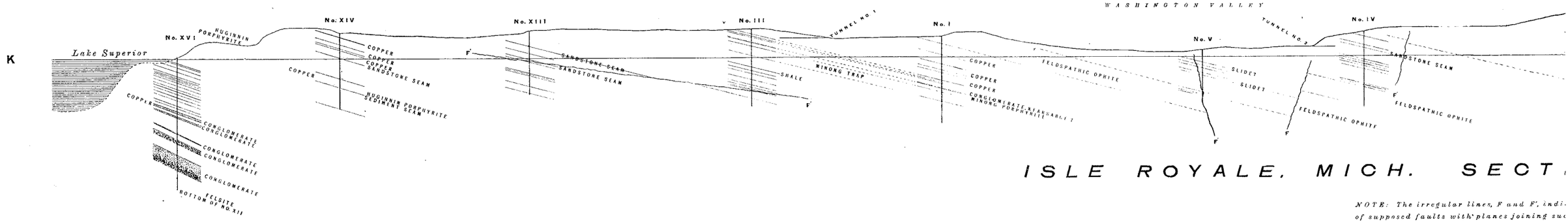
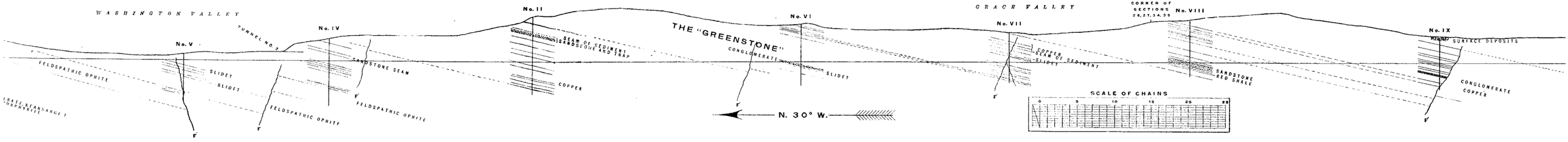


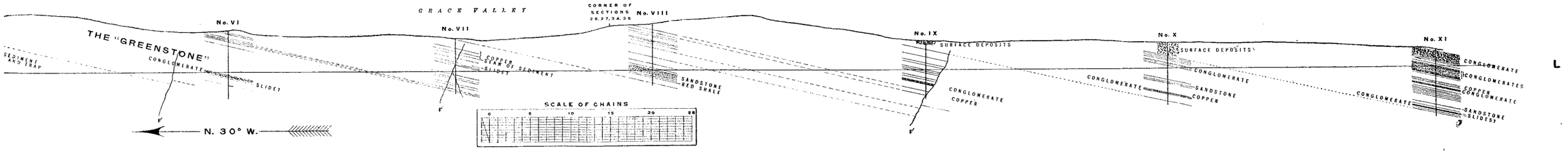
ISLE ROYALE, MICH. SECT

NOTE: The irregular lines, F and F', indi... of supposed faults with planes joining suc... mation, those marked F' to strike nearly n... hade of the fault.



ISLE ROYALE, MICH. SECTION ACROSS WENDIGO PROPERTY.

NOTE: The irregular lines, F and F', indicate the projection upon the plane of the section, of the intersection of supposed faults with planes joining successive drillholes. The fault F is supposed to strike with the formation, those marked F' to strike nearly north. The inclination of the latter, therefore, does not measure the hade of the fault.



ACROSS WENDIGO PROPERTY.

upon the plane of the section, of the intersection
The fault F is supposed to strike with the for-
ion of the latter, therefore, does not measure the

