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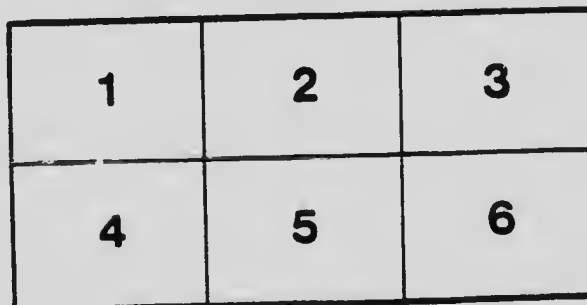
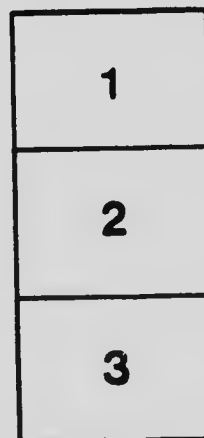
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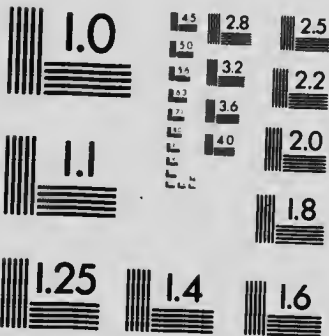
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DOMINION WATER POWER BRANCH
DEPARTMENT OF THE INTERIOR
OTTAWA, CANADA

WATER RESOURCES PAPER No. 10.

GENERAL GUIDE
FOR THE
**COMPILATION OF WATER POWER REPORTS AND
THE SECURING OF FIELD DATA**

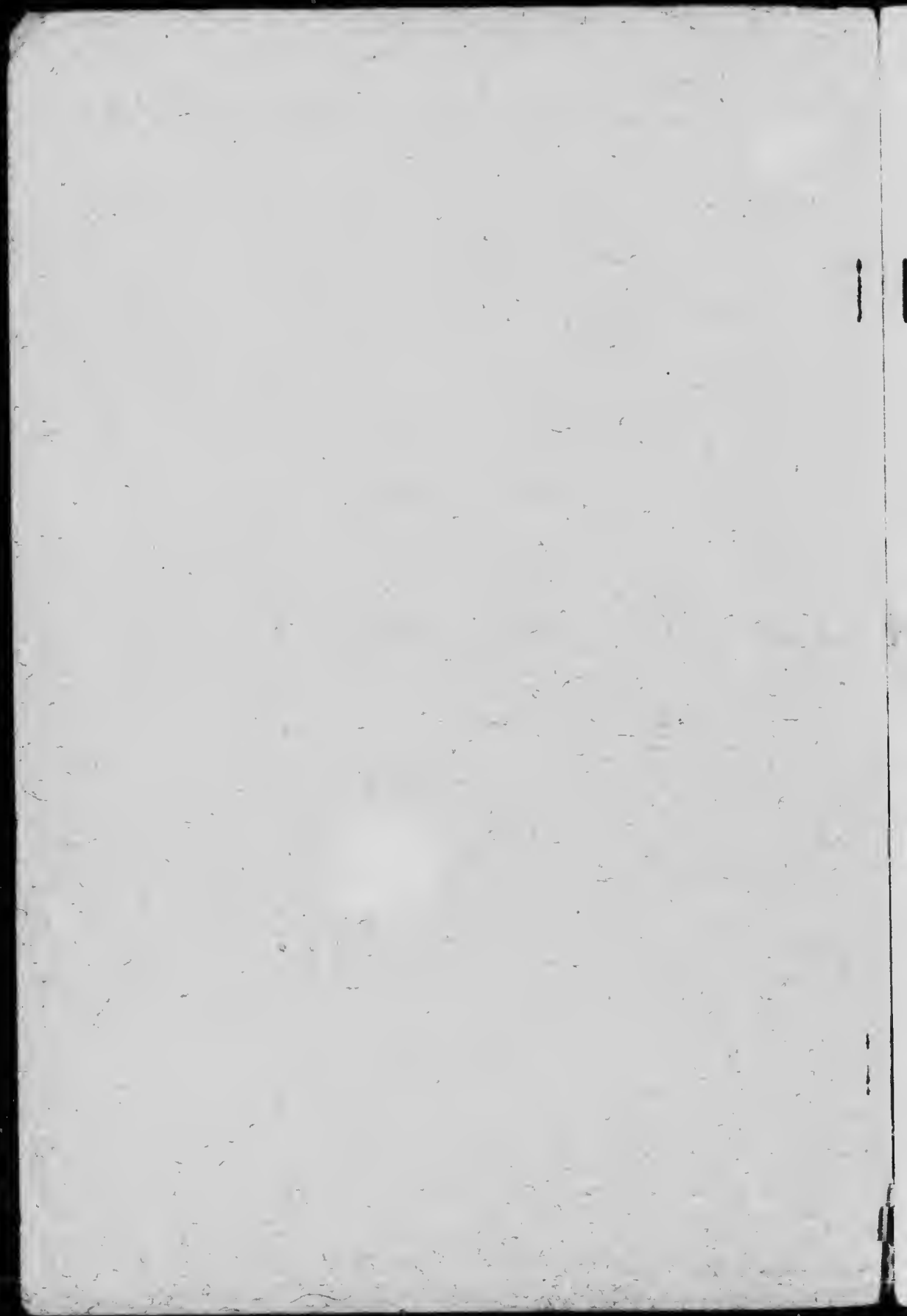
BY

J. T. JOHNSTON, B.A., Sc.
Hydraulic Engineer

Prepared under the direction of the Superintendent of Water Power

Reprint of Appendix 5c, Part VIII, Annual Report, 1914.

OTTAWA
GOVERNMENT PRINTING BUREAU
1915



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DEPARTMENT OF THE INTERIOR
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CONTENTS.

	PAGE
INTRODUCTION.....	7
Summary of principal divisions.....	7
Details of principal divisions.....	8
Building report for submission.....	14
Investigation and inspection of a series of sites.....	14

LOOSE LEAF FIELD FORMS APPENDED

R-11, Diary Form.....	17
R-12, Level Form.....	18
R-13, Transit stadia Form.....	19
R-14, Level stadia Form.....	20
R-15, Transit Form.....	21
R-16, Level Form.....	22
R-17, Description of gauging station Form.....	23
R-18, Current meter Form, Ice cover.....	25
R-19, Current meter Form.....	27
R-20, Photograph Form.....	29
R-21, Metering Form.....	30
R-22, Change of gauge Form.....	31

SPECIMEN MAPS AND PLANS APPENDED

Plan showing watershed of the Winnipeg river.....	Inside back cover.
Curve of mean monthly discharges of Winnipeg river at Slave falls, Kenora and Fort Frances.....	" "
Plan showing existing plants and possible power sites on the Winnipeg river in Manitoba.....	" "
Profile of the Winnipeg river showing existing plants and proposed power sites.....	" "
Map showing the location of the gauging stations of the Manitoba Hydrographic Survey for the year ending March 31, 1914.....	" "
Map showing drainage area and possible power concentrations of the Manigotagan river.....	" "
Reconnaissance profile of Manigotagan river showing possible power concentrations.....	" "
Plan of Kananaskis falls dam.....	" "
General section of Kananaskis falls development.....	" "
Pasquia Reclamation Project Saskatchewan river to Cross Lake, Topographic sheet No. 1.....	" "
Pasquia Reclamation Project Saskatchewan river to Cross Lake, Topographic sheet No. 2.....	" "



OTTAWA, March 31 1914.

J. B. CHALLIES, Esq.,

Superintendent, Dominion Water-Power Branch,
Ottawa.

SIR,—I have the honour to submit a General Guide for the Compilation of Water Power Reports and the securing of Field Data, for use by the field engineers of the Dominion Water Power Branch.

I have the honour to be, sir,

Your obedient servant,

J. T. JOHNSTON,

*Hydraulic Engineer,
Dominion Water Power Branch.*



GENERAL GUIDE FOR THE COMPILATION OF WATER POWER REPORTS AND THE SECURING OF FIELD DATA.

The increasing number of inspections and field investigations on the part of the field engineers of the Dominion Water Power Branch, has rendered desirable the preparation of a uniform guide upon which may be based the various reports forwarded to head office, in order that, so far as possible, their form may be standardized.

It is also considered that a guide of this description can be used to advantage by the engineer when making his field investigations into the projects under examination. A careful study in the field of the points outlined herein, will, as a rule, prevent the overlooking of important data which should be secured on the ground.

The guide is therefore submitted for a dual purpose; first, for use as a framework for the standardization of the text of power reports submitted by field engineers, and second, for use by engineers while in the field as a general memorandum of the various features calling for attention and field study.

Field investigations vary in character, the majority dealing with the following conditions: (1) Applications for water-power privileges, such applications being unaccompanied by detailed data as to the site or stream. (2) Applications for water-power privileges accompanied by fairly well developed plans, setting out the general scheme of development. (3) First-hand investigation of entirely new sites or series of sites, for the purpose of studying power, storage and conservation features.

In preparing the following instructions, the above has been kept in view, and the outline hereunder is intended to serve as a general guide, only such portions being utilized as are directly applicable to the class of report under preparation. It is not intended that these instructions should limit a report solely to the ground covered herein; much must be left to the discretion of the engineer in charge of the investigations. The points briefly dealt with represent, however, the general important features which require investigation and discussion, in order that the ground may be completely covered.

All reports should be addressed to the Superintendent of the Dominion Water Power Branch.

SUMMARY OF PRINCIPAL DIVISIONS.

A brief summary of the sections and sub-headings follows. Further details of the ground to be covered under each section are given later.

1. Sources of data used in report—

- (1) Why investigated and scope of investigation.
- (2) Personal examination—route followed and time consumed.
- (3) Run-off records from departmental stream measurement offices.
- (4) Maps.
- (5) Existing reports.
- (6) Miscellaneous.

II. *Summary of report.*III. *General introductory.*—

Description, including location as to province, river, cities, township, range and section.

IV. *Water Supply.*—

- (1) General description of drainage area.
- (2) Actual records if available, showing maximum, minimum, and mean discharge for each month, also absolute minimum for year. Measurements on ground if foregoing are not available.
- (3) Rainfall, temperature, evaporation.
- (4) Storage, already developed and effect of same.
- (5) Storage possibilities,—
 - (a) Location of reservoir site or sites.
 - (b) Height of dam and class of dam suitable.
 - (c) Capacity of reservoirs and extent of adjacent drainage basin.
- (6) Prior water rights above and below power site,—water supply, irrigation or power.
- (7) Ice conditions, during winter months and in spring flood (frazil, anchor and floating ice).
 - (a) Under present conditions on river.
 - (b) After construction of plant.
 - (c) Without storage.
 - (d) With storage.

V. *Description of existing Power Development on the River.*—VI. *Detailed Work at Site investigated.*—

- (1) Scope of the inspection at the site.
- (2) Accessibility of site and transportation problems.
- (3) Detailed information and plans at site,—
 - (a) Contour plan of site.
 - (b) Cross sections.
 - (c) Profiles.
- (4) Foundation conditions.
- (5) Flooding and pondage.
- (6) Existing interests.

VII. *Possible Power Developed.*—

- (1) Horse-power at wheel shaft without storage,—
 - (a) At minimum flow.
 - (b) For the 9 high months.
- (2) Horse-power at wheel shaft with storage. Discuss utilization of local pondage at site for peak loads.

VIII. *Estimates.*—

Cost of power developed.—Capital and annual.
 Cost of storage.—Capital and annual.

IX. *Market for power.*—

- (1) Present.
- (2) Future.
- (3) Length of transmission lines, etc.

X. *Suggestions and Recommendations.*

XI. *Appendices.*—

- (1) Plans pertinent to the actual sites investigated.
- (2) Photographs.
- (3) Run-off records.
- (4) Gauge records.
- (5) Reports.
- (6) Maps and plans of existing power plants and structures, etc.

DETAILS AS TO THE FOREGOING SECTIONS.

I. *Sources of Data used in Report.*

This section should set out the basis and authority on which the investigation was instituted, outline the scope of the same, and the organization by means of which the field data were obtained.

It is also intended to summarize the sources of information upon which the subject matter of the report is founded, and to set out in full the degree of thoroughness with which the investigation has been carried on.

II.—*Summary of Report.*

All the essential features of the report should be brought together here, in a brief statement forming a concise summary of the whole, tabulation of results being made where possible.

III.—*General Introductory.*

This section should cover the general features of the situation being investigated. This involves a general description of the river and its characteristics, and of the basin as a whole, touching on drainage area, source, direction, drop, falls, rapids, banks, river bed, tributaries, lakes, muskegs, swamps, forest, cultivation along banks, settlements, glaciers, general topographical and geological features, etc., and giving the definite location of the site under study.

IV.—*Water Supply.*

(1) *General description of Drainage Area.*—Under general description of the drainage area those features should be dealt with which are of direct importance to the question of the water supply, such as probability of sudden floods, influence of the seasons, etc.

(2) *Run-off Records.*—If the site inspected is situated on one of the rivers covered by any of the systematic stream measurement work carried on by the department, the existing records should be utilized as a basis upon which the run-off may be discussed. A summary of the essential features of the discharge covering high, low and mean flow, etc., should be inserted, while the records in their complete form should be attached as appendices in Section XI. of the report. Where no records have been taken on the river, estimates or measurements of the flow at the time of the inspection should be made, either by meter or by whatever method of stream measurement is most applicable or convenient. From this, in conjunction with high water marks in evidence and from the testimony of local inhabitants as to extreme low and high water conditions, and from a study of the run-off conditions of streams in the vicinity, as careful an estimate as is possible should be made of the extreme low and high water conditions on the river, also of the average low and high flows which may be expected. With this data, the months and seasons in which the above conditions are usually in evidence, must be given.

(3.) *Rainfall, Temperature and Evaporation.*—The maximum, minimum and mean annual rainfall as recorded at the nearest stations maintained by the Meteorological Service, should be discussed, being utilized in estimating the run-off if stream flow records are not to hand. Temperature and evaporation records, if available, should also be fully considered.

(4.) *Storage already developed.*—If storage is already in operation in the river basin above the site, a full discussion of the same is required under the heads of location; owners and operators; date of installation; area and volume of reservoir and of tributary drainage basin; description and condition of dam and structures; effect on natural run-off conditions, actual experience since being placed in operation covering date, time of filling and emptying reservoir; gauge records if available (to be attached in full in appendix); method of control; photographs, comments, etc., etc. Copies of plans of structures are to be secured if possible.

(5.) *Storage possibilities.*—The question of storage possibilities and locations on the upper waters should be covered as thoroughly as the conditions of the inspection, and the detailed instructions issued therewith, may require. If a visit is made to any lakes in the upper basins, the general elevation of the banks of the same relative to the water service should be recorded, with notes as to what flooding would result if the lakes were raised to various definite limits. When the reservoir is in a surveyed district the approximate land flooded should be given in sections and quarter sections.

At the outlets all the conditions affecting the construction of a dam, and the type of structure advisable, are required. This will include, foundation conditions; height and character of banks; a section across the river at the point selected for the dam carried sufficiently far up the banks to cover all possible limits to which it may be advisable to hold the lake surface.

