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Minnesota Valley: [specimens] 5194-5235. No. 30 1884-07

Hall, C. W.

[s.l.]: [s.n.], 1884-07

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Hall, 5.

U. S. GEOLOGICAL SURVEY

FIELD NOTE BOOK

No. 20

July, 1884
Minnesota Valley.

C. W. Hall.

5194-5235

Description of Nos. 5194 to 5235

Survey of the Pre-Cambrian Rocks of the N. W. States.

INSTRUCTIONS.

1. Devote at least two pages of this note book 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 figure attached, showing the amount and inclination of the dip. Denote slaty or other very plainly bedded rocks by lines running in the direction of the strike, with figures and a dip arrow attached as before. 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 smaller spaces as 100 paces, each of the spaces between the red lines as 500 paces, and four of these large spaces as one mile, or 2,000 paces. Usually the southeast corner will be placed at the first red 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 down one space, or the map may be turned around and the north placed at the left hand side of the page.

2. On the right hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, after which give in order 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 exposure as possible. Very often the notes for one section will cover more than one page in which case pass to the next right hand page, *repeating the map on each left hand page* as long as the notes, with regard to one section, continue.

3. Collect a specimen from each separate ledge of rock, or whenever there is a change of rock on any one ledge. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be sampled, the position and extent of the ledge being marked on the map, with the note that it is of a rock identical with specimen so-and-so. Under the same conditions small sized samples will be allowed, but in all other cases *large sized trimmed specimens*, with chips for slicing, must be selected in accordance with § 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. All specimens are to have numbers painted on them, in white on a black background, in camp.

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, etc., etc.

5. Forward this note book, as soon as filled, as registered mail matter, to R. D. IRVING, U. S. Geologist, Madison, Wisconsin.

30

July 7, 1884.

In reviewing the locality at "Redtown" in Courtland Township two or three facts were more clearly observed than in the examination last year:

1st The dip at several places along the railroad track was seen to vary as follows:

At cut furthest from bridge eastward,
N 20° W at 38° to 40° dip

at middle cut figured last year
N 10° E 20° "

In quarry directly below this cut
N 10° E 28° "

In deepest cut - one nearest the bridge across the Minnesota river
N 10° E 20° dip

At several points upon the terrace a track about midway between the river bottom and the prairie proper the rock is spread out in quite an extensive ^{nearly} level expanse the attempt was made to find a dip: at only one place was ~~certainly~~ ~~seen~~ - ~~that~~ ~~at~~ ~~an~~ ~~angle~~ ~~of~~ ~~8°~~ ~~the~~ ~~other~~ ~~places~~ ~~indicated~~ ~~from~~ ~~the~~ ~~surface~~ ~~that~~ ~~if~~ ~~any~~ ~~dip~~.

The dip at the easternmost railway cut and the exposure of the lowest rocks occurring at this locality is the greatest; approaching the bridge the track is seen to cut through higher and higher layers and each one is nearer a horizontal position than its predecessor. As the highest part of the exposure is reached & the uppermost beds are examined the dip is observed to be least of all.

2- Again the boundaries of the exposure were determined. On the line between sections 35 & 36 7.110 R 30 W some 250 paces from the South end of that line a few cords of stone have been quarried.

Other knobs frequently appear scattered over the $S\frac{1}{2}$ of Sec. 35, but none were seen or reported to occur in Sec. 36. Altho' called knobs none of them stand over one or two feet above the level of the soil; here & there a water course or slough extends along one side giving a face of 3 or 4 feet.

The outcrop from this point upon the East line of the section spread over a good share of the South half with an average height of from ~~100~~ 8 to 25 feet above the river. The level surface of rock in this part suggests the horizontal position of the strata, or at least a position much nearer the horizontal than the tilted position observed in the railroad cuts & everywhere between the track and the river.

Nowhere upon this upper and rather level surface ~~was~~ a typically glaciated surface noticed — the roughness & irregularity of the

abrupt elevations along either side of the railroad was also wanting. The drift deposits reaching down upon the north and east stand in a semicircle of knolls from 40 to 75 feet high with their bases standing upon the furthest part of the rock exposures.

"Some of the rock at New Ulm is
is also a red quartz, of fine grain,"

Winchell Am. Rep. Geol. & Nat. Hist. Sur. Res.
1884, p. 71, footnote.

32

And a third fact is that the rock everywhere over the upper part of the exposure is thoroughly quartzitic in character.

Induration is complete.

The material as a rule is coarse; so the rock instead of being a quartzite is a Quartzitic Conglomerate.

The pebbles are as a rule not large - averaging perhaps one fourth inch in diameter with occasional larger ones.

