Vermilion district of Minnesota [with W.S. Bayley and J.M. Clements]: [specimens 27200-27324]. No. 305 Summer of 1897

U. S. GEOLOGICAL SURVEY

FIELD SECTION BOOK

9-891

LAKE SUPERIOR DIVISION.

INSTRUCTIONS.

1. Ordinarily at least two pages of this book will be devoted to one section. On the left-hand page, place a map of as much of the section as has *actually been seen.* Denote rivers, lakes, marshes, etc., by the usual topographical signs. Denote the ledges of rock, when no structure is made out, by cross-hatching, making the cross-hatching cover as nearly as possible the areas occupied by the exposures. If the rock is a massive one, but still more or less plainly bedded, use the same sign with a dip arrow and number attached, showing the direction and amount of the dip. Denote a shaly or other very plainly bedded ledge by right parallel lines, and a ledge having a secondary structure by wavy parallel lines running in the direction of the strike, with dip arrow and number attached as before. The greatest care must be taken to avoid confusing slaty or schistose structure with bedding, and in all cases where there is the least doubt about the true bedding direction, indicate it by a query. To each exposure on the face of the map attach the number of the specimen representing it. In mapping the section count each of the spaces between the blue lines as 100 paces, and twenty of these spaces to one mile, or 2,000 paces. Usually the southeast corner will be placed at the bottom of the page, or at the first black line above the bottom of the page, and at the right-hand side. If, however, for any reason, it is desirable to show portions of an adjoining section, the southeast corner may be shifted up, or the map may be turned around and the north placed at the left-hand side of the page. The ruling of the left-hand pages is also arranged so that, if desirable, a larger or a smaller scale can be used, eight inches, two inches, one inch, or one-half inch to the mile. With the two-inch scale, the squares outlined in black represent sections, and those in red, quarter sections and "forties," while the space between the blue lines is 200 paces.

2. On the right-hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, placing the number on the left-hand side of the red line, after which give in order on the right of the same red line the position of the ledges as reckoned in paces from the southeast corner of the section and the dip and strike when observable, the latter always being expressed from the north; for instance 4025, 250 *N.*, 300 *W.*, *Strike, N.* 78° *E.*, *Dip* 50° *S.* Then follow with a full description of the ledge. When topographical maps are used for locations this paragraph applies only in part.

3. Collect a specimen from every ledge, or wherever there is a change of rock on any one ledge, taking care to get fresh material, unless for a special purpose the weathered surface is desired. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be specimened. The position and extent of the ledges not specimened should be marked on the map, with notes that each is of a rock identical with specimen so-and-so. Under the same conditions small-sized specimens, trimmed to a uniform size of 2 x 2½ x ¾ inches will be allowed, but in all other cases *large-sized specimens*, trimmed to a size of 3 x 4 x 1 inches, must be selected, in accordance with section 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. Specimens should not be placed together without protection in the collecting bag, as the fresh surfaces, important in determining the character of rocks, are thus destroyed. They should be damaged by no temporary mark, but the numbers should be at once marked in at least two places upon the inclosing paper or cloth bags. Specimens may be permanently marked in camp by painting the numbers upon them in white upon a black background, using Silver White and Ivory Black oil tubes for color, with turpentine as a diluent.

4. On the last twenty-five pages of the book give, as may seem desirable, a general account of the examination of the region mapped in the previous pages, correlation of observations, sketches, cross sections, etc.

5. Forward this note book as soon as filled as registered mail matter to C. R. Van Hise, U. S. Geologist, Madison, Wis.

#305

Vermilion district of Minnesota, summer of 1897. (With W. S. Bayley and J. Morgan Clements).

Made given in place of dup. Plat complement of made on map.

July 7.

Ran south on the E. line of 33-62-15.

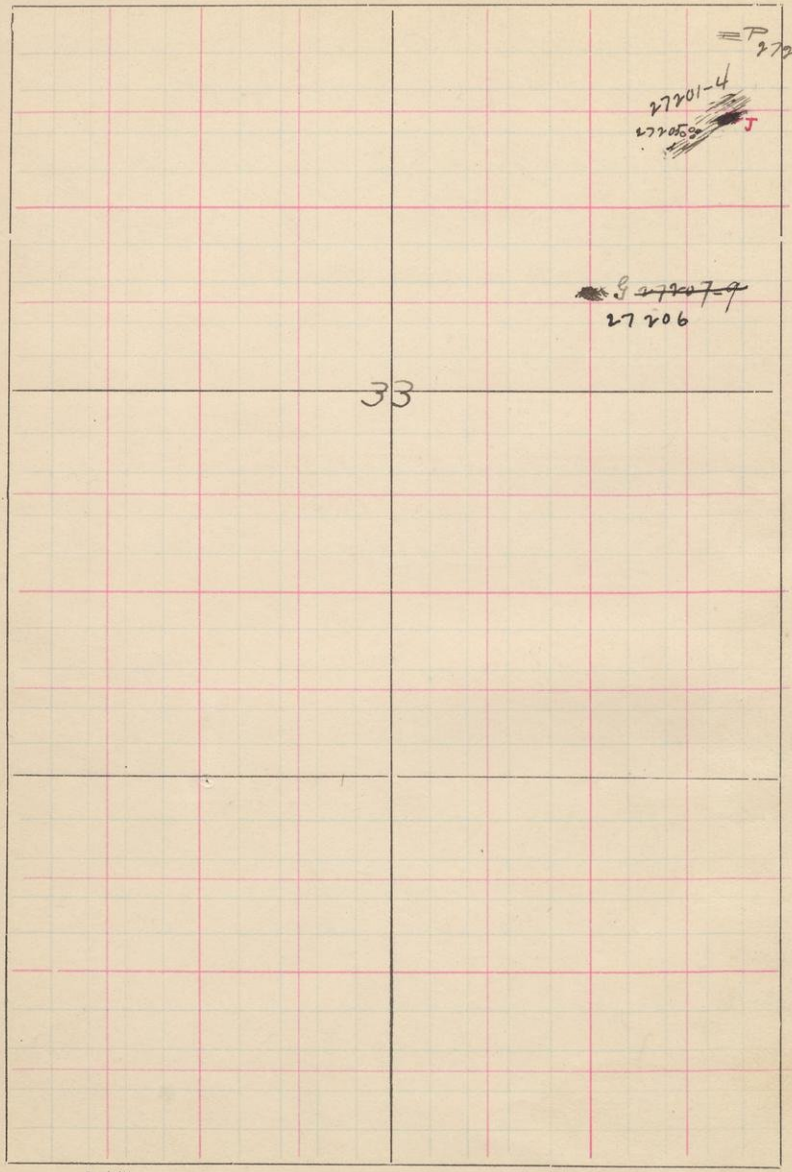
FP
27W00 At 1940 N 140 W. is greenstone porphyrite, slightly schistose. Schistosity strikes N. 80 W. Ledge about 50 paces long.

1775 N 115 W. to 1675 N 765 W. is nearly continuous exposure of green-schist intimately associated in places with a greenish siliceous quartz-schist.

(27W01 is a slightly schistose diabasic greenstone.
27W02-3 are micaceous quartz schists.
27W04 is chlorite-schist.

The relations of these rocks were not made out, though it was guessed that the green schists are intrusive in the quartz-schists and all have been

S. 33 T. 62 R. 15



6—747

together squeezed. The schistosity strikes uniformly ~~N. 10° E.~~ N 80 E.

At 1775 N 115 W. in the green schist is a belt about 4 ft wide, and several smaller belts, and perhaps lenses, of jasper, striking with the schist.

At 1700 N, 775 W. is a small ledge of quartzite conglomerate, slightly schistose. It seems probable that the quartz-schists 27702-3 are but more metamorphosed phases of the conglomerate. C 27705

At 1775 N 500 W. is a large exposure about 50 feet in diameter, standing high above the flat near the Ry. track, of a coarse diabase greenstone, somewhat similar to 27701. This is very massive, and no regular schistosity could be made out. D. di 27706

July 3.

With Dr. Clements made reconnaissance on Soudan Hill

Immediately N. of the Mine office in an old cut in the road, on the S side of the exposure is a
Rev. 27707 porphyritic quartz schist, followed to the N. by about 10 ft. of light gray
F.P 27708 much crumpled hornblende-schist. Between the two is a narrow band, resembling a vein of pale green
Sl 27709 quartz-schist, showing numerous eyes of quartz, apparently rounded

North of 27708, in the same cut, is about 17 ft. of a dark purplish slate, also much crumpled. No sharp line can be drawn between the slate and schist, the one apparently grades into the other

Immediately in front of the office is an exposure of green-schist inclosing a fragment of black slate.

Alt. 930 ft. N75°W 28-15-62

Beside the road ascending the hill is an outcrop about 30 feet wide
Sl 77/10 of a beautiful black slate, with perfect slatiness, containing
Sl 77/11 interbedded beds of a dark hornblendic tuffaceous schist, from a fraction of an inch to 18 inches wide. The tuffaceous character is marked, particularly on the weathered surface, though the fragments are small.

On the N. side of the exposure the schist is in a band 7 or 8 feet across.

The strike of the schistosity is N. 5°E. Dip vertical or slightly to the W.

There are layers of the coarser tuffaceous material alternating with the fine.

Along the contact between the slate and the tuffaceous layers, fingers of the slate interpenetrate.

July 5.

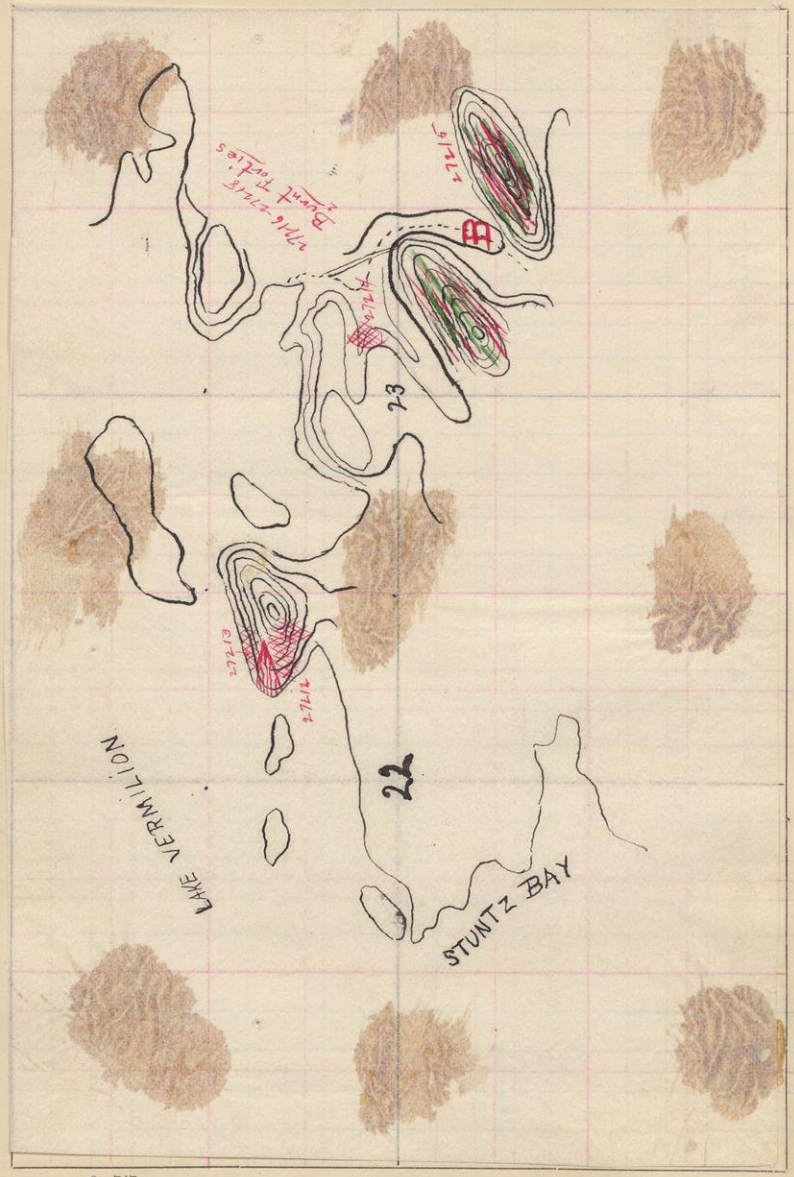
Took canoe and paddled up lake to the "Burnt Portage," on the SE shore of Lake Vermilion, in Secs. 23 and 24 T. 15 R. 67. Made reconnoissance of intervening country.

On the way stopped at point marked A. on topographic map on opposite page. Here an exposed quartz-porphyry and jaspar, the jaspar occurring in the shape of a wedge in the west end of the porphyry, as indicated on map.

The porphyry shows two phases. QP 27/12 One is schistose, and along the planes of schistosity much chlorite has developed. Also in this phase are small green patches of greenish material largely chlorite, which resemble inclusions.

QP 27/13 Another phase of the porphyry occurs N. of the jaspar. It is a very massive reddish light colored porphyry, in which are large rounded quartz phenos. On the weathered surface, besides the quartzes, are

S. 22 & 23 T. 62 R. 15



6—747

angular fragments of light colored mineral which may be altered feldspar. These minute fragments give to the rock a slightly tuffaceous character though it is just possible that the fragments represent phenocrysts.

