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## Marquette region Negaunee, Michigan. No. 127 1891

Bayley, William Shirley, 1861-1943

[s.l.]: [s.n.], 1891

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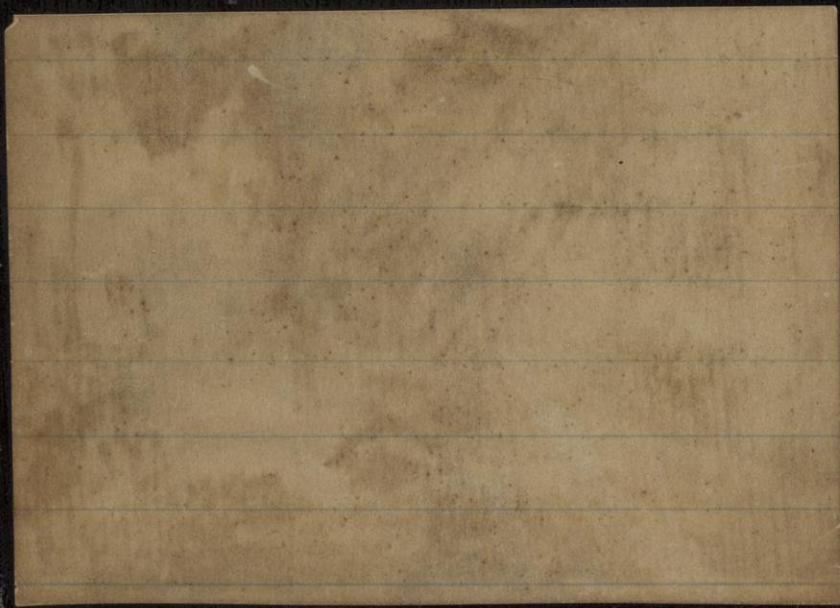
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Plane Table  
Notes  
No 7  
Wegannee

U. S. GEOLOGICAL SURVEY  
FIELD SECTION BOOK



# 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 page is also arranged so that, if desirable, a smaller scale can be used, two inches, one inch, or even 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, for instance 4025, 250 N., 300 W., *Strike, N. 6° E., Dip, 50° E.* Then follow with as full a description of the ledge as possible. 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, but chips of them must be taken. 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  $2 \times 2\frac{1}{2} \times \frac{3}{4}$  inches will be allowed, but in all other cases *large sized specimens*, trimmed to a size of  $3 \times 4 \times 1$  inches, must be selected, in accordance with section 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. In all cases collect chips for slicing. 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. It is desirable that specimens 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.

21223 — 21315

#127

Plane Table Notes

Marquette Region

Negaunee

1891

W. S. Bayley

Sept 191.

- (572) Station.
- (573) E. end of large chert and ore ledge in plains. The rock is well banded, with a strike a few degrees N of E and dip about  $65^{\circ}$  N.
- 21223 W. end same ledge.
- (574) Bottom of slope of Jasper Hill.
- (576) Middle of ledge of contorted chert. 20 ft long & 10 wide  
A few feet east of this point begins another ledge of the same rock, which runs 50 ft. further E.
- 21224 Back in the hill a few feet is Jasper and ore, contorted, but not as much so as the more cherty rock.  
The entire top of the hill is a bare Jasper ledge
- (577) Point in ledge, from which  
21225 took specimen
- (578) Southern face of Jasper and ore ledge
- (579) Point in hill where ledge separates into two.

(580) Chest and one on hill. Specimen  
21226 new taken

(581) Base of slope  
The little precipice cuts times  
along the top of the hill, but at

(582) it seems to pass into Jasper

(583) Jasper ledge back on hill.

(584) " " front on hill.

(585) W. end of a ledge of chert  
material

(586) Center ledge of Jasper 50x50 ft.  
21227 Specimen.

(587) Brecciated chert ledge

(588) " " "

(589) E end Jasper ledge where west  
end is (584)

(590) Jasper ledge, front top of hill.

(591) At this point is a great display  
of cherts and jaspers, the  
two seeming to graduate into  
each other.

21228 is the transitional phase.

21229 Just below these are well banded  
Jaspers dipping 70° W. and  
striking about E-W. on a fresh  
fracture this rock seems to differ  
slightly from the true jaspers

and seems to be intermediate<sup>d</sup>  
between these and cherts (looks  
like Thompson's soft ore jasper).

- (592) E. end top of ledge  
(593) Gap between hills.  
(594) Jasper and ore, at W. foot of  
hill.  
(595) Small ledge, low down in hill.  
(596) W. end ledge (593).  
(597) Large ledge cherty jasper box  
60 ft.  
(598) W. end, top of precipice of center-  
led, cherty jasper etc.  
(599) Another point in precipice  
(600) Ledge of jasper in top of hill.  
Others lie from (600)  
15 paces 10° E of N.  
9 " N.E.  
16 " 20° N. of E.  
16 " 20° S. of E.  
24 " N.W.  
30 " W.  
(601) Front of precipice.  
(602)  
(603) Front of precipice.  
(604) " " "  
(605) E. end, back part of ledge.



Another ledge is 40 ft. E.

One piece runs all the way to (606)

(606) Station on line. This end of the line is a solid ledge, with the front of the precipice 20 ft. S of (606).

(607) Base of slope at gap.

(608) In road.

(609)

(610)

(611)

(612)

(613)

(614)

(615)

(616)

Points for topography.

(617) 75 ft. N. of 1/4 post.

(618) Face of greenstone precipice.

(619) E. foot of hill.

(620) Foot of hill, south side.

(621) In road.

(622) E. end foot of hill.

(623) Jasper ledge, runs 20 ft. further west and is 5 ft. wide.

(624) E. End of another ledge of center-tid jasper and vein, with a gen-

21230

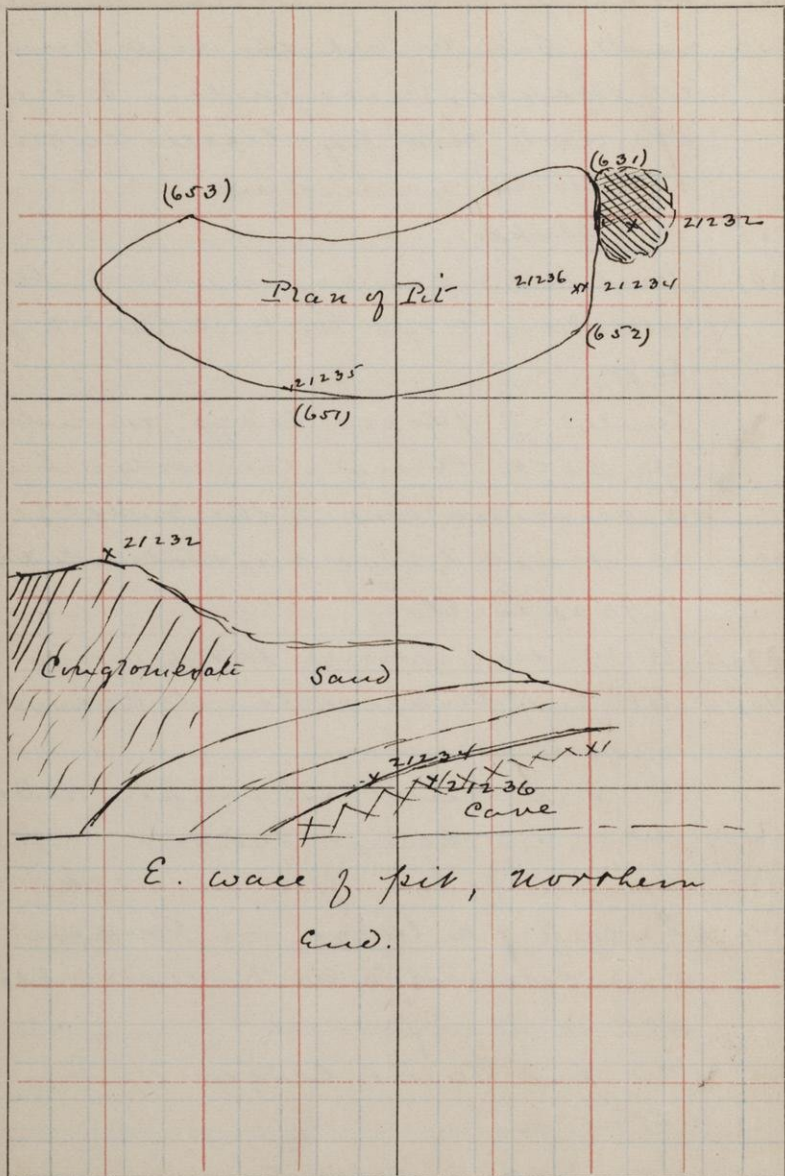
and dip to the north.