A profile should be secured of the water surface from the lake outlet to the dam-site. Should there be a possibility of securing storage by means of dredging or otherwise clearing the outlet, a profile should be obtained of the water surface, and, if possible of the river bed from the lake to a sufficient distance below the dam-site; any other field information necessary to determine what is involved in the construction of a dam and in the operation of a storage reservoir is also required.

When circumstances render it inadvisable to visit the upper waters of the basin for the purpose of personal inspection, a review of the storage situation, as far as it can be gathered from existing maps and from local information, should be included.

The surface area and capacity of all storage reservoirs considered, together with the area of the drainage basins adjacent to the same and their sufficiency to fill the reservoirs, should be fully covered; the beneficial effect of such storage on the flow of the river should be discussed.

(6.) *Prior Water Rights.*—Any existing or projected schemes of municipal water supply, irrigation or water-power, which have diverted or may in the future permanently divert a portion of that river flow, thus reducing the water available at the site, should be investigated and reported on.

(7.) *Ice conditions.*—The general conditions in winter along the river as a whole, covering time of freeze up, conditions in mid-winter, and time and manner of break up in the spring, should be secured from whatever local sources may be available, or, if possible, from personal observation. The question of anchor and frazil ice under present conditions should be considered carefully, also that of ice jams in the spring, both above and below the site. The possible formation of ice jams below the site and the consequent effect on the tailwater and floor elevation of the power house, should be particularly noted.

The frazil and anchor ice conditions, to be anticipated at the site after the construction of the plant, should be discussed. In this connection a careful study covering the winter conditions and troubles experienced in the operation of any existing plants on the river, together with methods of remedying the same, is advisable.

The probable effects on ice conditions of the development of storage for the purpose of increasing the winter flow, should also be covered.

V.—Description of existing Power Plants.

Existing power developments along the river should be dealt with under the following general heads: ownership of plant and when constructed; description of layout and structures (dam, intake, penstocks, tunnels, canal, forebay, power house, foundations, transmission, sub-stations, etc.) and present conditions of the same; head at different seasons; installation (electrical and hydraulic machinery in detail); auxiliary power, power load and power factor, daily load curves if possible, use of power, market for power, present and future; special features, etc., etc.; comments and photographs. Plans of plant to be secured if possible and attached to appendix.

VI.—Detailed work at Site Investigated.

(1) *Scope of the inspection at the site.*—If a definite and well defined project be investigated, the engineer making the inspection should study the general scheme carefully in the light of his personal inspection of the ground, and should record his opinion as to the engineering and economic feasibility of the same, pointing out whatever weaknesses may be apparent, and recommending whatever changes in design, layout or scheme of development he may consider advisable.

When no definite scheme of development has been proposed, the inspecting engineer is expected to outline the most feasible scheme which his study on the ground may suggest, setting out the head available and method of securing the same. He should also gather all information and field data which may be essential to its proper consideration and to getting out the estimates. A layout of his scheme, together with all pertinent data, should be plotted on the contour plan of the site.

Arrangements should be made on the ground for the installation and continued reading of gauges at all points where the record of the same is advisable.

Numerous photographs illustrating the site are required.

(2) *Accessibility of site.*—Secure all data with reference to accessibility of the site. This includes the distance to the nearest railway line; the ease or difficulty of building a spur line to the site should the size of the development warrant it; the condition of any roads in the vicinity and their suitability for heavy transport; the length of new road that may be required; the use which can be made of water transportation as a means of access. In brief, the best means of connecting the site with existing lines of traffic, should be covered.

(3) *Detailed information and plans at site.*—(a) *Contour plan.*—Enough roughment work must be done to permit of plotting a fairly accurate contour plan of the whole vicinity covered by the proposed layout. These contours should extend above the highest elevation to which there is any possibility of raising the headwaters of the proposed plant. Sufficient notes should be taken to plot on the said plan, with the elevations, any rock outcrops which may be in evidence. Should the rock outcrop along both banks of the river, the continuous line of demarcation between the rock and the overlying material should be plotted, with the elevations, along both shore lines. The plan should also indicate all other classes of material, such as: clay, gravel, sand, loam, etc., which may be in evidence together with notes as to whether the site is wooded, cleared or cultivated, etc.

Water levels (together with date of taking, and river flow if possible) should be recorded and plotted on this plan at all important points, such as the brink and foot of falls and rapids, marking the limits of the still water above and below. A eddies and back waters should be marked and the elevation and date recorded. The general line of the brink and foot of any falls which will be involved in a proposed scheme of development should be secured and tied in to the plan. The high and low water levels to be expected in the tail water of the projected power station are of particular importance. Maximum high water marks along the shore should be carefully noted.

All natural features of which advantage might be taken in laying out a power plant should be fully shown on the plans and discussed in the report.

(b) *Cross Section*.—A cross section of the river bed and both banks along the line of the proposed dam, and sections of any alternative sites which may present themselves to the engineer on the ground, should be secured and plotted. Sections when plotted should indicate the character of the ground surface and river bed and of foundation conditions, either in evidence or assumed, throughout.

(c) *Profiles*.—A profile of the river surface from the upstream limit of the new pond created by the plant is desirable, but is not essential should the circumstances of the inspection render the securing of the same inadvisable. In all cases, however, a profile of the river surface and if possible of the river bed, from a point up stream from the dam, to below the tailrace of the power plant is required. A profile section through the dam, intake, headrace (or pipeline as the case may be), power plant, and tailrace, showing such governing elevations as, head water, crest of dam, floor of generator room, tail water, etc., should also be obtained in the best manner which circumstances may dictate.

Profiles of any pipe or canal lines are also required.

(4) *Foundation Conditions*.—Full note should be made of the natural conditions of the ground and river bed at the proposed dam and power house site. If there is rock in sight a full statement of its character, weathering qualities, etc., is required. If no rock is in evidence as careful an investigation of the existing conditions as circumstances permit is required.

(5) *Flooding and Pondage*.—The direct flooding which will be caused by the construction of the proposed or any feasible plant at the site should be determined approximately either by inspection or if necessary by rough instrument work. If the land has been surveyed the flooded portion can be listed by sections and quarter sections.

The utilization of this local pondage in connection with peak loads at the project plant should receive general consideration.

(6) *Existing Interests*.—All existing interests, such as bridges, trails, roads, railways, buildings, etc., that may be affected by the construction of the plant and by the consequent flooding, should be fully reported on. The question of the logging and fishing interests on the river should be discussed in considerable detail.

VII.—Possible Power Developed.

The question of power possible of development should be discussed from the standpoints of, first,—no storage available, and second,—storage available. Under the first head the power available at minimum flow and the power which might be developed during the eight or nine months not included in the extreme low water season should be covered.

Under both headings the beneficial utilization of the local pondage for peak loads and the consequent increased power output should be dealt with.

VIII.—*Estimates.*

Approximate estimates of the capital and annual operating costs of the proposed scheme of development and the basis on which these are made should accompany the report, together with similar estimates of the cost of any proposed storage reservoirs.

IX.—*Market for Power.*

This will involve as thorough an investigation as the circumstances warrant, of the present and future power market in the surrounding municipalities and district. Possibilities for the local use of power at the site and in the immediate vicinity are also to be covered. With the question of power market, the question of distance of transmission necessary to reach the same requires careful consideration.

X.—*Suggestions and Recommendations.*

Suggestions, comments or recommendations with reference to the foregoing and the writer's opinion as to the questions at issue should be set out in full. The location of suitable metering stations for the continuous record of the river flow at vital points should be covered in these recommendations. The question of sources of power other than water, in the vicinity and their possible more economic development is, at times, most important. All recommendations should be set out definitely and concisely.

XI.—*Appendices.*

(1) *Plans.*—(a) A general plan (a section of published map is desirable) showing the location of the power and storage sites with reference to centres of population. (b) A general plan (a section of published map) showing the whole drainage basin above the power site, together with storage reservoirs. (c) Contour plans of the sites of power plants and storage dams. (d) Cross sections along dam sites. (e) Profiles of reach of river affected and of pipe and canal lines. (f) Any other plans warranted by the nature of the investigation.

These detail plans should, if at all feasible, be plotted on standard sheets, *i.e.*, outside measurement 40 inches by 32 inches, and inside or border measurement 37 inches by 30 inches. This allows 1-inch border on the top, bottom and right edge, and a 2-inch border on the left edge for binding, if necessary. Lettering on these plans *should permit of reduction to at least one-quarter size.* Reports may, with advantage, be illustrated by general plans of suitable size for inclusion (with folding if necessary) by binding in the report cover. All plans, sections, and profiles, etc., should be suitably numbered, and should be referred to in the text by these numbers whenever necessary. A complete list of the above plans, giving numbers and description should be included in the table of contents of the report.

(2) *Photographs.*—A set of all the views taken to illustrate the different features of the report should be mounted and included. Where these views deal with power plant and storage dam layouts, they should be accompanied by a sketch plan showing the point from which each is taken, and the direction the camera faced. The films should be numbered, dated and titled, in order that all prints may be immediately recognized. A complete list of the photographs, giving numbers, date and subject should be included in the table of contents of the report.

(3) *Run off records.*—All tabulated records and plotted curves which may have been secured.

(4) *Gauge records.*—Copies of all gauge records which are of interest in connection with the power or storage features of the report.

(5) *Reports*.—Copies of any existing reports which may have been made with reference to power development on the river.

(6) *Maps*.—Any maps which may usefully illustrate the report, and any plans which may have been obtained covering existing power plants, storage works, bridges, etc., etc.

Binding Report for Submission.

All reports submitted to head office should be typed on the standard 8 by 13-inch paper, and should be suitably bound in the regular covers of the Dominion Water Power Branch. A table of contents listing the headings and the pages upon which each subject is dealt with should preface the text. The plans pertinent to the actual sites investigated (*i.e.* under No. 1 of the appendices) should, if not too bulky, be bound in with the report. If the plans are too numerous to be inserted in the bound report, they should be properly listed and forwarded in a roll or package.

The photographs should be listed and suitably mounted on 8 by 13-inch paper and bound with the report together with the sketch plans locating the same.

The run-off and gauge records together with copies of existing reports should be included in the bound report if not too bulky, otherwise they should be bound separately.

Maps and plans of existing structures should be suitably listed and forwarded.

INVESTIGATION AND INSPECTION OF A SERIES OF SITES.

Frequently the investigation of a river involves the consideration and detailed inspection of a series of power sites. In such cases, the report covering the work should follow the foregoing guide, with the following slight changes.

It will be noted in the foregoing, that Sections I to V can be applied as they stand, to the compilation of a report on a series of sites. Sections VI to VIII are directly applicable to each individual site; section IX is applicable to individual sites or to groups as conditions may warrant, and Sections X and XI are applicable as they stand to the ending up of the report. In preparing a report on a series of sites, the only alteration advised in the foregoing guide is that under section VI, each site be treated as a unit and completely covered according to the outline in Sections VI to IX. The new Sections VII and VIII will correspond to X and XI in the foregoing synopsis.

Following is the outline for a report covering a series of investigated sites, with the necessary alterations:—

I.—*Sources of Data used in Report*—

- (1) Why investigated and scope of investigation.
- (2) Personal examination, route followed and time consumed.
- (3) Run-off records from departmental stream measurement offices.
- (4) Maps.
- (5) Existing reports.
- (6) Miscellaneous.

II.—*Summary of Report*—

Concise statement of results of investigations covering all essential features of the report. Tabulation of results as to power and storage.

III.—*General Introductory*—

Description, including location as to province, river, cities, township, range and section.

IV.—*Water Supply*—

- (1) General description of drainage area.
- (2) Actual record if available showing maximum, minimum and mean discharge for each month, also absolute minimum for year. Measurements on ground if foregoing are not available.
- (3) Rainfall, temperature, evaporation.
- (4) Storage already developed and effect of same.
- (5) Storage possibilities.
 - (a) Location of reservoir site or sites.
 - (b) Height of dam and class of dam suitable.
 - (c) Capacity of reservoirs and extent of adjacent drainage basin.
- (6) Prior water rights above and below power site; water supply, irrigation or power.
- (7) Ice conditions during winter months and in spring mood (frazil, anchor and floating ice).
 - (a) Under present conditions on river.
 - (b) After construction of plant.
 - (c) Without storage.
 - (d) With storage.

V.—*Description of existing Power Developments on the River.*

VI.—*Sites Investigated.*

- (a) *Detailed work at each site investigated.*
 - (1) Scope of the inspection at the site.
 - (2) Accessibility of site and transportation problems.
 - (3) Detailed information and plans at site,—
 - (c) Contour plan of site.
 - (b) Cross sections.
 - (c) Profiles.
 - (4) Foundation conditions.
 - (5) Flooding and pondage.
 - (6) Existing interests.
- (b) *Possible Power Developed.*
 - (1) Horse-power at wheel shaft with at storage,—
 - (a) At minimum flow.
 - (b) For the 9 high months.
 - (2) Horse-power at wheel shaft with storage. Discuss utilization of local pondage at site for peak loads.
- (c) *Estimates.*

Cost of power developed, Capital and annual.
Cost of storage, Capital and annual.
- (d) *Market for Power.*
 - (1) Present.
 - (2) Future.
 - (3) Length of transmission lines, etc.
- (e) *Recapitulation.*

Comprehensive discussion of the foregoing data as to the individual sites, and a consideration of the same as a whole or in groups, as local conditions may warrant.

VII. *Suggestions and Recommendations.*VIII.—*Appendices.*

- (1) Plans pertinent to the actual sites investigated.
- (2) Photographs.
- (3) Run-off records.
- (4) Gauge records.
- (5) Reports.
- (6) Maps and plans of existing power plants and structures, etc.

The details of the data to be covered in each section are in the main as previously outlined in connection with the report on an individual site. A careful study of the details is desirable.

In section VI each site investigated should be completely covered under the headings,—a, b, and c, before discussion on a second site is commenced. The material for power under the heading "d" should be discussed with each individual site or with groups of sites as general conditions may warrant. Plans and photographs should be suitably numbered in order that they can be referred to, when necessary, in the text.

The general instructions as to binding will correspond to those given above in connection with reports on individual sites. Should the full data be too bulky for inclusion in one cover, it should be bound in sections as may be convenient.

Attached as appendices to this Guide are reproductions of the loose leaf forms R-11 to R-22, used in the field by the engineers of the Water Power Branch. Standard size leather covers, holding 5" x 8" fillers are provided, and have been found to give excellent satisfaction in the field. The great flexibility of the loose leaf system has proved of outstanding advantage to the rapid and efficient carrying on of survey work, more especially on those investigations where the results have been plotted into final shape in the field. The loose leaves also lend themselves most readily to a simple filing system in which the records of the survey are properly grouped, and are at all times available for ready reference.

Reductions of eleven typical plans are also appended herein, as illustrative of the general character of the plans desired for submission with various classes of reports.

FORM R17—FRONT.

R. 17.

RETURN TO

WATER POWER BRANCH, DEPARTMENT OF INTERIOR, OTTAWA.

DESCRIPTION OF RIVER STATION.

On (Creek) / (River) 'st

near Post Office, Prov. of

Established 191 by

Name of observer P. O. address

pay \$ occupation distance time of daily observation

Location of station with respect to towns, bridges, highways, railroads, tribu-
taries, islands, falls, dams, etc.