MAP
SHOWING
PROPERTY
OF
WENDIGO COPPER CO.
ISLE ROYALE
LAKE SUPERIOR
MICHIGAN

FROM SURVEYS MADE BY

W.W.STOCKLY

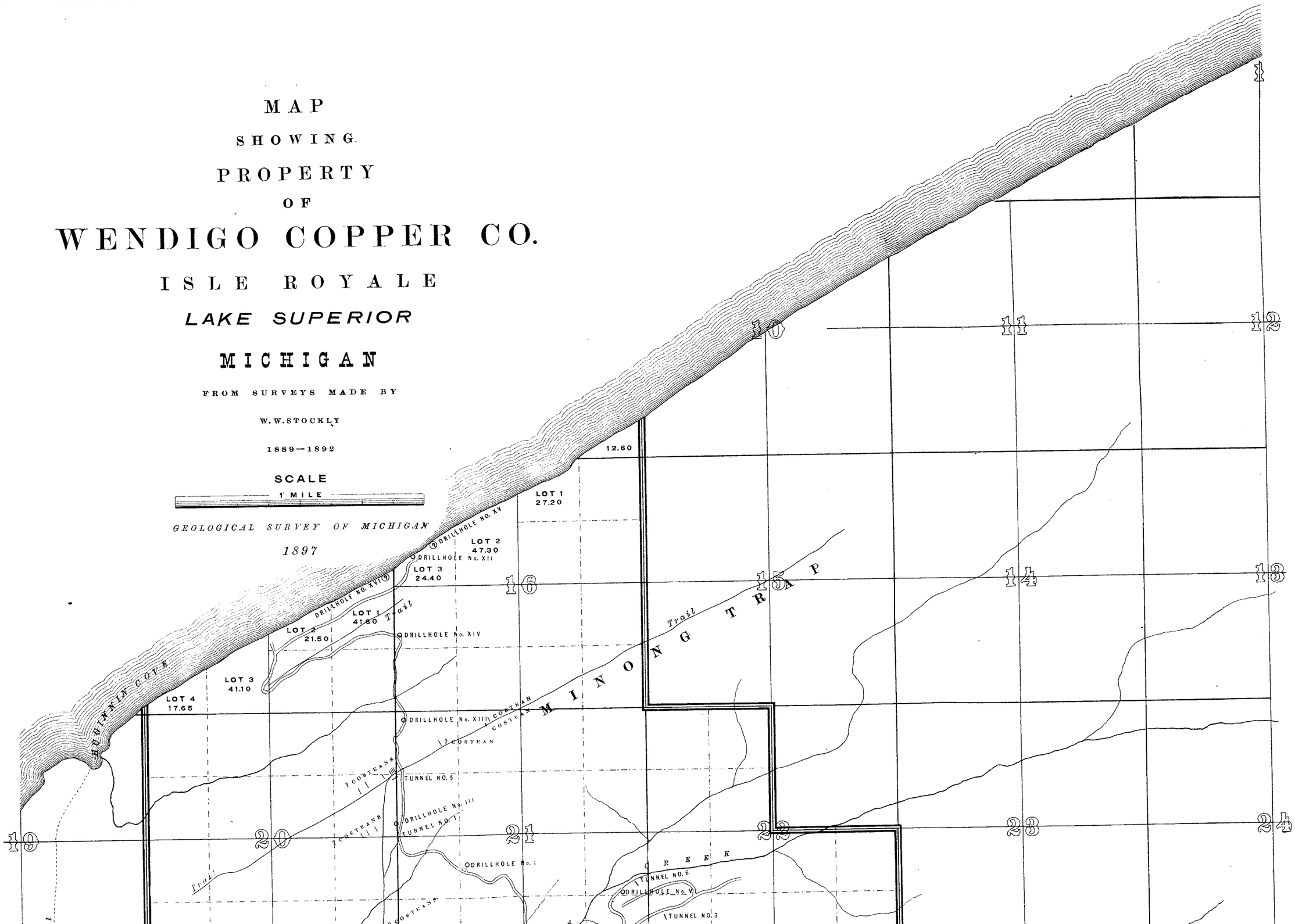
1889—1892

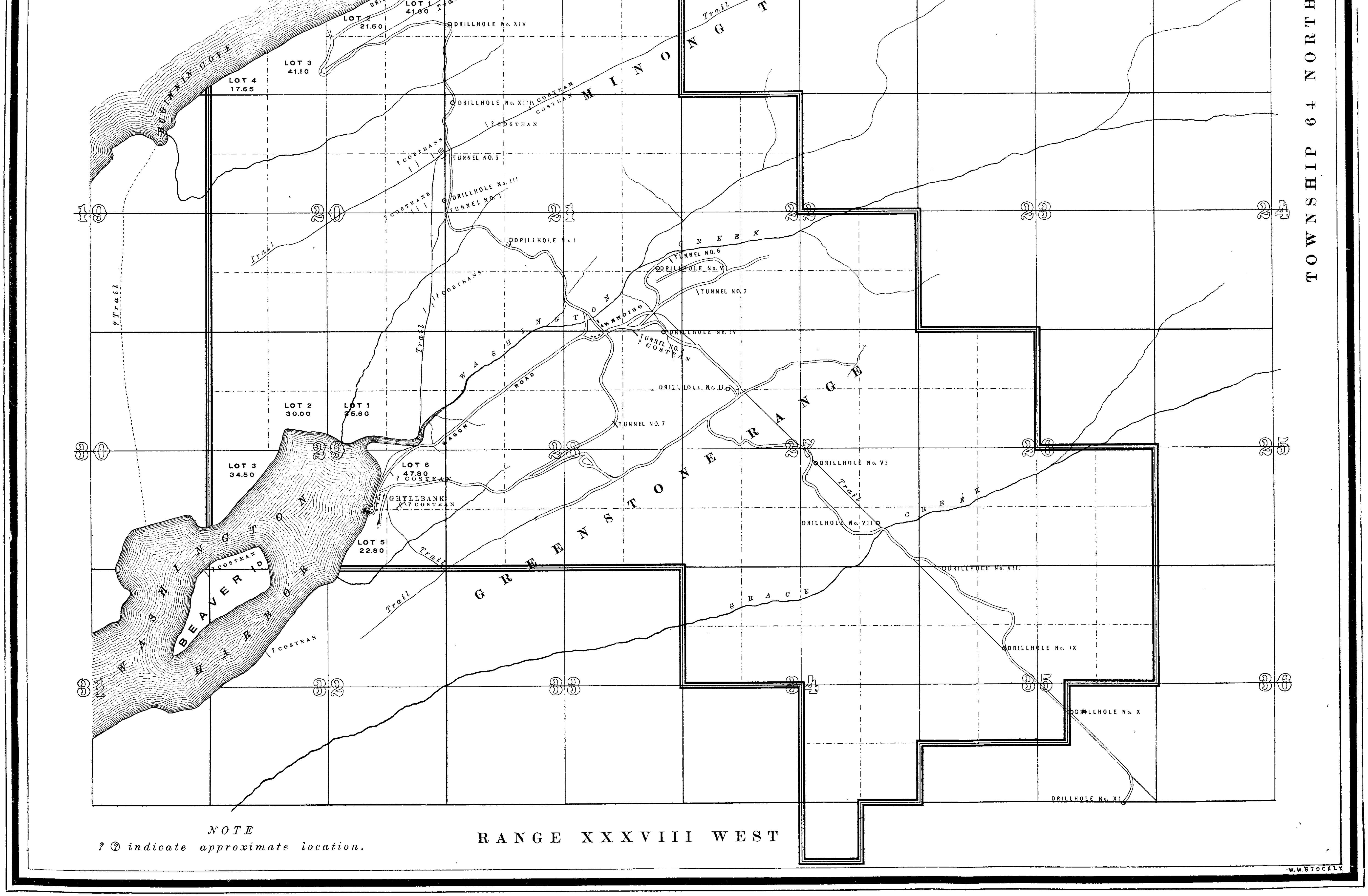
SCALE

1 MILE

GEOLOGICAL SURVEY OF MICHIGAN

1897





LOT 1
41.60
LOT 2
21.50
LOT 3
41.10
LOT 4
17.65
HUGINNIN COVE
DRILLHOLE No. XIV
DRILLHOLE No. XIII
COSTEAN
? COSTEAN
? COSTEANS
TUNNEL NO. 5
DRILLHOLE No. III
TUNNEL NO. 1
M I N O N G
Trail
19
20
21
22
23
24
DRILLHOLE No. I
C R E E K
TUNNEL NO. 6
DRILLHOLE No. V
TUNNEL NO. 3
? Trail
W A S H I N G T O N
WENDIGO
DRILLHOLE No. IV
TUNNEL NO. 2
? COSTEAN
WAGON ROAD
DRILLHOLE No. II
LOT 2
30.00
LOT 1
35.60
TUNNEL NO. 7
G R E E N S T O N E R A N G E
30
29
28
27
26
25
LOT 3
34.50
LOT 6
47.80
? COSTEAN
GHYLLBANK
DRILLHOLE No. VI
DRILLHOLE No. VII
C R E E K
LOT 5
22.80
BEAVER ID
DRILLHOLE No. VIII
G R A C E
W A S H I N G T O N H A R B O R
DRILLHOLE No. IX
31
32
33
34
35
36
DRILLHOLE No. X
DRILLHOLE No. XI
NOTE
? ? indicate approximate location.
RANGE XXXVIII WEST
TOWNSHIP 64 NORTH
W. W. STOCKLY

Record of Diamond Drilling done on Isle Royale, Lake Superior, Michigan, by The Wendigo Copper Company, Ltd.—Two of the M. C. Bullock and Co.'s "Dauntless" Drills—one and one-half inch core—were used.
By W. W. Stockly.