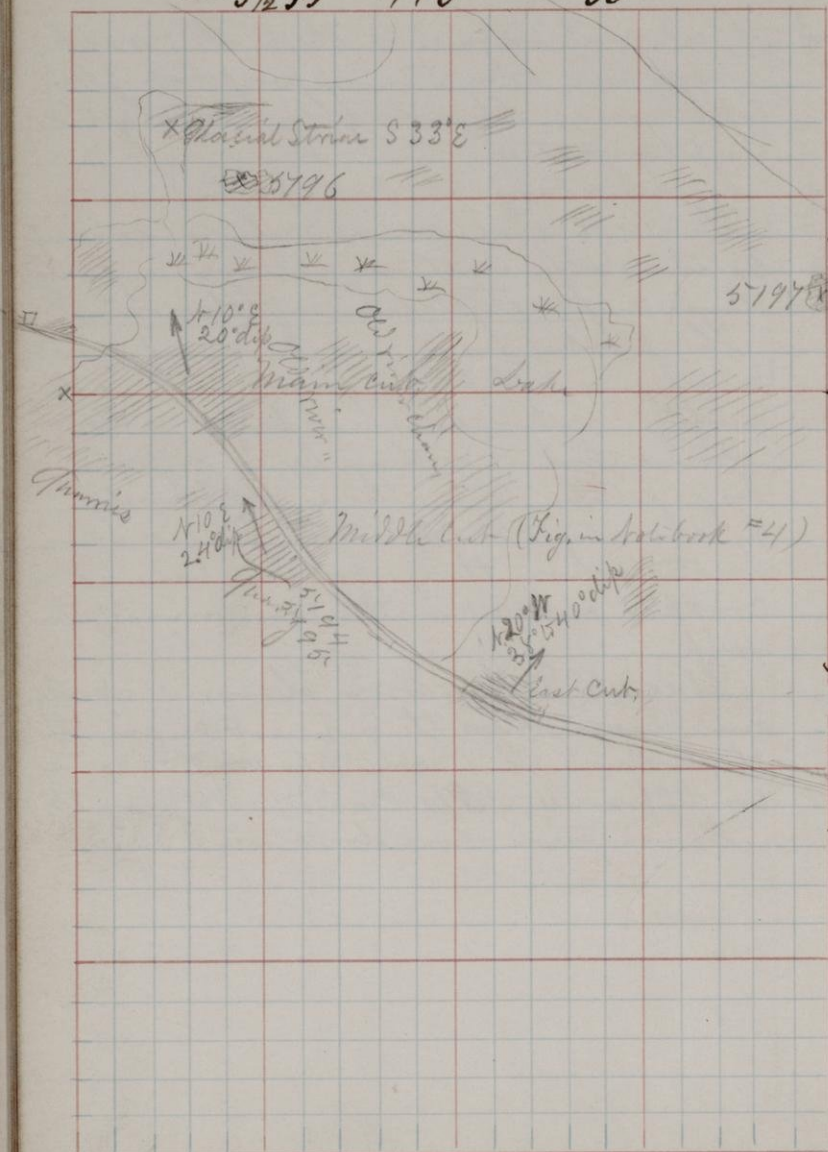
Here + there is a thin layer of quite large pebbles like those represented by number 5170. Several places were noted where these coarse layers cropped out upon the surface of the rock.

Glacial Striae were observed at only one place altho' they must be visible elsewhere. This was about 200 paces south from the SW Cor. $S\ W\frac{1}{4}$ to $W\frac{1}{4}$ sec 85.

These Striae gave direction $S. 33^{\circ} E.$

Sec. $\frac{2}{S\frac{1}{2}35}$ T. $\frac{109}{110}$ R. $\frac{30}{30}$

$S\frac{1}{2}$ Sec. 35, 110:30 Section 2, 109:30,



5794

1500 ft; 1500 ft (Sec. 2, 109:30)

This sample was taken from the quarry below the middle cut. This quarry has been excavated deeper than last year & these samples show micaceous scales much clearer than any samples secured one year ago.

The rock is very shaly, some quite soft layers alternating with harder quartz-rich ones.

The color is a silvery gray due to presence of scales & absence of Fe₂O₃.

5795

1500 ft; 1500 ft (Sec. 2, 109:30)

This is a softer shale than 5794. It is red in color; easily broken in the fingers and contains also the silvery micaceous scales which occur in the preceding.

These layers (represented by 5794 & 5795) seem to alternate with the flags taken out in quarrying. These flags are a fine sandstone some showing ripple marks, others mudcracks etc. (2)

Sec. 35 T. 110 R. 30.

See plat opposite #5194

550 N; 1550 W. (Sec. 35; 110:30)

This is a fine Quartzitic Conglomerate. The grains are not coarse but they show the average size of the grains so far as observed on all the outcrops upon this upper terrace of the Redstone exposure. And the whole mass of this upper part is with only here & there an exception conglomeratic; with a few spots where quite large pebbles are seen.

About 200 paces N. westward from this spot glacial striae were seen having direction S 33° E.