. Description and location of the gauge, also relative to the measuring station.
If chain gauge, give length from end of weight to the marker

Description of the equipment from which measurements are made

Location and description of initial point for soundings

ABLE.

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FORM R 17 —BACK.

Channel above the station: straight or curved for about feet, water swift, sluggish, etc.

Channel below the station: straight or curved for about feet, water swift, sluggish, etc.

Right bank: high, rocky or low, liable to overflow, clean or wooded, etc.

Left bank: high, rocky or low, liable to overflow, clean or wooded, etc.

Bed of the stream: rocky, gravel, sandy, clean or vegetation, shifting ...
Number of channels at low and high water, approximate depth of water, etc. ...

Note any condition which may affect the measurement, etc.

Bench marks: Describe fully, give elevation above zero of the gauge and above sea level or other datum, if possible; make sketch bringing out the principal features ...

Take sufficient soundings to develop a cross section of stream bed and, by use of level, develop banks to above high-water mark. Refer all elevations to gauge datum.

Make a sketch plan on cross section paper, showing the relative location of the station, gauge bench marks, tributaries, towns, etc.



R-21.

○

DEPARTMENT OF THE INTERIOR, OTTAWA

WATER POWER BRANCH

DISCHARGE MEASUREMENT NOTES

Date 191.... No. of Meas.

..... River at

Width Area Mean Vel. Cor. M. G. H.

Party Disch.

Gauge, checked with level and found

Measurement began at Measurement ended at

First reading of gauge ft. at	Date rated
Gauge ft. at sta. at	Method of meas.
“ “ “ “ “	No. meas. pts. Coef.
“ “ “ “ “	Av. width sec. Av. depth
Last reading of gauge ft. at	G. Ht. change (rate per hr.)

Meter No. % error by rating table

Meter No. % error by rating cable

Meas. from cable, bridge, boat, wading; Meas. at ft. above, below gauge

If not at regular section note location and conditions

Method of suspension Stay wire Approx. dist. to W. S.

Arrangements of weights and meter; top hole....; middle hole....; bottom hole....

Gauge inspected, found; Cable inspected, found

Distance apart of measuring points verified with steel tape and found

Wind upstr., down-str., across. Angle of current

Observer seen and book inspected

Examine station locality and report any abnormal conditions which might change relation of G. Ht. to disch., e.g., change of control; ice or debris on control; back water from; condition of station equipment

Sheet No. 1 of sheets. If insufficient space, use back of sheet.

R-22.

RETURN TO
Water Power Branch, Department of Interior, Ottawa
GAUGE RECORD

Station No.

..... River at

OLD GAUGE

Location

.....

.....

Zero 191.... Elev.

Kind of Gauge Length

NEW GAUGE

Location

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Established 191.... by

Zero 191.... Elev.

Kind of Gauge

Reading from ft. to

Gauge Reader Address

Time of observation

Reason for Change

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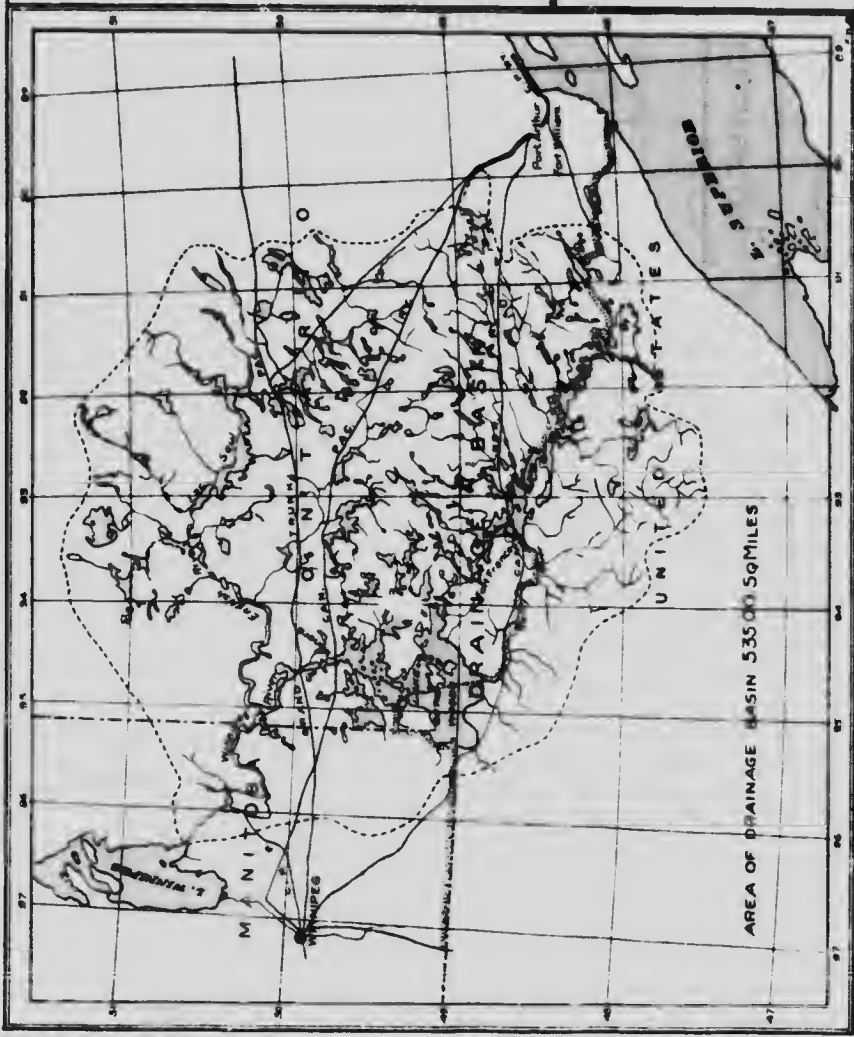
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Engineer.

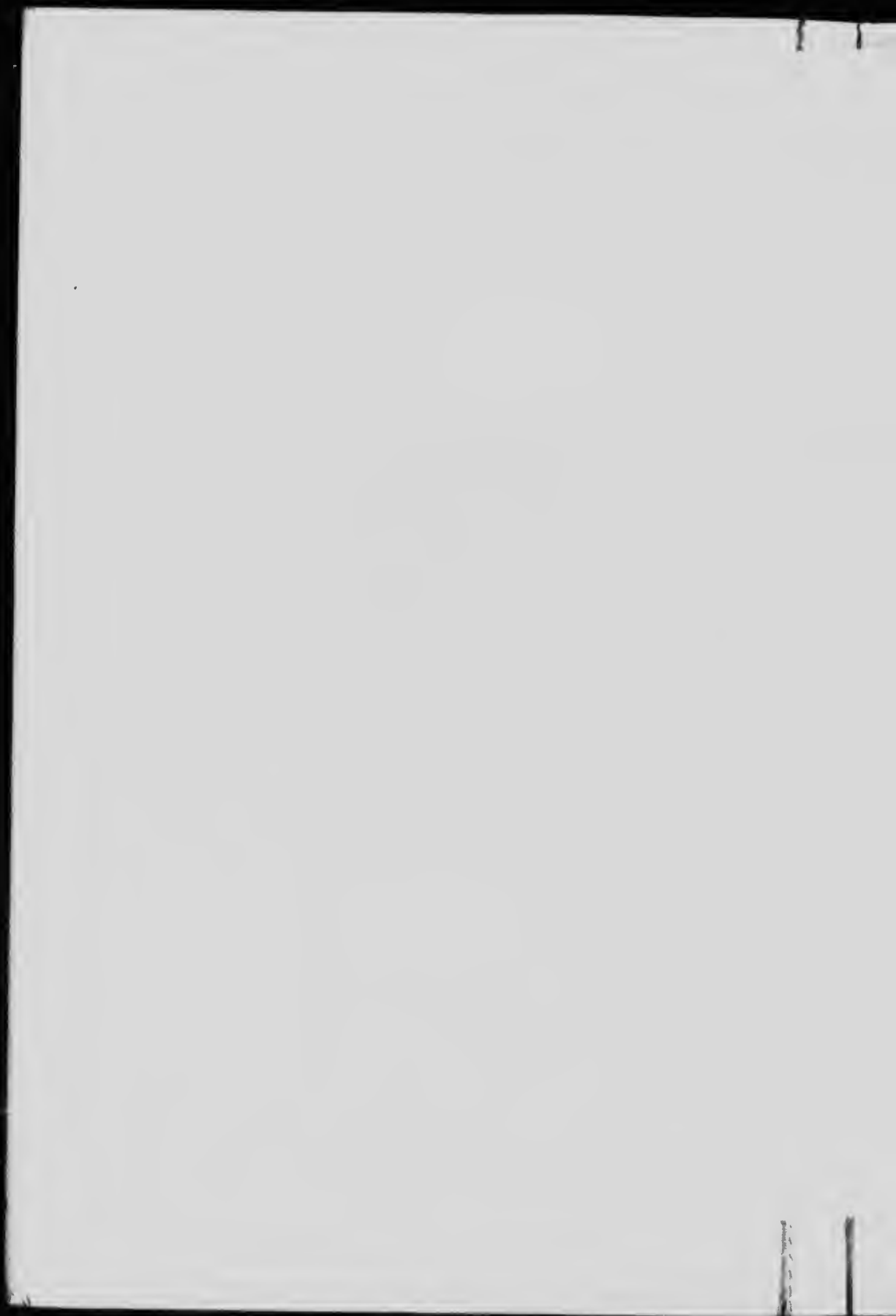


DEPARTMENT OF THE INTERIOR, CANADA.
WATER POWER BRANCH.
J.B. CHALLIES, SUPT.

MANITOBA POWER SURVEY
WINNIPEG RIVER
PLAN SHOWING
ENTIRE RIVER BASIN

Scale of Miles
0 10 20 30

Winnipeg, S.S. Scovill, Asst. Chief Eng.
March 31st 1914.