C X7214 ~~Location lost~~. See following page

X7215 On the two hills on each side of "B" is jasper, mostly black, but in places red, interbanded with green schist. The green schist is in places very massive. It forms probably the larger part of the hill. In places it contains fragments of the jasper, and on the eastern hill the fragments are so numerous as to resemble conglomerate. So far as mapped yet the green schist forms the greater mass of the hills, while the jasper is mainly confined to the flanks. This is particularly the case on the western hill

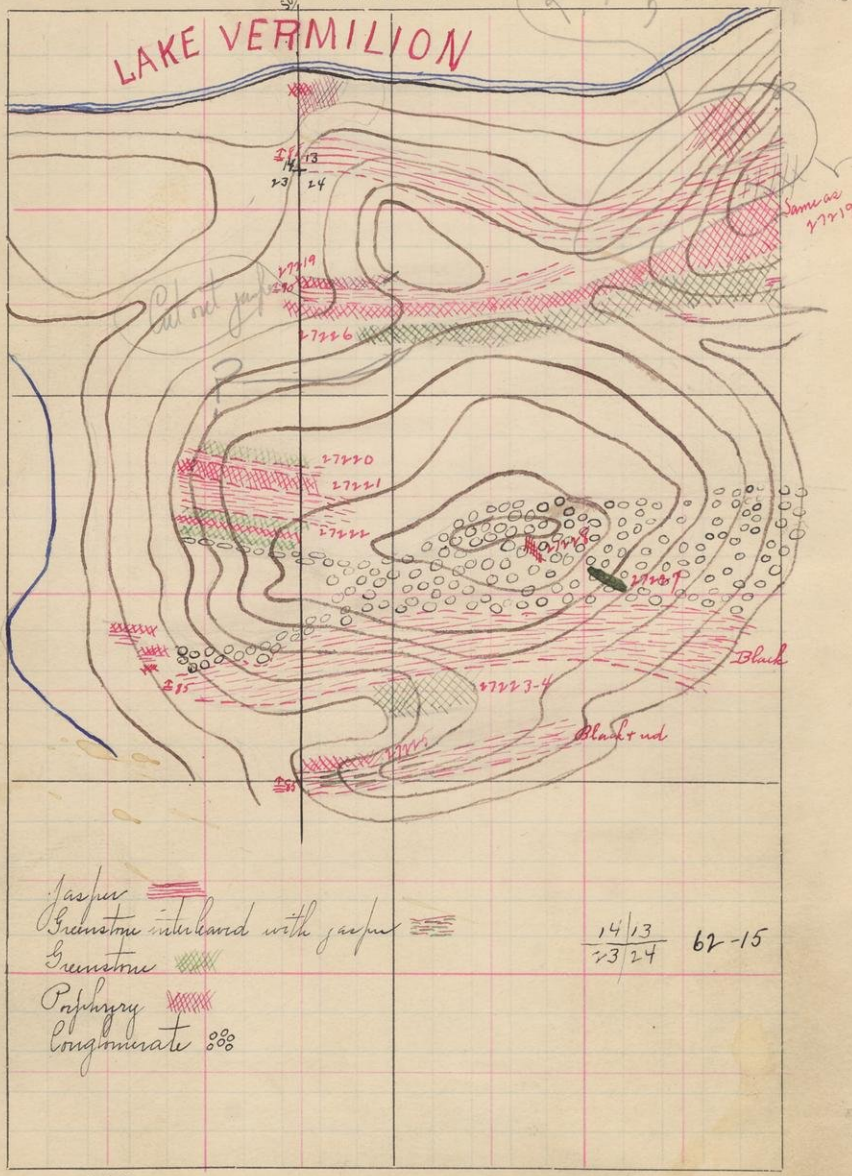
27214 At place indicated on map of preceding page. A very quartzose schist contains fragments and pebble-like areas of jasper and greenstone. Shows large porphyritic quartzes, and on weathered surface may be seen tuff-like fragments of the same material. The rock is apparently a sheared porphyry, though it has a clastic aspect.

27216
27217
27218
} Collected from hill across valley from 27214 on Burnt Knobs. This place was visited a second time and carefully studied, new specimens being collected, so that here no description will be given

Map of "Burnt Forties".

S. T. R.

1200 PACES



14/13
23/24

62-15

6—747

Ran south on the section line through "Burnt Fortis".

At the shore is very schistose porphyry. Just before the corner is reached a belt of jasper occurs, about 50 feet across. Almost vertical, but if anything dips to N.

QP
27219 At 700 S of corner is an exposure of porphyry with large eyes of quartz, including fragments of green schist, which to a remarkable degree simulate a conglomerate. Along this belt, 150 feet east, a dike of green schist about 12 inches wide cuts the porphyry.

~~27220~~ ~~Massive greenstone 4755 700 W.~~

27221 - G

This is immediately followed by a narrow belt of jasper, and this in turn by porphyry like 27219.

To the S and 100 feet east, the porphyry
27226 is succeeded by a belt of greenstone

D.S 27220 425 S 200 W. Massive greenstone.

Then follow in rapid succession,

Jaspar

F.D 27221 Porphyry with green-schist fragments largely altered to serpentine. Contains no large quartz eyes. On close examination this rock may be a greenstone.

D.S 27222 ~~Jaspar~~ Greenstone-schist, with numerous small eyes of reddish brown color.

Porphyry with large quartz eyes. No green schist fragments

Greenstone-schist like 27222

Then follows a narrow belt of very schistose conglomerate, resembling much the schistose porphyry to the N. The conglomerate was followed to the E and S around a horse shoe curve, as indicated on map.

This is followed by a wide belt of jaspar, off the W. end of which ~~was~~ is composed apparently of jaspar and porphyry in which no relations of definite distribution could be ascertained.

Ran east along the jaspar for about 150 paces from line, and then S into the valley. This is occupied by greenstone. The jaspar stands on edge, nearly vertical, but possibly dips slightly to the N.

S.A
27273 The greenstone just south is amygdaloidal and schistose. On the weathered surface it is pitted owing to more rapid weathering of amygdules. The weathered surface may also be seen round quartz eyes which may be amygdule fillings but they seem to have a somewhat different aspect.

S.S
27274 I take to be a more sheared phase of the same rock.

O.P.
27275 Just across the valley is a belt of schistose porphyry. Contains two green-schist fragments, and no large quartz eyes.

This is followed by a belt of jasper

S.
27276 See p. 8

S.S.
27277 Greenstone dike about 10 paces wide cutting conglomerate. See map.

P
27278 (Specimen lost) Crystalline porphyry cutting conglomerate. See map. About 1½ inches wide.

(S

C
27279 is a specimen of the matrix of the conglomerate, showing numerous

quartz eyes, and occasional minute fragments of jasper.

C
27730 is a pebble from the conglomerate. It is the massive porphyry with large quartz eyes. The rock has been somewhat sheared, as shown by the schistose matrix.

The conglomerate pebbles are well rounded, ~~and show~~ in general little deformation. They are mainly of the porphyry. Many jasper fragments are contained, but these are not well rounded. The porphyry is of the massive type with large quartz eyes. Though these are present in the white porcelain the rock have a slightly tuffaceous or pseudo conglomeratic aspect.

Toward the contact with the jasper and in the northern arm extending to the West the conglomerate becomes very schistose. This would be expected as the plane of contact would naturally be a plane of weakness in folding.

The jasper ranges have a general parallel E-W. direction, possibly a

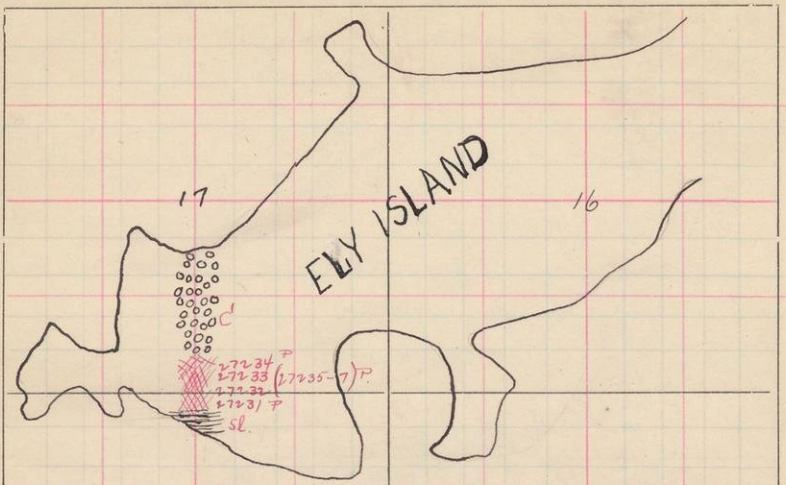
few degrees N of E., and dip nearly vertically, possibly slightly to the north. Prof. Van Hise thought that they plunged to the N., but I was unable to make out the pitch. They are three parts of monoclinal folds. They form in all cases the ridges, and the greenstones and occupy the depressions.

The conglomerate has been folded between gabbro on the S & N. and dips off to the ~~West~~ in a synocline, where on the limbs the belt is seen to divide.

The conglomerate at the top of the hill presents a magnificent exposure for 600 yards, and one could doubt its true conglomeratic character.

On the S W. it seems probable that more gross folds have brought the gabbro and porphyry to the surface in the related outcrops there occurring.

S. 17 T. 62 R. 15



Section across end of Ely island.

Made section across Ely island about a half mile east of the west end.

First crossed about 75 paces of slate.

Then about 75 paces of
Q.P. 27V31 schistose quartz porphyry with large quartz-eyes. Looks conglomeratic.

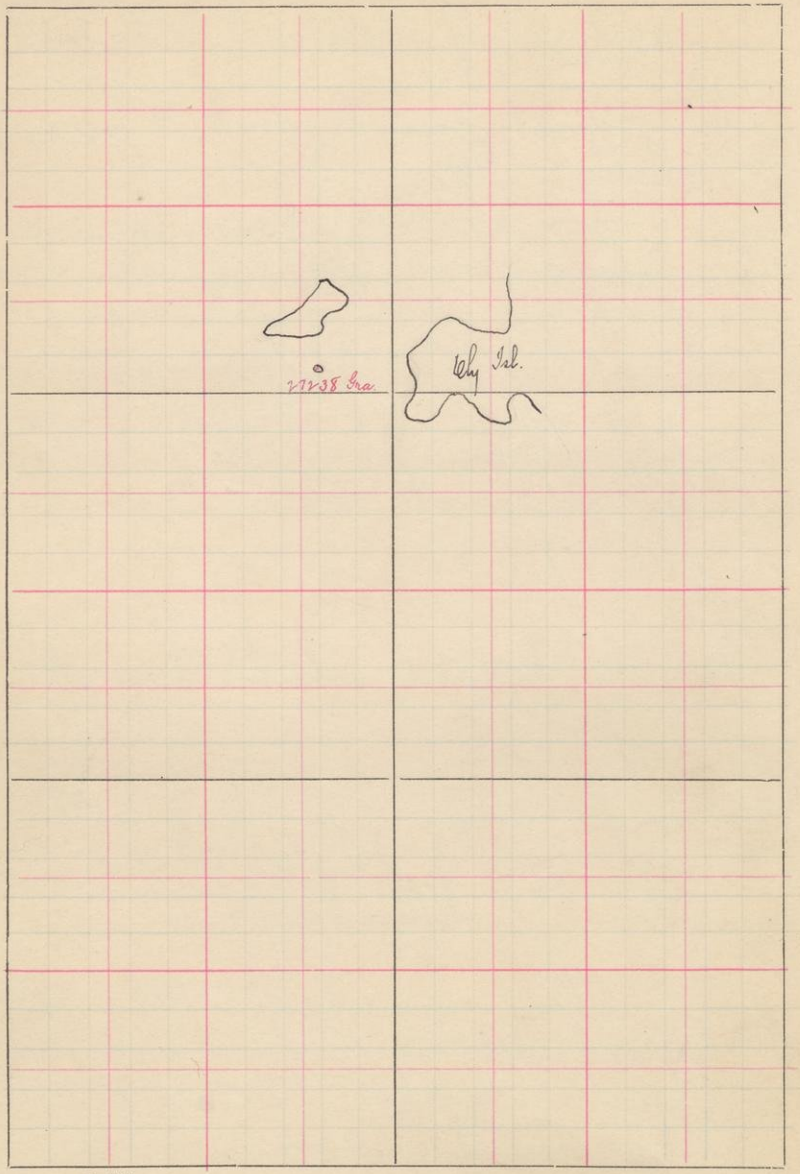
This is followed by about 50 paces
F.P. 27V32 of porphyritic green schist. Very viterous and apparently acid. May be a porphyry

F.P. 27V33 Porphyry
Q.P. 27V34 " extremely schistose and altered.

Then was found conglomerate with large boulders of porphyry with white eyes, and of jasper. Boulders in places 1V inches across.

Then commenced to follow the
27V35-7 wrong end of compass, and came back on tracks, collecting, 27V35-7 duplicates of previous numbers.
F.P. brown conglomerate is found on the

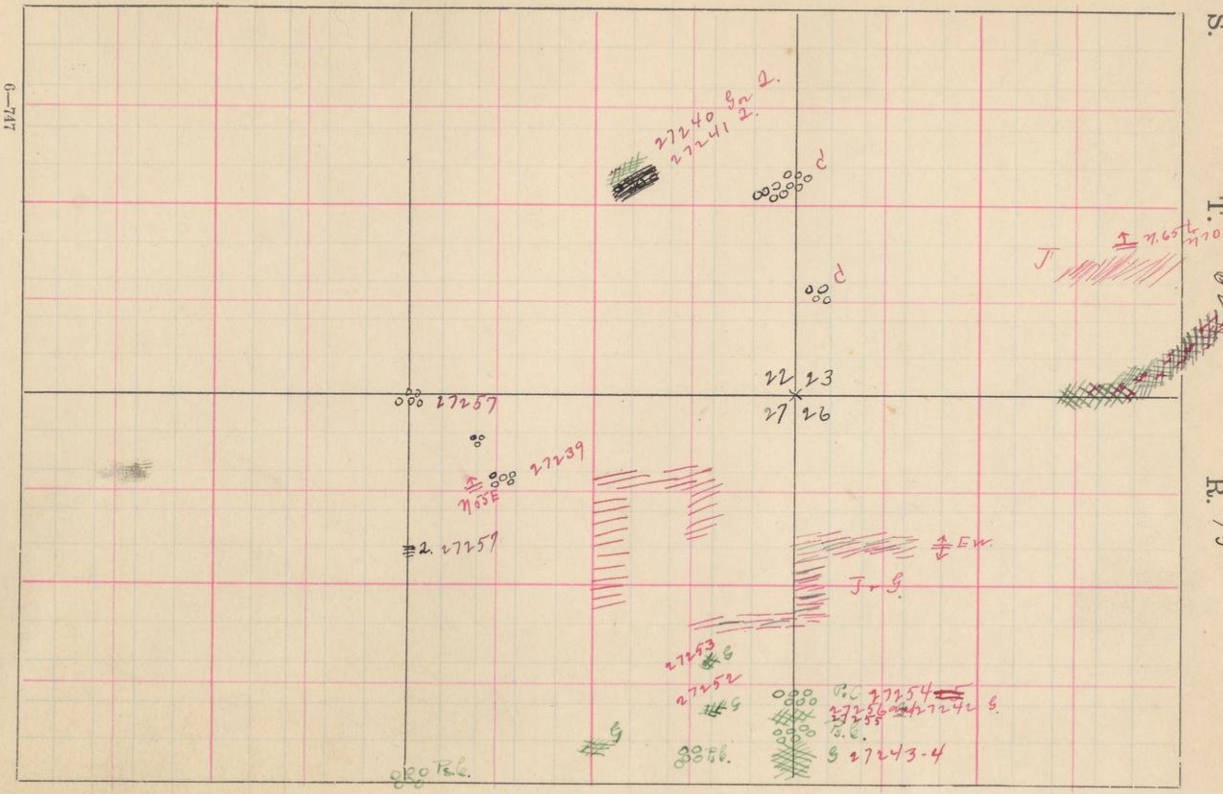
S. T. R.



northern edge of the island, so it is probable that the conglomerate continues across. Section complete and accurate so far as slate and porphyry are concerned.

SE
7 T 38 Graywacke slate from little island off W end of Ely Island, not indicated on map.

6—747



S. T. 62 R. 15

July 11. Made run with Prof. Bayley east from Stuntzes bay, D.L. Bayley taking most of the notes.