5197

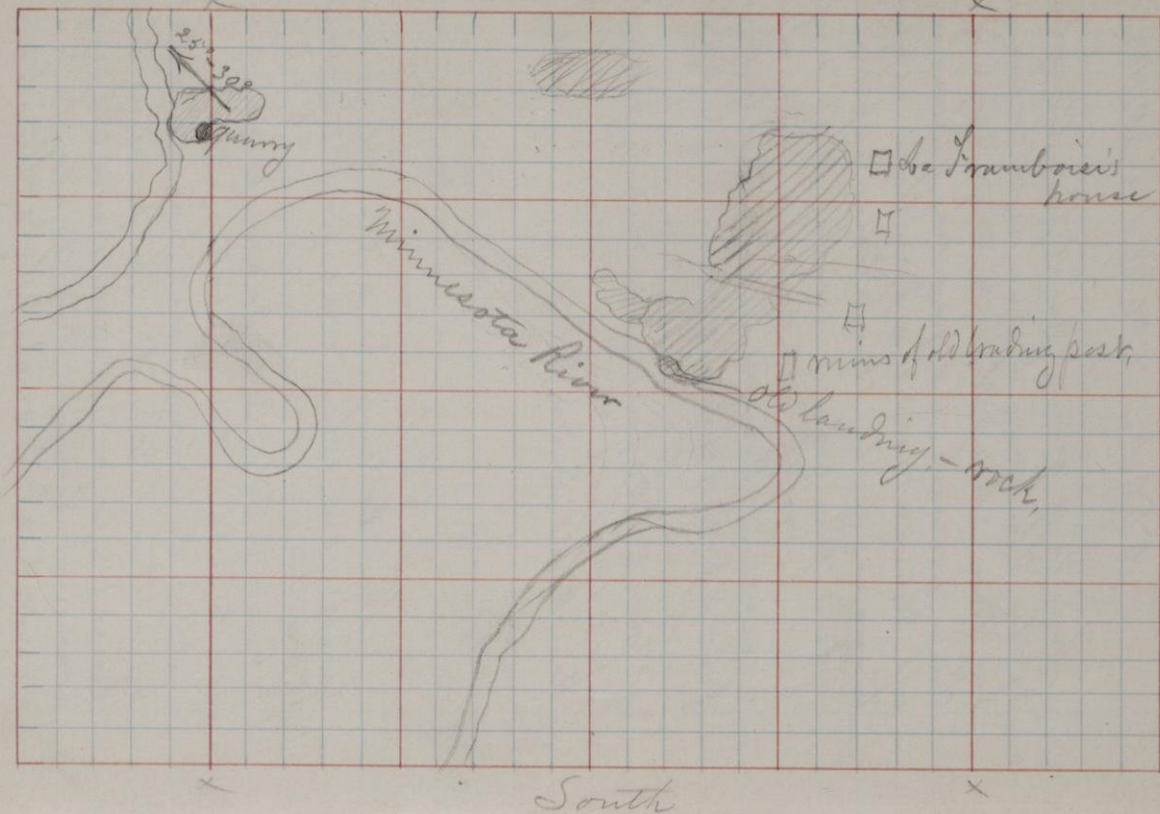
250 N. : —

This outcrop is a small quarry directly on what was pointed out to be the line between Secs 35 & 36 about 250 (or 300) paces from the South Side of these sections.

It is conglomeratic like other samples from this vicinity. The peculiar cleavage lines (a layer) $\frac{1}{4}$ inch under the surface was not seen at this quarry but was observed at several spots other than where 5171 was taken last year.

Sec. 22 T. 11 R. 32

North



This rock taken from Hindarman and a duplicate of # 5782 which when gathered was thought to be a granite. It was taken from the quarry. It is undoubtedly gneissic.

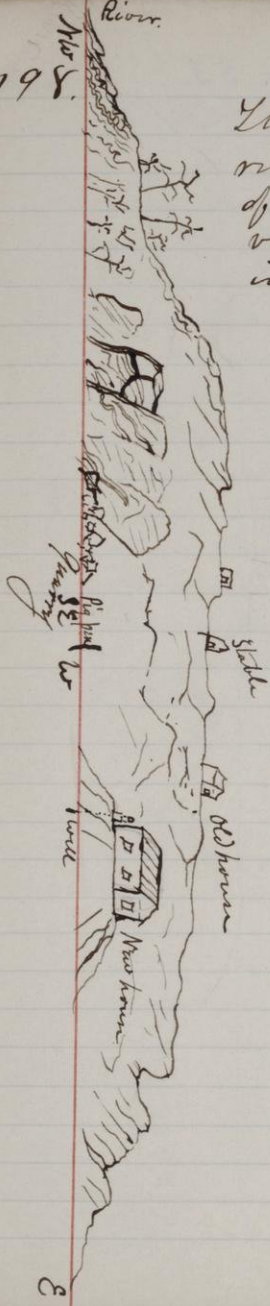
Everywhere over the surface the weathering brings this fact plainly to view. It shows clearly ~~the~~ differences between the light & dark strata which are seen on the fresh specimens in the darkened appearance of the latter & lightened color of the former.

The dip at the quarry is NW at an angle of 25° to 30° . East of the house it is also NW angle $20^{\circ} \pm$.

The alternating minerals occur in bands of such thickness that a hand specimen does not bring out the gneissic character so clearly as an examination of the rock in situ.

5798.

River.



The surface of the rock by the river is rough from action of water upon a surface of varying hardness. The laminae are distinct dipping obliquely under the water. They show marked corrugations.

At this point east of the house the dip can be distinctly seen in looking at the rocks from the south.

Sec. 34. T. 112 R. 33

5199

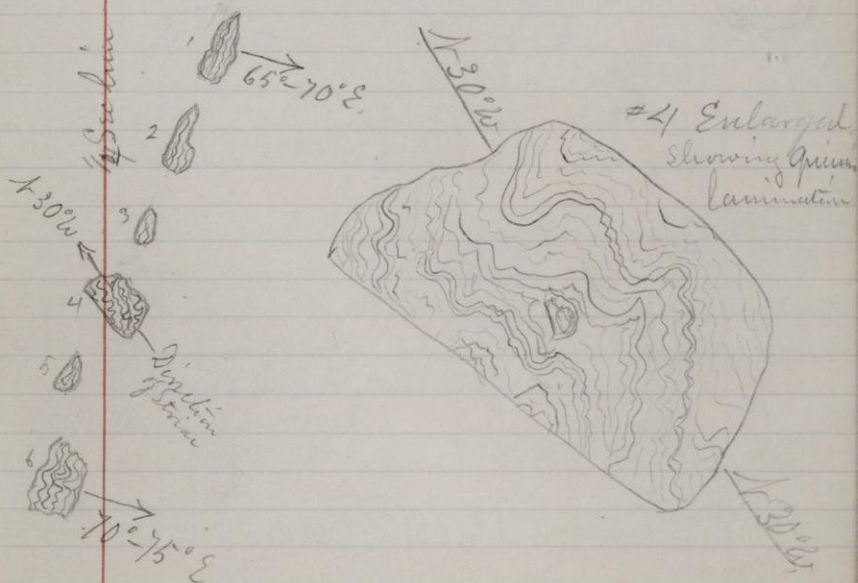
5199

900 ft; 500 ft.