DOMINION WATER POWER BRANCH

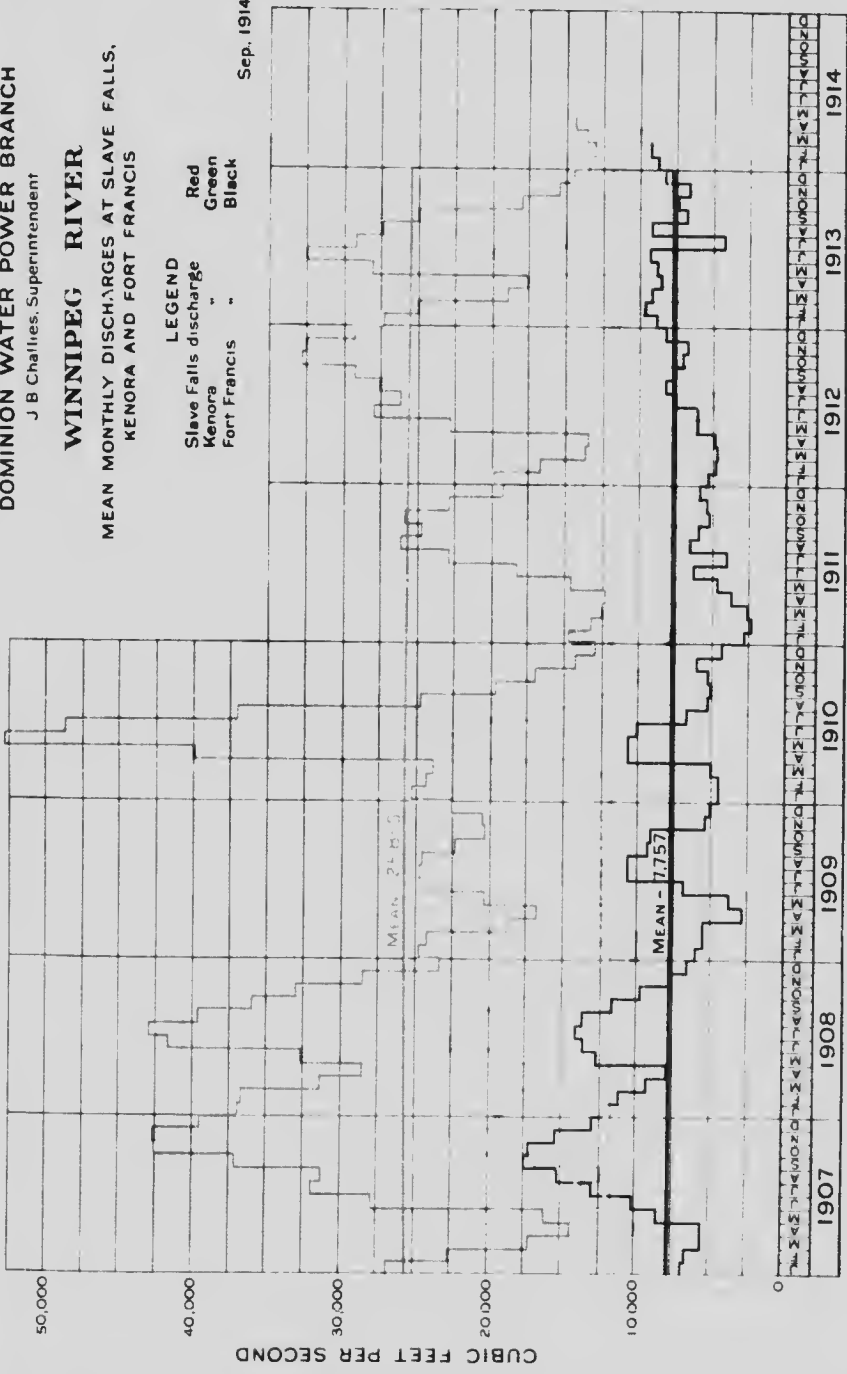
J B Challies, Superintendent

WINNIPEG RIVER

MEAN MONTHLY DISCHARGES AT SLAVE FALLS,
KENORA AND FORT FRANCIS

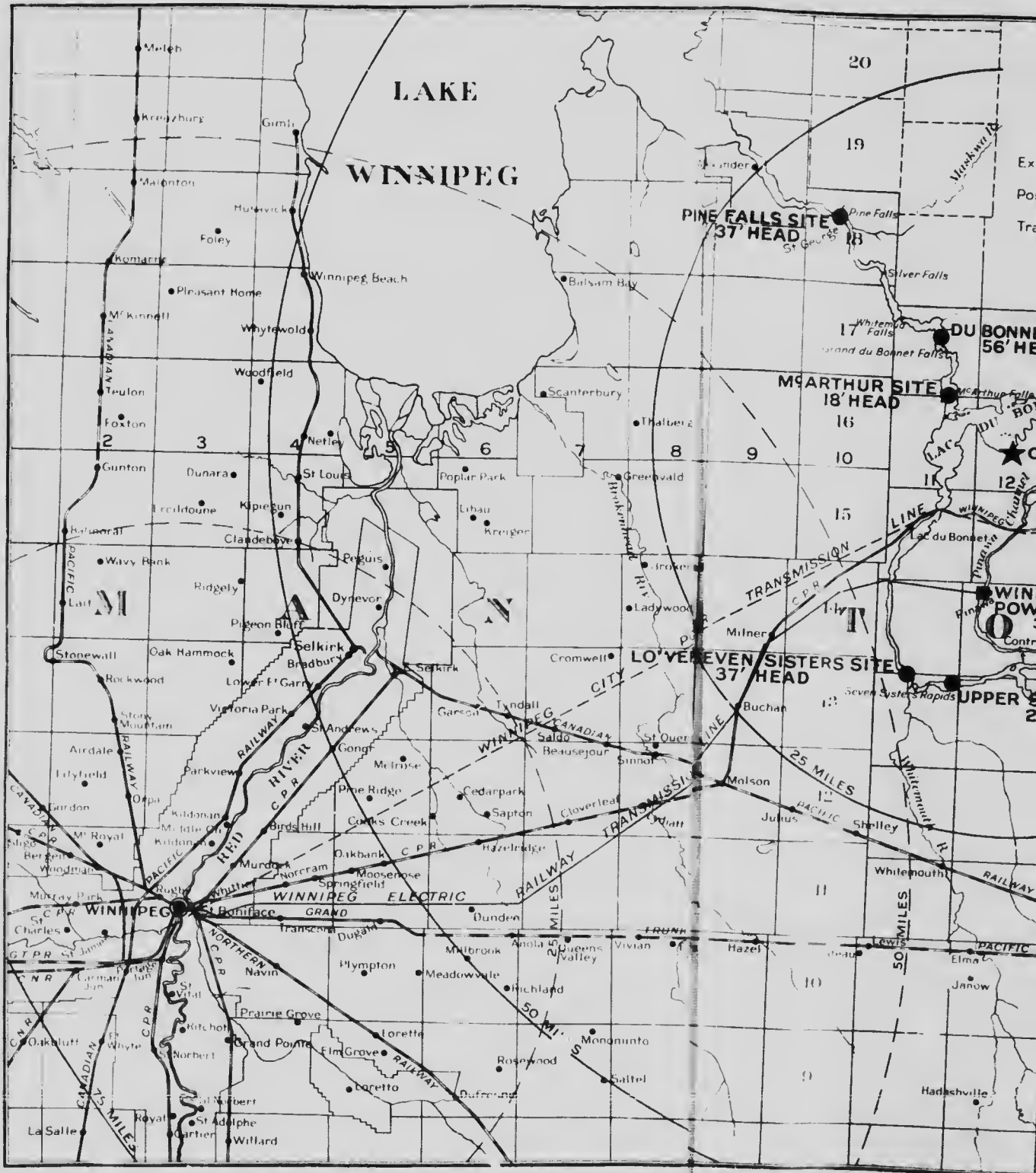
- LEGEND
Slave Falls discharge Red
Kenora Green
Fort Francis Black

Sep. 1914









LAKE WINNIPEG

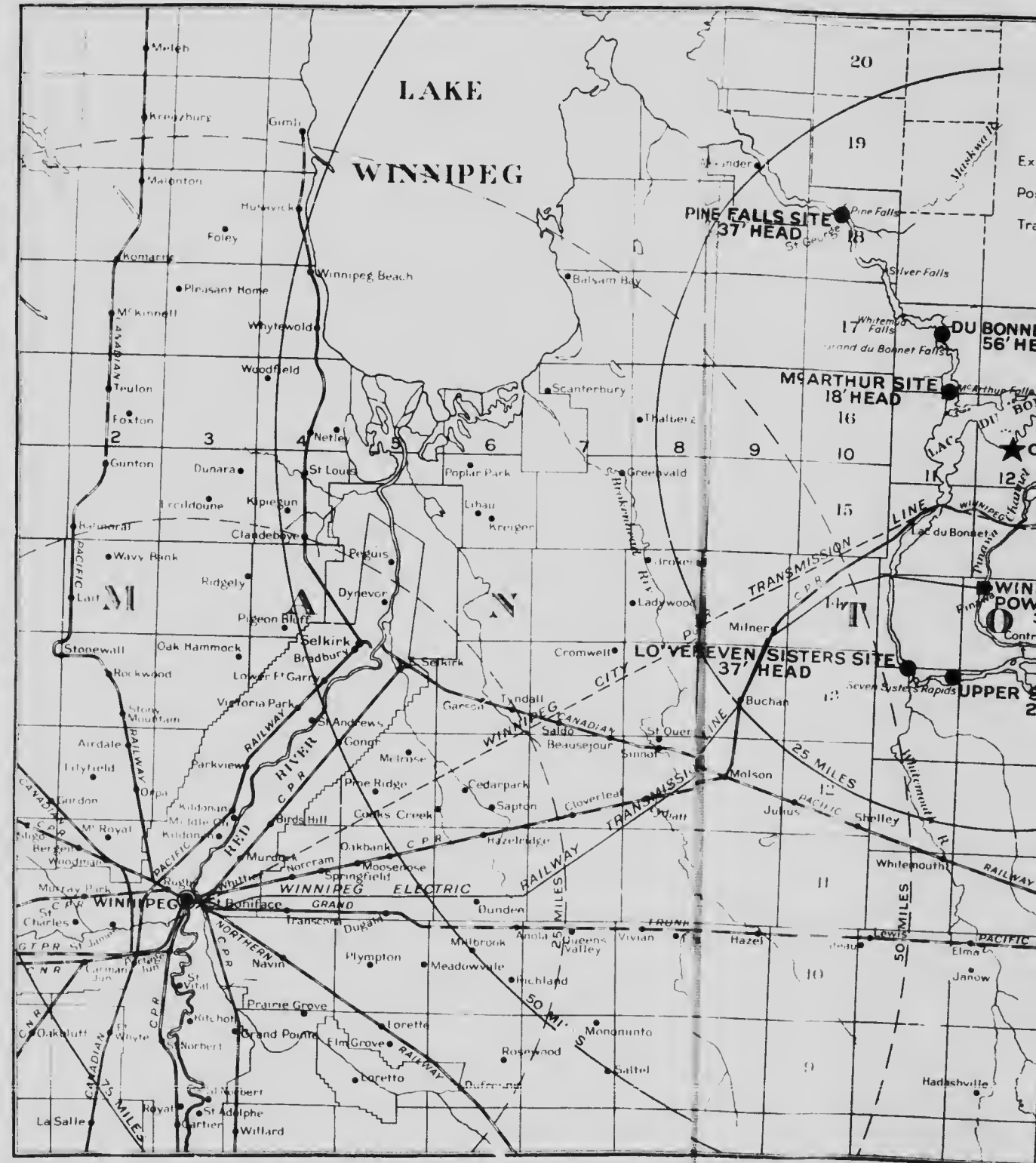
PINE FALLS SITE
37' HEAD

MCARTHUR SITE
18' HEAD

LO'VEEVEN SISTERS SITE
37' HEAD

DU BONNET
56' HEAD

WINNIPEG
POW



LAKE WINNIPEG

PINE FALLS SITE
37' HEAD

MCARTHUR SITE
18' HEAD

LO'VEEVEN SISTERS SITE
37' HEAD

DU BONNET
56' HEAD

WINNIPEG
POW

Department of the Interior, Canada

HONOURABLE W J ROCHE, MINISTER

W W CORY C M G, DEPUTY MINISTER

Water Power Branch

J B CHALLIES SUPERINTENDENT

LEGEND

- Existing Plants ■
- Possible Sites ●
- Transmission Lines - - - - -

WINNIPEG RIVER POWER SURVEYS

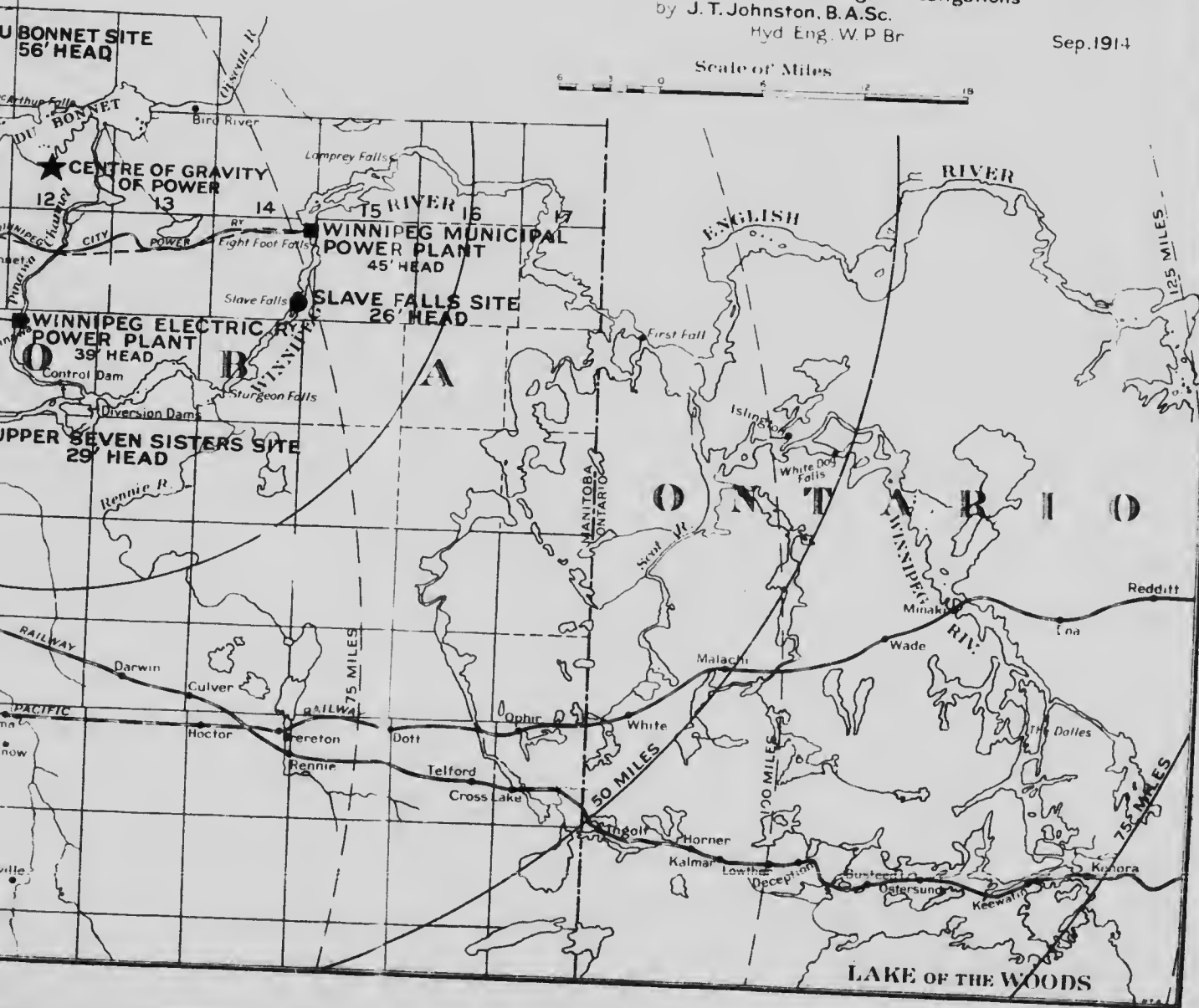
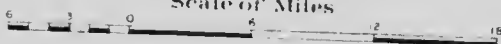
PLAN SHEWING

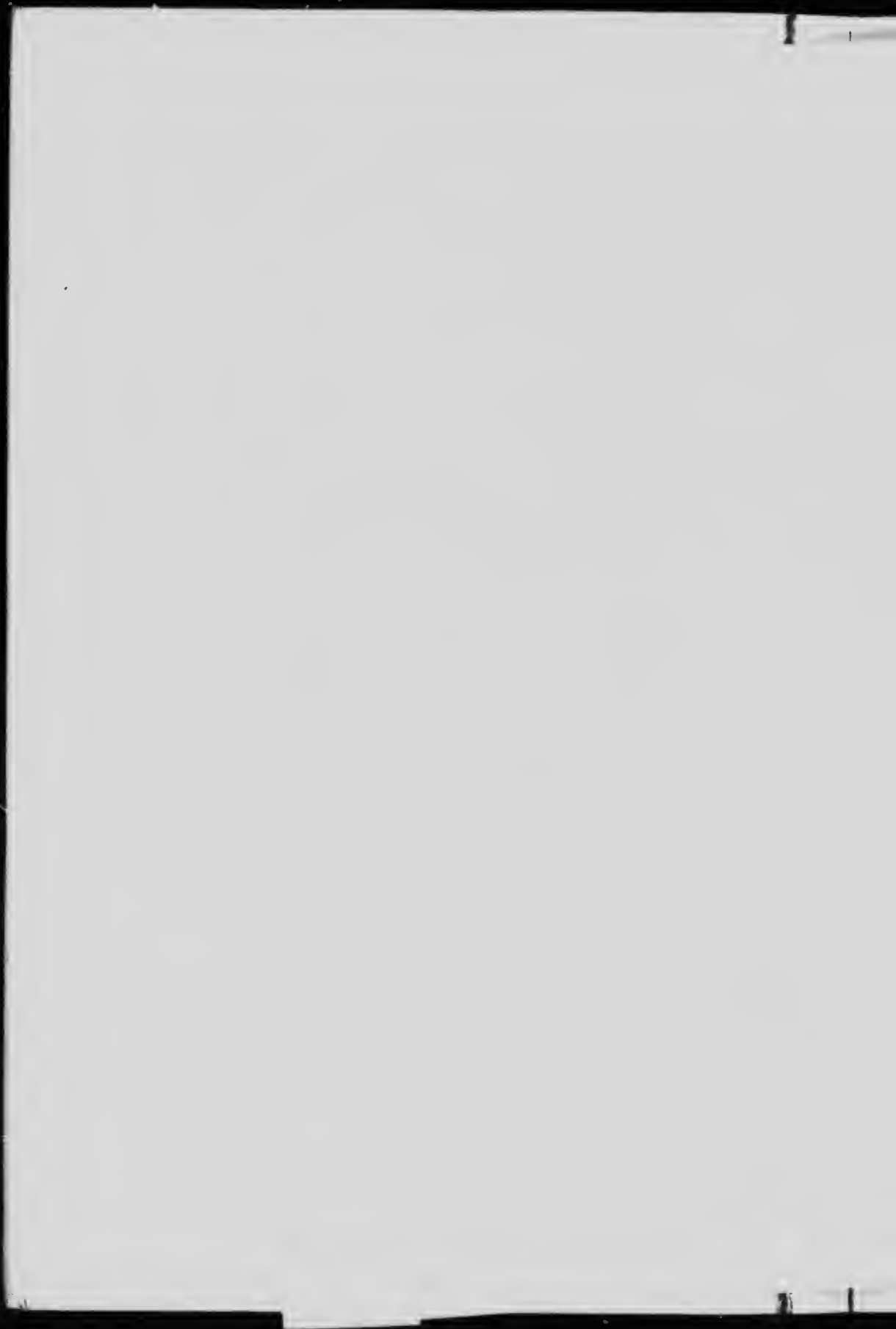
EXISTING PLANTS AND POSSIBLE SITES

To accompany report on Power & Storage Investigations
 by J. T. Johnston, B.A.Sc.
 Hyd. Eng. W. P. Br