C 7739 1800 N 720 W., Sec. 27. Fine-grained quartzite conglomerate, containing also fine pebbles of jasper. Strike of schistosity is N 55° E. Dip to the N at steep angle

At 300 N. 0 E Sec. 23 is a large outcrop of conglomerate, containing pebbles of porphyry, green schist, and jasper. Matrix contains many eyes of quartz.

At 500 N 0 E. Sec. 23 is a large exposure of quartzite conglomerate containing fragments of jasper, porphyry, and green schist. Many eyes of quartz in matrix

D. 7240 At 560 N 400 W in 27 is greenstone or sheared quartzite. Could not decide.

22/23

27 26

S.

T.

R.

6—747

27241 Immediately south of which is Quartzite similar to the quartzite conglomerate before found. No conglomeratic characters, observable.

At 375 N 1270 W in 23 is a ledge of jasper, with strike varying from N 65° E to N 30° E. Dip nearly vertical, but probably slightly to N.

150 N 925 W is a large ledge of greenstone containing fragments of jasper

At 1600 N 1780 W in 26 is a ledge of red jasper interleaved with green schist, strike E & W. Dip ⊥.

At 1740 N 2000 W in 26 is a (pseudo?) conglomerate containing pebbles of jasper. The strike is approximately E & W. The dip could not be ascertained, but is approximately vertical. The porphyry fragments have edges of quartz, but not large ones, either in

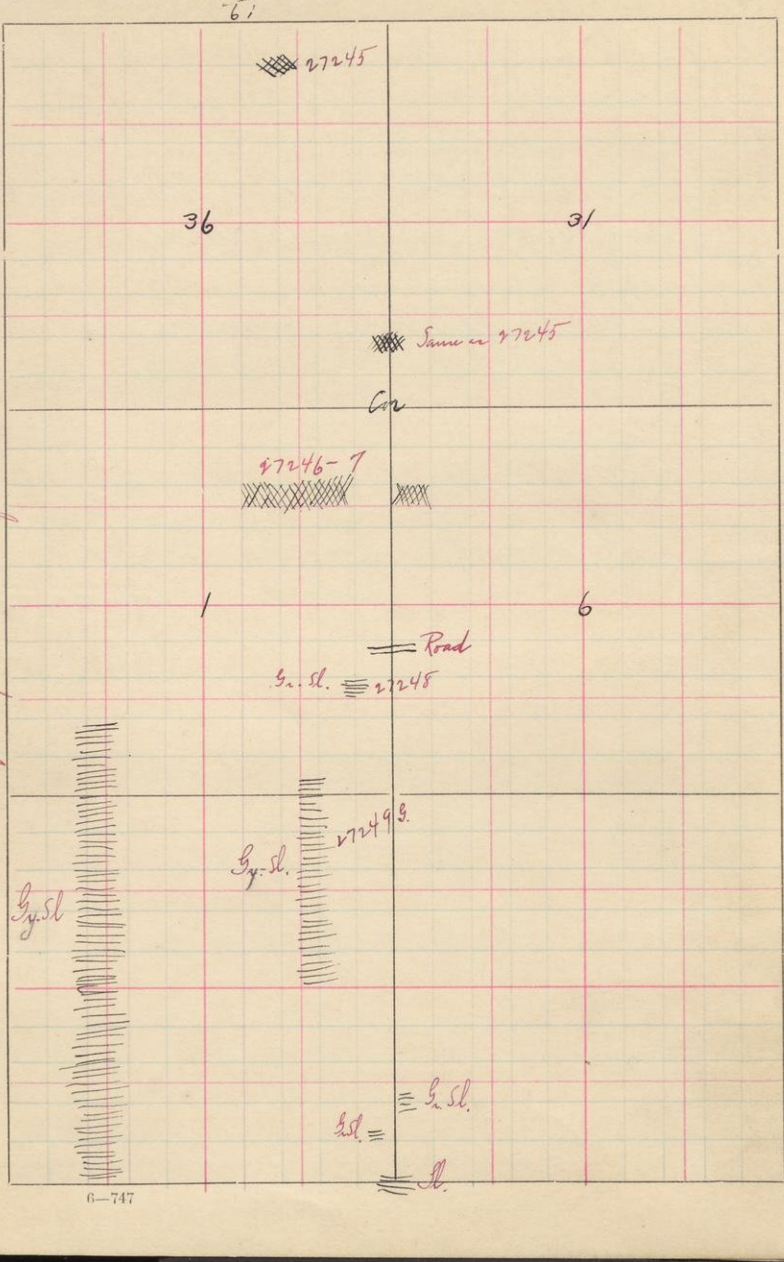
Sw sf. 27254

fragments or matrix
To the N. the rock becomes fine grained, scarcely recognizable as a conglomerate. To the S. the conglomerate becomes coarse, the pebbles being 6 or 8 inches across.

Sl. (?)
27242 This is followed immediately to the S. by a belt of ~~graywacke~~, which may be greenstone

B.P Followed by
27243 Green-schisty. On weathered surface dark green phenocrysts appear.
B.A.
27244 Green-schist, ~~possibly graywacke~~.

S. T. 62/61 R. 15



Strikes uniformly about 5° S of E.

6—747

July 17.

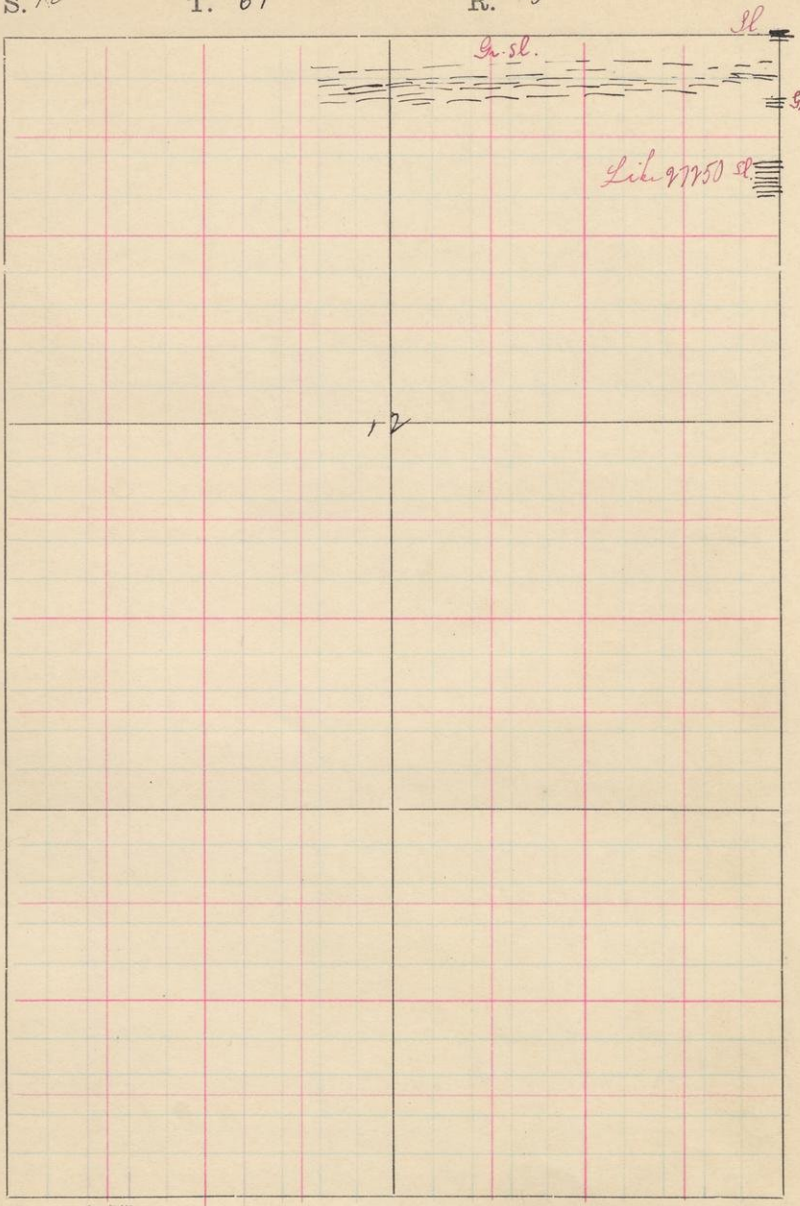
Started at point in Pike River Bay near N-S. section line of 36 + 31, and ran south for 1½ miles.

bw 900 N 300 W in Sec. 36
27245 Knot of very quartzose schist exposed immediately at the point. Strike of schistosity E. & W.

At 1750 N 0 & in 36 is another exposure of the same material; & same strike

At 1800 N 100 to 400 W. in and at just across the line in 6, are
c 27246-7 large exposures of conglomeratic & recomposed material. Its character appears best on weathered surface. Here may be seen fragments of jasper up to an inch across. Most of them angular. Large eyes of quartz + smaller roundish fragments of porphyry. Very massive and is cut by great veins of

S. 12 T. 61 R. 15



quartz. On weathered surface has a greenish tinge. To me looks more like tuff or recomposed rock than a conglomerate.

mw + Sl
27248 At 725 S 100 W of NE cor of 1 is a ledge of graywacke slate. The slaty material is included in coarser material of the same sort, in angular lenses, like inclusions, some of these ranging up to 3 or 4 ft. The coarse material is very massive. Lenses + slight schistosity strike E-W.

1000 S 700 W Sec. 1 - Same material as North, but here the slaty material is in larger masses and in places is in long winding layers. Coarser material here holds fragments of jasper.

8.
27249 The whole is in turn cut by long stringers of graystone, which strongly contrast with the lighter surface.

Exposure continues to about 1380 S.

M.S
27250 At the SE. corner of Sec. 1 is a ledge of slate, with him and thru a layer of the graywacke. The strike is probably 10° S of E.

From this corner ran S 500 paces and then W 1000 paces and then N to lake in both W & N runs getting marshes. Graywacke and slate & strata are found, as indicated on map.

Returning to corner, at the point about 400 N 1600 1700 W in 36 is a ledge
C
27251 of material which resembles the conglomerate stuff 27246-7. Looks like an unshearred form of 27245.

Throughout the (in the graywacke-slates) range it may be said that in general the slate is predominant to the S and the graywacke to the N. At the extremes the ledges are almost entirely of one or the other kind of rock.

July 13. Soudan Hill.

Started on road 700 N of Chain of 27-62-15, and ran N.

See map p. 15+16

First rose about 50 paces of jasper with green schist.

H.S. 27252 at 1185 N 700 W is green-schist

H. 27253. Greenstone on map.

C 27254 Pseudo conglomerate. Numerous fragments of jasper. See description on page 16.

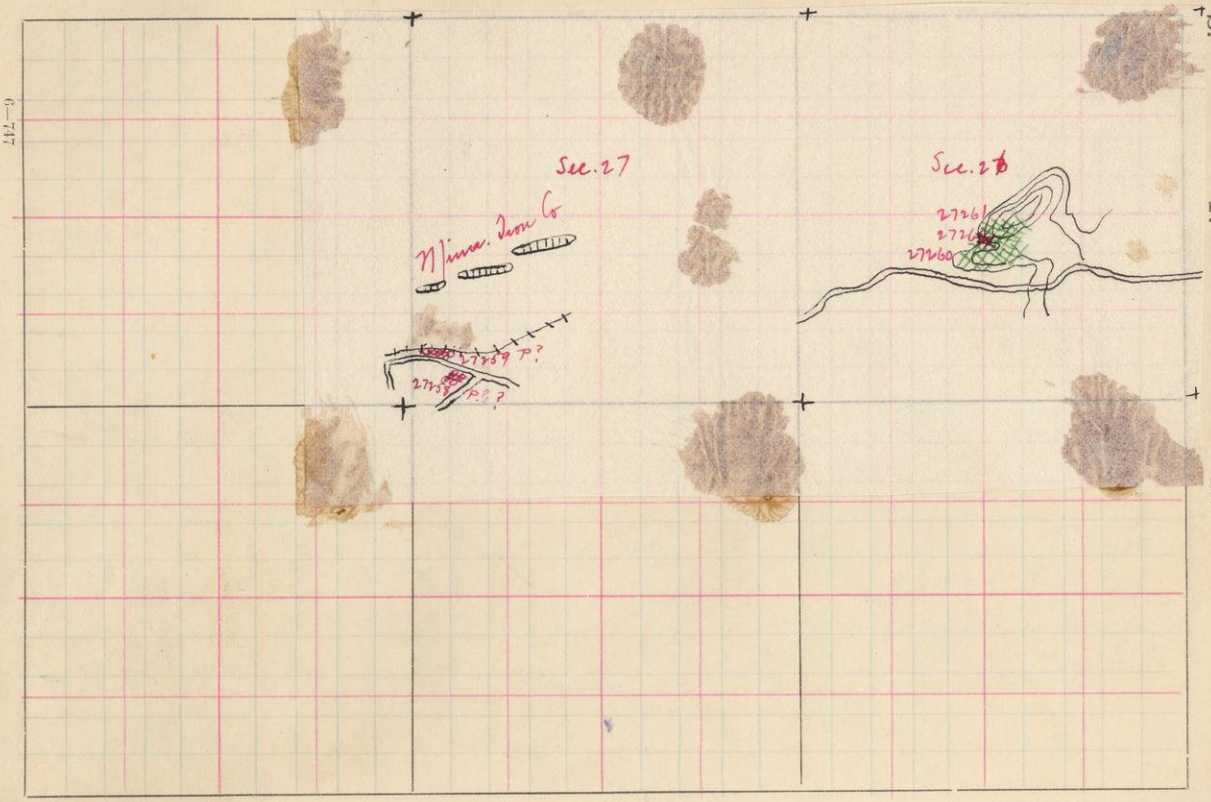
F.P. 27255-6 Cut by 55 and 56 Greenstones? 55=C? 56=H?

H. 27256 700 N 100 W. Sec. 27 x The two are found cutting one another, and the greenstone is later than jasper.

Much of the greenstone to the S of the pseudo conglomerate, have a fresh green aspect as though later than the greenstone intruding jasper.

In crossing Soudan Hill jasper is carried until we reach

C 27257 1600 N 1000 W Sec 27 is a ledge of fine-grained pseudo conglomerate approaching conglomerate in coarseness. In fact in places it is slightly conglomeratic.


Sec. 27
Mine. Dam 6
27289 P?
27288 P?
Sec. 28
27261
27260
27260

27258 In town S of Soudan, just S of road and S of the stock pile, is ~~gabro schist~~ containing ~~fragments of jasper~~ masked, Strike E+W. (porphyry)

27259 Just S of the R.R. track and S of the Stock pile Soudan is ledge of schistose porphyry conglomerate. Strike E+W. Fragments are of porphyry and some of them are and highly schorse No jasper fragments, but the fragments so well rounded that there is little doubt as to the character Upon closer examination it appears probable that few jasper fragments are present

27260 870 N 1350 W Sec. 26 Greenstone The exposures are apparently a mass of rock, with many cavities but examination shows the rock to be solid. Seems to be the result of cooling. At times the fragments between cavities are slightly roundish. Weathered as greenstone?