The mass of rock taken here is best represented by # 5185 gotten last season. This No. 5199 shows the contents of a coarser strata or vein thro' the mass of the schist.

The rock shows a lamination which on some outcrops is very contorted. The general direction of these laminae is $N 20^{\circ}$ to $25^{\circ} E$. There is an exception both in direction of the bands & in the degree of contortion.

The dip is 65° to 70° towards $N 80^{\circ} E$ excepting in #4 below



Sec. 13 T. 112 R. 34



5200

500 N; 250 W.

Dimensions; 300 paces long; 245 ft wide
Marshy N. + E.; lake S. + W.

Rock stands 30 or 40 feet above water
in a smooth + rounded knob with
many boulders broken from it lying
over the surface.

Color of rock reddish for main part
tho' on north side a grayish lam-
inated modification occurs.

There seem to be 6 main mineral
fractures, in several directions - largest
running north + south,

Structure of the rock is gneissic,
laminar course N 75° to 80° E but
amt of dip was not determined but
guessed to be about 50° N.

The rock is only medium as to
coarseness of grain.

An outcrop extends eastward to the
dec. line between 13 + 18; between the
town line separating Camp from
Birch Cooley.

Sec. 13 T. 112 R. 34

See plat opposite #5200

5201

500 ft; 250 ft

This is a modification of 5200 appearing on the north end of the exposure constituting many of the large surface boulders and the rock mass as it disappeared under the snow.

It has a more distinctly gneissic structure in small specimens than does 5200 which makes up the larger part of the exposure.

Sec. 13 T. 112 R. 34

See plat opposite # 5200.

1100 ft; 300 ft

30 paces long and 20 do. wide

Stands in a hay meadow and
rises 10 feet above it.

Surface inclines towards north
at from 6° to 8°

Mississippian Structure: direction
of laminae N 80 E with a
northward dip of 40° to 50° ,

Joints: E. + W.; N. 20 W.; etc

Rock has a reddish color; is much
decomposed and shows the al-
ternating bands of more + less
easily decomposed material

Sec. 13 T. 112 R. 34.

See plat opposite #5200

5203.

750 N.; 950 W.

Exposure 250 paces long; 150 ft. wide
River within 150 paces on the Southwest.

Grass and under brush cover most
of the area.

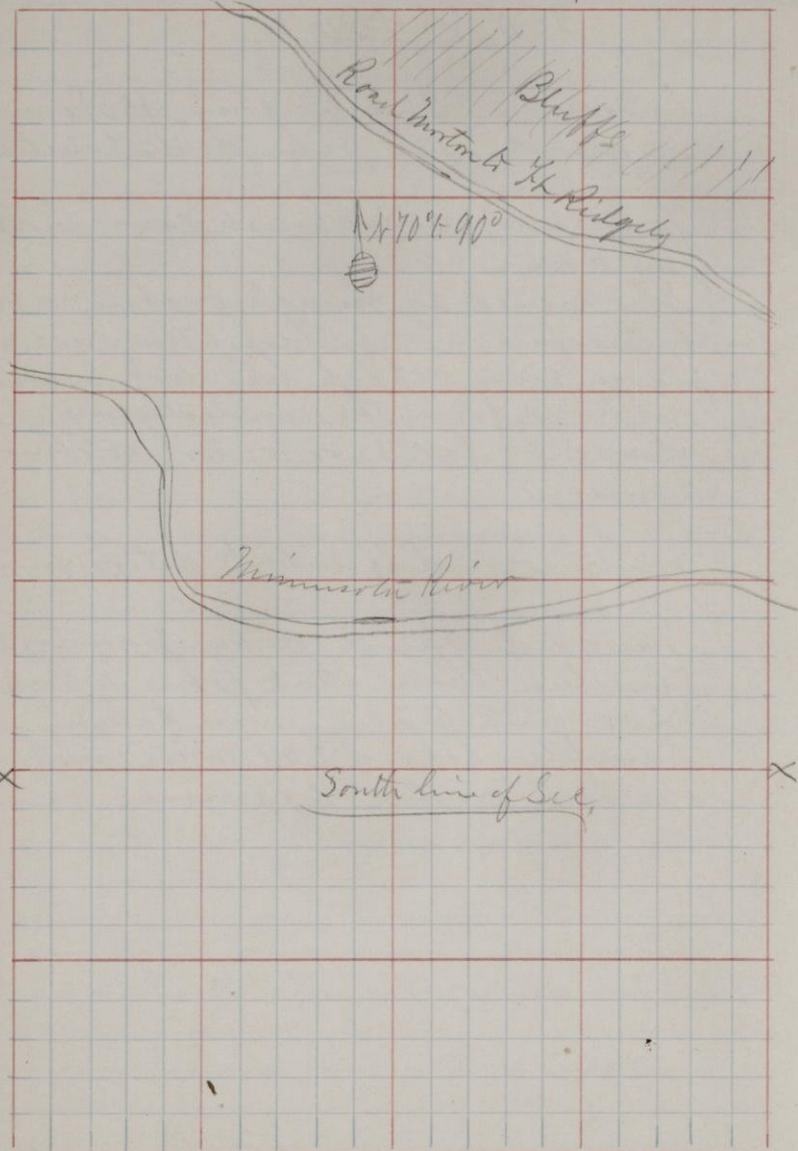
The mass is much broken at
the surface - only here & there were
places seen which had not been
ruptured from the underlying
mass by frost or river or other
agency.

Joints were difficult to determine.