Sep. 1914

Scale of Miles





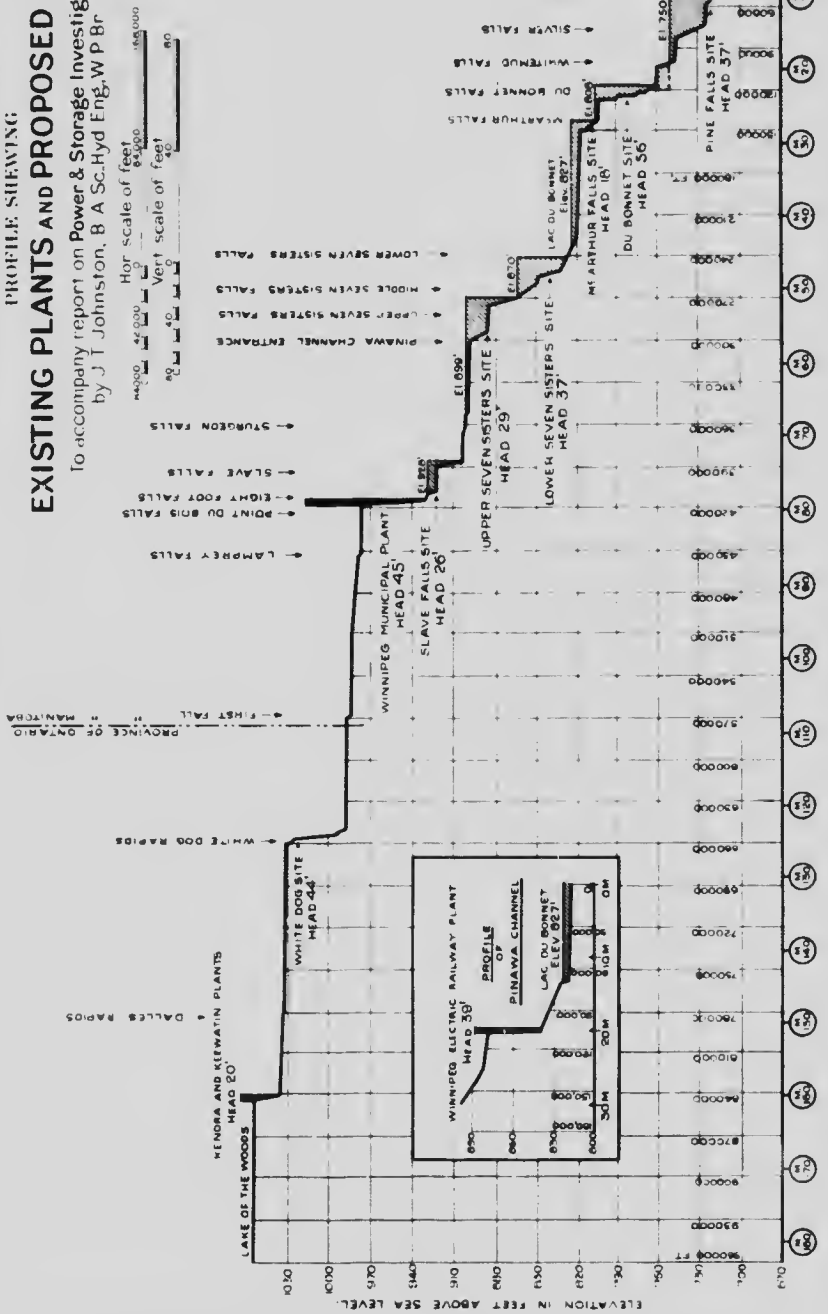
Water Power Branch
J. B. CHALLIS SUPERINTENDENT

WINNIPEG RIVER PROFILE SHEETING

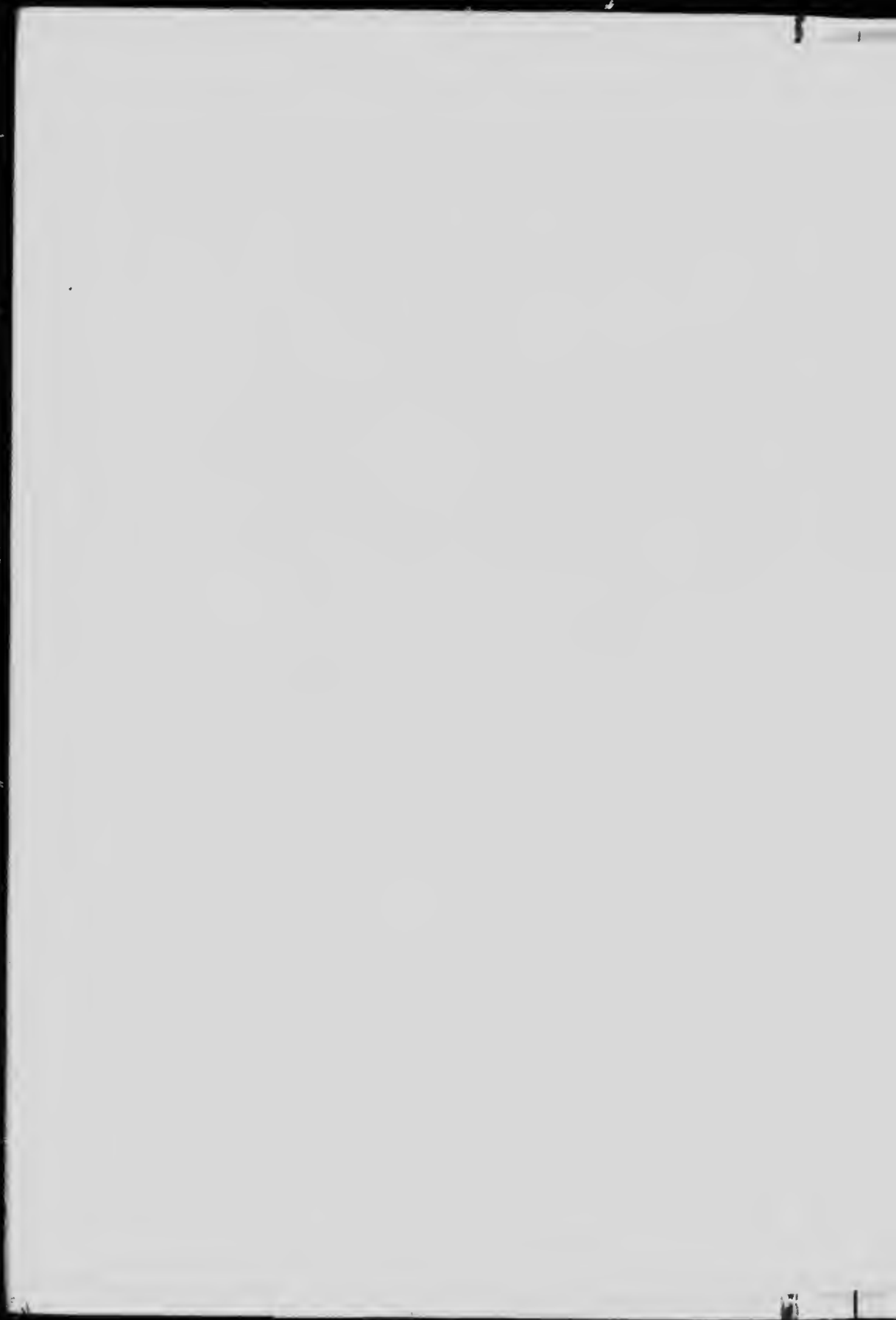
EXISTING PLANTS AND PROPOSED SITES

To accompany report on Power & Storage Investigations
by J. T. Johnston, B. A. Sc., Hyd. Eng., W. P. Br.

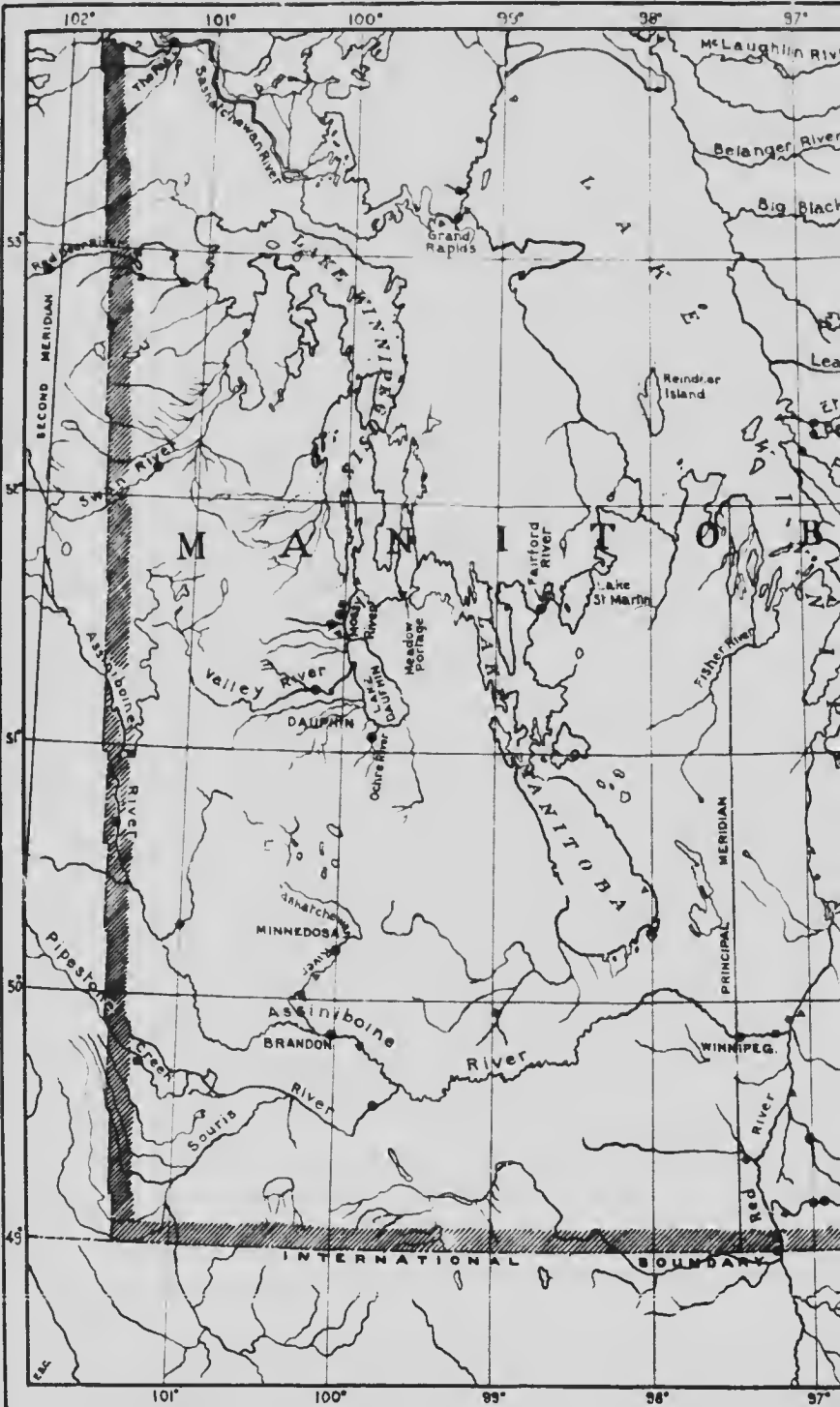
Sep. 1914



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DEPARTMENT OF THE INTERIOR, CANADA
HONOURABLE W J ROCHE, MINISTER
W W CORY, C.M.G. DEPUTY MINISTER
WATER POWER BRANCH.
J.B. CHALLIES, SUPERINTENDENT

MANITOBA HYDROGRAPHIC SURVEYS

MAP SHOWING
LOCATION OF GAUGING STATIONS
Scale of Miles

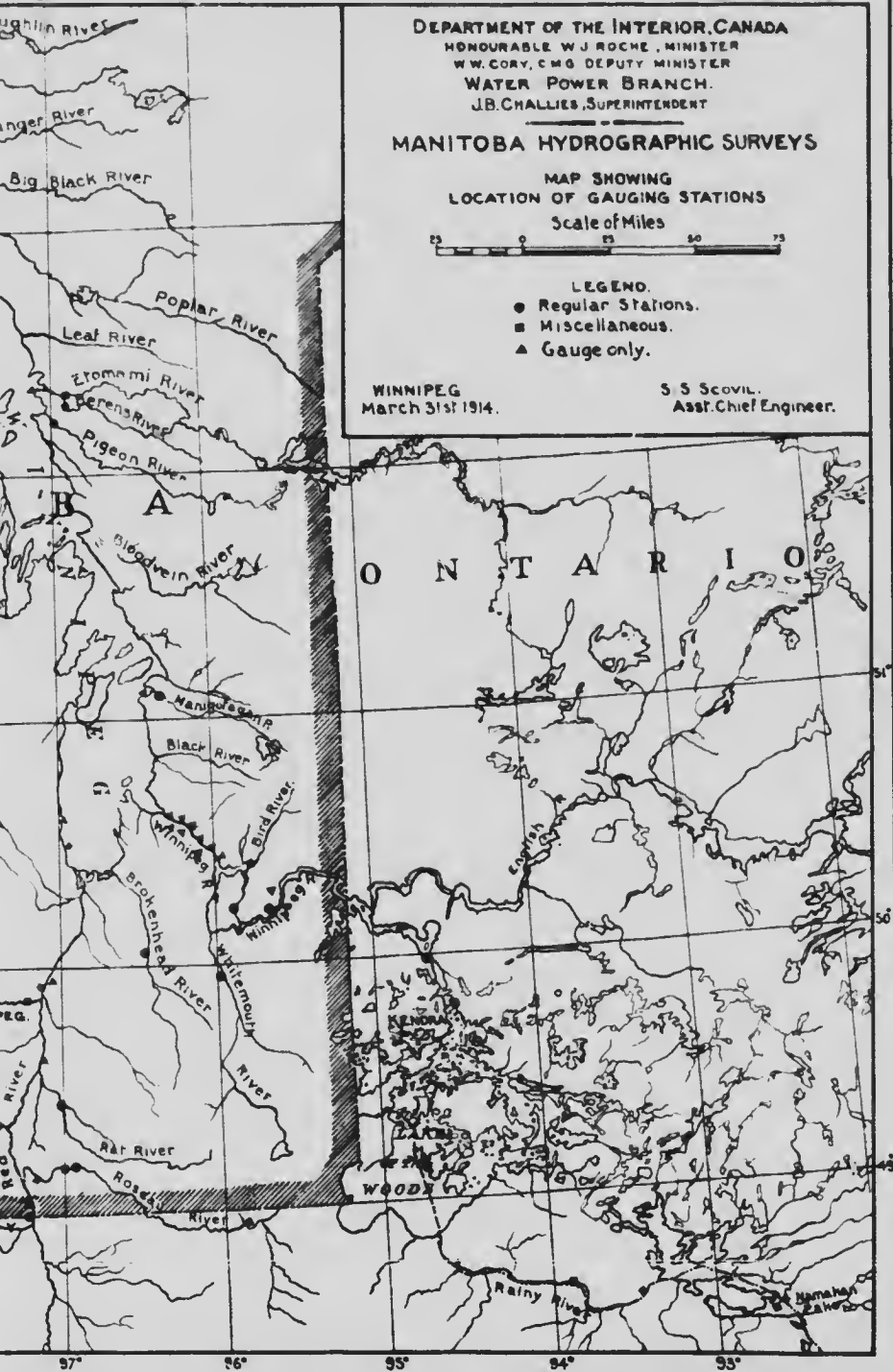


LEGEND.