B.S
27261 Across valley to the north on the next hill is the same thing?. More ~~cementation~~ schistose. Strike E 5-25 S

C
27262 In valley between is greenstone-schist of the same kind containing fragments & pebbles of white ~~granite~~ feldspar.

July 14

Crossed country E of Soudan, using topographic map. Went on road to east section line of 26-62-15 Then N to section line then E 1000 paces and then S to road.

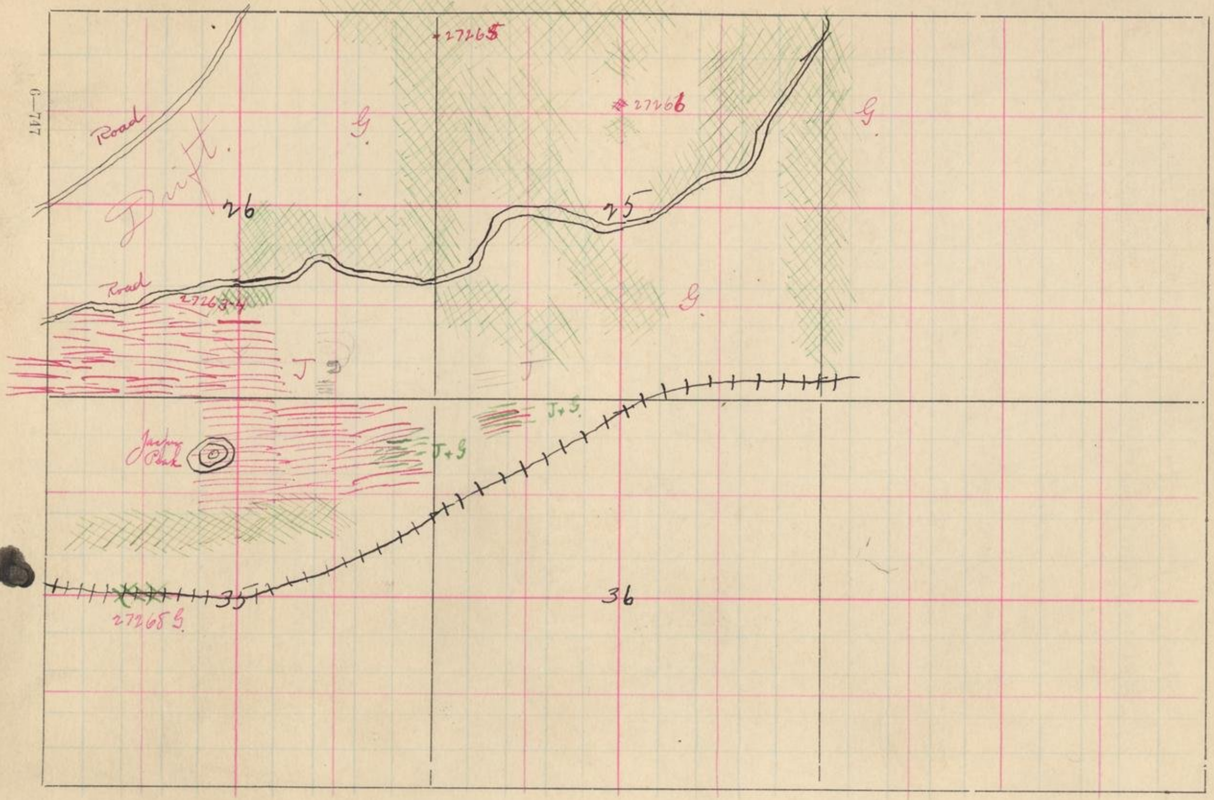
All exposures are of greenstone Specimens were taken.

On the hill S of the road at about 1300 W in Sec 26 are large exposures of
M.C. C 27263 greenstone which in places take on a ~~conglomeratic character~~ tuffaceous character.

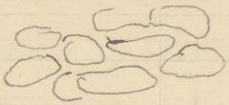
M. 27264 This is cut by massive greenstone

M.C. 27265 At 1900 N on the E line of 26 is a well developed aa greenstone

S. T. 62 R. 15



Surface of exposure presents appearance somewhat as follows:



The round areas are occasionally 12 inches across. Not all complete

Qtz. Por.
27266 1600N 1000W Sec. 25. Porphyry followed immediately to S. by greenstone, which here for a few feet has the peculiar brecciated and conglomeratic aspect so common in the area.

In the SW¼ of 25 hills show two ranches of greenstone, - the light coloured brecciated phase cut by the massive phase.

S of the road on 26 and 35 much jasper outcrops, as shown on map.

B.S.
27268 Schistose greenstone from Qy cut S W. of Jasper Peak.

July 17

Made section across Sucker Point, beginning at the Indian Village, ranging S to lake then W. and finally N, using topographic map.

First crossed pinch tail a ledge of graywacke slate

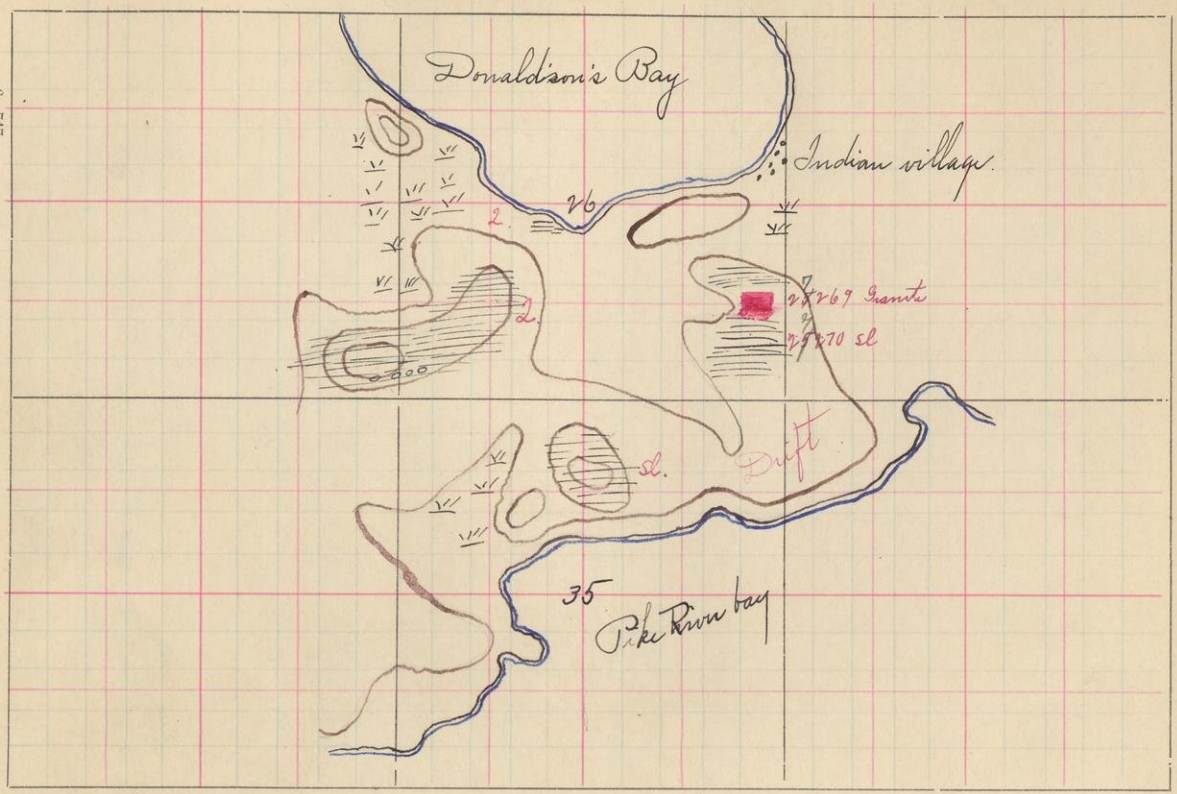
At about 700 paces S of the landing is an exposure 20×30 ft. of coarse granite, with large feldspars with crystal outlines. Weathered surface give striking appearance. Strike E 10° S

G.D. 27269

At about 875 paces S, and perhaps 25 paces W. of the last outcrop is another of the same rock. Here it apparently grades over to the N into coarse granite without large feldspar phenos. Strike same.

G.P. 27270

900 S Slate, striking nearly E+W. The granite is found in almost continuous exposure to within 10 paces of the slate



S. T. 63 R. 16.

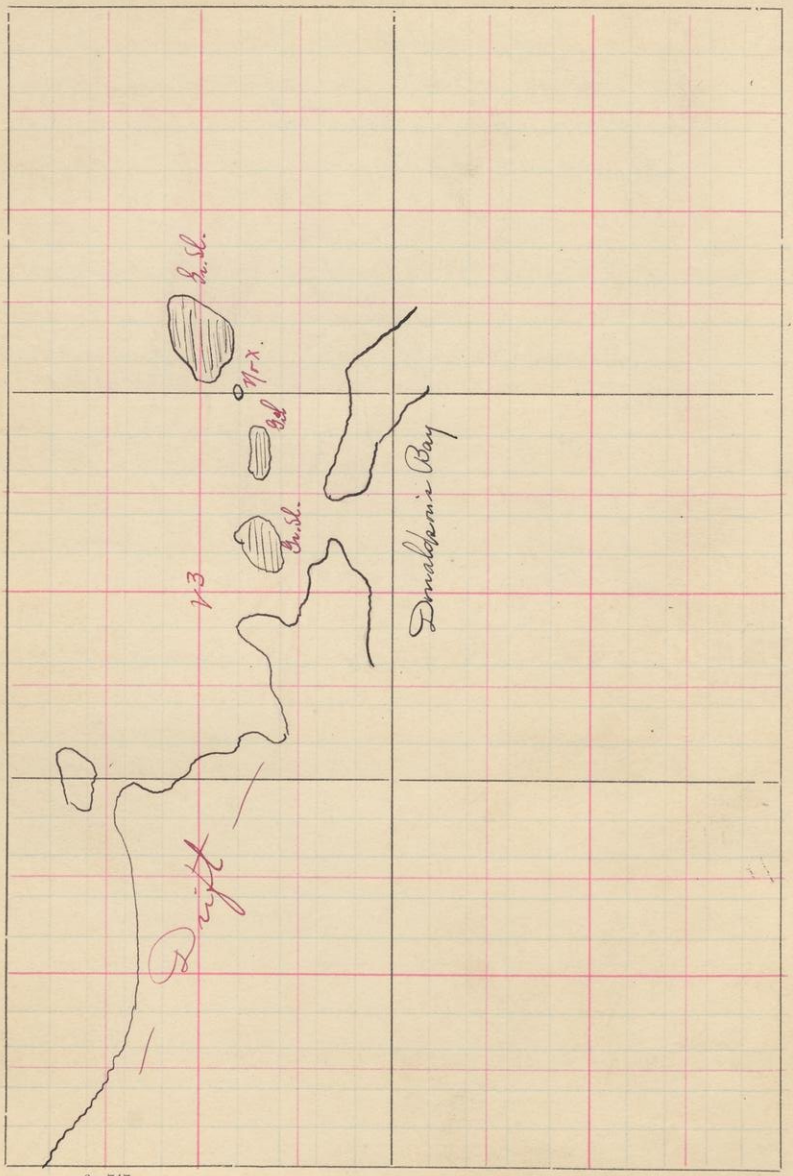
6-717

In returning N. on the S. flank of the high ridge to the N. is quartzite, which in places is slightly conglomeratic. On the N flank is graywacke-slate.

In returning to camp on Pine Island, visited 3 islands at mouth of Donaldson's bay. All graywacke-slate.

Also visited 3 islands passed in crossing the lake, and found them all to be the same thing. Strike on first island N 85 E.

S. T. R.



6—747

July 19

Studied Birch Pt., Lake Vermilion, starting at NE end and skirting the shore to Donaldson's Bay.

First visited four islands off end of point.

The two to the S are graywacke-slate. The large one to the N is graywacke-slate on its east end, but at the W. end is very sericitic and chloritic.

Hs 2 7 21 1

The next island to the W., just S of the end of Birch Pt, is graywacke-slate - about as sericitic as that on island to E.

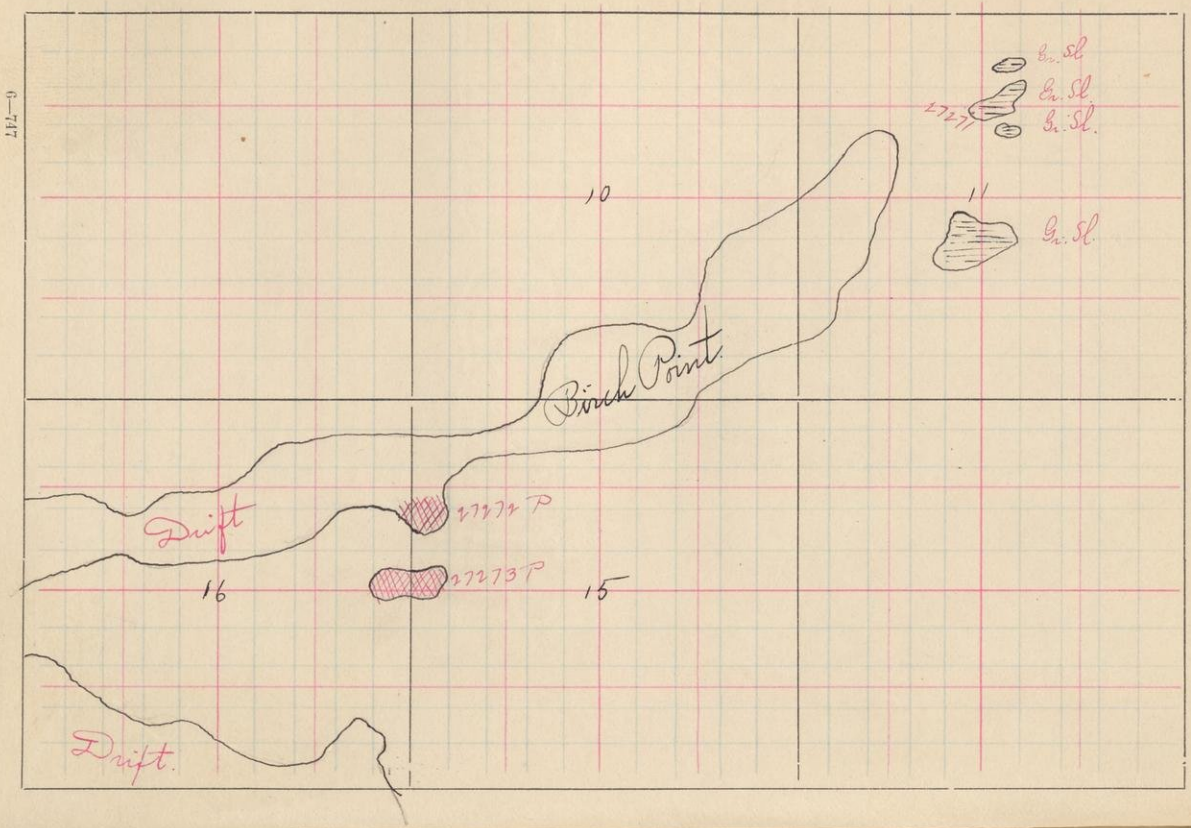
Schistosity on all islands is almost due E + W. Dip slightly to N.