- (625) S. side in middle of 40 x 40 ft. ledge banded jasper and one strikes  $10^{\circ}$  N of E. Dip  $55^{\circ}$  N.
- (626) Top of jasper ledge in which  
21231 rock is more cherty than most jaspers, i.e. intermediate between chert and jasper.
- (627) Foot of ledge.
- (628) Curved jasper and iron, 40 ft. E.W. 20 ft. wide.
- (629) W. end of chert ledge, extending 20 ft. further S. and forming a precipice.
- (630) Ledge of jasper, W. end. Dimensions 40 x 30 ft.
- (631) N.E. end open pit of Jackson Mine. Here is a conglomerate ledge 30 ft long in a N.W. direction and 20 ft. wide. The  
21232 rock is slightly schistose, with a strike  $10^{\circ}$  S of E and a dip of about  $30^{\circ}$  N.E.
- (632) W. end ledge jasper and iron, that must be a fault here and then widens out as it goes on to

- (633) Station.
- (634) Test pit in which is a banded Jasper, more or less brecciated and cut by little dykes of schistose greenstone.
- (635) On slope.
- (636) Contorted Jasper and one ledge extending 40 ft E. with width of 20 ft.
- (637) Center of Jasper ledge, in which the rock though contorted has a general dip to the north.
- (638) East end large contorted ledge of Jasper etc.
- (639) N.W. end same ledge.
- (640) W. end triangular ledge, with apex to observer.
- (641) E. end another Jasper ledge.
- (642) W. " same ledge.
- (643) Small ledge same rock.
- (644) E. end of a ledge, so broken and contorted as to resemble an unconformity<sup>d</sup>.
- (645) W. end same ledge.
- (646) Station.
- (647) Top of sand hill.
- (648) Bottom of hill, south side.

T.

R.



(649) Top of ledge of greenstone, pre-  
21233 cipitous to the north.

(650) ditto.

(651) Top of ledge on S. side of open  
pit, whose N.E. corner is 631

(652) S.E. corner same pit.

(653) N.W. corner " "

The pit just outlined is now  
being worked for soft ore.

21232 At its N.E. corner as already  
stated is schistose conglomerate.  
This extends about  $\frac{1}{2}$  way across  
the East end of the pit, as shown  
in the sketch opposite. Under  
it is a massive bed dipping  
to the N. at 25° in its upper  
part and 45° in lower, resting  
with the underlying conglomerate  
what looks like an unconformity.

On the South side is a schis-  
tose rock that seems like green  
stone

21234 Iron bed underlying the  
conglomerate

21235 Schistose greenstone, from South  
wall of pit.

21236 Greenstone underlying 21234  
Sept 11/91

(654) Long ledge of contorted gasper  
and ore, 50 ft. E.W. 15 ft. N.S.

(655) W. end long ledge same rock.  
A small ledge lies 30 ft. S.E. of  
(655)

(656) Outcrop on same ledge further  
East. Precipitous to north, and  
extending back 10 ft., forming  
the edge of a terrace. General  
strike E.W. General dip 40° N.

(657) Top of precipice further East.

(658) Gasper and ore precipice, a  
little south of one located by

21237 (656) etc. The rock has same  
general dip and strike as here  
before, but the band are much  
contorted

(659) E. end of same ledge

(660) The lower precipice begins  
again at (660) and runs East to

(661), where it is not a true precipice,  
but is rather an expanded ledge.  
In places the rock looks

21238 like conglomerate.

(662) W. end long ledge 50 ft wide.

(663) E " " "

The rock in this ledge is more cherty than elsewhere on north side of the hill.

(664) E. end main precipice

(665) North side of pit in hill. The pit is 40 ft. long from E to W. An examination of the dump heap shows in it sand ore and jasper, conglomerate and quartzite.

The rock probably dips north.

(666) W. end of ledge (664)

(667) Near west end of ledge of cherty-rock, 40 ft. x 20 ft.

(668) Ledge of jasper and ore.

(669) N.W. Edge of pit.

(670) N.E. " " "

(671)

(672) } Points in tongue extending from  
(673) } south side of pit.

(674) S.W. Edge of pit.

The rocks in the pit are interesting in that they show clearly the mode of formation of the brecciated layers. On the north side

the wall is composed of a much  
 contorted Jasper, that by its  
 crumpling and crushing pass-  
 es into a true breccia.

21239  
 21240 On the South side is banded jas-  
 per,

and along the west side schis-  
 tate greenstone.

(675) } with (671) mark the outlines  
 and } of a striped ledge of Jasper.  
 (676) } that must certainly belong  
 with the older formation, for no  
 chert layers thus far seen are  
 any more contorted than is this  
 Jasper rock.

(677) is about 110 ft S.W. of a small  
 test pit connected with main  
 pit. It is also at the East  
 end of the long shallow test-pit  
 whose west end has already  
 been given. A precipitous ledge  
 connects this pit with the one  
 further west.

(678) Point in road.

(679) Mouth of pit. Rock full of calcite  
 all the way to main pit

21242  
 (680) Small flat ledge of greenstone



(681) West end of stripped greenstone ledge facing railroad.

(682) Another pit in same

(683) ditto.

(684) Foot of ledge, further East.

(685) East end cherty iron exposure in cut in railroad.

(686) W. end same ledge.

21243 The general dip is E. to the north and the rocks are more or less contorted as usual.

(687) } E } end of another chert cut.

(688) } W } in railroad

(689) Little test pit in chert.

21244 Specimens of the chert.

(690) W. end of long test pit running 50 ft. toward observer, with the chert dipping high to the South.

Another ledge begins 30 ft E. of (690) and 20 ft. N. and runs for 30 ft. parallel to (690)

(691) Test pit in chert.

(692) East end ledge of chert, dipping N. at about 30° and striking 15° N by E. Ledge runs 75 ft. W. on line strike and is only 5 ft wide.

