This class of eye diseases, so prominent in earlier years of the inspection work, has similarly become greatly reduced. This is due in large measure to the care exercised by the medical officers at the European seaports. There were only 298 cases detained, of which 100 were for conjunctivitis, 36 for observation, and 151 actually termed trachoma, with 137 rejections, as compared with 486 rejections in 1904-5.

Class 4.—As already referred to regarding deportations, this class of nervous diseases has taken on a special importance. While but 5 cases of insanity were detained and 5 rejected, the number detained for mental observation was 67, and 57 were detained on account of feeble-mindedness and imbecility, and 54 were rejected. One epileptic only was rejected.

Class 5.—Diseases of the circulatory system are naturally rare in the class, usually young people, who emigrate. It is probable, however, that more would be detected if a physical examination were made in all cases; but this seems unnecessary when it is noted that but 7 cases were deported on account of heart disease.

Class 6.—In all, there were but 23 detained on account of diseases of the respiratory system, and but 3 deported, of these 2 being for pneumonia.

Class 7.—Diseases of the digestive system are few, as would be expected from the age of most immigrants. There were, however, 13 deportations on account of hernia, of which 11 occurred at New York. Presumably the physical examination of the immigrants has been more complete at this port.

Class 8.—The diseases of the genito-urinary system seldom bear such outward signs as to make their detection on ordinary inspection easy. In all, but 12 were detained and 7 were rejected.

Class 9.—That in 144,789 immigrants only 59 cases should have been detained on account of any disease of the class of skin diseases says much for the general cleanliness of the immigrants. Of these, 29 were Orientals in a total of 32 cases detained for scabies. Only 4 cases of tinea were detained, and all were rejected, as it is a tedious disease to treat, and very communicable.

Classes 10 and 11.—Obviously, malformations and senility are so readily diagnosed that these conditions are not very frequently found amongst immigrants on arrival. There were 2 cases of spinal defect, and 1 of senility rejected. In the class of accidents, while detention is necessary for a time, their curability makes rejection but seldom necessary.

Class 12.—Except class 3, this class of ill-defined causes contains the largest number of detentions, these being 277. Of these, 220 were for general observation. The generally unsatisfactory appearance, both mentally and physically, of many immigrants coming out of the steerage often demands a more careful observation than the necessarily rapid examination in the line makes possible; hence, thoroughness dictates that certain immigrants be sent to the hospital where a more careful examination can be made. Of these, 3 died, but the rest passed the final inspection. The

question of poor physique enters definitely into such an examination, and probably could be pushed further with advantage. Of these, 38 were rejected out of 41 detained. When it is noted, however, that but 6 in every 1,000 immigrants were detained, the class, on the whole, must be considered satisfactory.

I thus have summed up the chief features of the work of the medical immigration service during the year in which whatever immigration there was has been the result of former efforts rather than the effect of any new initiative. While the number of immigrants during the year has been much limited, the statistics given nevertheless present many points of interest. What we learn from these may well serve to indicate various directions in which still greater attention may be given to medical inspection in the permanent interests of the people of Canada.

Respectfully submitted,

PETER H. BRYCE,
Chief Medical Officer.