Hri 2 7 21 7 Conf. Sedim.

Porphyry from little point just north of island in Birch Bay. Strike E + W.

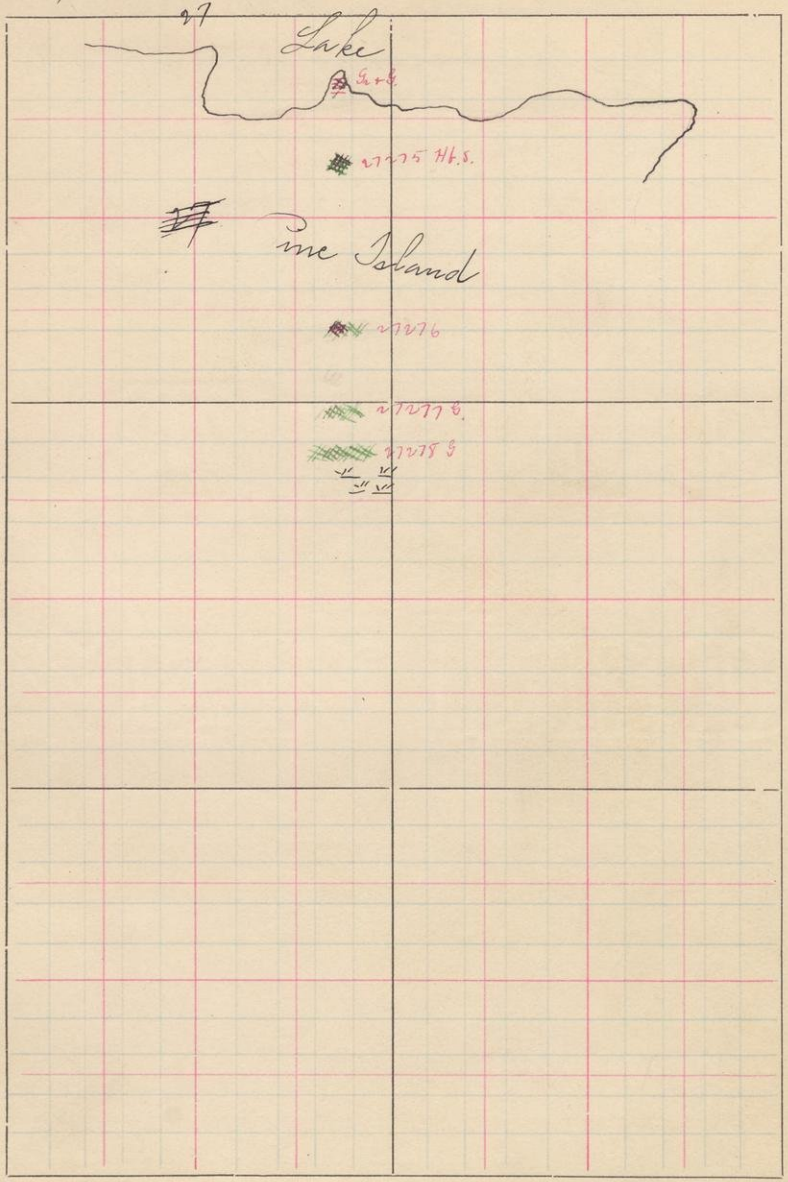
Hri 2 7 21 73

Porphyry on island in bay just S of 2 7 21 72. Porphyritic greenstone?


S.
T. 61
R. 16
6—747
10
11
Gr. Sl.
Gr. Sl.
Gr. Sl.
Gr. Sl.
Birch Point.
Drift
16
15
Drift.

Remainder of hills around
show are drift.

S. 27 T. 63 R. 16



6—747

Ran S into Pine veland from N. shore, as nearly as could judge about 200 paces W of the E. line of 27/62/16.

At point of landing is green-schist cut by granite, ~~[illegible]~~ intruded by Bayley.

H6.S
27275 400 S of the shore is a hornblende-schist. - Graywacke? Continuing for 300 paces.

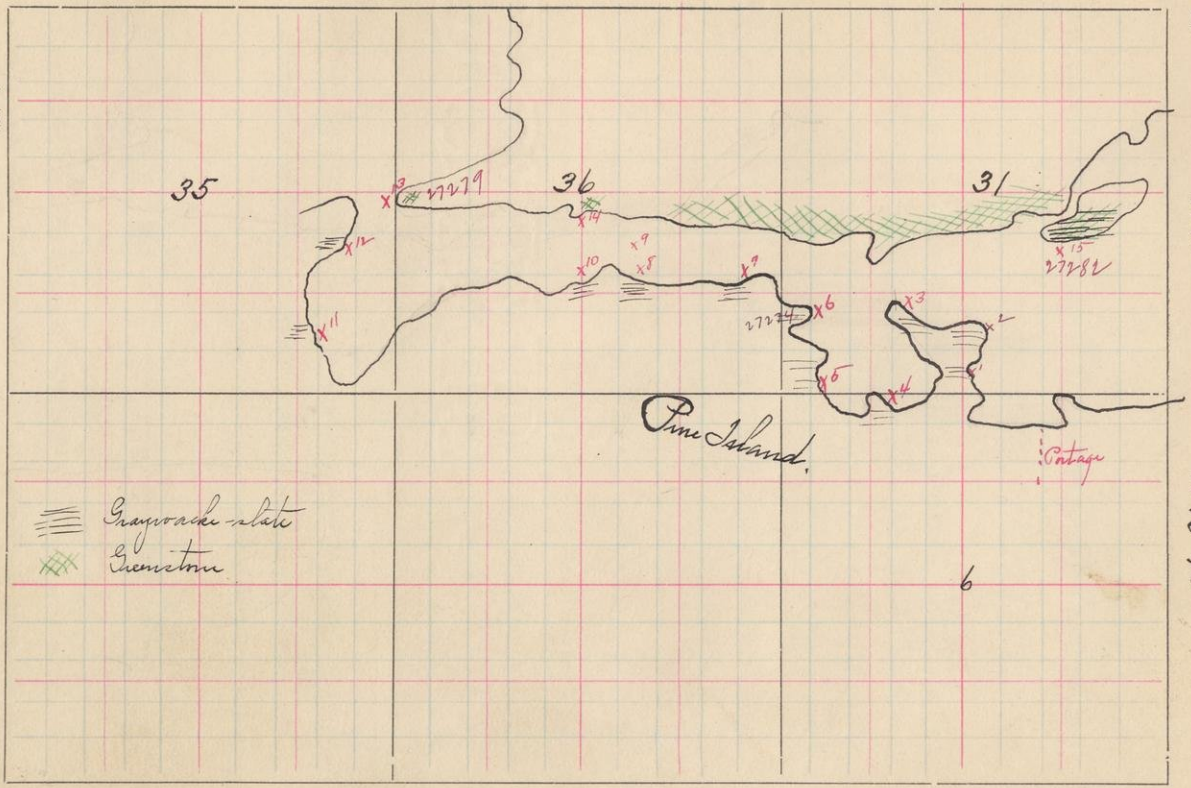
Gx

H.si
27276 1300 S. Massive greenstone. Forms large hill or knot.

H.S
27277 1800 S Green-schist. Strike E-W.

H.si
27278 2000 S. By the Nedge of a great marsh is massive greenstone forming a high hill. Coarse and diabasic.

Had Muldrow's topographic map, but could make little use of it. According to this map should have struck big swamp about 1000 paces. S. Did not strike it until


27284
27283
S.
T. 63
R. 16-15
35
36
31
6
27279
27274
27282
Pine Island.
Cottage
Graywacke slate
Greenstone

marked 7000 S.

Coasted N shore of Pine Island to the Narrows, and then back on the main shore to the N. Secs. 31 + 36 62 / 15-16. See locations on opposite map. Stopping places indicated by crosses.

At X¹ Graywacke-slate E. 15° N.
X² Same, somewhat more quartzose
X³ Graywacke-slate. So schistose and chloritic or sericitic as to almost be called a sericite- or chlorite-schist.
X⁴ Same as X¹
X⁵ Graywacke-slate, or perhaps sericitic or chloritic schist. Very schistose and has green aspect
X⁶ Sericite-schist. Presumed to be metamorphosed graywacke-slate
X⁷ Graywacke-slate
X⁸ " "
X⁹ " Rather massive. So much so that no strike could be obtained.
X¹⁰ Sericite-schist
X¹¹ Quartz-schist
X¹² Graywacke. Massive. Jointing has

broken into polygonal blocks.

N.91
27279 (3 phases) X[13] Green-schist. Rather massive
Strike 5° S of E. A little further on
become schistose.

East along N shore is almost
continuous exposure of green-schist,
in place massive and resembling
N.9 graywacke, and in places very
27280 schistose, becoming sericite-schist.

N.9. At several places the green-schist
27281 includes fragment-like areas of
(2) lighter colored material, which vary in
size from three ½ inch across to those
3 or 4 ft. long. All sharply angular.

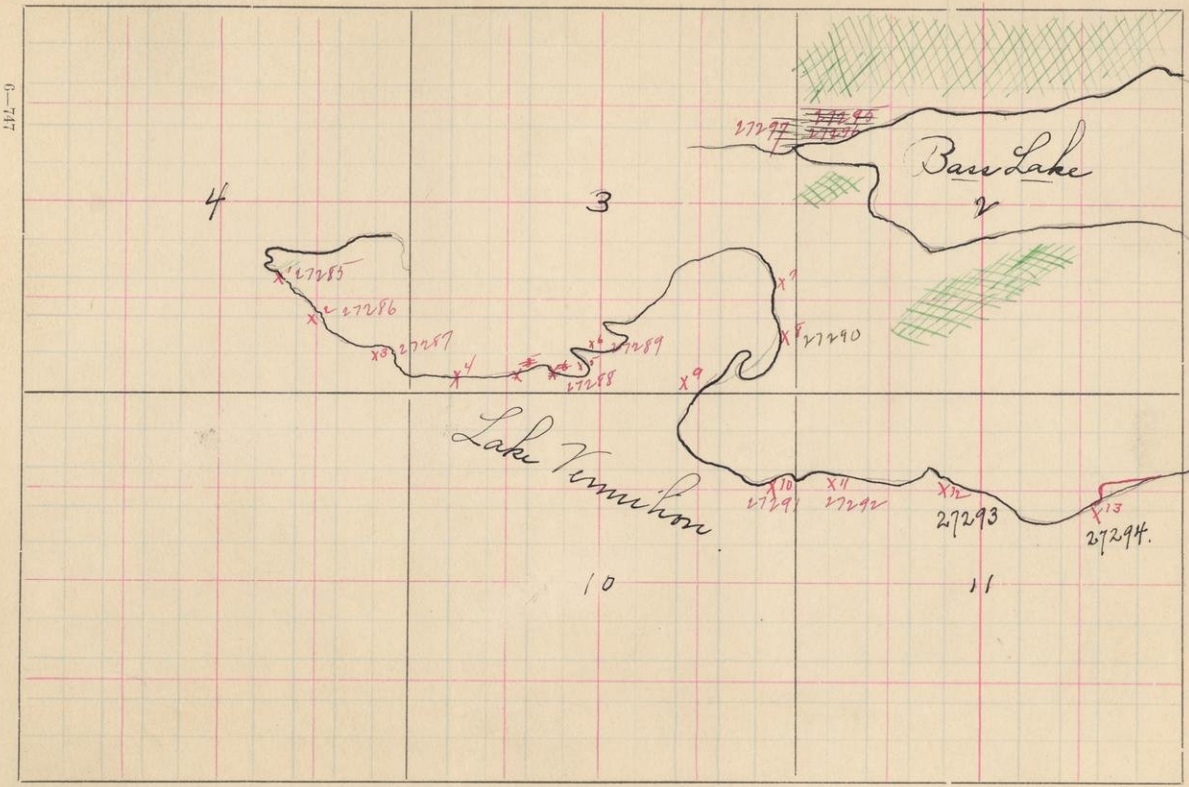
The green-schist continues up shore to
N.91 X[15] where the rock has the aspect
27282 of graywacke.

During day's run the strikes
except where otherwise indicated
were about 5° N of E. In
many cases it was hard to
discriminate between greenstone and
graywacke.

Can go with on main land from shore opposite frontage on Pine island to reach the northern granite.

S. cut by gr. 27783 (2) At 1300 N of lake gneiss granite and green schist intimately intermingled. Seems like [illegible] and injection. Could make little from relations.

gr. 27784 At 1345 N Solid granite


S.
T. 62
R. 15
Bass Lake
Lake Vermilion
4
3
2
10
11
27283
27286
27287
27288
27289
27290
27291
27292
27293
27294.

July 21

Started at point in 4-62-15 E. and worked along S. shore to Mud Creek Bay

B.S 27285 At x' on opposite map is green-schist

B.S 27286 x² Also taken to be greenstone, but 27287 resembles very closely graywacke.

27287 x³ Graywacke?

B.S 27288 x⁴ Green-schist

B. 27288 x⁵ Graywacke?

B. 27289 x⁶ Greenstone. Massive. In the N this rock becomes schistose and sericitic.

x⁷ Graywacke. Strike N 70 E. Right degree joint to SW. similar graywacke was found

B. 27290 x⁸ Green-schist enclosing fragment like augen of lighter rock, similar to material found yesterday N 7 Pine island.

F.P. x⁹ Green-schist same as x⁸

27291 x¹⁰ Partially green-schist. Fragment like augen

Hallowtop B. 27292 x¹¹ Massive green-schist ~~a~~ graywacke

sl
27293 X 12 Green schist ?
27294 X 13 " "

There runs N to Bass Lake
On the N shore of the lake at
the W. end are huge ledges of
massive greenstone Strike (Trend of ledge) 10° N of E.
Between these ledges and the
lake are several narrow bands of
rock.