- (693) N. End of 10 ft. wide pit, exposing cherts, generally dipping north and striking E.W.
- (694) S. tongue of this pit.
- (695) E. end. Dip varies from  $30^{\circ}$  N at E end to  $70^{\circ}$  at west end.
- (696) 20 ft. W. of little ledge of green stone
- (697) S.E. corner of little pit 20 ft. N.W. 40 ft. E.W.
- (698) W. end of long pit same 20 to 30 ft. wide. Cherts much contorted but usually dipping to the north.
- (699) E. end this pit, and west end of another beginning 10 ft. N.
- (700) North side of northern pit, 15-ward East. Pit widens toward the south, with extreme south end and distant 100 ft.
- (701) Another point in front of pit.
- (702) }  
 (703) } Points in another pit in cherts  
 (704) }  
 (705) }
- (706) Middle of little ledge in south

- 21245 side of railroad track.
- (707) Pit. 10 ft. from north side. opening here 30 ft. wide, with rocks dipping north.
- (708) E. end of north side. Pit 30 ft wide from (708) to (707) and 50 ft wide beyond.
- 21246 At (708) rock is schistose greenstone.
- (709) E. end of pit.
- (710) Station.
- (711) W. end, south side of pit
- (712) E. in chert material dipping north at about 30°. Pit only 15-20 ft. wide with mound at (710).
- (713) S. side one of Jackson open pits.
- (714) ditto.
- East side of pit shows crumpled cherts with general dip to the north.
- (715) E. end of pit.
- (716) Station.
- (717) Edge of pit, on north side of which the dip of the rocks appears to be very high (60°) to the

South, and the strike about  
20° S of E.

(718) U. side of pit

(719) N.W. corner.

21247 The west side is all greenstone

(720) N.E. corner of another little  
pit.

(721) U.W. corner of this pit.

(722) W. end tongue extending from  
this pit.

The rocks on the west side of  
the pit are well banded cherts,  
etc., dipping north at various  
angles.

21248 Specimen of chert.

21249 One, associated with chert.

In the tongue the rocks are  
much corrugated, but with a  
general dip to the south at 30°.

(723) W. side of pit.

(724) S.E. corner of pit

(725) S.W. " " "

(726)

(727)

(728) S. E. cor. Sec. 1.

(729) W. Jackson pit.

(730) S. side ditto.

- (731) S. E. side ditto.
- (732) U. E. " " The pit is  
in contorted cherts etc, with a  
general dip of 50° S.
- 21250 Specimen from (732).  
In the extreme U. E. corner is  
a small schistose greenstone  
dyke about 10 ft. wide.
- (733) U. W. corner pit.
- (734) S. side. 50 ft. from East end  
of long narrow pit 20 ft. wide.
- (735) W. end same pit.
- (736) Mouth of pit. Narrow open  
way leading into pit next out-  
lined.
- (737) )  
(738) ) Pits in this pit.  
(739) )  
(740) )
- (741) ) Little pit near railroad.  
(742) )
- (743) Bridge between this and next  
large pit of Lucy Mine.
- (745) Pits of ledge of cherts
- (744) U. W. corner of pit.
- (746) Edge of ledge.
- 21251 One from pit.

- (747) W. edge of ledge near railroad track.
- (748) is the west side of a pit back in the woods.  
It measures sixty feet in width at point taken and runs 50 ft. south. At 30 ft. S of (748) is some schistose greenstone that crosses the pit, and is exposed all along its south side, and  $\frac{1}{2}$  way along E and W. side. All the other rock exposed here is chert. The one is black and soft - much like 21251.
- (749) S. side of tongue of pit.
- (750) S. side of pit at section line.
- (751) S. side of pit, where tongue makes wide cut.
- (752) Bridge at E. end of tongue of first pit and at west end of second pit.
- (753) E. end of 2" pit. 10 ft. wide.
- (754) Point on large pit.
- All these pits are in chert there is much concretion. The one is soft, limonitic, and dark or yellow.

21253 Carbonated rock, from Dump Heap  
of Milwaukee Mine.

Sept 12/91

(755)

(756)

E. end top of greenstone hill.  
Ledge runs westward. Width of  
ledge 25 ft.

(757)

South side at top of level, at  
the same time south side of  
greenstone ledge, separated  
by small gully from other ledges  
taken later.

(758)

Point on spur, covered with  
broken ledges of greenstone.

(759)

S. side of spur. Ledge all the  
way to this point.

(760)

Broken ledge of greenstone on  
slope of hill. Ledge 30 ft long  
NW to S.E.

(761)

Ledge of greenstone at shoulder  
of spur. Ledge runs 20 ft west  
and 10 ft north.

(762)

Ledge 40 x 40 ft. on south slope of  
hill.

(763)

Small ledge on slope.

(764)

Greenstone ledge on slope. 10 x 10 ft.

- (765) S. E. end of nest of ledges, covering an area 40 ft. wide and stretching N. E. to (766)
- (766) N. E. end of this nest of ledges.
- (767) North side of top, forming a small hillock of greenstone, sloping north and precipitous to N. E., where separated from another small hillock by little valley.
- (768) Point in this second greenstone hillock.
- (769) Point on north side of hillock on edge of 30 ft. precipice.
- (770) N. W. edge of hillock.
- (771) E. edge of hillock.
- (772) S. side of hillock.  
Hillock not solid ledge of greenstone, but a number of them separated by patches of soil.
- (773) West end of ledge on top of main hill.
- (774) N. W. edge of hill end of ledge.
- (775) on side of little pit, whose walls are schistose greenstone, with here and there little patches of chert in contact with it. The



width of the pit, which is about  
15 ft. represents that of the chest  
bed originally present.

21254 Schistose greenstone from this  
pit.

21255 Chest.

(775) is five feet from west end of  
the pit. Its East end is 25 paces  
further East, and greenstone ex-  
tends 25 ft. further.

(776) Slope of hill. No rock.

(777) Near base of slope on road.

(778) Point on slope.

(779) N. E. corner of pit. Dimensions  
40 paces E-W. 30 paces N-S. Walls  
composed entirely of schistose  
greenstone.

(780)

(781) S. E. corner of pit, whose wall  
is principally schistose green-  
stone. Vein of chest runs through  
middle of pit, and is exposed  
on both sides of it.

(21256) Specimen of chest.

(782) N. W. corner of pit

(783) N. E. side of another pit, about  
40 ft wide and 40 ft long.

The north wall is extremely well preserved greenstone, and south wall schistose greenstone. The chert layers between these dip north at a high angle.

- (784) } North side of tongue of green-  
 (785) } stone very west.  
 (786) } North edge of greenstone tongue  
 and south side of little pit.

A band of chert striking  $25^{\circ}$  S of E is cut through by the pit.

The band is only 12 ft. wide and is bounded on both sides by greenstone. The dip is about  $55^{\circ}$  to the south.

- 21257 } Iron chert band, very near south  
 end greenstone.

- (787) } Greenstone  
 (788) } ledges.

- (789) } E }  
 (790) } side } of pit. The west side  
 (791) } W } is greenstone and  
 (792) } side } the east side chert.

- (793) } North side of pit.

- (794) } Greenstone ledge

- (795) } Top of little kilcock, with a  
 sloping greenstone ledge on

in north side.

(796) Little greenstone ledge 10 ft wide and running 40 ft toward observer.

Another ledge of same rock about 10 ft long, begins about 50 ft. from last sight.

(797) S. E. corner }  
 (798) N.E. " } of pit in center-  
 (799) N.W. " } ted chest.  
 (800) S.W. " }

(801) Station

(802) N.E. end of pit.

(803) N.W. corner of large pit.