Number of drill hole	I.	II.	III.	IV	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	
Began drilling in rock	July 21, 1891.	Aug. 11, 1891.	Sept 7, 1891	Oct. 6, 1891.	Oct. 26, 1891.	Dec. 7, 1891.	Dec. 22, 1891.	Jan. 4, 1892.	Jan. 28, 1892.	Mar. 21, 1892.	Mar 7, 1892.	Apr. 23, 1892.	Apr. 22, 1892.	Ma
Finished " " "	Aug. 31, 1891	Sept 30, 1891.	Oct 17, 1891.	Nov. 12, 1891.	Nov. 21, 1891.	Dec. 30, 1891.	Jan. 7, 1892.	Feb. 3, 1892.	Feb. 27, 1892.	Apr. 8, 1892.	Apr. 6, 1892.	----	May 10, 1892.	Ju
Hours required to drill the 1st hundred feet	84	61	71	93	91	85	68	109	117	101	134	92	66	
" " " " " 2d " "	77	74	81	91	88	68	86	89	96	71	144	88	65	
" " " " " 3d " "	91	78	89	93	90	62	67	141	107	88	88	84	79	
" " " " " 4th " "	115	112	100	109	142	81	75	111	155	123	85	114	67	
" " " " " 5th " "	106	121	150	124	----	81	----	153	----	----	99	115	9½	
" " " " " 6th " "	108	177	178	143	----	----	----	----	----	----	----	121	----	
" " " " " 7th " "	114	146	----	----	----	----	----	----	----	----	----	109	----	
" " " " " 8th " "	----	----	----	----	----	----	----	----	----	----	----	117		
" " " " " 9th " "	----	----	----	----	----	----	----	----	----	----	----	138		
" " " " " 10th " "	----	----	----	----	----	----	----	----	----	----	----	251		
Number of "shifts" of 8 hours each	----	----	----	----	----	54	43	78	72	48	80	165	46	
" " " " 10 " "	69.4	76.8	71.5	66	44.5	----	----	----	----	----	----	----	----	
Average number of feet of rock drilled per hour	1.01	0.91	0.87	0.92	0.93	1.29	1.28	0.81	0.81	1.04	0.86	0.79	1.37	
Total depth of hole in rock	700	699	619.5	605.5	415	557	440	505	470	401	550.5	1038	504	

No. XII was continued to a depth of 1054 feet.
The rock below 900 feet was very much broken.
The above shows time required to do the drilling and includes all delays, such as raising and lowering rods, repairing broken machinery, etc., but does not include the time when the drills were idle to allow the drill men to engage in work which was not connected with the drillin
No. IX was idle for three full shifts.
The connection between rate of drilling and character of rock may be obtained by comparison with the record of Chapter III.
* Aggregate of 14 holes.

Record of Diamond Drilling done on Isle Royale, Lake Superior, Michigan, by The Wendigo Copper Company, Ltd.—Two of the M. C. Bullock and Co.'s "Dauntless" Drills—one and one-half inch core—were used.
By W. W. Stockly.

Number of drill hole	I.	II.	III.	IV	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	General averages.
Began drilling in rock	July 21, 1891.	Aug. 11, 1891.	Sept 7, 1891	Oct. 6, 1891.	Oct. 26, 1891.	Dec. 7, 1891.	Dec. 22, 1891.	Jan. 4, 1892.	Jan. 28, 1892.	Mar. 21, 1892.	Mar 7, 1892.	Apr. 23, 1892.	Apr. 22, 1892.	May 27, 1892.	
Finished " " "	Aug. 31, 1891	Sept 30, 1891.	Oct 17, 1891.	Nov. 12, 1891.	Nov. 21, 1891.	Dec. 30, 1891.	Jan. 7, 1892.	Feb. 3, 1892.	Feb. 27, 1892.	Apr. 8, 1892.	Apr. 6, 1892.	----------	May 10, 1892.	June 25, 1892.	
Hours required to drill the 1st hundred feet	84	61	71	93	91	85	68	109	117	101	134	92	66	76	89.1
" " " " " 2d " "	77	74	81	91	88	68	86	89	96	71	144	88	65	76	85.3
" " " " " 3d " "	91	78	89	93	90	62	67	141	107	88	88	84	79	66	87.4
" " " " " 4th " "	115	112	100	109	142	81	75	111	155	123	85	114	67	89	105.6
" " " " " 5th " "	106	121	150	124	----------	81	----------	153	----------	----------	99	115	92	103	114.4
" " " " " 6th " "	108	177	178	143	----------	----------	----------	----------	----------	----------	----------	121	----------	102	138.1
" " " " " 7th " "	114	146	----------	----------	----------	----------	----------	----------	----------	----------	----------	109	----------	----------	123.
" " " " " 8th " "	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	117			
" " " " " 9th " "	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	138			
" " " " " 10th " "	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	251			
Number of "shifts" of 8 hours each	----------	----------	----------	----------	----------	54	43	78	72	48	80	165	46		
" " " " 10 " "	69.4	76.8	71.5	66	44.5	----------	----------	----------	----------	----------	----------	----------	----------	51	
Average number of feet of rock drilled per hour	1.01	0.91	0.87	0.92	0.93	1.29	1.28	0.81	0.81	1.04	0.86	0.79	1.37	1.17	0.95
Total depth of hole in rock	700	699	619.5	605.5	415	557	440	505	470	401	550.5	1038	504	596	*8100.5

No. XII was continued to a depth of 1054 feet.
The rock below 900 feet was very much broken.
The above shows time required to do the drilling and includes all delays, such as raising and lowering rods, repairing broken machinery, etc., but does not include the time when the drills were idle to allow the drill men to engage in work which was not connected with the drilling. For the latter reason,
No. IX was idle for three full shifts.
The connection between rate of drilling and character of rock may be obtained by comparison with the record of Chapter III.
* Aggregate of 14 holes.