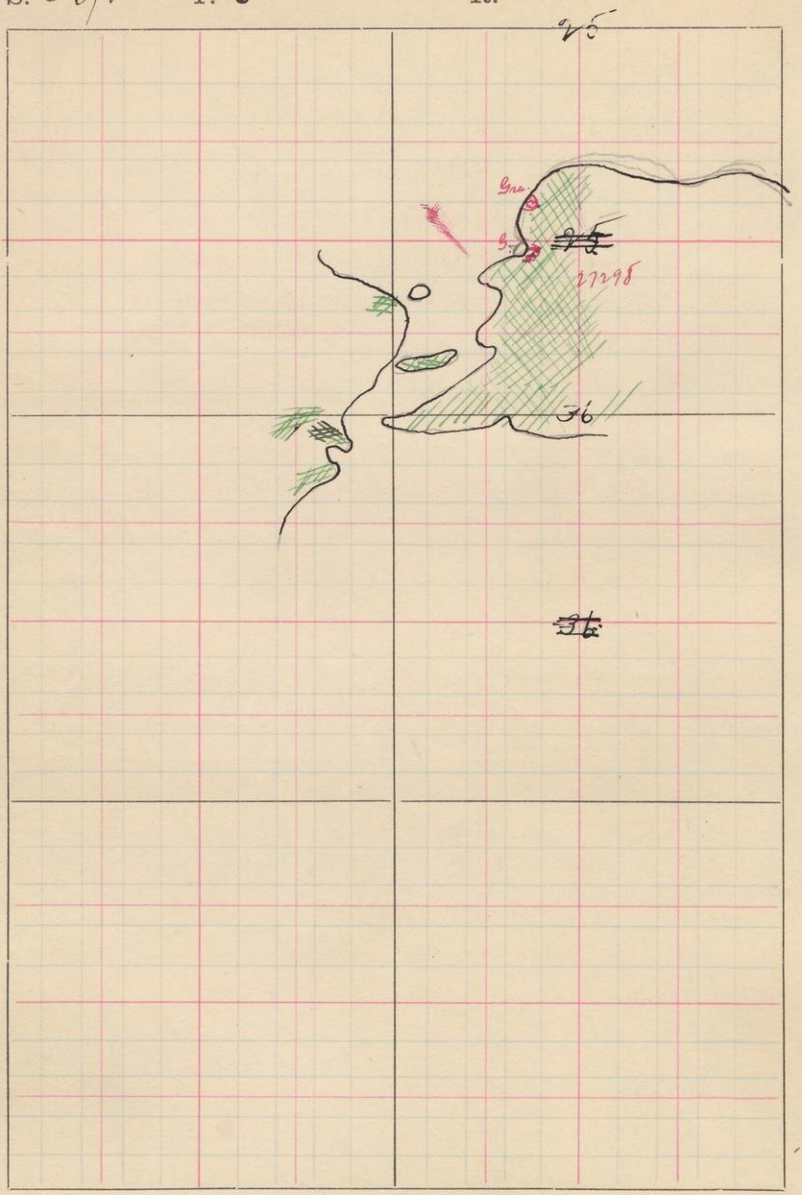
qp.
27295 Rotten fine phyllite schist

sl
27296 Slate and graywacke closely
interbanded, dip to S. The slate
in place is black and ferruginous,
and so slaty that a specimen cannot
be obtained.

In the 100 paces between the greenstone
and the lake there are a half dozen
interlaminations of schist, slate,
and graywacke.

West along the strike of the slate
and graywacke, N of the [illegible]
is material which was supposed to
be greenstone. This material also
occurs on the hills of the S end

S. 36/25 T. 63 R. 16



of the lake, overlooking the lake

July 22

Made sections on both sides of narrows N of Pine Island.

In going N on the W side no exposures but green-schist were found. Exposures rare.

In coming back on the E side the first rock crossed was green-schist including fragments of light pink cherty material. This continues for about 300 paces.

Then come a wide layer of coarse hornblende rock. Prof. Bayley has specimen.

H.B.S. 27298

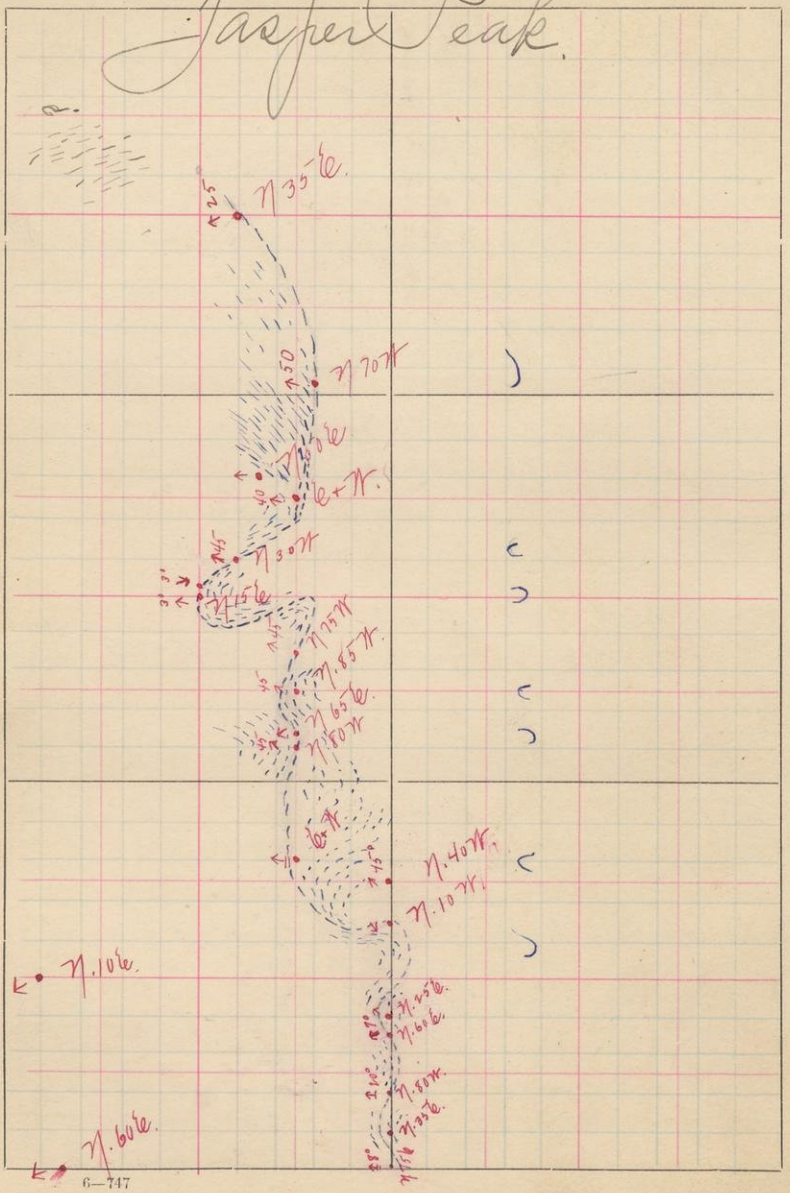
This is followed by green-schist, and this by another in which hornblende? crystals are developed along shearing planes. From here on to the lake 500 paces, green-schist only is found.

Ran N. from Lake Vermilion
on line between 32 and 33 - 63 - 15.

At the lake is green-schist
Gr. At 400 N of lake is a high ledge
27299 of granite cut by numerous large
G.s quartz veins
27300 Associated in same ledge with
green-schist. Not possible to
determine the relations of the two
though my impression is that the
granite is intrusive in the green schist
Granite forms much the larger
Gr. mass.
27301 At 810 N. solid granite

S. T. R.

Jasper Peak.



6—747

July 24.

Made detailed plat of Jasper Peak.

Started near summit in SW. cor., at point 400 E 700 N of the SW. corner of Sec.

First made reconnaissance of the hill and found the jasper to be in a series of folds plunging to N.W.

Then ponked out east from W to E taking strikes and dips of banding of the jasper. The results are indicated on the plotted page.

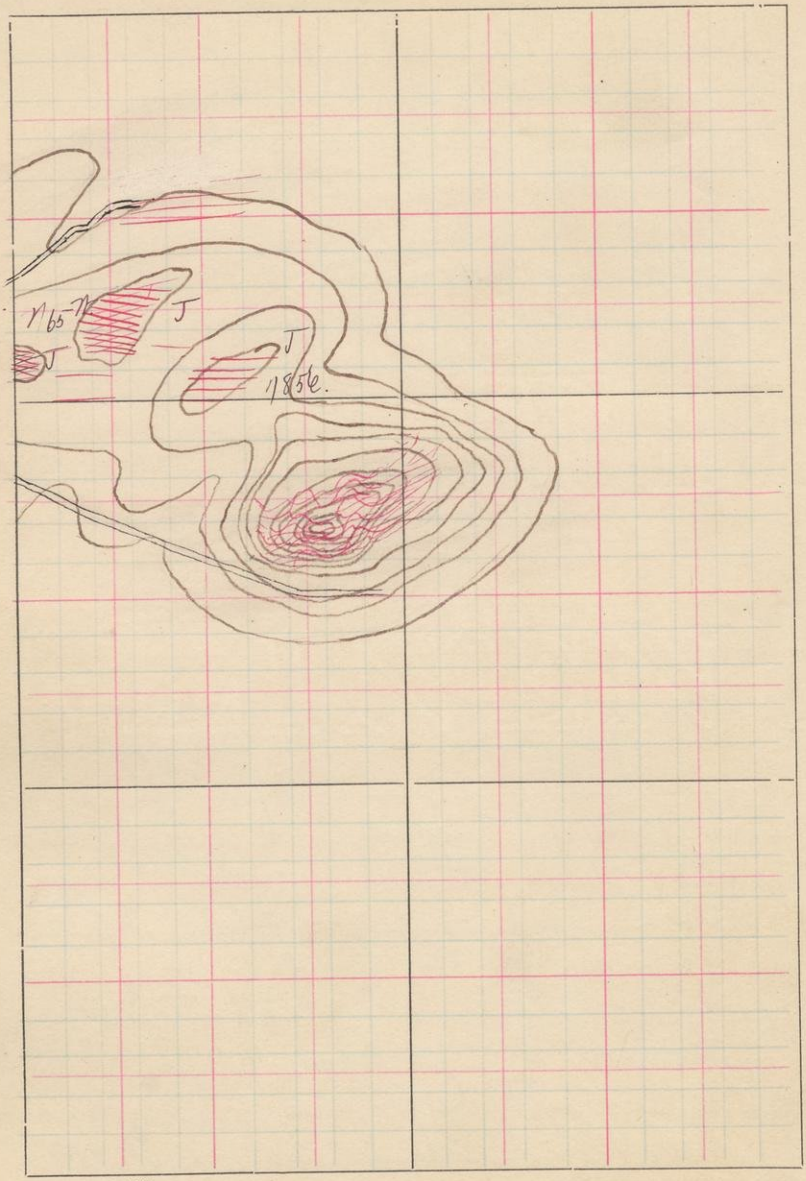
The salients to the N indicate anticlines. The folds plunge to the N - rather a few degrees W. of N.

The strikes and dips show that the minor folds have been pushed over from the N.E. The dips on the NE sides of the anticlines are flat, running up to 45°. On the SW side, however, they are high, in many cases nearly vertical. As a result in approaching the N. end of the anticline from the E the strata bend gently, gradually changing

to synclines. However, passing around the end of the anticline, the laminae are seen to bend very suddenly, both laterally and vertically, and on this side the jasper is ordinarily much fractured. Also the fracturing around the outer edge of the anticline is less than along the inner layers. Thus:

The jasper on the NE. corner of the hill is much precipitated, and it is almost impossible to get strike. It is believed that the jasper forming the E. limit of the syncline, which swings off to the NE. was caught by a late cross folding, and swung around to a direction about N 15° W., and greatly precipitated. The jasper is here cut by large cracks. N 70° E. ×

S. T. R.



The S side of Jasper Peak drops off sharply and steeply, and the topographic map is bad. The map on opposite page indicates some of the corrections which might be made – though this map is itself faulty.

On the S. side of the bluff the ends of the main folds may be seen in section, and the structure easily traced. Observations here verify the main folds worked out above by strike and dips.

(N65E.

In a whole the crest tends NE SW, though at the W., it is believed that the plunge swings N.W. – thus: Its pitch could not be ascertained.

The main folds pitch steeply to the NW in all higher than 40° from the vertical and are many nearly vertical.

The main fold is exposed in only one knob the strata breaking off abruptly to the S.

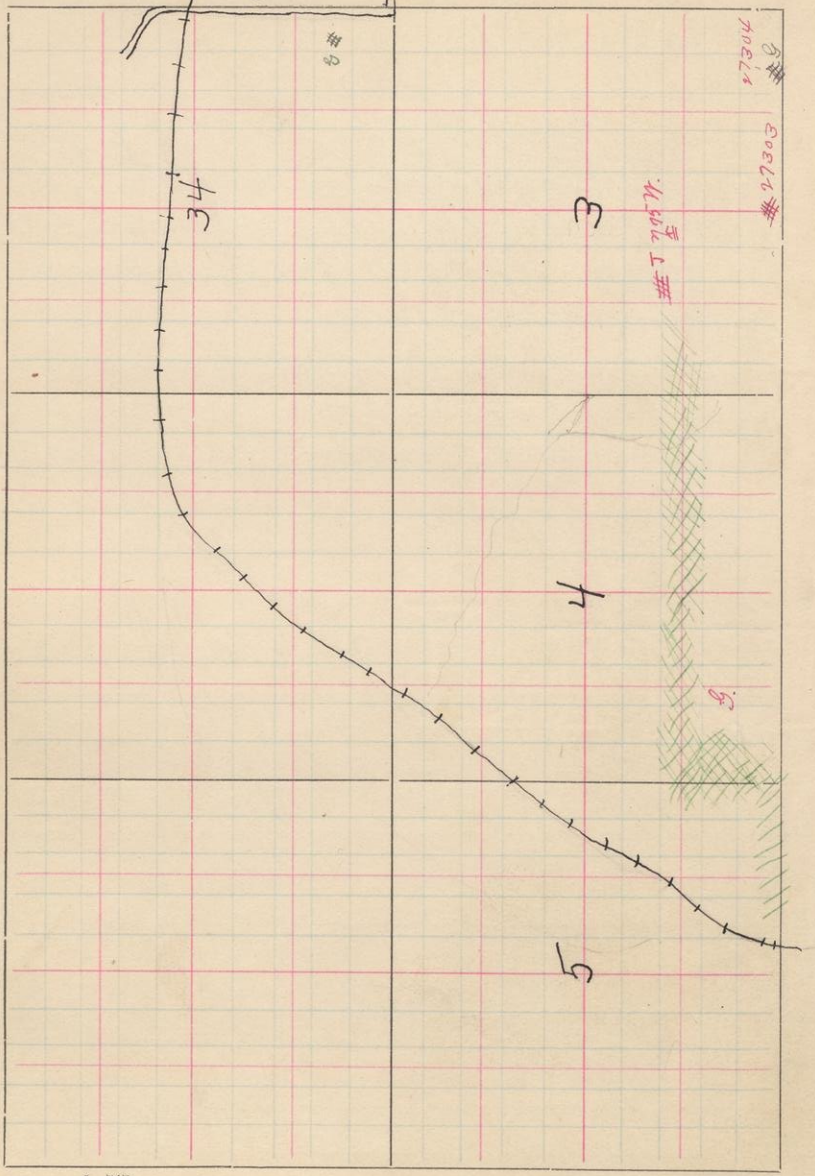
The strike of the main folds

as nearly as I could measure is N. 45° W.