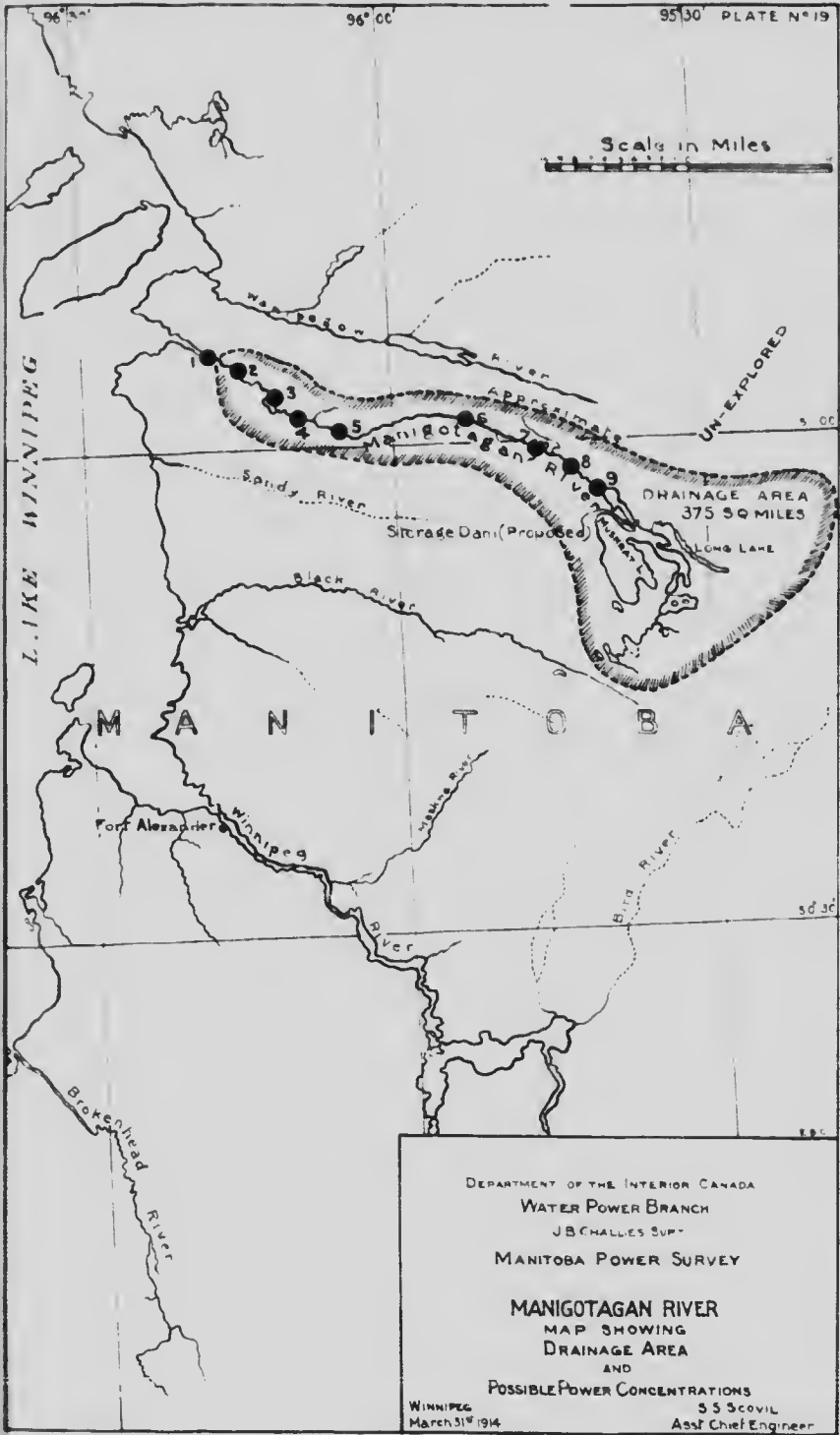
- Regular Stations.
- Miscellaneous.
- ▲ Gauge only.

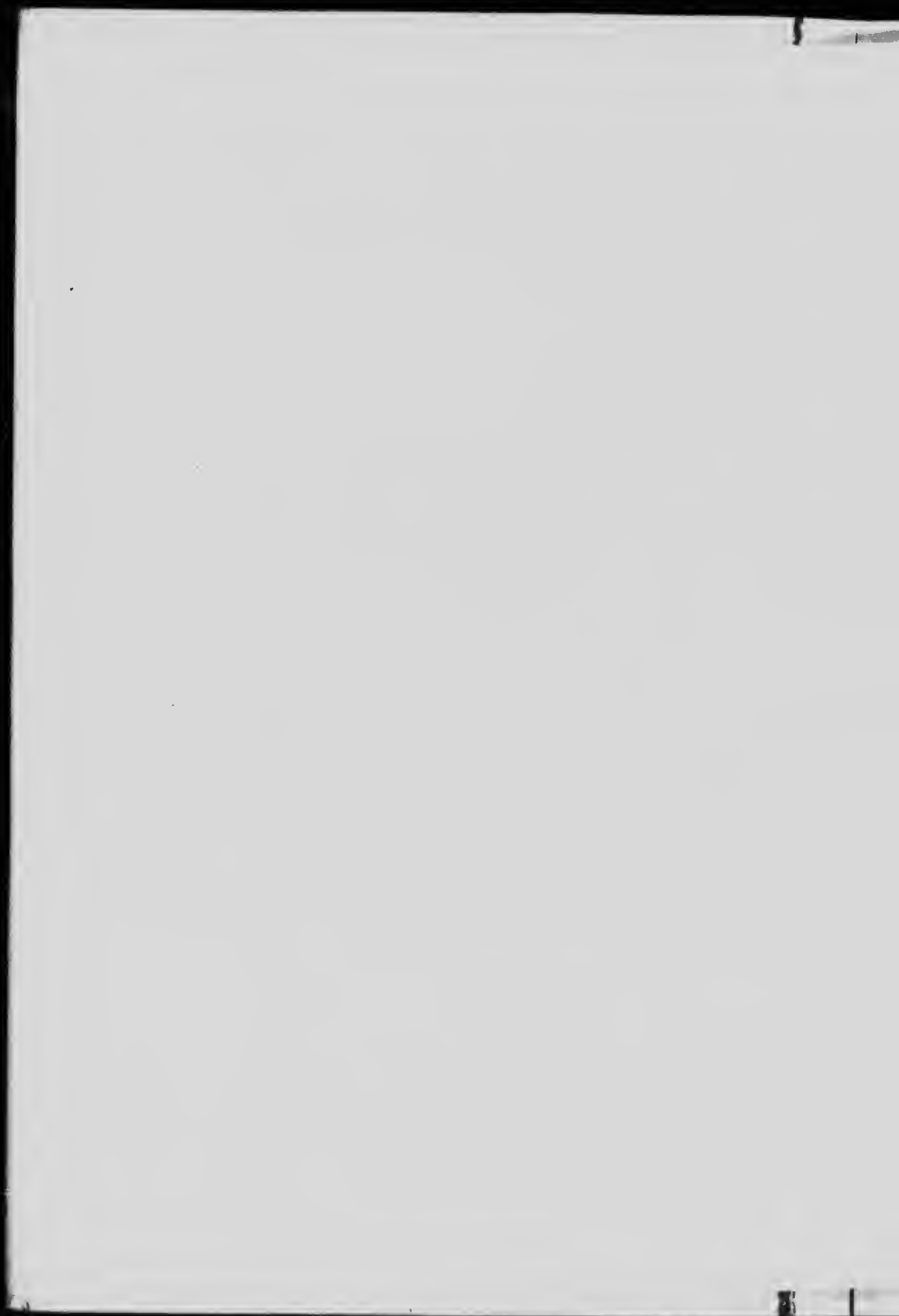
WINNIPEG
March 31st 1914.

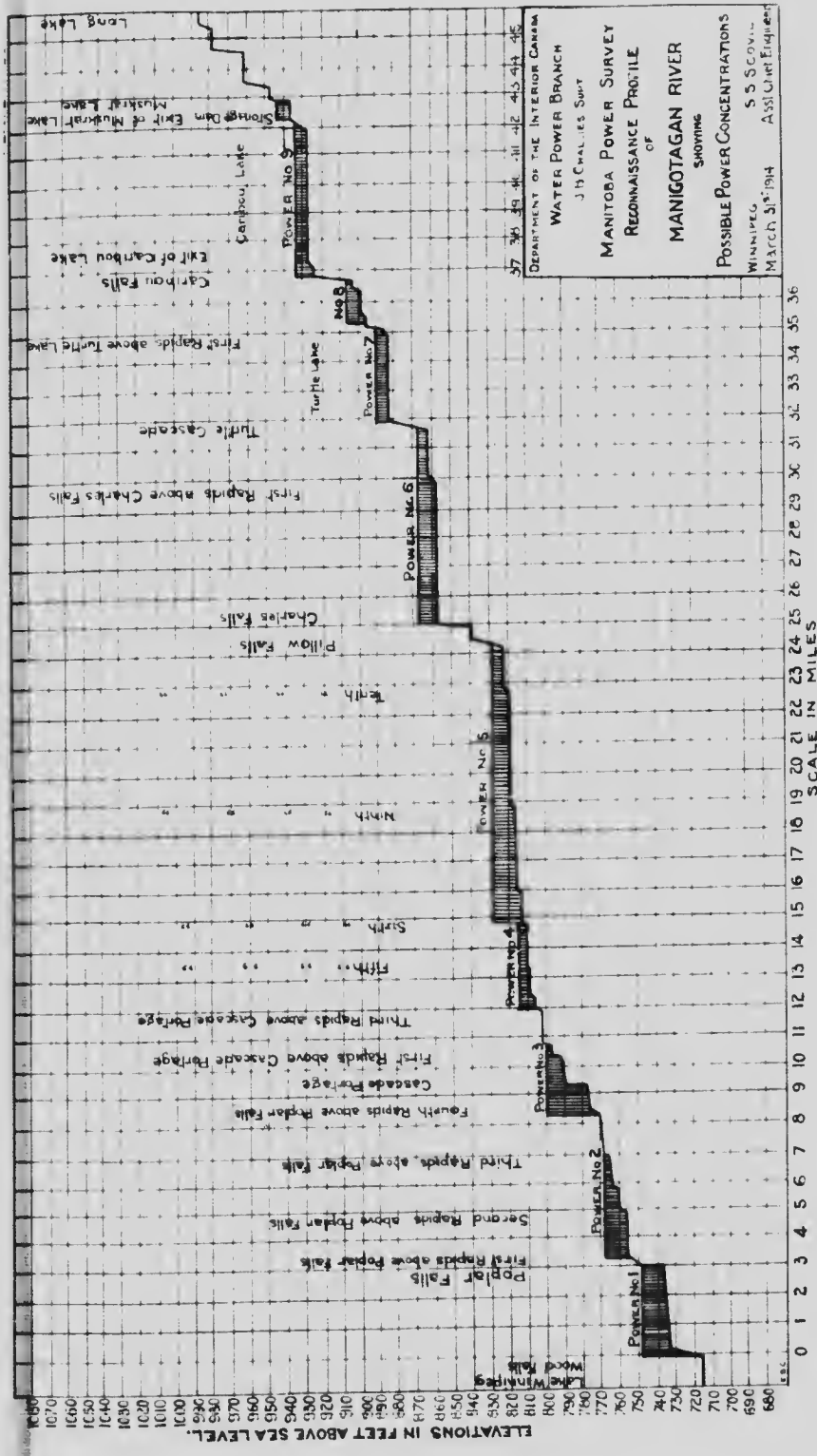
S S SCOVIL.
Asst. Chief Engineer.











DEPARTMENT OF THE INTERIOR CANADA
 WATER POWER BRANCH
 J. B. CHALILIES SURVY
MANITOBA POWER SURVEY
RECONNAISSANCE PROFILE
OF
MANIGOTAGAN RIVER
 SHOWING
POSSIBLE POWER CONCENTRATIONS
 WINNIPEG, S. S. SCOVILLE
 MARCH 31st 1914 ASSISTANT ENGINEER

0 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 28 29 30 31 32 33 34 35 36
 SCALE IN MILES

ELEVATIONS IN FEET ABOVE SEA LEVEL.

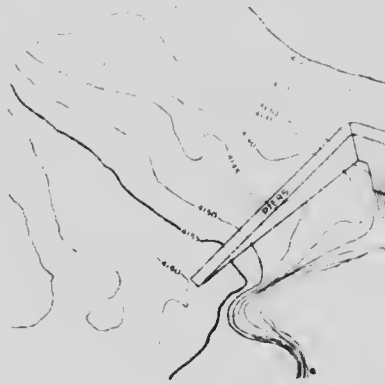
1

140



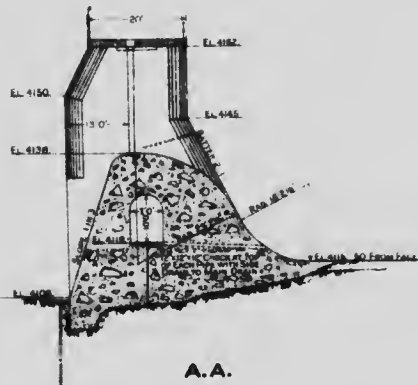
GENERAL LAYOUT

Scale of feet

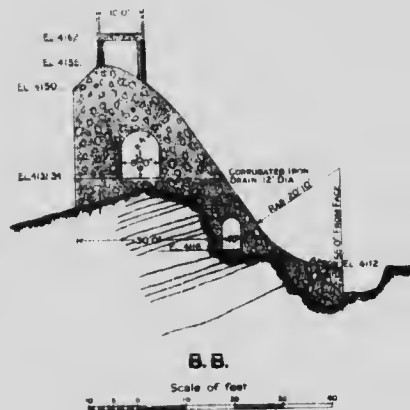


UPSTREAM

Scale of feet

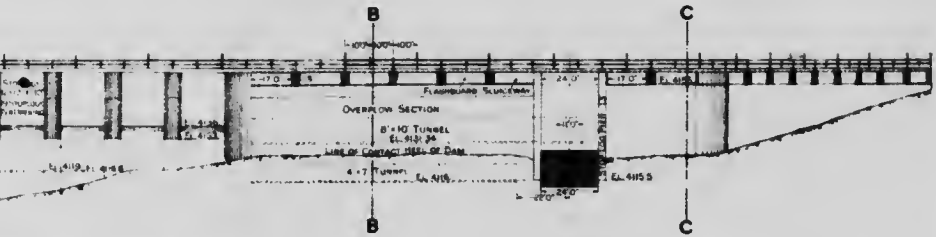
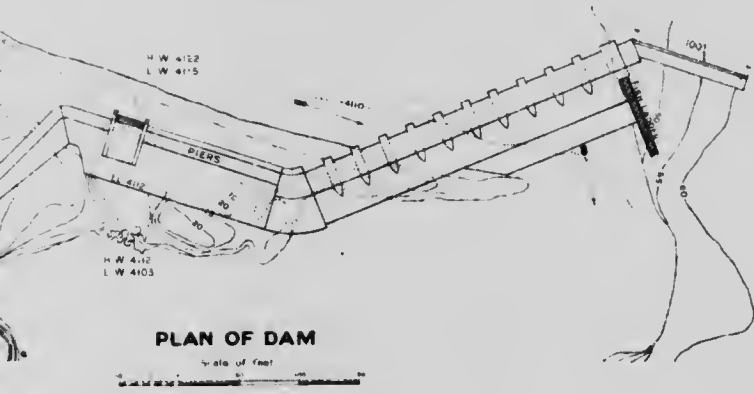


A.A.