(804) S.W. " " " " , and N.W. corner of another pit to the south-east. The two are separated by a dike of chert greenstone.

(805) E. end of bridge separating pits

(806) N.E. cor of S. Eastern pit

(807) S. E. " " " "

The northwestern pit has greenstone walls plastered here and there with chert. The walls of the south-eastern pit show blue en-

tiny greenstone.

- (808) Small flat ledge of greenstone at bottom of hole.
- (809) Ledge of greenstone 20 x 20 ft. at bottom of hole.
- (810) Small ledge greenstone at bottom of hole.
- (811) Ledge greenstone 30 ft. long E-W.
- (812) Ledge of greenstone 40 ft. long in N.W. direction. 20 ft. wide.
- (812) Center of south side of pit in entailed chest, with general dip S.
- 21258 Chest.
- (813) Ditto.
- (814) S. side of little fir in entailed chest.
- (815) E. end of long fir 30 ft. wide, in
- (816) W. chest.
- (817) S. side of old fir, with shaft. Rock seems to be a denser chest than elsewhere. It is the nearest fir to diabase in the south.
- 21259 Chest from this fir.

- (818) E. end of bank of schistose greenstone.
- (819) West end ditto.
- (820) In valley.
- (821) } Ledge of greenstone justifying  
 (822) } East from section line.
- (823)
- (824) Western end of western rock exposure in hill.
- (825) Western end of ledge further up slope.
- (826) Pair in front ledge of greenstone in hill.
- (827) West end of large ledge in W. of hill.
- (828) East end of same ledge.
- 21260 Specimen greenstone from this ledge
- (829) Top of greenstone cliff.  
 A few feet west of (829), a line open of greenstone just west from the hill, extending 50 ft. Elsewhere the cliff is perpendicular.
- (830) Ledge of greenstone 40 ft. long E. W. and 20 ft. wide.
- 21261 One from working shaft of

## Lucy Mine.

- (831) Southern edge of top ledge 40 ft long. Greenstone
- (832) Top of ledge.
- (833) About 20 ft. S. of top of ledge.
- (834) Another point in front of ledge.
- (835) Ditto.
- (836) at base of cliff in slope of hill.
- (837) Further west, at base of cliff.
- (838) Small greenstone ledge, at foot of slope.
- (839) S.W. corner of pit. Greenstone in north side. Chert well present. Now all excavated.
- (840) S.E. corner of same pit.
- (841) Middle of north side of pit, which is 35 ft. long E to W and 40 ft. N to S. The rocks are slightly contorted cherts, with a general dip to the northwest.
- (842) In valley, on railroad track.
- (843) S.E. corner of large pit. Wall north of this point is all schistose greenstone.
- (844) S.W. corner of same pit. Southern wall is sand and gravel. The wall from (844) to (845)

is chest.

(845) Middle of western side of pit

(846) N.W. corner of pit.

From (845) to (846) are well bedded cherts, striking  $40^{\circ}$  E of N and dipping  $50^{\circ}$  N.W., as a rule, but not continuously as the west wall is clearly seen to be anticlinal, with an axis dipping to the N.W.

21263 is one from this pit

21264 chest and one.

(847) is Eastern corner of pit

(848) Middle of East side. Rock at bottom of East side is chest, but above this and a little further to the East greenstone is well exposed.

N.B. Ledge by Italianus House [No ( )] has its center 35 paces S. and 5 paces N. of Cupola Staff. The exposure runs S. of E and is 60 steps long. The rock is a banded jasper and ore.

Sept 19/91

(852) Point above ledge of chert in lit.  
the pit.

(853) Near shaft of most Easterly  
Seal Lake Mine. There is no  
open pit here, but the under-  
lying rock is undoubtedly chert,  
21265 as this material constitutes  
the dump heap.

(854) S. E. corner of pit of cherts etc.  
Dipping S. at about  $40^{\circ}$ - $45^{\circ}$  and  
21266 striking E.W. But little if  
any contortions.

U.S. It is noticed that the  
banding of the rocks in the  
Seal Lake range is regular,  
and thus this region differs  
from the contorted region to  
the south. There are besides  
few dykes here as compared  
with the number to the south.  
These facts indicate the quartz-  
are the cherts north of the con-  
glomerate, of the same age as  
those south?

(855) N.W. corner of pit.

(856) 60 ft. N. of N.E. corner of big



pit in north side of green-  
stone hill.

The pit measures 40 ft E-W,  
and 40 ft N-S, with the cherts  
in it dipping S. at about  
30°.

21267

is from N.E. corner of pit.

21268

greenstone ledge in side of hill,  
just S. of SW corner of pit.

N.B. The above work (852) - (858)  
was done in a heavy rain  
storm, and so may not be as  
accurate as some of the rest.  
There is but little of geologic  
interest in this region however,  
the rocks being all well banded  
cherts except in Luger hills, where  
are greenstones.

The Balance of these notes  
were taken by Messrs  
King and Erickson.

- (859) Station
- (860) S. W. side of hill, at foot of slope.
- (861) Further west in slope.
- (862) Greenstone ledge, 10 x 12 ft.
- (863) Valley
- (864) On gradual slope
- (865) W. end of tongue of land.
- (866) Valley
- (867) Top of slope
- (868) " "
- (869) Small exposure of greenstone 10 ft. long and 4 wide.
- (870) Greenstone ledge 20 x 4 paces.
- 21269 Specimens.
- (871) S. W. end of valley.
- (872) Edge of woods
- (873) Greenstone ledge, 30 x 15 paces.
- (874) West end of ridge. (874) is 12 ft. west of greenstone ledge forming precipice running N of E.
- (875) Point at foot of greenstone precipice.
- (876) Edge of precipice.
- (877) On top of hill, on ledge of greenstone 20 ft wide and running west some distance.

- (878) Another point on same ledge.  
 21240 Specimen from (878).
- (879) Edge of precipice.
- (880) Further East on edge of green-  
 stone precipice.
- (881) Further East on edge of same cliff.
- (882) In valley at foot of precipice.
- (883) Lowest point in valley.
- (884) Station
- (885) Lowest point in valley, East of  
 (883)
- (886) Station on dump pile.
- (887) East end of hill.
- (888) Extreme end of hill, where precipi-  
 tains greenstone ledge to north.
- (889) At foot of ledge, extending from  
 (888)
- (890) East end of spur beginning at  
 (889), also end of ledge extending  
 from (889). Precipitous from here  
 to the north. Many outcrops on  
 slope, but these could not be  
 seen from station.
- (891) Foot of slope.
- (892)

- (893) S.E. corner  
 (894) S.W. ..  
 (895) N.W. ..  
 (896) N.E. ..

} of small pits, at west  
 end of sink hole.