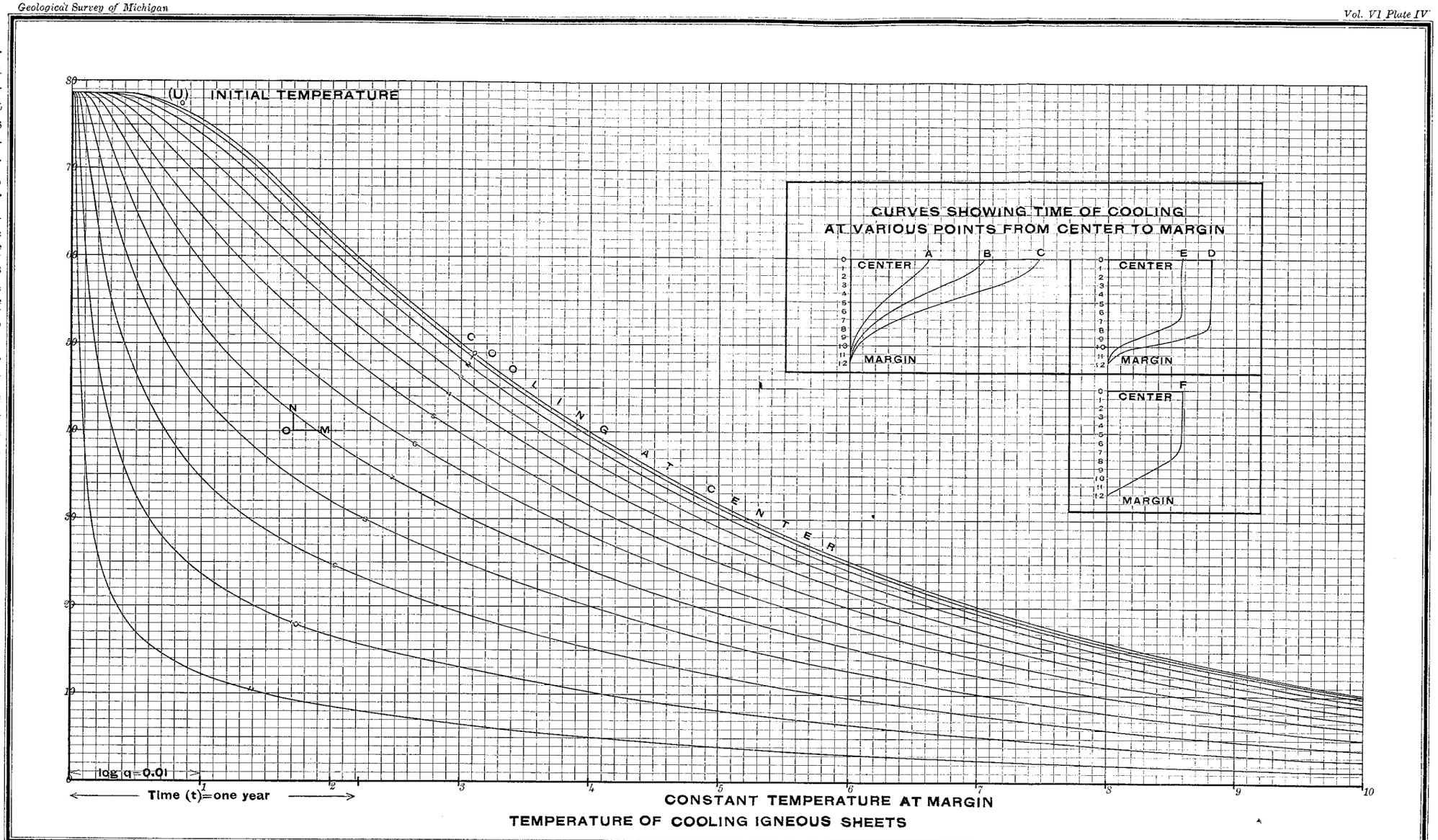
TEMPERATURES OF COOLING IGNEOUS SHEET.

Plate IV. Illustrates the cooling and consequent variation in grain in a sheet which has a uniform initial temperature, the conductivity being as everywhere else in this report assumed as constant. The main plate shows the contours of the surface defining the connection between the time (t), the temperature (U), and the position in a cooling sheet, the interval from the margin to the center being divided into twelve equal parts, and the curve showing the temperature as the time elapses. It is the graphic solution of eq. 11, just as the table on page 122 gives the numercal solution. The horizontal scale from left to right represents the lapse of time; the distance indicated as equivalent to one year is for the case of a 100-foot sheet, whose conductivity has Kelvin's value. Other conductivities and sizes of sheet merely vary this unit. The original temperature of the sheet (U_o), is taken as $\pi/4$, i. e., 0.7854 above that of the margin. This can also be changed to any scale. The smaller curves in the upper right hand corner show the times required to cool through a given interval at various points e. g.

For the curve marked A the interval is from the initial temperature (U_o) 0.7854 to 0.7800; for the curve marked B, from 0.7854 to 0.7500; for the curve marked C, from 0.7854 to 0.7000.

These curves therefore illustrate the variation of grain when solidification occurs at an early stage of cooling, and should be compared with Fig. 14.

For the curve marked D the interval is from 0.300 to 0.250; for the curve marked E the interval is from 0.400 to 0.300, while the curve F is derived from E by taking the square roots of the times as abscissæ, and is to be compared with Fig. 17. These latter curves illustrate the variation of grain when solidification takes place at a late stage of cooling.



TEMPERATURE OF COOLING IGNEOUS SHEETS

Part of a classification of igneous rocks, i. e., "Massen Gesteine," rocks whose stratigraphic relation is due to a sudden, abnormal eruption or intrusion, 2.12, including types indigenous to ISLE ROYALE.
After Rosenbusch, "Mikroskopische Physiographie der Massigen Gesteine." II, 1896. Extracted from Am. Geologist, June, 1891, and revised for latest edition. The references are to pages and lines, each page being supposed to have 40 lines.

III. (**Effusive** or volcanic, ("vulkanische") rocks, 551, in streams and sheets, pp. 6 and 7, with tuff at times, normally more or less glassy, although not so at the center of large masses, or when altered by secondary devitrification: more acid than the equivalent intrusive rock, 552.02, also having less specific weight.)

(**Porphyritic,** 553, i. e., porphyries in the broadest sense. There has been a recurrence in the formation of certain minerals, 553.05. The earlier formed, intratelluric, pre-effusive crystals, "Einsprenglinge," [phenocrysts] are mostly larger and have sharp form, if not thereafter chemically corroded. In certain very glassy or basic rocks the earlier crystals fail.)

III B. (**Paleovolcanic** (559) rocks have a more lithoid or stony, and less vitreous, glassy lustre than neovolcanic, 559.34. This is probably due to secondary devitrification. Their connection with craters is less obvious, 6.20. They may have a structure more characteristic of intrusive rocks (regarded as primary, 1111.10), the granophyric, rarely possessed by modern lavas, 592.40 (but compare 599, 600, 841.40, 885.3, 897.25), also sometimes an allotriomorphic, secondary ground mass (mosaic) (687–689), of quartz and feldspar, 679.03, 593.22, in which neither quartz nor feldspar has form or precedence. The original presence of glass may be inferred from (1) rounded gas pores = amygdules, 1061.26. (2) skeletal growths of magnetite, 1057, (3) flow lines and fluidal structure, 593.22.)

Names according to composition, without regard to details of structure, although each division affects only certain structures and may be in part characterized by the absence of other structures.	MICROGRANITIC, 670, ground mass of quartz and feldspar grains aggregated without particular arrangement, and either hypidio—, allotrio— or panidiomorphic.	GRANOPHYRIC, 674.12, ground mass of contemporaneous quartz and feldspar regularly intergrown, as in pegmatite.	PILOTAXITIC, no apparent glass, 885.	HYALOPILITIC, glass cement, 885.	INTERSERTAL [DOLERITIC], 1072.06, 1056.25, glass occurs only as cement or filling, i. e., mesostasis, in angular spaces left here and there in an incomplete diabasic granular structure.	FELSOPHYRIC 593–602, full of microfelsite, a fibrous, scaly, colorless, grey, yellow or brown substance, isotropic except in sphaerocrystals.	VITROPHYRIC, so nearly all glass that the ground mass cannot be referred to any other structure, 691.
			Ground of small feldspar laths with a fluidal arrangement, amygdules often associated.				
			TRACHYTIC [MICROLITIC], 883.08, 198.07.				
	Ground mass holocrystalline, i. e., without glass, 11, transition to dike forms.		Ground mass hypocrystalline, 11.07,—with glass.				