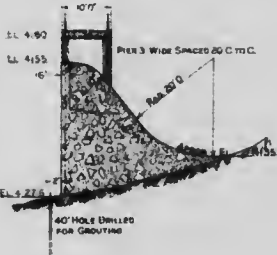
B.B.

Scale of feet



DISCHARGING CAPACITY OF KANANASKIS DAM

Elev. OF HEAD WATER	DISCHARGE IN SEC. FT THROUGH			
	SLUICES EL. OF SILL 4158	ROLLWAY AND LOG RUN	SLUICWAYS AND WITH STOP LOGS AT EL. 4155	TOTAL
4152.0	34,600	0	0	34,600
4153.0	38,400	0	0	38,400
4154.0	42,400	0	0	42,400
4155.0	46,100	0	0	46,100
4156.0	50,300	940	560	51,240
4157.0	54,400	2,020	1,750	57,220
4158.0	58,800	3,450	3,420	64,250



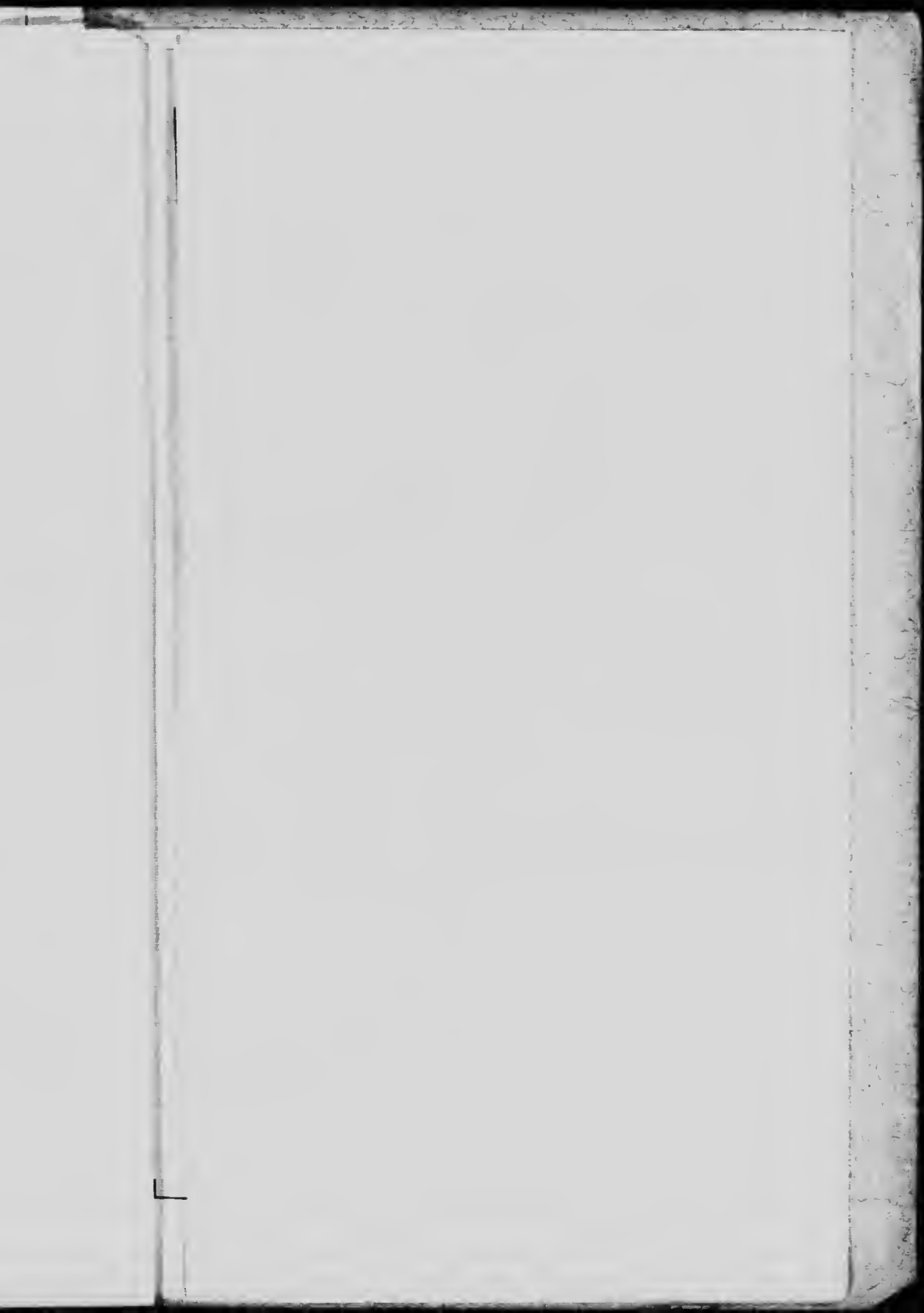
Department of the Interior, Canada

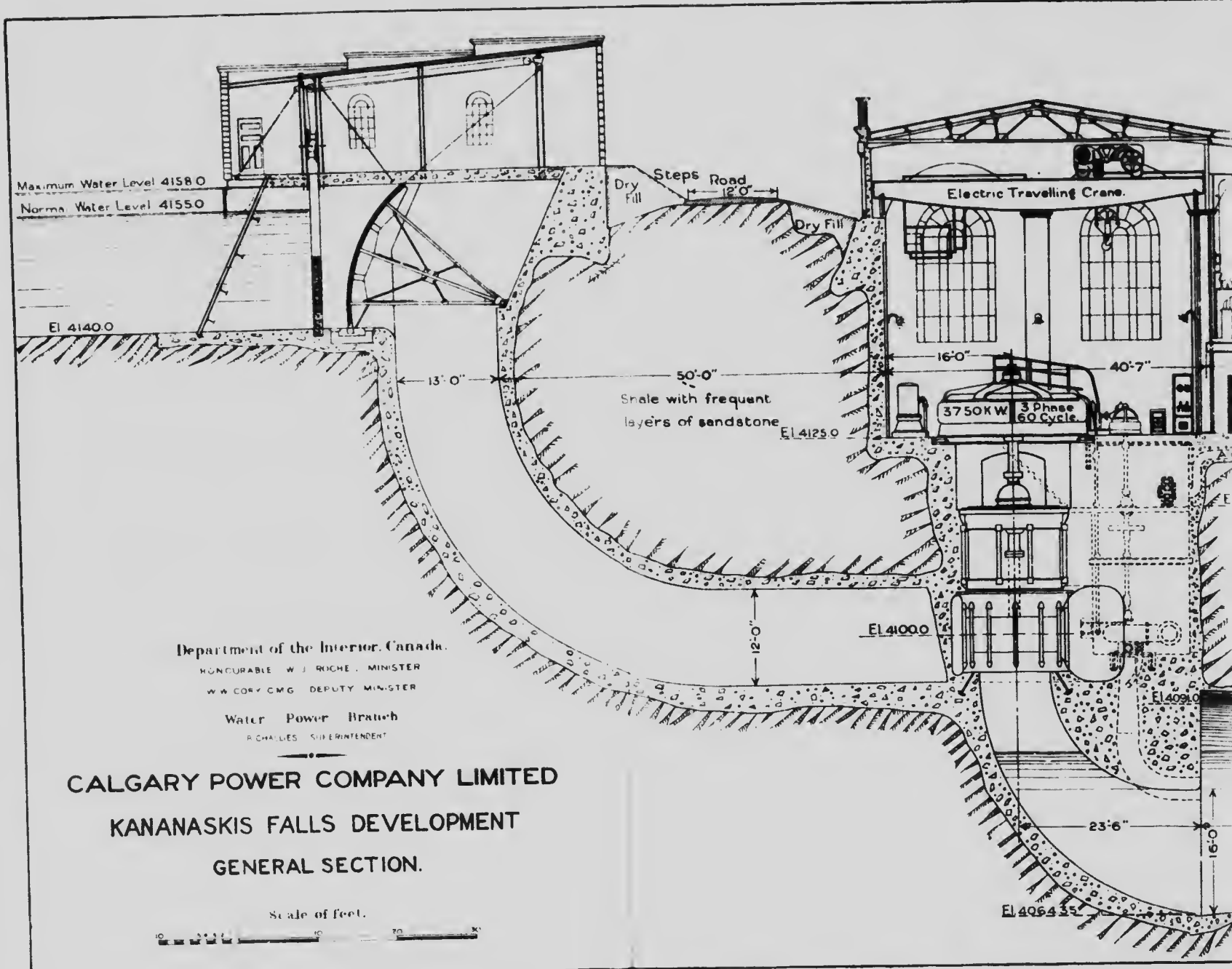
DESIGNED BY H. H. HARRIS
 W. W. LADD & C. E. L. SMITH
 W. L. HARRIS & SONS
 J. D. CHAPMAN, Supervising

CALGARY POWER COMPANY
 PLAN OF
 KANANASKIS FALLS DAM

SHOWING GENERAL DESIGN.







Department of the Interior, Canada.

HONOURABLE W. J. RICHE, MINISTER

W. W. CORY, C.M.G., DEPUTY MINISTER

Water Power Branch

R. CHALLIS, SUPERINTENDENT

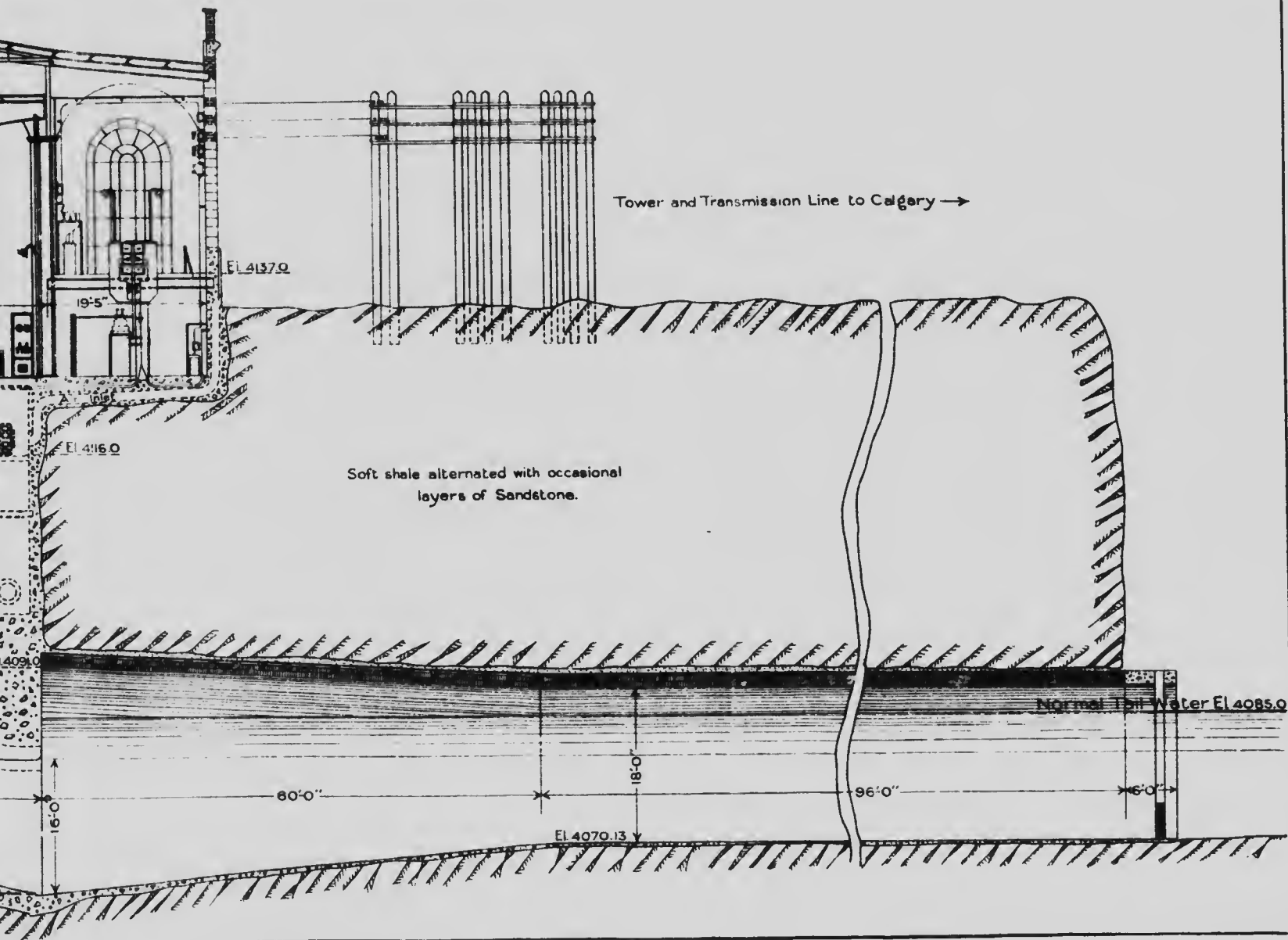
CALGARY POWER COMPANY LIMITED

KANANASKIS FALLS DEVELOPMENT

GENERAL SECTION.

Scale of feet.