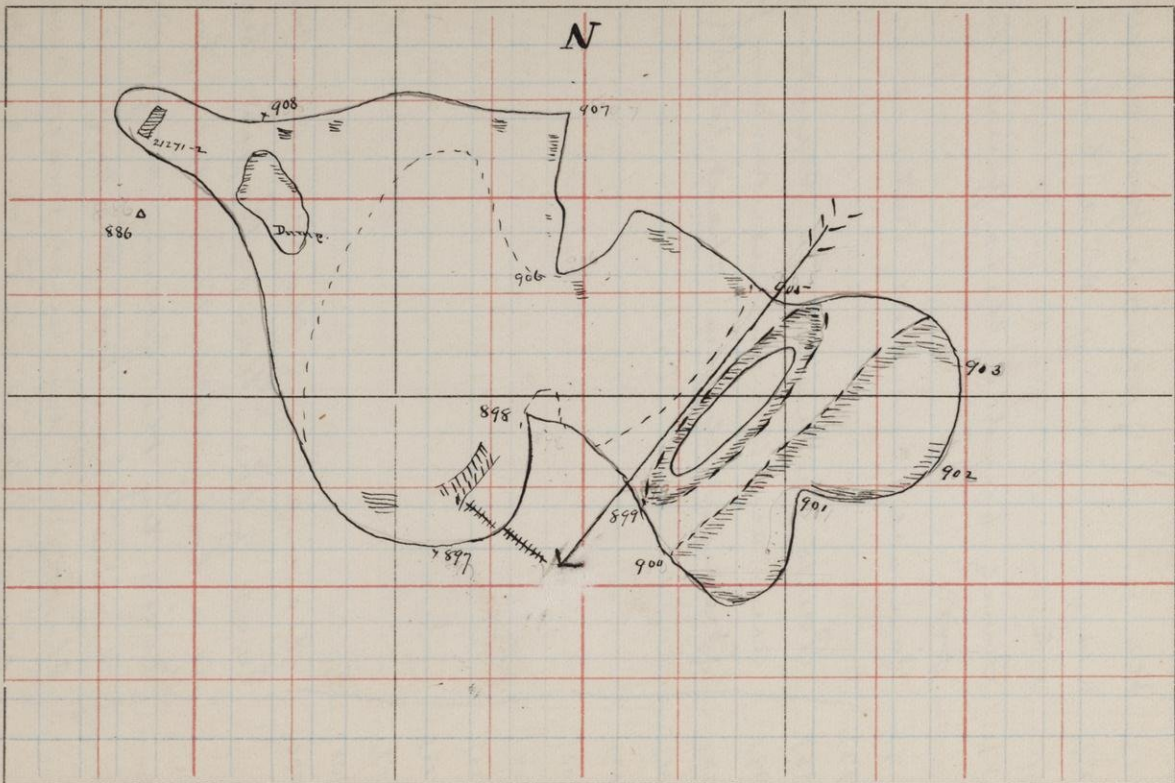
21271 Finely banded chest from this  
 pit.

21272 Coarsely banded ditto.

- (897)  
 (898)  
 (899)  
 (900)  
 (901)  
 (902)  
 (903)  
 (904)  
 (905)  
 (906)  
 (907)  
 (908)  
 (909)

Pits outlining a sunken  
 area in which are many pits,  
 [presumably in chest. WSB].

Description of the sunken area.  
 East of the Grand Rapids Mine  
 is a large sunken area, pro-  
 duced by the filling in of ex-  
 cavation chambers. The original  
 shafts are in most cases com-  
 pletely obliterated. In bounding  
 this area, it was thought best to



T.

R.

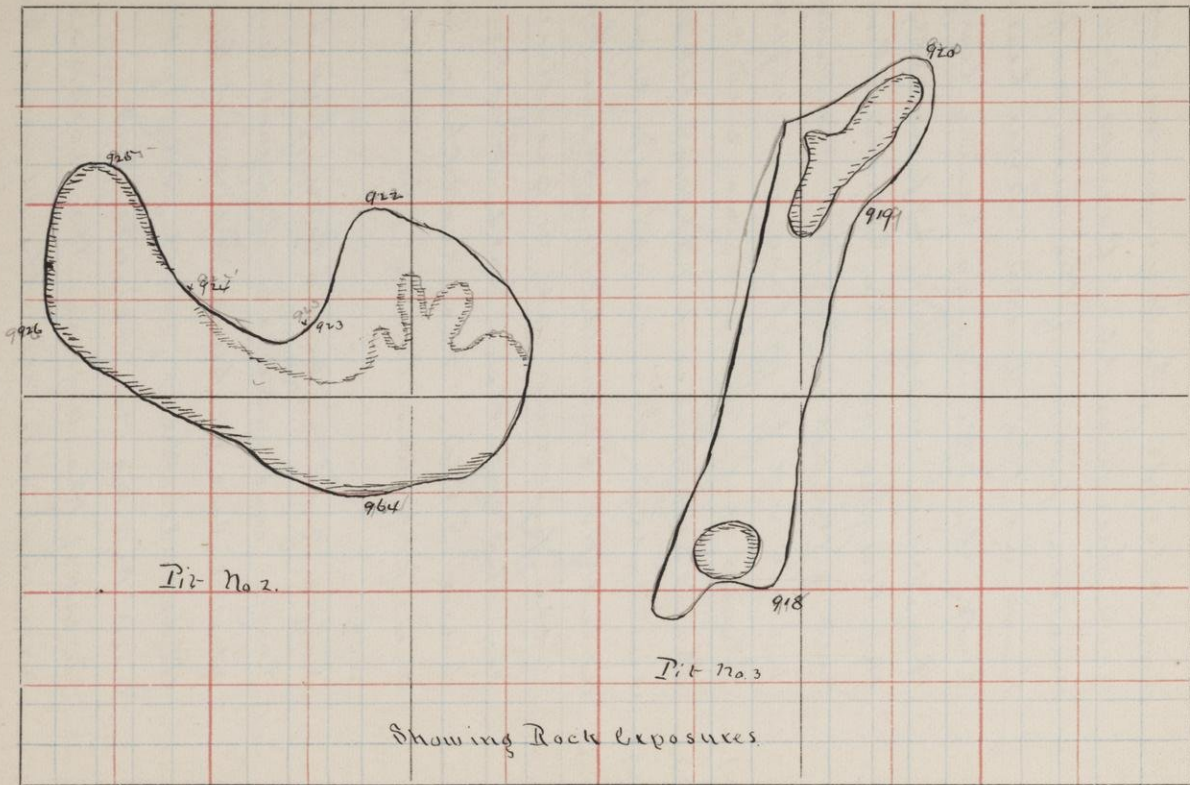
outline it merely, with out attempting to locate the numerous holes, and pursued this course in the western portion of the area, as far East as the arrow. From here on East the openings being large they were mapped separately. In the tongue at the extreme Eastern end of the area is an excavated pit about 25 ft. long and 10 ft. wide. Chert are exposed as indicated.

- 21271 The specimens 21271 and 21272 are  
 21272 samples. The rocks dip regularly about  $40^{\circ}$  S. in the northern half of the pit and at a greater angle in the southern half. Strike about E to W. The northern beds are fresher than the southern ones.

East of this smaller pit is a large one, with its longest axis about 200 ft. long. The rock exposed is all chert, with same strike and dip as in small pit.

West of the arrow the rocks are well exposed with the regular bedding, dip and strike as given.

N



T.

R.

Separated from the area just described by a natural bridge of banded chert 12 ft. wide is another or large pit with a continuous exposure of banded chert on all sides (No. 2)

Fifty feet East of this is another pit (No. 3). This has an excavation in its South end. It shows banded chert all around the rim.

(910) At edge of top slope of hill. Greenstone ledge 20 ft. long EtoW. 5 ft. wide.

(911) South slope of hill. Ledges of greenstone occupy a large area beginning 10 ft. back of observer.

(912) Small greenstone ledge, S. slope of hill.

(913) Top of little rise in hill.

(914) Top of hill. Ledge of greenstone running EtoW. 30 ft. north of

(914) hill drops precipitously

(915) Slope of hill.