The rock has a more granitoid
structure than that from which
5200 and 5202 were taken.

Samples like 5201 were not
observed on this exposure.

Sec. 10 T. 112 R. 34



5204.

75

1300 N.; 1050 W.

Exposure 60 paces long; 40 ds. wide
on edge of hay meadow 250 paces
from the wall for Norton to $\frac{1}{2}$ Ridge.

Rock 8 or 10 ft above ground surface.

There seems to be a general E. + W.
direction to the lines of coarse & fine
material; to the feldspar rich & horn-
blende rich; to the quartz veinlike and
lenticular inclusions, and to the
very compact material mostly
feldspar which are seen over
the surface of the rock.

The dip is nearly st at an angle
varying from 70° to nearly vertical.

This rock is a reddish colored
mixture of feldspar & hornblende
with the former predominating thus
giving a flesh colored appearance to
the rock. Quantity varies however,

But little quarrying has been done
30 or 40 cords at utmost,

Compare Winchell's Rep. 1873 p. 162
last paragraph on page!

Sec. 10 T. 112 R. 34

See plat opposite 5204.

5205

1300 N; 1050 W

In some places e.g. South side the inclusions of an apparently nearly massive hornblende rock are quite prominent. Then they appear as in the figure:



The dark represents hornblende rock. The grain is rather fine. When struck with a hammer the light green powder is noticeable indicating the decomposition into Chlorite (?).

5206

1300 N; 1050 W.

Shows streaks of coarser mixed feldspar and hornblende seen here and there, lenticular masses of quartz, etc.

The streaks were noticed in several places and there are all intermediate degrees of coarseness between this & No. 5204. The lenticular masses of quartz are not abundant.

5207

1300 N; 1050 W.

This is the nearly pure feldspar which shows itself in vein-like streaks thro' the rock & in apparent inclusions. Runs into 5204 just as 5206 does. Diverging along
grain

Sec. 4 T. 112 R. 34,

Bluffs.

Road from Merton to 1/2

Mt. Sp. Ry.

Ridge

15° W
40°

5208
5209

5208

17

200 N. ; 1250 N.

Upon river with meadow between it & road.
Exposure along the river 200 paces
and upwards of 100 paces wide.

The rock is much decomposed & is
mostly covered
never been quarried.

Quartzitic structure very conspic-
uous, with alternating coarse feld-
spathic and fine micaceous lam-
inae varying from $\frac{1}{4}$ inch to 2 or
more inches in width.

Course of these laminae N. 70° - 75° E.
dipping N. 15° N. at 40° as determined
at several places.

The rock differs materially from
that at See 10 (5204) but perhaps
this is brought about by the conversion of the
hornblende of 5204 into the mica-like
scales of 5208 - probably not.

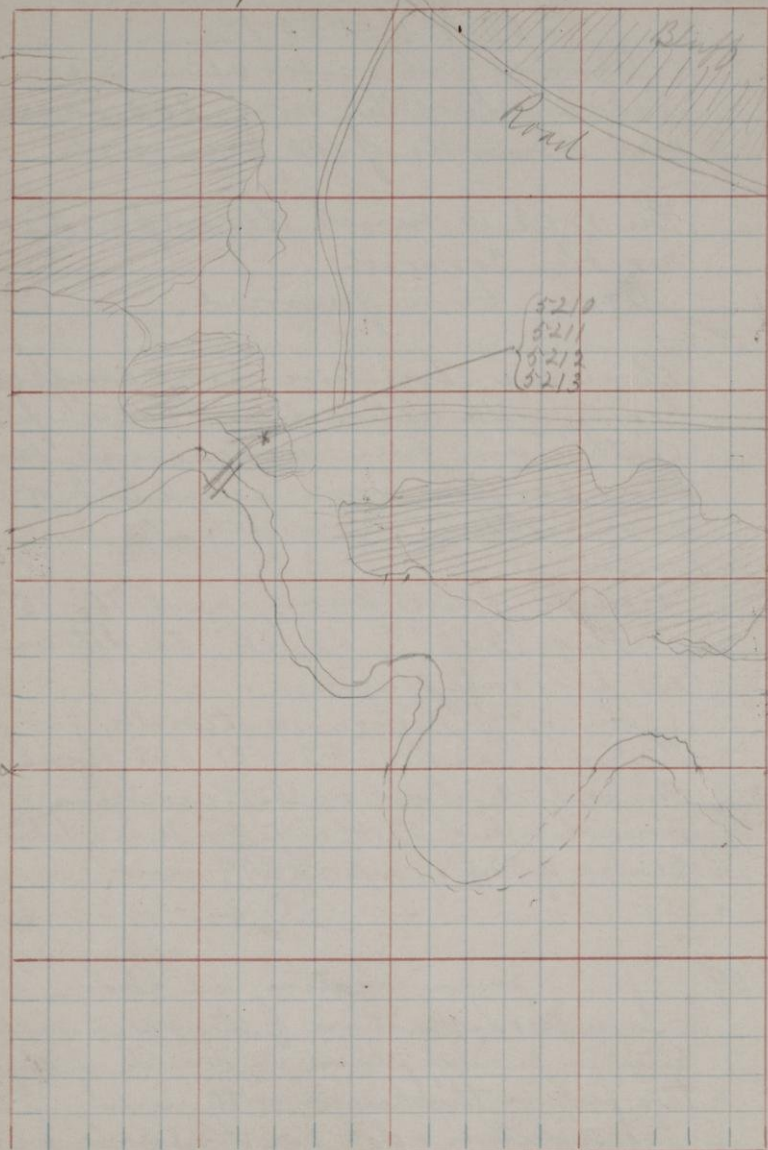
5209

Same location as above.