1850

ANCHOR POINT

1850

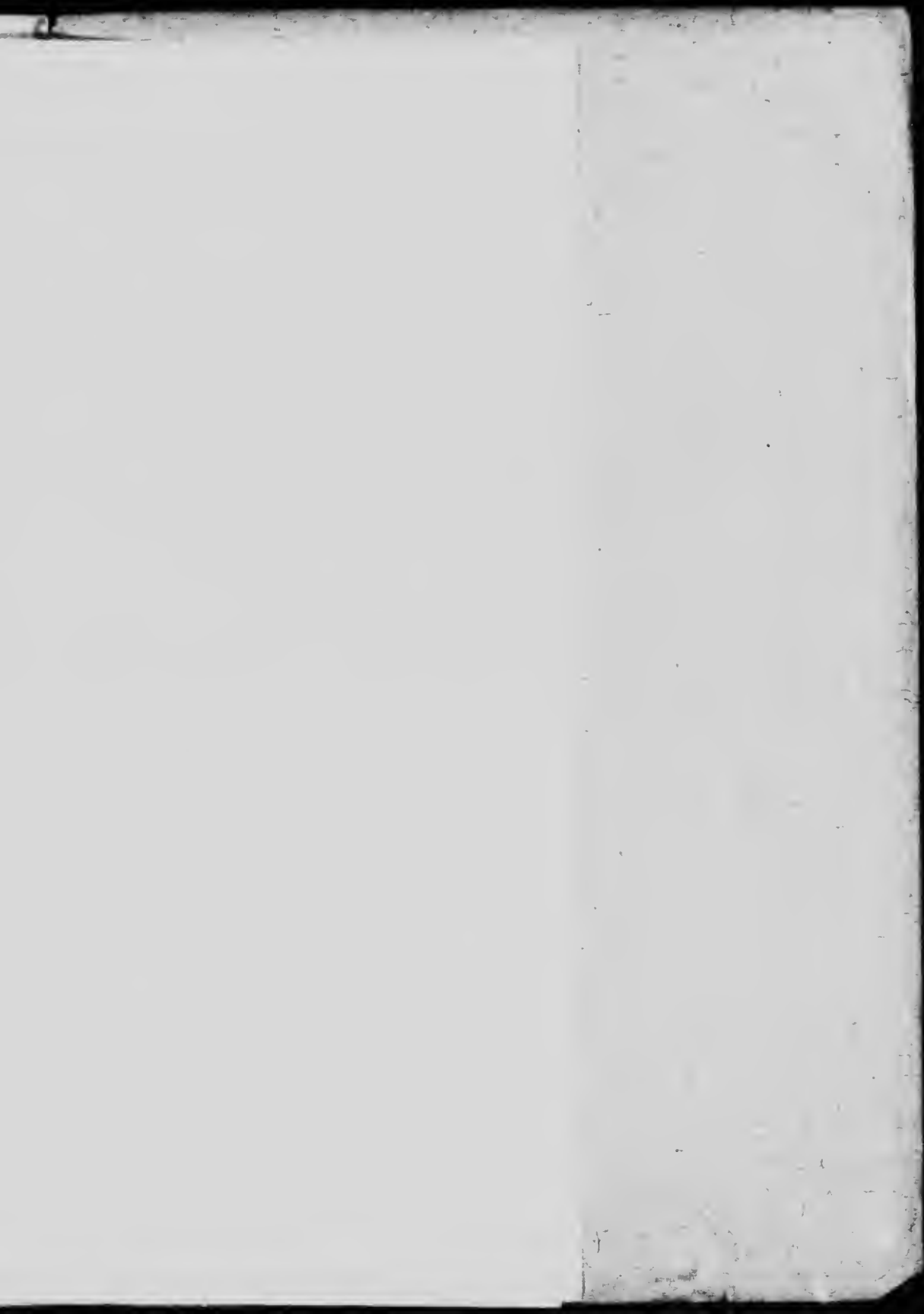
1850

1850

1850

1850

1850







CROSS LAKE



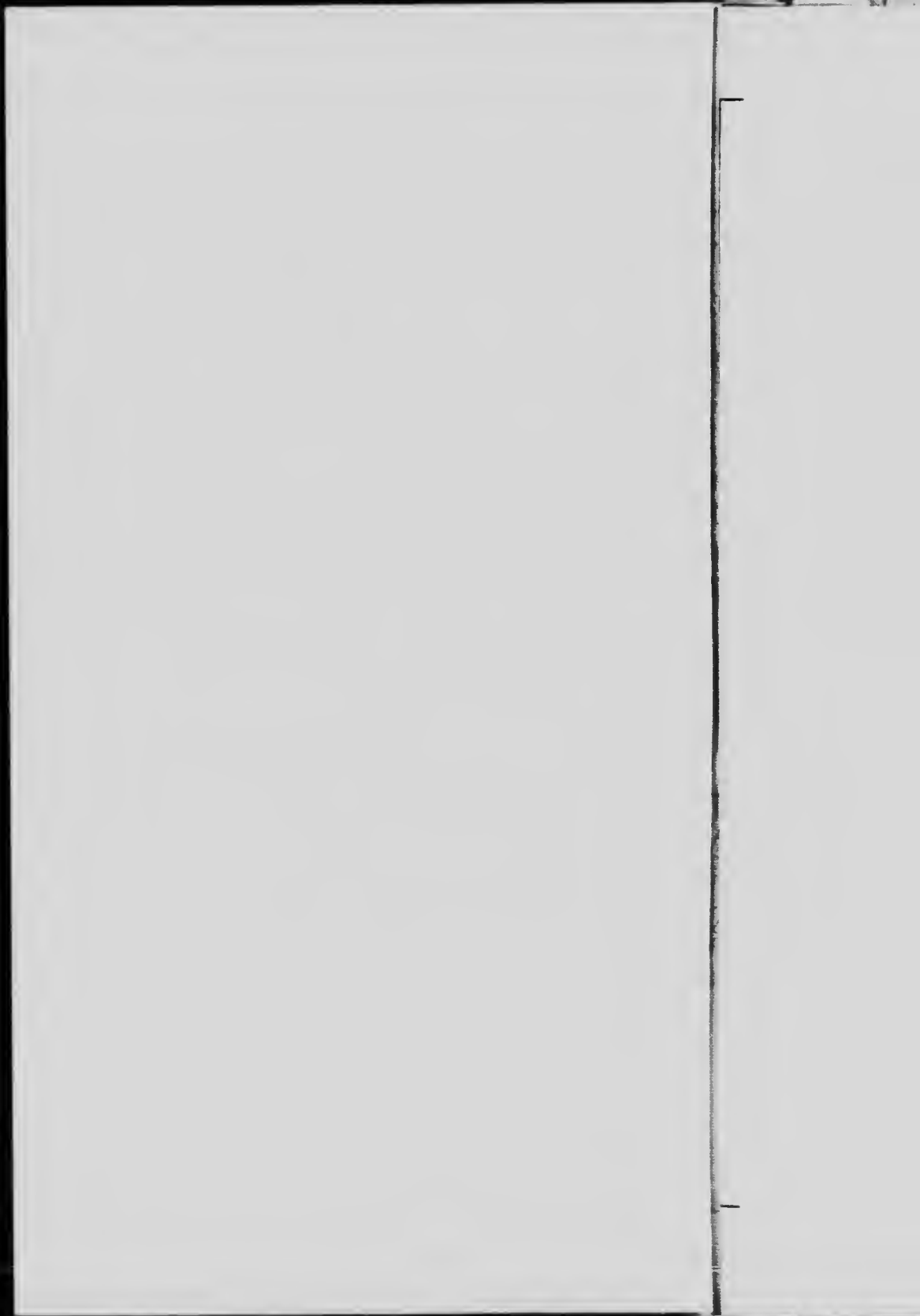
Department of the Interior, Canada
 MINISTRE DES TERRES ET DES MINES
 BUREAU DES SURVEILLANCES
 Water Power Branch
 Ottawa, Canada

PASQUA RECLAMATION PROJECT
 SASKATCHEWAN RIVER
 CEDAR LAKE TO CROSS LAKE
 TOPOGRAPHIC SHEET N° 1



March 1914

John W. ...
 Chief Engineer
 of Reclamation





Heavy Ridge
Spruce & Fir

Mean
Land

Tail
Moss
&
Heads

Moss
Land

SHALLOW
BAY

Tail
Moss
&
Heads

500

BAY

500

500

Vertical text along the left margin, likely a page or document identifier.

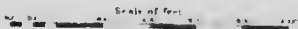


Department of the Interior Canada

Ministère des Travaux Publics et des Infrastructures

Water Power Branch

PASQUA RECLAMATION PROJECT
 SASKATCHEWAN RIVER
 CEDAR LAKE TO CROSS LAKE
 TOPOGRAPHIC SHEET N° 2

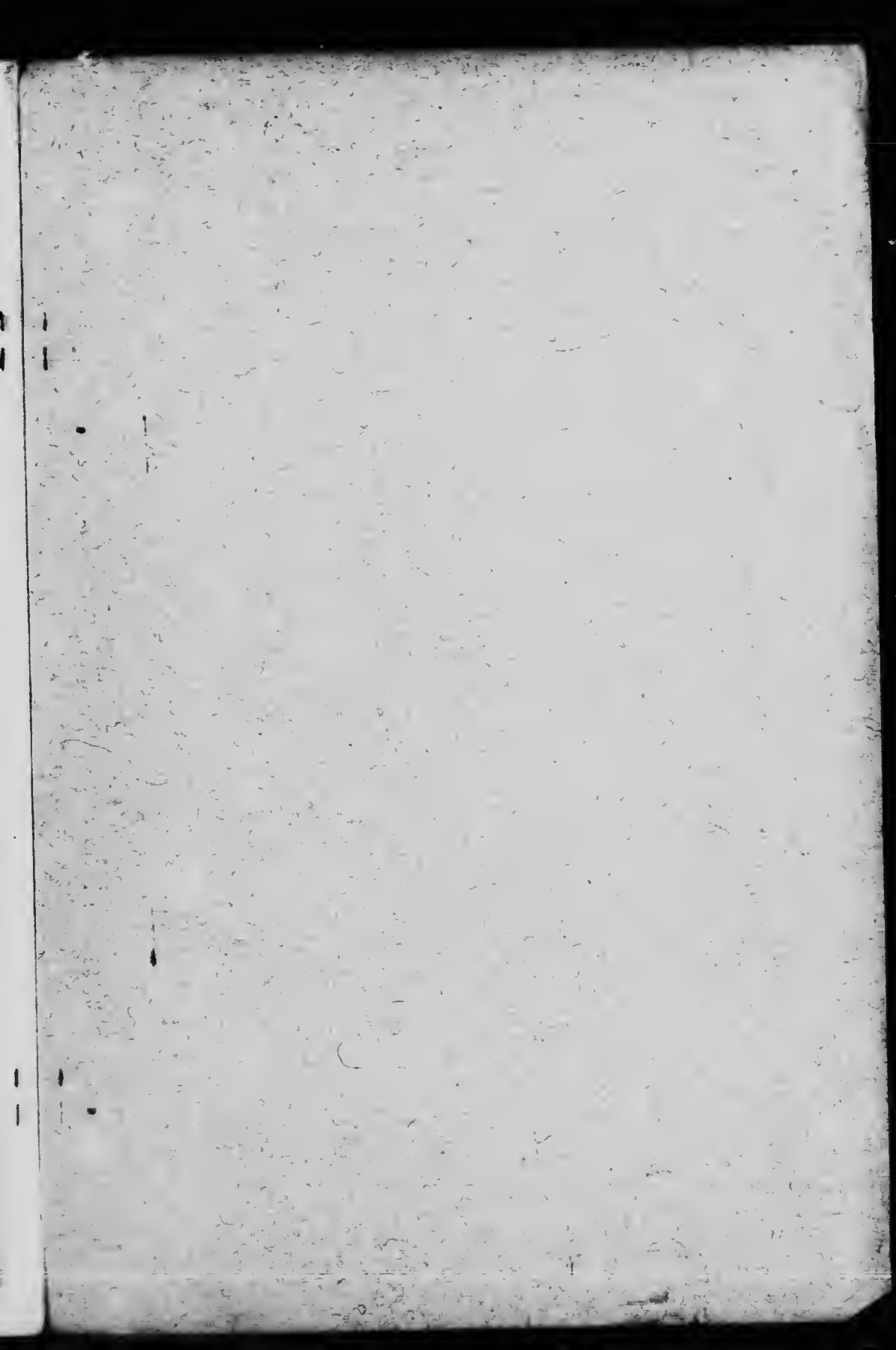


Map No. 104

J. R. [Signature] Chief Engineer







CLASSIFIED LISTS OF REPORTS

The Reports published by the Dominion Water Power Branch with the exception of the Annual Reports, have been called Water Resources Papers, and have been numbered 1, 2, etc.

Annual Reports previous to 1913 are included with the Annual Report of the Department of the Interior, and can be secured from the Secretary of the Department.

Annual Report for 1912-13, published 1914.

Annual Report for 1913-14, published 1915.

Annual Report for 1914-15. In Press.

WATER RESOURCES PAPER No. 1.—Report of the Railway Belt Hydrographic Survey for 1911-12, by P. A. Carson, B.A., D.L.S., Chief Engineer. Published 1914.

WATER RESOURCES PAPER No. 2.—Report of Bow River Power and Storage Investigations (Bow river west of Calgary.) by M. C. Hendry, B.A.Sc., Chief Engineer in charge of surveys. Published 1914.

WATER RESOURCES PAPER No. 3.—Report on Power and Storage Investigations, Winnipeg river, by J. T. Johnston, B.A.Sc., Hydraulic Engineer of Water Power Branch. In Press.

WATER RESOURCES PAPER No. 4.—Report of the Manitoba Hydrographic Survey to the year ending 1914, by M. C. Hendry, B.A.Sc., Chief Engineer. In Press.

WATER RESOURCES PAPER No. 5.—Preliminary Report on the Pasqua Reclamation Project, by T. H. Dunn, C.E., O.L.S., Chief Engineer in charge of Reclamation Survey. Published 1914.

WATER RESOURCES PAPER No. 6.—Report on cost of various sources of power for pumping in connection with the South Saskatchewan Water Supply Diversion Project, by H. E. M. Kensit, M.I.E.E. and Mem. Arv. Inst. E. E. Mem. Can. Soc. C. E. Published 1914.

WATER RESOURCES PAPER No. 7.—Report on the Manitoba Water Powers, by D. L. McLean, S. S. Scovill, and J. T. Johnston, compiled for the Manitoba Public Utilities Commission. Published 1914.

WATER RESOURCES PAPER No. 8.—Report of the British Columbia Hydrographic Survey for 1913, by R. G. Swan, B.A.Sc., Chief Engineer. Published 1915.

WATER RESOURCES PAPER No. 9.—Report of Red River Navigation Surveys, by S. S. Scovill, B.Sc., Assistant Chief Engineer of Manitoba Hydrographic Survey. In course of preparation.

WATER RESOURCES PAPER No. 10.—General Guide for Compilation of Water Power Reports of Dominion Water Power Branch, prepared by J. T. Johnston, B.A.Sc., Hydraulic Engineer of Water Power Branch. Published 1915. Limited edition.

WATER RESOURCES PAPER No. 11.—Final Report on the Pasqua Reclamation Project, by T. H. Dunn, C.E., O.L.S., Chief Engineer in charge of Reclamation Survey. Published 1915.

WATER RESOURCES PAPER No. 12.—Report on Small Water Powers in Western Canada, and discussion of sources of power for the Farm by A. M. Beale, B.Sc. Published 1915.

WATER RESOURCES PAPER No. 13.—Report on the Coquitlam-Buntzen Hydro-Electric Development, by G. R. G. Conway, M. Inst. C.E., M. Can. Soc. C.E., Chief Engineer of the British Columbia Electric Railway Company, Limited. In press.

WATER RESOURCES PAPER No. 14.—Report of the British Columbia Hydrographic Survey for 1914 by R. G. Swan, B.A.Sc., Chief Engineer. Published 1915.

WATER RESOURCES PAPER No. 15.—Report on the Water Powers of Alberta and Saskatchewan by C. H. Attwood, O.L.S., Chief Engineer Alberta and Saskatchewan Power Surveys. In course of preparation.

WATER RESOURCES PAPER No. 16.—Water Powers of Canada. A series of five pamphlets in one volume covering the water power situation in Canada prepared for distribution at the Panama-Pacific Exposition, San Francisco, 1915, by G. R. G. Conway, Consulting Engineer to the Vancouver Power Co., Percival H. Mitchell, E.E., Consulting Engineer, Toronto, H. G. Acres, Hydraulic Engineer Hydro-Electric Commission Ontario, F. T. Kaelin, Asst. Chief Engineer Shawanegan Power Co., K. H. Smith, Engineer, Nova Scotia Water Power Commission. Published 1915.