Finished grade Sec. 34, the party left between the Ry and the section line to the N. No exposure was found. Country is low and marshy. A few drift hills.

Worked the hills between Jasper Peak and Soudan, finding jasper.

S. T. 62/61 R. 15



6—747

July 76

Started at point where the line between Secs. 5 and 8 - 61 - 15 crosses the Ry track S of Tower. Followed this line E. to the NE. corner of 10

From the corner ran E 140 paces, then N 500 paces, then E. 500 paces. All greenstone.

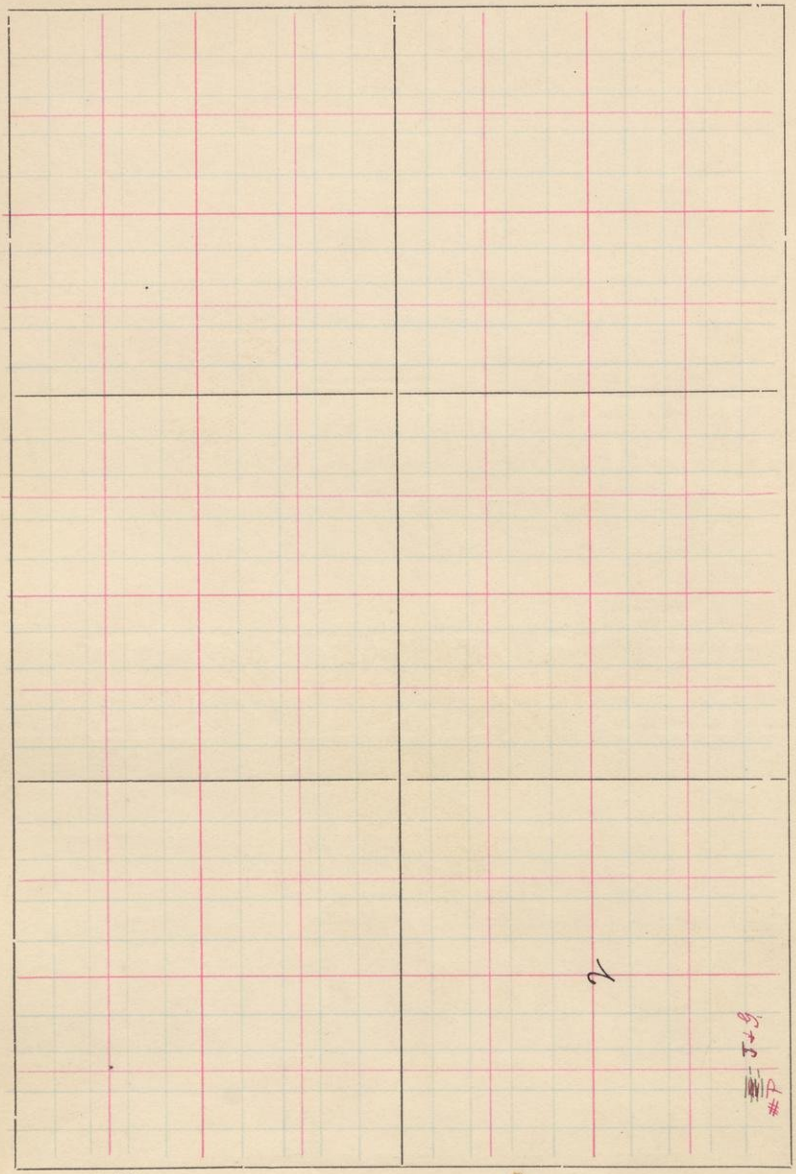
90 N 140 E in 4 is a bigger mass of jasper, striking N 65 W., which was at first thought to be in place, but which upon further examination was thought to be an erratic.

645 N 530 E in # 3. Jaspar Strike N. 75° W. Dip 30° ~~W~~ N.

QP. V. 7303 1000 E. 50 N Sec. 3. Porphyry with greenish tinge. Massive In places may be seen to have dark green inclusions or segregations.

V. 7304 1700 E. 50 N - Sec. 3 Greenstone Massive.

S. 1 T. 61 R. 15



6—747

350 E 50 N Sec. V. Porphyry somewhat similar to 7303. Coarsely crystalline. Large eyes of quartz some of which are 3/8 inch in diameter

400 E 190 N Sec. V (and green-schist fragments) Strike N 65° W. Dip 10° N. This is a large ridge consisting mainly of green-schist, containing large gabbro masses.

From here ran E as far as 1800 N. hoping to strike road in the E. half of Sec. V indicated on map. But because of storm cast him was abandoned before road was reached.

300 N 175 W of S E cor. Sec. 34 Greenstone. This is a large low flat area covered with drift and the exposure is small. It might be mistaken for an erratic.

In going back to the Ry struck the N E corner of 3. From here

swung around to the N. W. over the broad flat drift hill in 34. No outcrops.

On the topographic map a road is indicated following the line between 34 and 35 straight to the S. E. corner. This is very much generalized. It winds about in a most intricate fashion.

The road after swinging to the S E into T-61-15 for a few hundred paces, stops at a farm house. On the map it is indicated as continuing to the S E. for some distance. The farmer informs me that there is a road a mile E. near the E. line of T which is not connected with this one. It seems probable that the map is in error.

During the day the ground it may be said that the greenstone first crossed

to the N is more massive and shows aa forms. To the E. however the greenstone is interbedded with jasper and is rather schistose, never showing the aa forms.

July 27

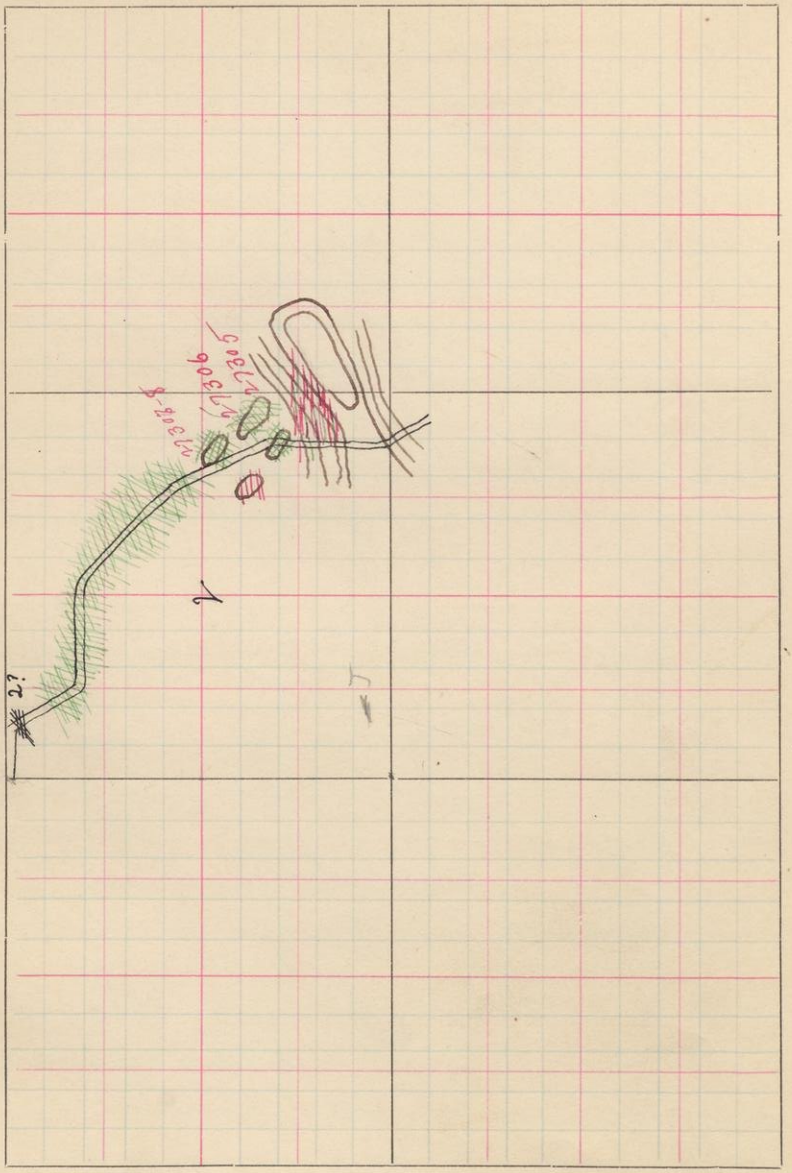
Started on Ry track S of Town where crosses S line of Sec. 8, and ran E.

At the Ry there is a large cut in massive greenstone? Resembles graywacke. Dr Clements has specimen. Although massive, it is cut by a rift, breaking the rock into 4 heavy layers about 6 inches across.

In the entire run along the S line of 9, 10 and 11, and thence N to the NE cor. of 11, nothing was seen but massive greenstone, though not in frequent exposure. To the N. the greenstone is uniformly massive and shows no forms. To the E. these forms are not so apparent, though not absent. In general the eastern greenstone is more schistose.

Striking road near NE corner

S. 2 T. 61 R. 15



of Sec. 11 ran N.

At 400N 100W of SE cor of V. is jasper and green schist. The N. part of the hill is black jasper. Strike is N 70° W and the dip is almost vertical to N. A good deal of test pitting has been done.

700N 900 W Sec. V on the road is ledge of green-schist, a part of which is very siliceous and another part of which is extremely schistose. The schistose part contains the fragment-like lenses of chert so frequently met with in the district.

A little way N in the road is greenstone containing fragments of jasper.

800N 500 W. Jasper. Strike N 60 W., Dip steep to N. Just S of road.

At other side of road is greenstone. At the S end the

greenstone is light colored, massive, and approaches somewhat a porphyry.

R. 7305 At the S.W. end the rock contains little red specks which may be jasper

R. 21 7306 Along ridge to N. the greenstone takes on a more coarsely crystalline aspect, and includes the chert looking fragments so frequently mentioned

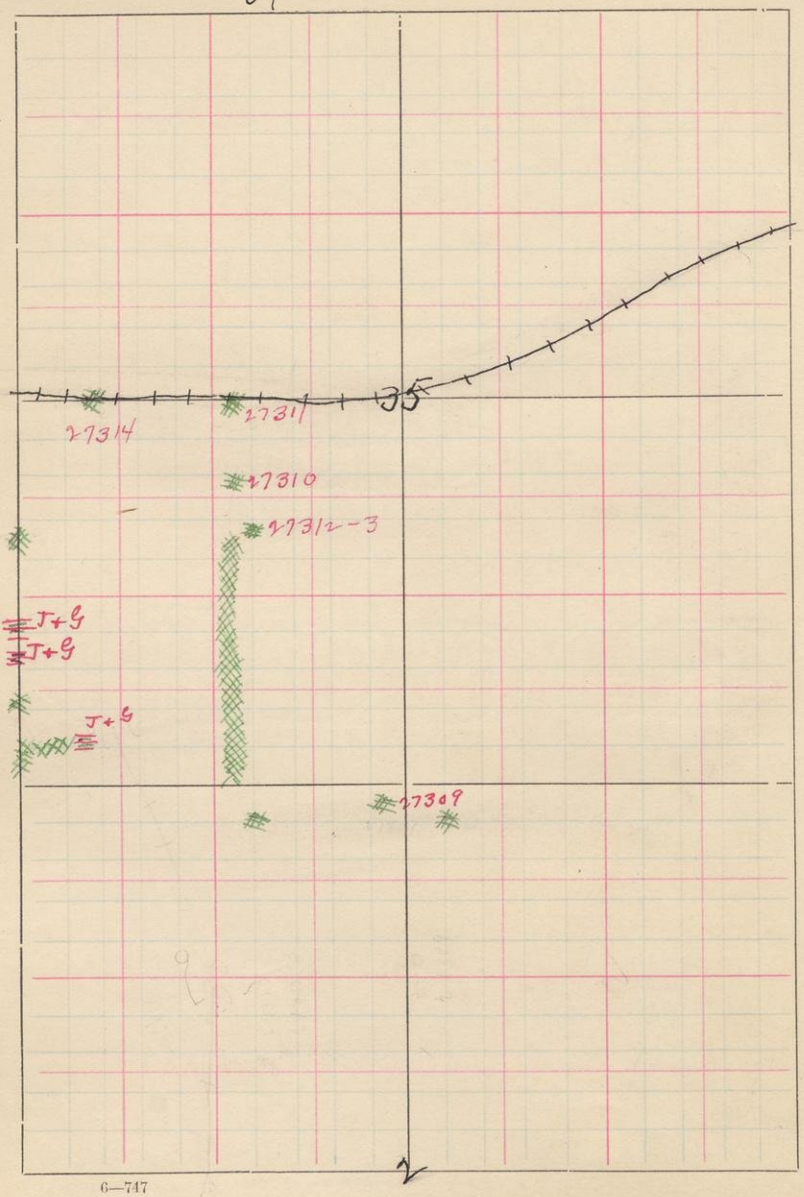
R. 7307 At very N.W. end, greenstone is very coarse and contains the fragment-like areas of chert material, which in places weather to a reddish color and resemble granite

R. 7308

From here on, greenstone was found in frequent exposure in the road left to the N.W. cor. of Sec. 2.

At one place just before the N.W. corner was reached, in the road is a small exposure of

S. T. 62/61 R. 15



6—747

white chert or even quartz or quartzite, containing reddish red fragments which may be jasper, but which are now much weathered. The ledge was so low and massive that no point of attack was found from which to get a specimen.

July 28

From the SW. corner of 35-62-15 ran S 500 paces, east 1600 paces, and then N to the section line. Nothing on S.um but swamp.

At 100S 600E 2-61-15 is a ledge of greenstone. Fresh, massive, and showing no forms. Ellipsoids 2 ft in diameter

975E 70S 2-61-15 Green-schist, enclosing large fragments of jasper, now very much altered. The green schist is in turn cut by and yields fragments

F. P.?
27309 to a [porphyritic] ~~porphyry or coarse grained~~ much altered greenstone.

1190 E 1005 N 35-62-15 ~~W~~ E a ledge of greenstone, schistose and containing chert fragments Strike E & W Dip about vertical

770 N 550 E. 35-62-15 At the ~~E~~ end of the low hill is
F. P.? 27310 porphyritic greenstone
~~On the N~~ 125 paces at a Ry cut through the same hill is
F. P. 27311 greenstone

A. 27312 600 E 680 N 35-62-15. ~~Schistose~~ Greenstone, containing
G. 27313 numerous areas of lighter colored ~~cherty looking~~ material up to those 8 in 9 inches across. These areas are in most cases roundish, and contain lithophysae cavities. Resemble hollow spherulites. The inclusions have a yellowish tinge and are largely epidotic.