III. B. 1. 631.

\+ porphyritic quartz 631 to 733. *Quartz porphyry* [FELSITE] and—
707. *Quartz keratophyres*, with soda feldspar and a light colored augite always metamorphosed. (?)

670, *Microgranite.* | 674, *Granophyre.* | 678, *Felsophyre*— | *Vitrophyre,* { + porphyritic ××, *Pitchstone porphyry,* 692. / no porphyritic ××. *Pitchstone,* 692.

III. B. 2. 778.

Normal type, 781, *Orthophyre.* { *Biotite orthophyre.* / *Amphibole orthophyre.* / *Augite orthophyre.* } [FELSITE.]

{ Effusive forms of augite syenite, 788 no quartz, hornblende rare, abnormal, + augite, and anorthoclase. } *Rhomben porphyry.*

(+ anorthoclase, metamorphosed, 789.) *Keratophyre.* (?)

III. B. 3. 919.

PORPHYRITE family, 926.

936, *Quartz mica porphyrite.*
943, *Quartz hornblende porphyrite.*
Quartz enstatite porphyrite.
940, *Mica porphyrite.*
944, *Hornblende porphyrite.*
(Corresponds to mica—and augite-diorite. 947, contains malacolite, but not hypersthene, which andesites contain.)
Enstatite porphyrite.

± olivine, 952, 1051. *Augite porphyrite.* { *Labradorite porphyrite,* 959, large porphyritic labradorite ××, orthoclase often in panidiomorphic or allotriomorphic ground mass. / cf Huginnin porphyrite *Navite,* 512, corresponding to labradorite porphyrite.

937, *Granophyrite.*

958, *Cuselite.*

rare in Weiselbergite.

rare

= augite andesite, 953, *Weiselbergite.*

954, *Olivine Weiselbergite,* (not much olivine, which is replaceable by enstatite, only porphyritic, in inverse ratio to the augite); equivalent of diorite and andesite.

Felsophyrite.

936, *Vitrophyrite,* rare.

III. B. 4. 1044.

MELAPHYRE family. { — olivine, 1058. / + olivine.

(coarse ground, 491), *Diabase Porphyrite.*

Spilite, no porphyritic ××, ground mass spherulitic, 1061, often amygdaloid, = marginal type.

[*Melaphyre porphyrite.*]

no intratelluric ××, *Tholeyite.*
closely akin to *diabase,* 1072.

[*Ophite.*]

1073, *Olivine tholeyite.*

III. B. 5. 1089.

DIABASE. { *Diabase.* / *Quartz diabase.* / *Hunne diabase.* / *Enstatite diabase.* / *Olivine diabase.*

[As used in this report, intrusive.]

Intersertal, but with augite or micropegmatite interstices.

III. B. 6. 1199.

PICRITE PORPHYRITE.

Part of a classification of igneous rocks, i. e., "Massen Gesteine," rocks whose stratigraphic relation is due to a sudden, abnormal eruption or intrusion, 2.12, including types indigenous to ISLE ROYALE.
After Rosenbusch, "Mikroskopische Physiographie der Massigen Gesteine," II, 1896. Extracted from Am. Geologist, June, 1891, and revised for latest edition. The references are to pages and lines, each page being supposed to have 40 lines.

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Names according to composition, without regard to details of structure, although each division affects only certain structures and may be in part characterized by the absence of other structures.	MICROGRANITIC, 670, ground mass of quartz and feldspar grains aggregated without particular arrangement, and either hypidio—, allotrio— or panidiomorphic.	GRANOPHYRIC, 674.12, ground mass of contemporaneous quartz and feldspar regularly intergrown, as in pegmatite.	PILOTAXITIC, no apparent glass, 885.	HYALOPILITIC, glass cement, 885.	INTERSERTAL [DOLERITIC], 1072.06, 1056.25, glass occurs only as cement or filling, i. e., mesostasis, in angular spaces left here and there in an incomplete diabasic granular structure.	FELSOPHYRIC 593–602, full of microfelsite, a fibrous, scaly, colorless, grey, yellow or brown substance, isotropic except in sphaerocrystals.	VITROPHYRIC, so nearly all glass that the ground mass cannot be referred to any other structure, 691.
	Ground mass holocrystalline, i. e., without glass, 11, transition to dike forms.		Ground of small feldspar laths with a fluidal arrangement, amygdules often associated. TRACHYTIC [MICROLITIC], 883.08, 198.07.		Ground mass hypocrystalline, 11.07,—with glass.		
III. B. 1. 631.							
+ porphyritic quartz 631 to 733. *Quartz porphyry* [FELSITE] and— 707. *Quartz keratophyres*, with soda feldspar and a light colored augite always metamorphosed. (?)	670, *Microgranite.*	674, *Granophyre.*				678, *Felsophyre*—	*Vitrophyre*, { + porphyritic ××, *Pitchstone porphyry*, 692. no porphyritic ××. *Pitchstone*, 692.
III. B. 2. 778.							
Normal type, 781, *Orthophyre.* { *Biotite orthophyre.* *Amphibole orthophyre.* *Augite orthophyre.* [FELSITE.]							
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III. B. 3. 919.							
PORPHYRITE family, 926. { 936, *Quartz mica porphyrite.* 943, *Quartz hornblende porphyrite.* *Quartz enstatite porphyrite.* 940, *Mica porphyrite.* 944, *Hornblende porphyrite.* (Corresponds to mica—and augite-diorite, 947, contains malacolite, but not hypersthene, which andesites contain.) *Enstatite porphyrite.*		937, *Granophyre.*	rare in Weiselbergite.	= augite andesite, 953, *Weiselbergite.*			936, *Vitrophyre*, rare.
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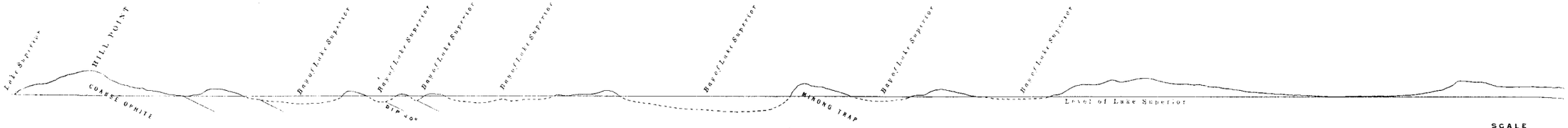
III. B. 4. 1044.							
MELAPHYRE family. { — olivine, 1058. + olivine.	(coarse ground, 491), *Diabase Porphyrite.*			*Spilite*, no porphyritic ××, ground mass spherulitic, 1061. often amygdaloid, = marginal type. [*Melaphyre porphyrite.*]	no intratelluric ××, *Tholeyite.* closely akin to *diabase*, 1072. [*Ophite.*] 1073, *Olivine tholeyite.*		
III. B. 5. 1089.							
DIABASE. { *Diabase.* *Quartz diabase.* *Hunne diabase.* *Enstatite diabase.* *Olivine diabase.* [As used in this report, intrusive.]		Intersertal, but with augite or micropegmatite interstices.					
III. B. 6. 1199.							
PICRITE PORPHYRITE.							