(916) " " "

41 paces west of (916) is a ledge of the carbonated rock, forming a 25 ft. cut on side of railroad track.



21273 from this point.  
25 paces north of 21273 is a green-  
stone ledge.

- (917)
- (918)
- (919)
- (920)
- (921)
- (922)
- (923)
- (924)
- (925)
- (926)
- (927)

Station

[Presumably points-in pits<sup>d</sup>  
and for topography. W.S.B.]

(928) Ledge of greenstone in spur  
from main hill. The ledge is  
70 ft. long and 25 wide, with  
(928) on its S.W. end.

25 paces north and a little  
west is a precipitous ledge of  
greenstone dropping from top of  
hill.

(929) S. end of saddle.

(930) Slope of new hill

Ledge of greenstone on top of East-  
ern hill, but not on slope, while  
western hill has precipitous

T.

R.



chest and banded one.

outline of fish

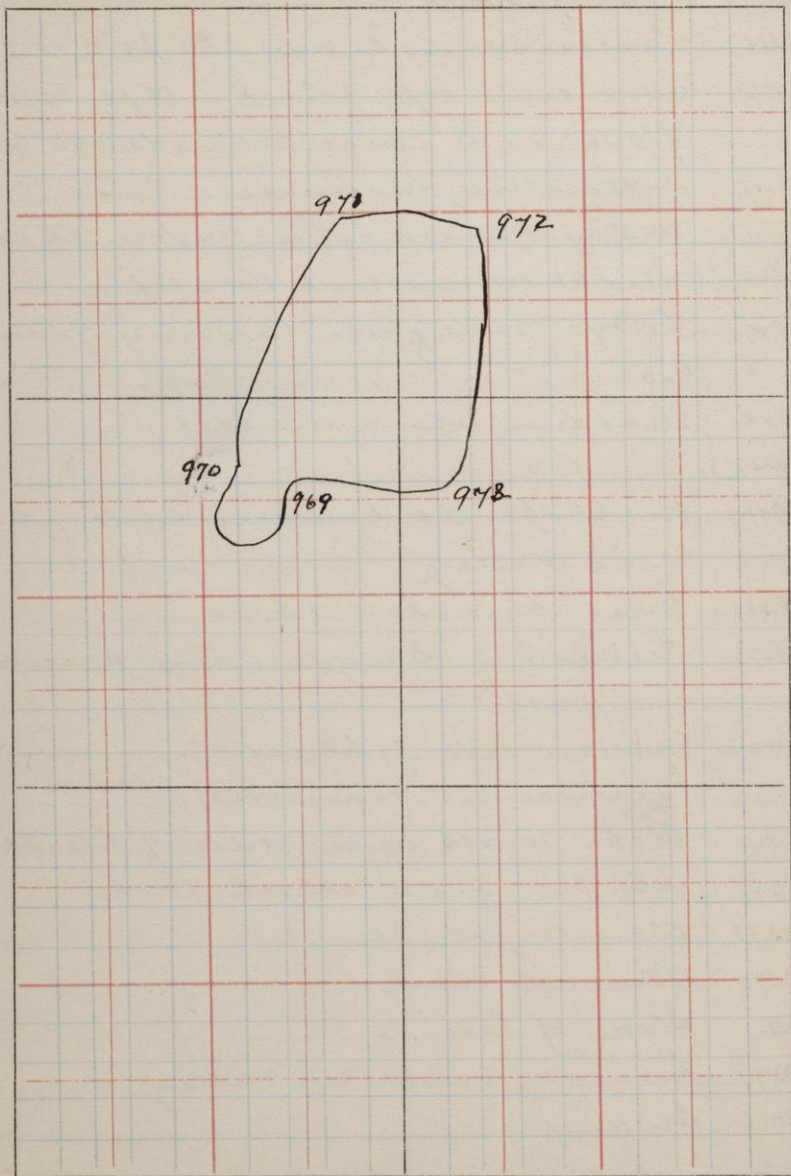
ledge saddle.

- (931) Same slope as (930)  
 (932) Center of valley.  
 (933) Valley, S. of Station.  
 (934) U.W. corner } irregular pit in slope  
 (935) S.W. " " }  
 in slope of hill.  
 21274 Chert from this pit.  
 (936) Point in pit  
 (937) S.E. end of pit  
 (938) U.E. " " "  
 Exposure of chert on south side  
 only, with regular dip S.  
 (939) Station.  
 (940) 30 ft. back from (940) in line of  
 sight is a square pit, whose walls  
 are regularly banded chert dip-  
 ping and striking as in pit to  
 the west. Pit 15 ft. wide and 25-  
 ft. long. Long axis pointed toward  
 observer.  
 21275 Chert from pit.  
 (941) Eastern slope of hill. Small green-  
 21276 stone ledge.  
 (942) Eastern exposure of greenstone, 20 ft. E.W.  
 8 ft. N.W.  
 (943) In valley.

- (944) East of (942).
- (945) Greenstone ledge 25 ft x 15.
- (946) West end, top of hill. 10 ft north of (946) is a precipitous ledge of greenstone, running East. Many small exposures in this neighborhood not located.
- (947) Ledge runs all the way from (946).
- (948) } Eastern spur on hill  
(949) }
- (950) On slope at Eastern side of very broad valley.
- (951) West shoulder of hill.
- (952) Middle of bluff, with precipitous wall.
- (953) Eastern end of bluff.
- 21277 Greenstone from (953).
- (954) Slope, north of middle of bluff.
- (955) Test pit from which took  
21278 chlorite schist
- 21279 Banded chert
- (956) Slope of hill.
- (957) Lowest part in valley.
- (958) Swamp
- (959) "
- (960) Greenstone ledge, 30 <sup>paces</sup> ft long and

T.

R.



15 feet wide, with long axis parallel to observer.

- 21280 Specimen from (960)  
 (961) Greenstone ledge 100 ft. in diameter,  
 21281 but covered in places.  
 (962) Greenstone 20 x 6 ft. on W. of spew.  
 (963) Small greenstone ledge  
 (964) Ledge of banded chert and ore,  
 21282 covering an area 50 ft. in diameter,  
 though not all as one ledge.  
 (965) S. E. cor. }  
 (966) S. W. " } of large test pit.  
 (967) N. W. " }  
 (968) N. E. " }

Rock exposure is best shown on the west side of the pit. Here the bedding is regular with the dip 44° S, strike 22° N of E. Rock is however, exposed on all sides of pit but northerly.

- (969) S. W. cor. of large irregular test pit  
 (970) N. side "  
 (971) N. W. corner "  
 (972) N. E. " "  
 (973) S. E. " "

21283 All sides except portion of south. are show exposures of banded

chest, with regular dip, to the south.

- (974) in slope of hill.
- (975) Greenstone ledge, running 40 ft. East from this point.
- (976) Greenstone ledge 18 ft. long.
- (977) West end of greenstone ledge.
- (978) East end of same.
- (979) East end top of hill. Large greenstone exposure.
- (980) Lowest point in valley.
- (981) Top of little terrace-like rise on slope of hill.
- (982) Station
- (983) Station, on East slope of spur. Small greenstone ledge.
- (984) Small greenstone ledge in valley.
- (985) Small greenstone ledge on South slope of spur, running to
- (986) in top of hill.
- (987) Greenstone ledge 10 ft. in diam, in top of spur.
- (988) Eastern end of main hill and ledge.
- (989) East end top of hill.
- (990) Ledge of greenstone in top of hill. Ledge 20 ft. diam.