Is a modification of the main mass,
seen in several places in bands of only
two feet in thickness or thinner.

Its direction & dip are the same as the
5208 enclosing it.

Sec. 3/ T. 113 R. 34



5210

900 N; 1300 N.

This is the dark-colored banded rock gneiss from the R₂ cut at Norton between the depot and the river.

The general direction of the bands or laminae upon the surface of the ledge is nearly East + west trending perhaps to 10° S of E. The surface is waterworn, several large potholes 2 or more feet deep were noticed, so that direction was only presumed to be the strike of the rock. The bands dip at an angle varying from horizontal to 50° . Sometimes the bands are quite fine; again they are coarse. They are interrupted often by the light and flesh colored feldspathic streaks + masses which ^{often} frequently band the micaceous laminae around themselves.

Again there is a faulting in the bands; sometimes the slip is one or two inches up or down from the band continues.

The prevailing minerals are mica, feldspar + quartz in about the order named.

Occasionally the quartz is amethystine,

Sec. 31 T. 113 R. 34

See plat opp. 5210

Section of the Railway cut Moulton North side end nearest the river

900 ft. 1300 ft.



5210
5211
5212
5213
5214

Sec. 31 T. 113 R. 34.

See plat opp. 5210

5211

900 N.; 1300 W.

This is the feldspathic rock which occurs with the preceding number 5210 in the relation of a vein to a country rock.

The material is very coarse as compared with the matrix rock contains large nests of quartz with feldspar - many reaching an inch or more across.

5212

900 N.; 1300 W.

Shows the rock towards the surface when instead of being in veins is a coarser modification of the whole mass. In coarseness it stands midway between the vein and the dark colored micaceous layer.

Distributed thro' this are clusters or nests of mica possibly hornblende intermingled of the size of large peas or beans giving the face of the rock a blotched appearance. These may have some relation to the large inclusions of # 5213,

Sec. 31 T. 113 R. 34

Explat opp 5210.

900 ft; 1300 ft.

This is the inclusion of mica - perhaps some hornblende - in the mass of the rock at the railway cut.

Some of these inclusions are large 2 feet or more in length others small.

They are irregular & some angular as a rule in shape.

The Mineral Constituents are Mica the large part and small scattering granules of feldspar & quartz.

Contact between 5210 & 5213 is shown on some pieces.

5214

Along the face of this exposure and in the waste thrown out from the blasting of the cut can be seen now and then segregated masses of quartz which often show an amorphous tint.

The masses are now when large not good.

Sec.

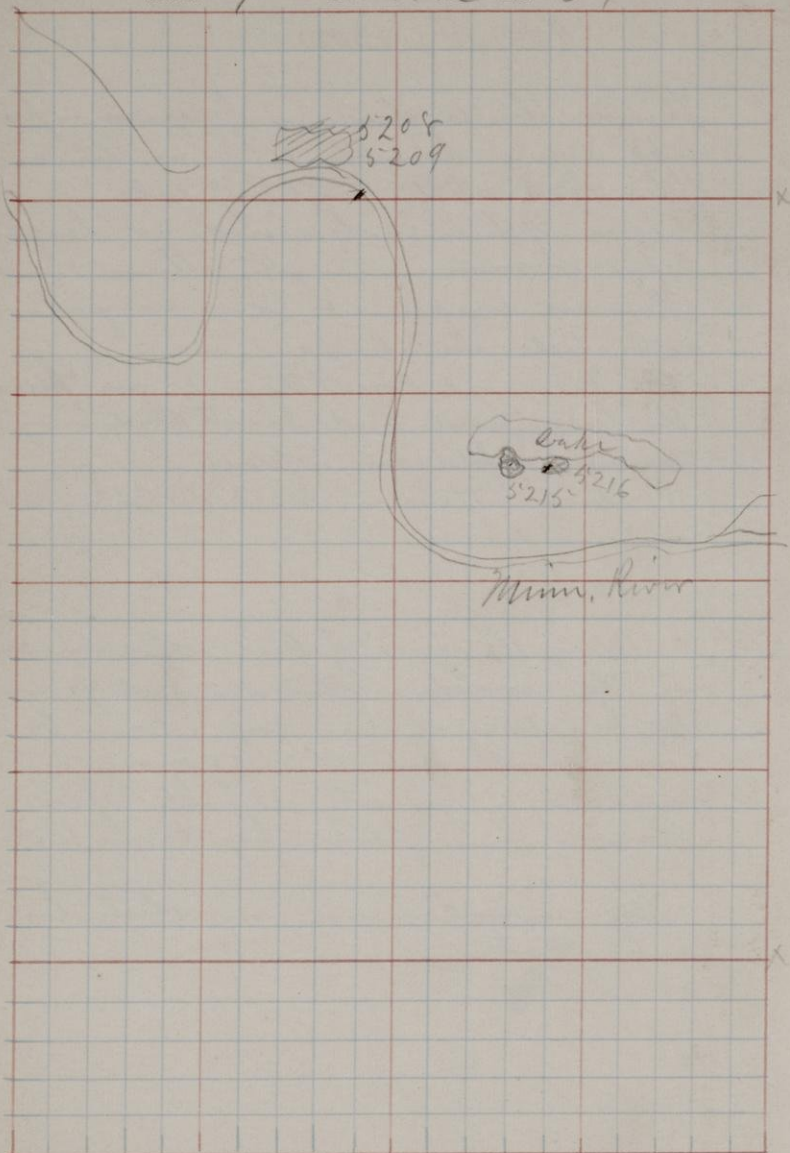
9

T.

112

R.