A



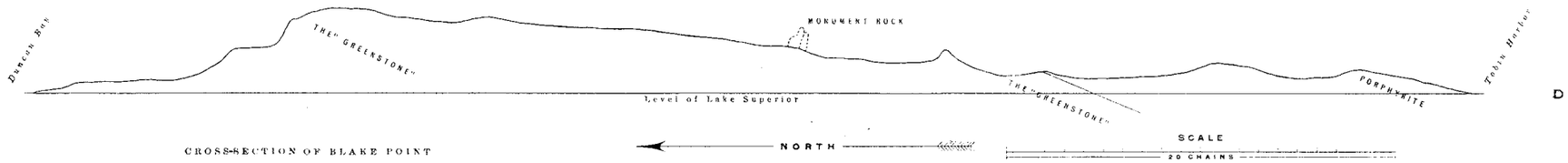
CROSS-SECTION OF HILL POINT

NORTH

CROSS-SECTION OF LOCKE POINT

SCALE
20 CHAINS

C



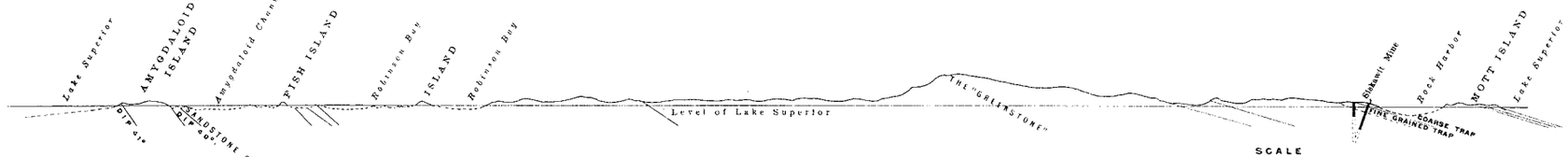
D

CROSS-SECTION OF BLAKE POINT

NORTH

SCALE
20 CHAINS

E



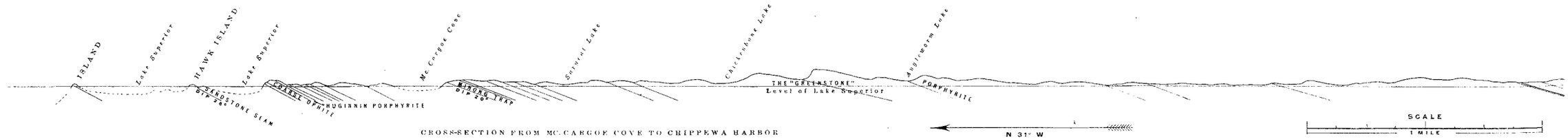
F

CROSS-SECTION FROM AMYGDALOID ISLAND TO MOTT ISLAND

N 31° W

SCALE
1 MILE

G

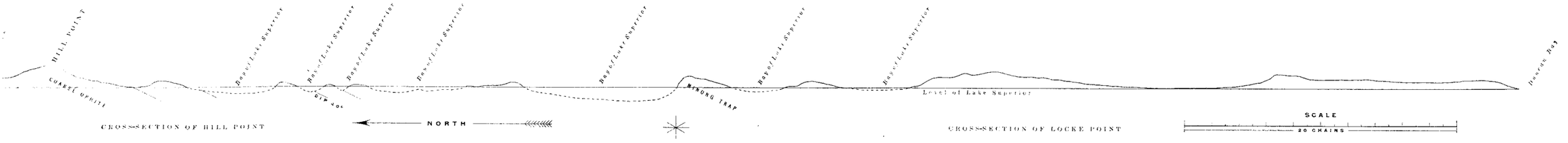


CROSS-SECTION FROM MC CARGOE COVE TO CHIPPEWA HARBOR

N 31° W

SCALE
1 MILE

CROSS-SECTIONS ISLE ROYALE, MICHIGAN

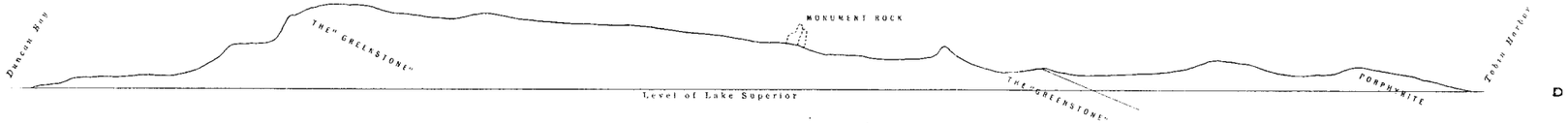


CROSS-SECTION OF HILL POINT

NORTH

CROSS-SECTION OF LOCKE POINT

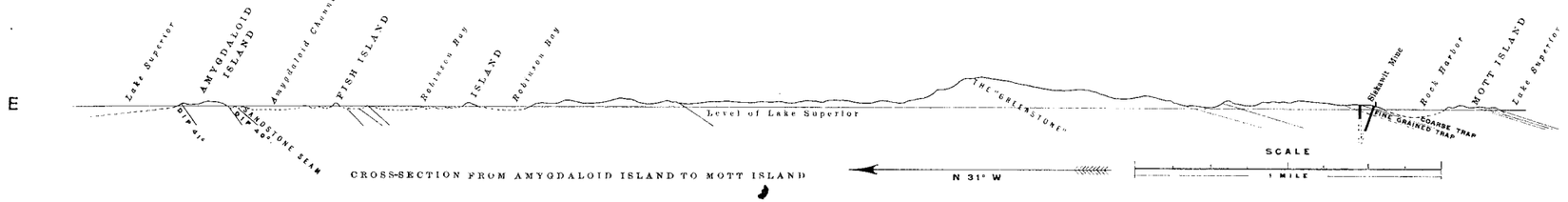
SCALE
20 CHAINS



CROSS-SECTION OF BLAKE POINT

NORTH

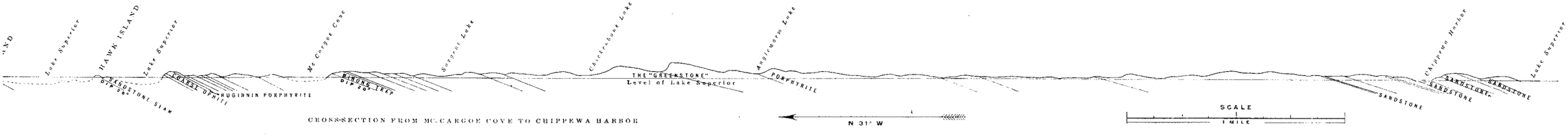
SCALE
20 CHAINS



CROSS-SECTION FROM AMYGDALOID ISLAND TO MOTT ISLAND

N 31° W

SCALE
1 MILE

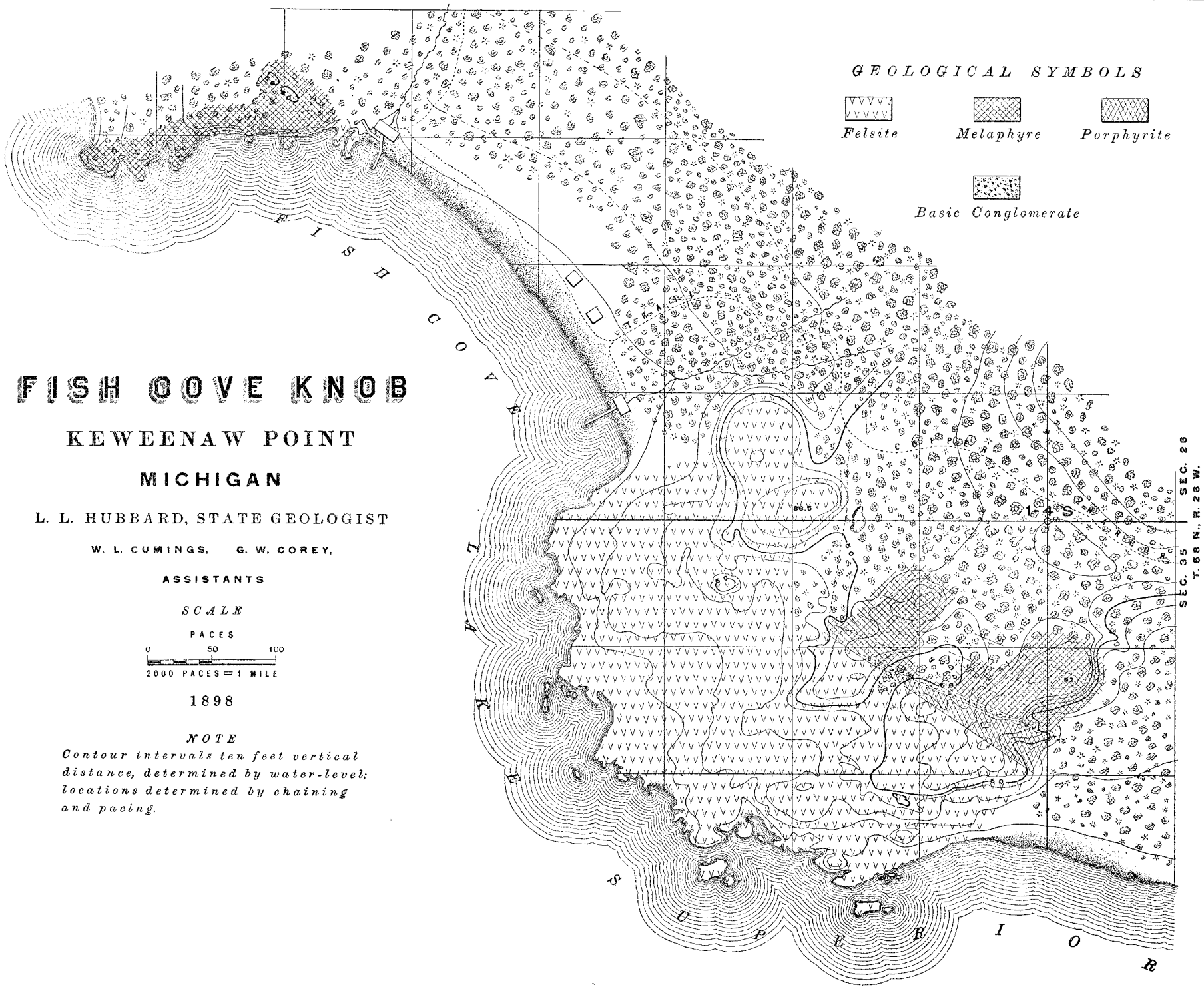