- (991) In valley, south end of bluff.
- (992) At foot of bluff.
- (993) Base of Exposure on slope,  
just East of bluff.
- 21284 Greenstone from this point.
- (994) In valley.
- (995) R. R. cut through Greenstone-  
21285 schist, measuring 60 paces W. of  
(996) slope. No ledge
- (997) on slope as far East as was  
possible. Bushes obscure sight.
- (998) Station near old shaft.
- (999) End of R. R. cut through green-  
stone.
- (1000) other end of same cut.
- 21286 Specimen from (1000)
- (1) bed test fir, on whose dump is  
chert and ore.
- (2) End of cut through banded chert.  
21287 dipping regularly to the south.
- (3) End of cut.
- (4) Test fir.
- (5) Test fir, with chert and ore on  
21288 dump. Specimen.
- (6) West end of greenstone ledge  
on north slope of hill
- (7) East end of same ledge, on old



T.

R.



21289 East pit was sunk here, but in its  
dump heap are very chert schist  
and joint rock.

(8) Station on East slope of hill.

21290 Chert and chlorite } From dump  
21291 chlorite schist } heap of Grand  
21292 Lean ore } Rapids Mine.  
21293 ore }

(9) Greenstone ledge on S.E. end  
of ridge; 25 ft. long.

(10) South side of ledge, where pre-  
cipitous.

(11) North side of same ledge.

(12) Ledge of greenstone 10 ft. long.

(13) Small ledge of greenstone,  
10 ft. long, 4 ft wide. Long axis  
in line of sight.

(14) Most easterly exposure of green-  
stone at foot of slope.

(15) Foot of slope

(16) N.W. corner of large pit.

(17) S.W. " " " "

(18) S.E. " " " "

(19) N.E. " " " "

The walls of the pit show local  
ore, without any regularity of  
bedding. On the South side is

greenstone.

21294

Cherty one

21295

Greenstone - Schist.

(20)

Greenstone knob, 10ft in diameter, with rock exposed only on north side.

Another knob of about the same size is 10 paces East of (20).

(20)

Greenstone ledge, 12 ft. E to W. 5 ft. wide. on north slope of hill.

(22)

N.E. cor. test pit

(23)

S.E. " " "

Pit 15 paces long, with long axis toward observer, and 10 paces wide. The rock is entered chert like 21294. A cut 10 ft wide extends from N.E. end of pit; for 20 paces within it chert is well exposed.

(24)

East end of top of hill, where is a large greenstone ledge 80 ft wide and 100 ft long, running nearly at right angles to line of sight.

(25)

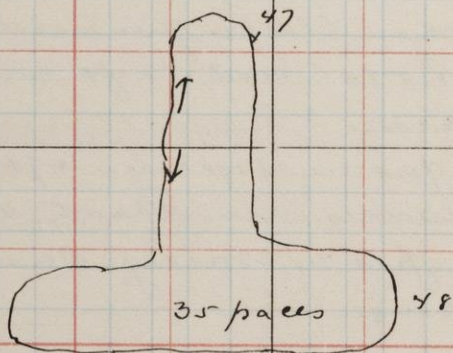
N.W. end, top of hill. 50 ft. precipice of greenstone toward observer.

- (26) East side of hill, with precipitous front of greenstone.
- (27) East end of banded chert exposure, 2 ft. wide.
- (28) West end of same, 8 ft. wide. The ledge is broken into small patches.
- (29) Another ledge of same rock, 30 ft long E & W. and 12 ft. wide.
- (30) In valley.
- (31) Test pit in valley, 6 ft in diameter, walls are cherty ore.
- (32) Test pit in valley, same size as above.
- (33) } Outline of irregular pit in chert.
- (34) }
- (35) }
- (36) }
- (37) }
- (38) Station
- (39) Test pit in valley, whose dump heap shows cherty ore.
- (40) Spur of hill.
- (41) West end of greenstone ledge 25 ft. wide
- (42) Slope of hill.
- (43) S. E. side of slope.
- (44) Valley

21296

T.

R.



(45) North end of valley.

(46) Test pit. Chest.

(47) North end of long test-pit.

(48) South east end of pit.

The rock like all the other  
21297 rock in this vicinity is chest.  
Dip generally to the south in  
the southern part of pit and  
to the north in northern part.  
The west wall shows an anti-  
clinal fold.

(49) Station

(50) Slope of hill

(51) W. side of circular pit 20  
ft. in diameter in contorted  
chest like 21297. On its south  
side is some chlorite schist

(52) Between two circular pits  
north of (51).

(53)

(54)

(55)

(56)

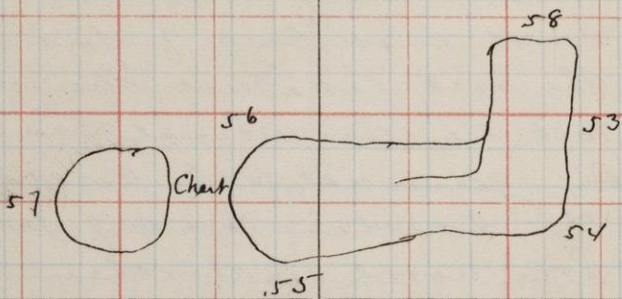
(57)

(58)

} Points in pit, whose walls  
are principally chlorite-schist  
a little chest plastered upon  
the schist are evidence that  
what is now the excavation  
was once filled with this rock.  
In the extreme north the wall

T.

R.



is principally chert.

- 21298 chlorite-schist  
 21299 Chert.  
 (59) On slope  
 (60) " "  
 (61) " "  
 (62) on Cascade road.  
 (63) Between Station and (62)  
 (64) }  
 (65) } Big fir, showing contorted  
 (66) } schist, with general dip to  
 (67) } the South. At the west end  
 a little chlorite<sup>2</sup> schists rests  
 upon chert.  
 (68) on slope.  
 (69) Station  
 (70) Best fir in chert and 'soap'  
 rock.  
 21300 from (70)  
 (71) on road.  
 (72) " "  
 (73) " " at r. r. crossing.  
 (74) " "  
 (75) " "  
 (76) " slope  
 (77) In valley  
 (78) on road.



- (79) In road  
 (80) " "  
 (81) " "  
 (82) " "  
 (83) " " at r. r. crossing.  
 (84)  
 (85)  
 (86)  
 (87) In slope of ground  
 (88) " "  
 (89) In valley.  
 (90) South side of ledge of greenstone.  
 (91) Top of ledge - precipitous.  
 (92) Foot of precipice.  
 (93) " " "  
 21301 Specimen from (93)  
 (94) Test pit  
 (95) Top of slope in edge of green-  
 stone precipice.  
 (96) North side of slope, in valley.  
 (97) Station in Teal Lake bluff  
 21302 Greenstone from (97)  
 (98) N.W. cor. of hill.  
 (99) S.W. " " "  
 (100) S side of hill, in middle  
 (101) S.E. cor. of hill  
 Top is solid ledge of greenstone.

Rocky spur Extends W. East.