34



82/5

1300 N; 600 W.

SW $\frac{1}{4}$ & E $\frac{1}{4}$ Sec. 9, 112: 34

Just about due west (corrected compass)
of the exposure of Syenitic (or hornblende)
gneissoid rock on the J. Grange (Sec 10)
occur two knobs of a dark colored
rock. The westerly one stands 10 ft high
^{both} on the south side of a lake $\frac{1}{2}$ mile
or more in length. They are estimated
300 paces from the river + near 900 do.
from #5208. The knobs are each
50 paces long and 30 or 40 do wide.
Their strike is their line of direction
is N 75° W.

No dip could be determined altho
a distinct southerly inclination
of 40° or 50° could be seen in
the gneiss.

The rock is weathered almost
beyond identification everywhere
except at the lake front of the west
knob. Here samples were taken
showing a tolerably fresh diabasic
(?) rock. The texture has only
a medium coarseness

Peridotite

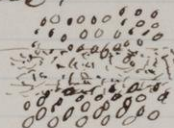
Sec. 9 T. 112 R. 34

See plot opposite 5215~

5216

1300 ft; 600 ft. Sec 9 112:34

But frequently we see large holes 8 or 10 in. in diameter and around them more frequently perhaps in long stretches parallel with the jointing mentioned in 5215 are amygdaloidal conditions. This condition seems to shade into a very fine fine modification from either side of a belt of this fine which is 5 or 8 inches wide thus:



These amygdaloidal cavities contain no minerals at the surface but the same frequent in the less compact portions carry two or three different mineral species. The two most prominent are; Quartz in some cavities Arsenic and Calcite. Another mineral was that observed

Sec. 33

T. 113

R. 34.

33

32

6214
6219
6220

6217

Rocky bluff - back

5217

1400 N; 2000-N.

In a cove in Birch Covey Creek near the west line of the Section the rock stands 30 ft high in a nearly perpendicular bluff pointing directly northward.

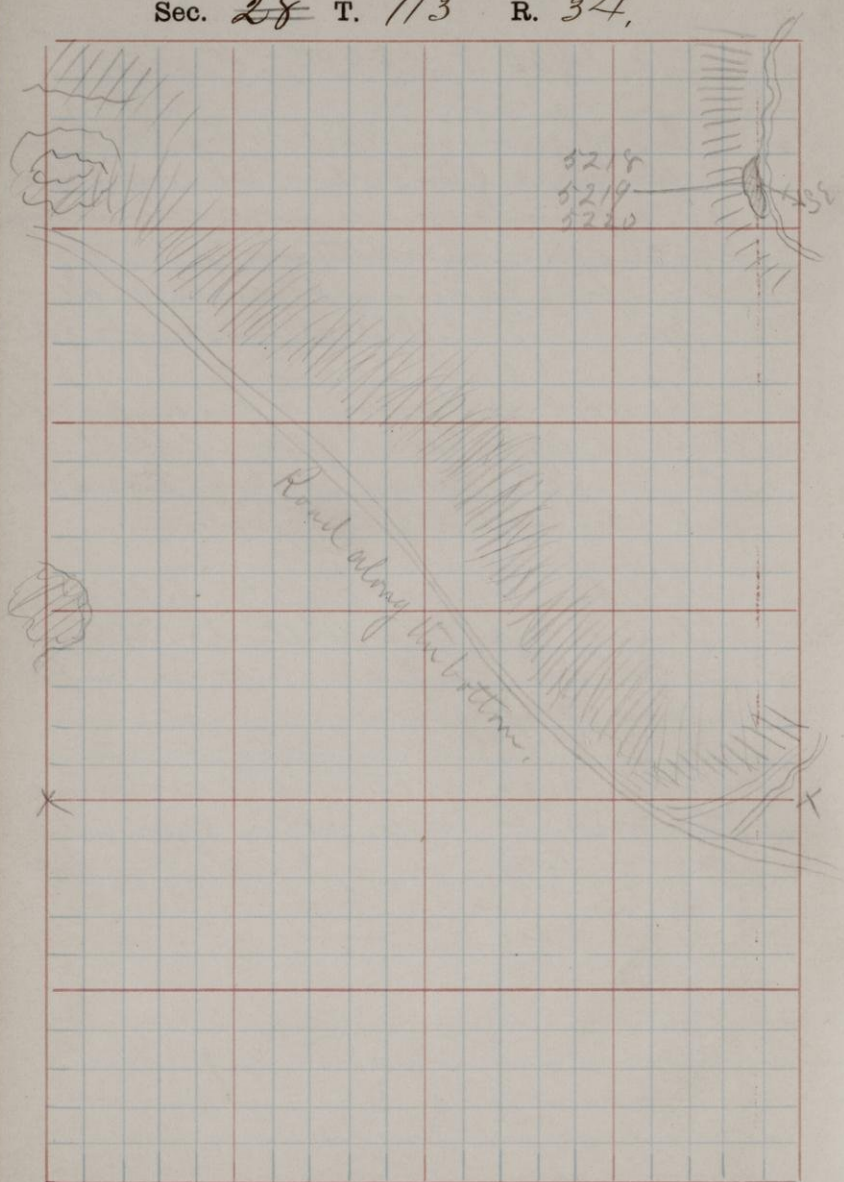
The dip so near as could be ascertained is $E 10^{\circ} S$ at an angle of 25° .

The rock is thoroughly decomposed to the very bottom of the bluff as the samples taken within two or three feet of the water clearly show.

Eddepar Crystals are the only constituent noticed with its form preserved unless it be perhaps a few quartz grains.

There was nothing overlying this rock - trees were growing over its top.