CROSS-SECTION FROM MC.CARGOE COVE TO CHIPPEWA HARBOR

N 31° W

SCALE
1 MILE

CROSS-SECTIONS ISLE ROYALE, MICHIGAN


GEOLOGICAL SYMBOLS
Felsite
Melaphyre
Porphyrite
Basic Conglomerate
FISH COVE KNOB
KEWEENAW POINT
MICHIGAN
L. L. HUBBARD, STATE GEOLOGIST
W. L. CUMINGS, G. W. COREY,
ASSISTANTS
SCALE
PACES
0 50 100
2000 PACES = 1 MILE
1898
NOTE
Contour intervals ten feet vertical distance, determined by water-level; locations determined by chaining and pacing.
FISH COVE
LAKE SUPERIOR
SEC. 35 SEC. 26
T. 58 N., R. 28 W.
14 S

Sec. Cor.

SEC. 27, T. 58, R. 28.

S — Line of Cross-section.

R — Line of Cross-section

M

N

O

Lw

K

J

H

F

G

E

D

C1

C

B

A

100

54°

1/4 S

Dam and Falls

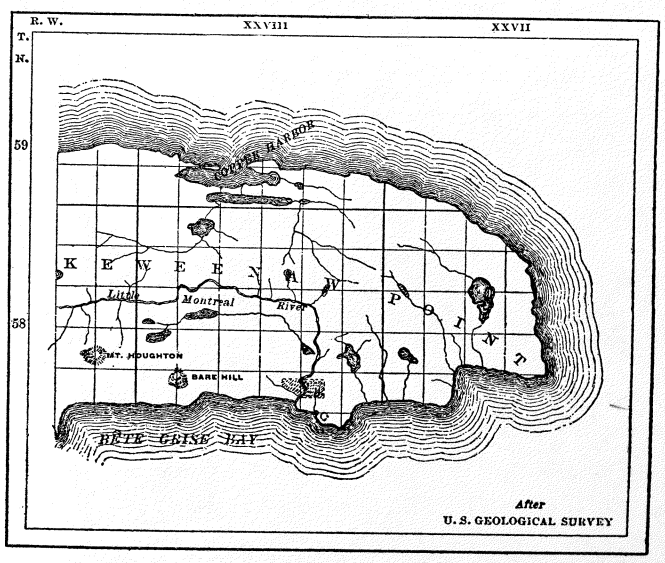
Falls

Falls

MONTREAL RIVER

LITTLE

LAKE SUPERIOR



Sec. Cor.

SEC. 27, T. 58, R. 28.

SEC. 26, T. 58, R. 28.

GEO

KEWE

M I

L. L.

Sec. Cor.