- (102) N. E. cor. of hill.
- (103) W. edge of bluff.
- (104) In saddle. No rock exposure in saddle.
- (105) Edge of bluff.
- (106) Middle of saddle
- (107) N. E. corner of ridge
- (108) Highest point of ridge
- (109) Precipice of greenstone.
- (110) S. W. corner of top of ridge.
- (111) N. W. corner of ridge
- (112) Middle of saddle, whose top is a rock exposure.
- (113) N. E. corner of next heelock of greenstone.
- (114) S. E. corner of heelock.
- (115) S. W. " " "
- (116) Middle of saddle.
- (117) North side of heelock.
- (118) S. side of heelock.
- (119) Saddle
- (120) W. end of ridge. Greenstone exposure.
- (121) In saddle.
- (122) " "
- (123) Station. Greenstone ledge 70

- ft. long and 25 ft. wide.
- (124) On top of spur running South.
- (125) In valley.
- (126) On swell, running South
- (127) Valley
- (128) On spur.
- (129) Valley
- (130) Spur.
- (131) Spur W.S.
- (132) Crossing of Swell and Cr. Sts.
- (133) Diamond Drive boring.
- (134) Road S of bluff.
- (135) " foot of bluff.
- (136) Middle of saddle.
- (137) Top of tongue.
- (138) " " "
- (139) Rounded point W of saddle.
- (140) Test pit, from dump for which
- 21303 took specimen of chert.
- (141) Saddle.
- (142) On point running from saddle.
- (143) In gully
- (144) In next gully
- (145) Top of tongue.
- (146) Bottom of next gully.
- (147) Top of the bank E. of the gully.
- (148) Top of tongue of land running W

## Teal Lake.

- (1149) Top of gully.
- (1150) Top of broad tongue gland
- (1151) End of slope gland.
- (1152) Station.
- (1153) Diamond drill boring, nearest Teal Lake.
- (1154) Water's edge. Teal Lake at foot of Teal Lake Ave.
- (1155) Water's edge E. of (1154).
- (1156) Iron pipe on N.W. section line.
- (1157) 114 ft. E of sec corner.
- (1158) Edge of swamp.
- (1159) Near top of plateau.
- (1160) Edge of swamp.
- (1161) End of the center of the bluff and W. quarter of Teal Lake Ave.
- (1162) Joining point of bluff at S.W. end.
- (1163) Foot of perpendicular cliff of quartzite facing lake.
- (1164) Foot of talus pile.
- (1165) Top of tongue running down from cliff.
- (1166) Test pit with quite large dump from which were taken:
- 21304 chlorite - schist.

- 21305 Banded chert.
- (167) Diamond drill boring. The entire way is a flat-topped sand hill-  
lock.
- (168) Station.
- (169) Center Pines Ave.
- (170) Top of small sand tongue
- (171) Further up in slope of sand hill.
- (172) Top of precipitous greenstone  
ledge, outcropping from sand  
hill. Rocky also on W. side of saddle.
- (173) on point west of gully.
- (174) on next point, in slope of hill.
- (175) Another point further west  
in which greenstone is exposed.
- (176) Top of little cliff, which is pre-  
cipitous for short distance, then  
passing into rounded slope.
- (177) On slope. Above is a plateau,  
then beyond (W.S.) is the steep  
slope of the main bluff.
- (178) N. E. corner of ledge running  
to station (168).
- (179) N. W. corner same ledge.
- (180) S. W. " " "
- at its East end the knee  
runs off into a sand tongue,

while at its west end it  
breaks off abruptly, as a precipice.

(181)

Center of the street at the north  
foot of the bluff.

21306

Greenstone from Station (168).

Sept 28.

Erickson Stands

Took Station (955) for beginning  
of day's work, Studd taking  
specimens at points indicated.

(182)

Ledge of chert etc., at Shallen,  
cut in railroad, from which  
specimens had already been taken  
by Mr. King (21555).

(183)

Small test pit, from dump  
heap of which specimens

21307

was taken

(184)

Small greenstone ledge, almost  
flush with ground.

21308

(185)

In bed of small stream

(186)

" " " " "

(187)

" " " " "

Below this point a short distance  
is a waterfall over iron chert.

- (188) Test pit near Central Station.  
Several others are in the near vicinity, but all show same rocks, which are probably iron cherts.
- 21309 Specimen from 188.
- (189) For topography.
- (190) " "
- (191) " "
- (192) Station in old dump near Cascade road.
- (193) In road
- (194) " "
- (195) near "
- (196) Dry bed of creek.
- (197) } Large test pit, where are ex-
- (198) } posed chert and one, banded
- (199) } jasper and some conglomerate (?). The strike of the rocks
- (200) } is about  $10^{\circ}$  N of W, and their
- (201) } dip  $60^{\circ}$  S. The strata are not
- (202) } much disturbed, but in the west
- (203) } wall show long, gentle fold.
- (204) }
- (205) }
- 21310 } From this pit.
- 21311 }
- (206) } in large pit further west.

(207)  
(208)

} on small deep pit. Nearly circular with small diameter. The strike of the rocks is about E-W and the dip is to the south. The layers do not show plainly, though they appear to be somewhat contorted in the south wall. At one place in the N.E. wall the dip appears to be 40°. In the dump is some conglomerate with small pebbles, and some porous one, resembling that of Foster Mine.

20312  
(209)  
(210)  
21313

Specimen.  
Near a small opening, apparently a drift into the hill.  
Small exposure of schistose rock of which specimen was taken.

(211)  
(212)  
(213)  
(214)  
(215)  
(216)  
(217)

Station in dump leaf.  
} Test pit.  
} Test pit.



(218) In road

(219) Highest point of the all west of  
pit.

(220)

(221)

(222)

(223)

Test pits

The three pits above outlined are separated from each other by narrow partitions of cherty layers, showing a general dip of  $60^{\circ}$  S. and a strike about E-W.

No outcrops can be detected in the strata. On the west side of the west most of the pits the layers show plainly, and here they dip  $62^{\circ}$  to the S.

21314 From second pit - at (216)

There is a large circular pit some 300 or 400 ft. S.W. of this last pit. It was not located by the plane table but was examined by Luther and Oley in their traverse.

Moved to station (206)

(223½)

(224)

- (225) } Points in large pit in chert<sup>o</sup>  
 (226) } The strike of the rocks is about  
 (228) } E-W, while the dip varies be-  
 (229) } tween nearly horizontal and  
 an inclination of  $55^{\circ}$  S.

Another pit, small, is north  
 of this last pit about 150 ft.  
 from its northern side. In  
 this the strata again show an  
 approximate E-W strike and  
 a dip to the S. of about  $60^{\circ}$ .

21315 is from (226).

(227) on slope.

N. B. - The plane table work  
 south of Nequamme is bounded  
 N and E by the Cascade road,  
 and south-easterly by the  
 small water course above de-  
 scribed, except for the three  
 small pits and a few points  
 high up in the valley around  
 Station (955). These lie to the S.  
 and E of this watercourse.  
 North of Nequamme it is worked

54

E as far as Seal Lake Aug., is the  
East end of Seal Lake bluff, except  
the one drill hole (167) E of the  
avenue.

E. J. Erickson

Sep 29/1891.

W. S. Bayley.

### Note

It was supposed that  
the rocks East of the Jackson  
mine were all in the old  
chest formation, but if the  
observations of Messrs King and  
are correct and there is a con-  
glomerate S. E. of Ne-gance, it  
is quite evident that more work  
will have to be done in the region  
before it can be stated definitely  
what the relations of these rocks to  
those of the Jackson mine are. The  
character of the chest S. N. of Ne-  
gance is contrasted with the  
green bedding of these S. of this city.  
And these on the other hand are  
quite like those of the Seal Lake  
Region.

It is quite certain that some-  
thing still remains to be looked  
into here.

W. S. B.