Exposure so low and flat that I was unable to get better speci-

mens, though I worked 20 minutes

~~645~~ 465 N 550 E Massive greenstone.

Continues S in almost continuous exposure to the section line. To the S it takes on aa forms and a pitted surface. Scoriaceous? At 280 N is a narrow belt of porphyry with quartz eyes. It apparently intrudes the greenstone

Strike of above porphyry ~~is at~~ to the N, 5° N of W, at ~~to~~ the ~~E~~ south 5° S of W.

On a line 100 N of the Section line ran W to the Sec. line

190 E 100 N Jasper and greenstone Strike 5° S of E.

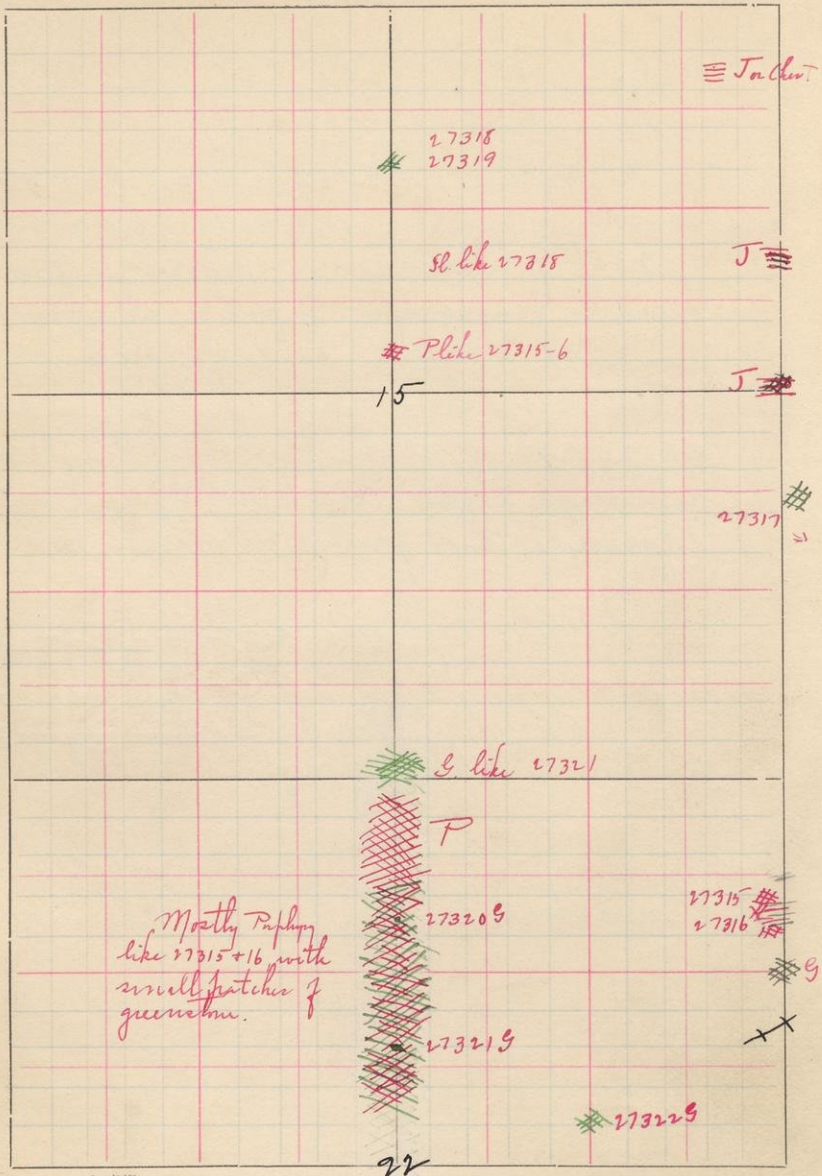
25 paces to the W. greenstone begins with same strike and continues to the section line. This greenstone is schistose and pitted, and contains minute fragments of jasper. ~~Con~~ No aa forms. However this material is not so very different from the aa greenstone as to enable me to certainly dis-

crimnate them

Ravine N to the Ry on the section line. At
50 Jasper N. Greenstone schistose and jointed. Continues some distance
935 N Greenstone containing numerous areas or fragments of chirty material
370 N. Jasper and greenstone the latter schistose and jointed. The jasper is much crumpled. However strike is about E 65° S. Dip NE. steep. Much of this jasper is white and chirty.
400 N Green schist and jasper. Strike N 70° S 80 E.
650 N. Fresh-looking greenstone Contains chirty fragment-like areas

On Ry 175 paces E of crossing.
M.S. 27314 Greenstone?

S. T. 62 R. 14



6—747

July 29

Ran N on line between 22+23
14+15 62-14: Beginning at Ry
track. Ran to NE. corner of 14, thence
N 1000 paces, thence south to track.
Ry crosses line between 22-3 at 650
S of corner.

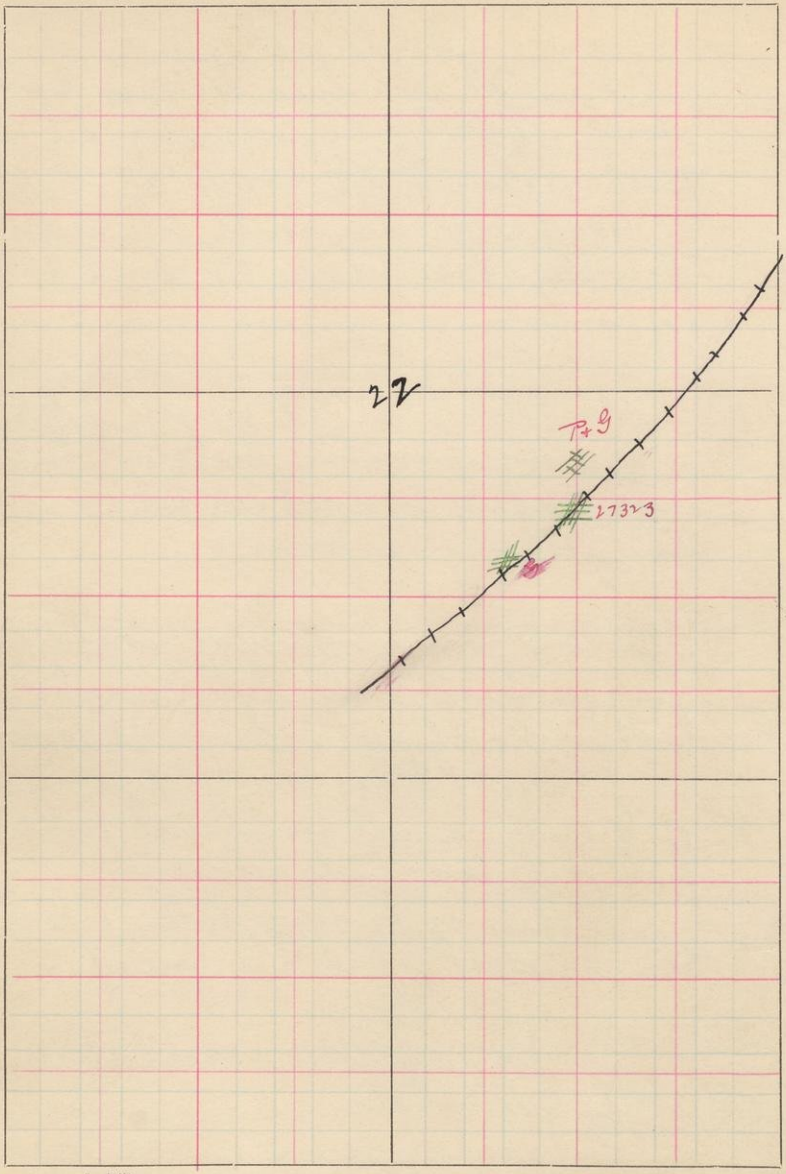
At 500S of the NE corner of 22
is massive greenstone, probably the
lava surface flow represented in
other places by ca forms.

375 S. Same material containing
fragments of and intermingled
with porphyry. The porphyry varies
in places having the large eyes
of quartz, and in places being
fine grained and massive.
This is a long hill. About
the middle of it is found

Jasper, in close association
with greenstone.
The jasper occurs in a narrow
belt varying somewhat in this fashion

Q.P.
27316
27315.
Q.P.

S. T. R.



The jasper is largely white and cherty, and is found in place in great abundance included in the greenstone.

G.
7317 75 N 50 E Greenstone-schist Strike E 5°S, which shortly becomes mixed with jasper. Green schist and jasper continue about 100 paces.

1033 N. Jasper. Strike N 30° E

1346 N. Jasper. Strike N 45° E. Dips practically vertical

1800 N, 150 W. White chert Strike N 40° E.

Sl
7318 Running S on quarter line at 318 S is slate. Strike a little N of E.

F.P
27319 365 S. Porphyritic greenstone

680 S. Slate, like 27318. Resembles jasper.

900 S. White porphyry, with large quartzes.

On the S line of Sec. 15. Basic ~~hornblende schist~~ diabasic greenstone like 27321.

At 75 to 760 S of in 22 Porphyry like 27316 ~~##~~ + 15

G.
27320 380 S. Massive greenstone Occurs in almost same exposure with the above porphyry, but relations could not be discovered

In the next 400 paces are several interminglings of greenstone and porphyry. The greenstone
G.Di 27324 for the most part is coarse and diabasic

G.P
27322 900 S 500 E on the eighth line is greenstone, containing numerous

angular lighter colored fragments some of which are 2" inches across.

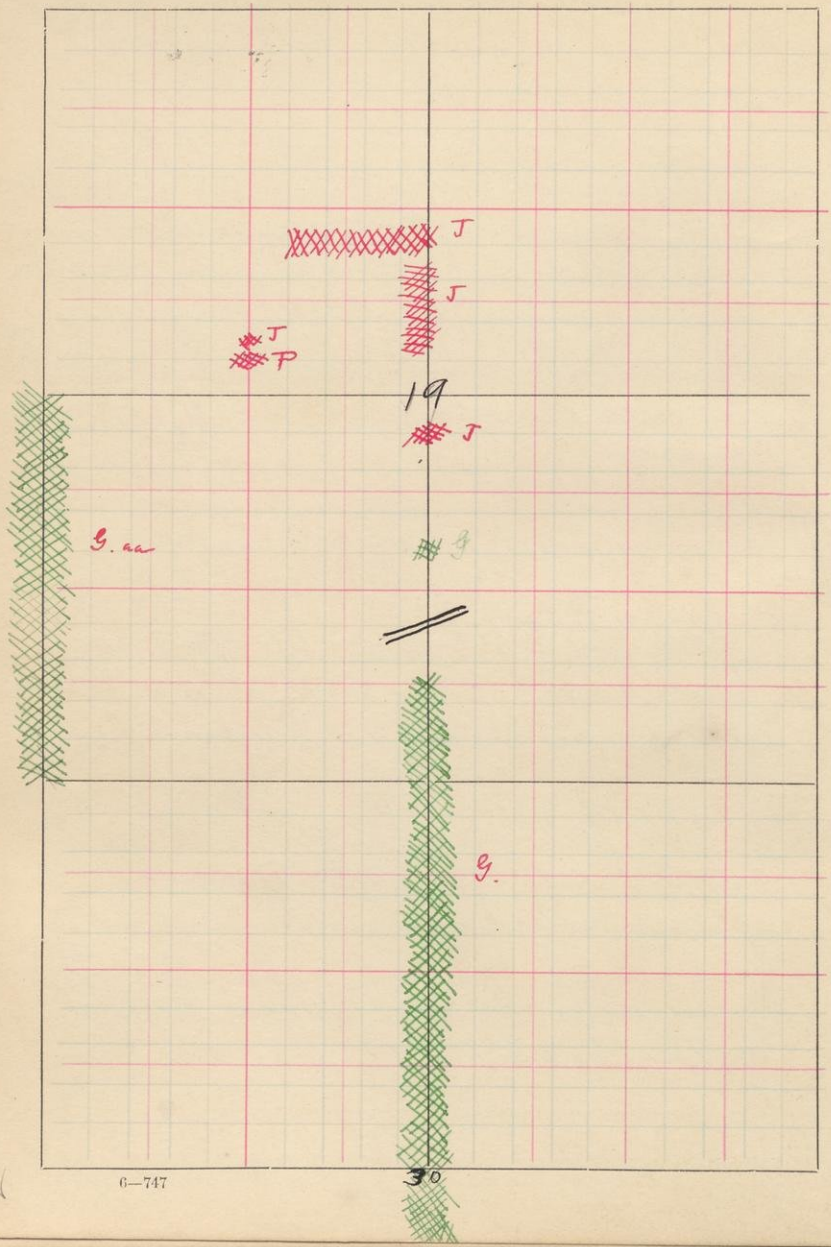
Near the Ry is the white eyed porphyry cut by green schist. The green schist contains numerous fragments of the porphyry. Strike of porphyry as well as could be ascertained was E & W. Nearly massive.

H. 27323 Immediately at the Ry 550 paces NE of the quarter line along the track is a massive greenstone? The rock shows banding in coarse and fine layers.

H. Di 27324 At 400 NE along the Ry in a cut is massive greenstone, much calcified.

Quarter line strikes track at 17005.

S. T. 62 R. 14



6—747

30

July 30

~~From NE. cor. of~~ 19-62-14
~~15-62-15~~
ran N 1000 feet, E. 500, then
N again.

In N run N 1000 feet, was almost continuous exposure of greenstone, much of it especially that to the S, showing dike forms.

1100 N 500 E in 19-14-6x.
Porphyry with large quartz eyes.
Very siliceous

A few feet N in same hill is jasper shiking N 80° W.
Dip is 35° N.

1400 N 600 E, 19-14-62 is a steep hill the slopes of which are strewn with large boulders of brecciated jasper and green schist. No outcrop was found which is certainly determined, but it is probable that this hill is jasper.

Following this hill to E, it

S. T. 62 R. 14

18

J+P

6—747

is found to be solid jasper, in which a large amount of test pitting has been done. Jasper found only in pits, and could get no strike & dip.

30N 1060E in Sec. 18 is jaspar and porphyry with large quartz eyes. Jasper strike N80E. Dip vertical. The jasper occurs in thin layers interlaminated with the porphyry, and in one big layer near center of hill. The two in about equal quantity.

At 650S 1000E NW. cor of Sec. 19. is black jasper, with a small amount of greenstone. Strike N80E; Dip 50N. The jasper continues in almost one

tinuous exposure to 900S, an occasional layer of greenstone appearing.

Jasper is again found at 1400S.

1400S Schistose greenstone. No aa forms. Strike 5° W of E.

Beginning at 150 paces S of the road, and continuing to about 1200S of the sec. line is greenstone. This is for the most part schistose, but to the S shows aa forms.

Ry track is 1685 S of sec. line