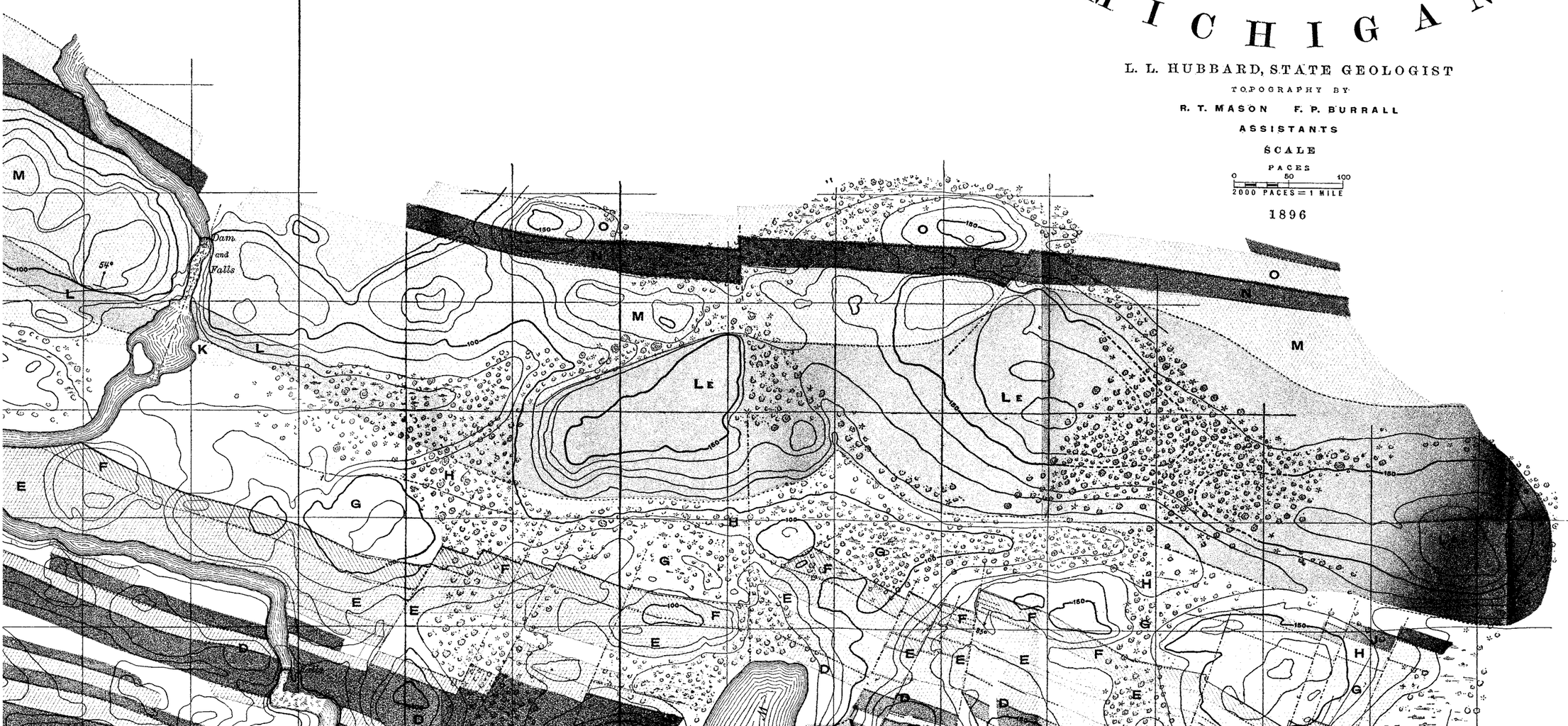
SEC. 26, T. 58, R. 28.

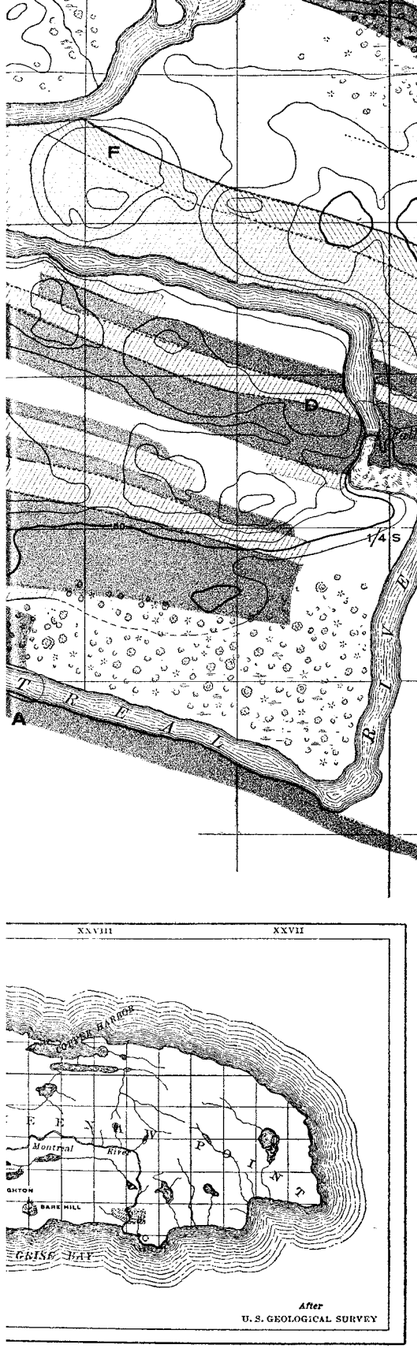
GEOLOGICAL MAP
OF A PART OF
KEWEENAW POINT
MICHIGAN

L. L. HUBBARD, STATE GEOLOGIST
TOPOGRAPHY BY
R. T. MASON F. P. BURRALL
ASSISTANTS

SCALE
PACES
0 50 100
2000 PACES = 1 MILE

1896





After
U. S. GEOLOGICAL SURVEY

NOTE

Contour intervals ten feet vertical distance, determined by hand level; locations determined by pacing.

GEOLOGICAL SYMBOLS

Felsite

Felsite Porphyrite

Porphyrite

Melaphyre

Felsite Conglomerate

Felsite Porphyrite Conglomerate

Porphyrite Conglomerate

Melaphyre Conglomerate

Fault

Line of Cross-section

ILLINOIS MONTREAL RIVER

LAKE SUPERIOR

Falls

R. W. XXVIII XXVII

T. N.

59

58

KEWEENAW

Little Montreal River

ST. HOUGHTON

BARE HILL

KETE CHISE BAY

After U. S. GEOLOGICAL SURVEY

NOTE

Contour intervals ten feet vertical distance, determined by hand level; locations determined by pacing.

Fels

Fels

Conglo

LITTLE MONTREAL RIVER

Line of Cross-section

1/4 S

LAKE SUPERIOR

Falls

R. W. XXVIII XXVII

T. N. 59 58

KEWEENAW

Little Montreal River

MT. HOUGHTON

BARE HILL

HEBE GEISE BAY

After U.S. GEOLOGICAL SURVEY

WHITEFISH POND

LE

NOTE

Contour intervals ten feet vertical distance, determined by hand level; locations determined by pacing.

Felsi

Felsi

Conglom