32
Sec. 28 T. 113 R. 34,



5218

1600 N 100 W

Passing ^{North} West some 75 paces from 5217 and into Sec. 28 we came to a bank 30 ft high which dipped so near as could be determined in the same direction as the preceding, and at about the same angle.

The material here was completely changed to a green or in some places blue impure kaolin. The lower part of the bluff was covered by the sliding down of soft mud material.

This No. 5218, was taken from near the top of the bank say within 5 feet of the roots of the trees.

It shows decomposition with many scales and grains of a micaceous substance — too white for chlorite — and granules of quartz. These constituents in constantly varying quantity give a variety of color tones.

Sec.

T.

R.

Sed plat opp. 5218.

5219

1600 N; 100 W

This specimen was taken from a point but 3 or 4 feet below 5218 in the same bluff.

This is finer + firmer and more distinctly laminated than that. It is also banded with alternating colors and strata of quartz - one an inch or more thick - the latter of which course nearly parallel with the supposed bedding of the rock.

5220

1600 N; 100 W

Came from 4 feet below 5219 in the same bluff.

The texture of this is quite uniform the color is blue and it can be broken out in comparatively large blocks. It has the weight, texture and structure (at least the fracture of) of an ordinary kaolin.

Then at many places along the bluffs of the Coaly when this decomposed material occurs; above the old dam along the road, &c. &c.

Sec. 29 T. 113 R. 34

North

5221
5222

5223

Old field

Yarrow Bay

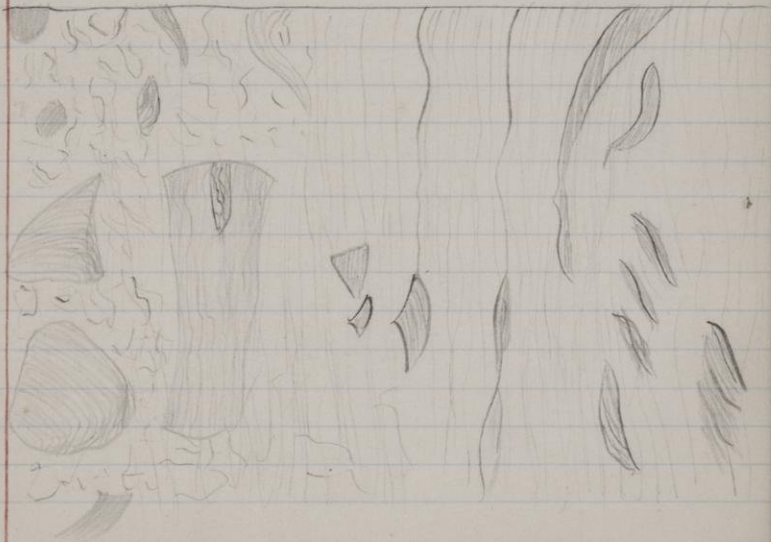
2

100 ft; 50 ft (Estimated)

At the falls on Birch Creek 500
feet from the old dam the rock is a
Gneiss. The water has worn the surface
smooth and to the fresh firm rock.

There is a northerly and southerly
direction to the contorted strata

Large feldspar crystals are occurring
some some 4 inches or more across;
inclusions of schist and many
gneissic masses running in all
directions were observed. The follow-
ing represents a surface about 8 feet
separ at this place:



Sec. 29 T. 113 R. 34

See plot opp # 5221

5222

700 N; 50 W.

This is a sample of the vein rock running through the gneiss at the falls in Birch Cooling Creek. General direction is N.E. + S.W. There are then or four of these veins of a harder + firmer texture than the mass of the Gneiss thro' which they run.

These seem to be examples of typical granitic veins and show signs from one foot in width down to a narrow seam scarcely perceptible.

Winchell figured these veins as a Crypto-crystalline felsite in his Rep. Geol. & Nat. Hist. for Minn. 1873, p. 164 et seq.

Sec. 28 T. 113 R. 34

Surplat opp. 5221

5223

29

100 N. 2000 W.

This sample was taken from one of the abutments of the old mill which stood a few rods from the corner S. W. of Sec. 28

The material is greatly decomposed; it has the reddish color of the first rock visited in the Cooley, i.e. #5217 and from the the Dip + Strike of these rocks cannot be very far from that rock stratigraphically.

This has more adhesion than 5217 and looks on the face of the ledge to be quite firm

The dip was Easterly at about 20° degrees

As only a face (vertical or rather oblique) was seen the strike could not ^{be} exactly determined.

Sec. 36 T. 11 S. R. 36

North



5224

225 ft; 250 ft

Sec. 36, 113:36

This and the two following numbers were taken at the falls ~~and~~ in the valley a short distance above the falls.

At this point the water falls 20 ft perpendicular. The rock on either side of the river is 50-60 ft high.

The rock is highly jointed - at the falls the joints incline NE at an angle of 35° . Other but apparently subordinate series of joints extend in several other directions.

Inclusions of schistose material were seen at all the points visited - some of considerable size others small. Large feldspar crystals occur - especially at the falls upon the extensive worn surface at that place.

The relative quantity of feldspar changes frequently with the mica making alternating lighter & darker lines.

This number shows an average of the exposures for a few hundred feet below the bridge across the river.

Sec. 36 T. 11 3 R. 36

See plat opposite # 5224

5225

200 N; 300 W

Near the falls in a quarry when some little work has been done this no. was taken.

Several knobs stand up (where the rock is evidently harder than the mass around) and make uneven the surface of a little meadow.

The rock is so jointed that no large blocks have been separated in the quarrying.

Neither dip nor strike was noted. The joints take the same direction as those by the river.

5226

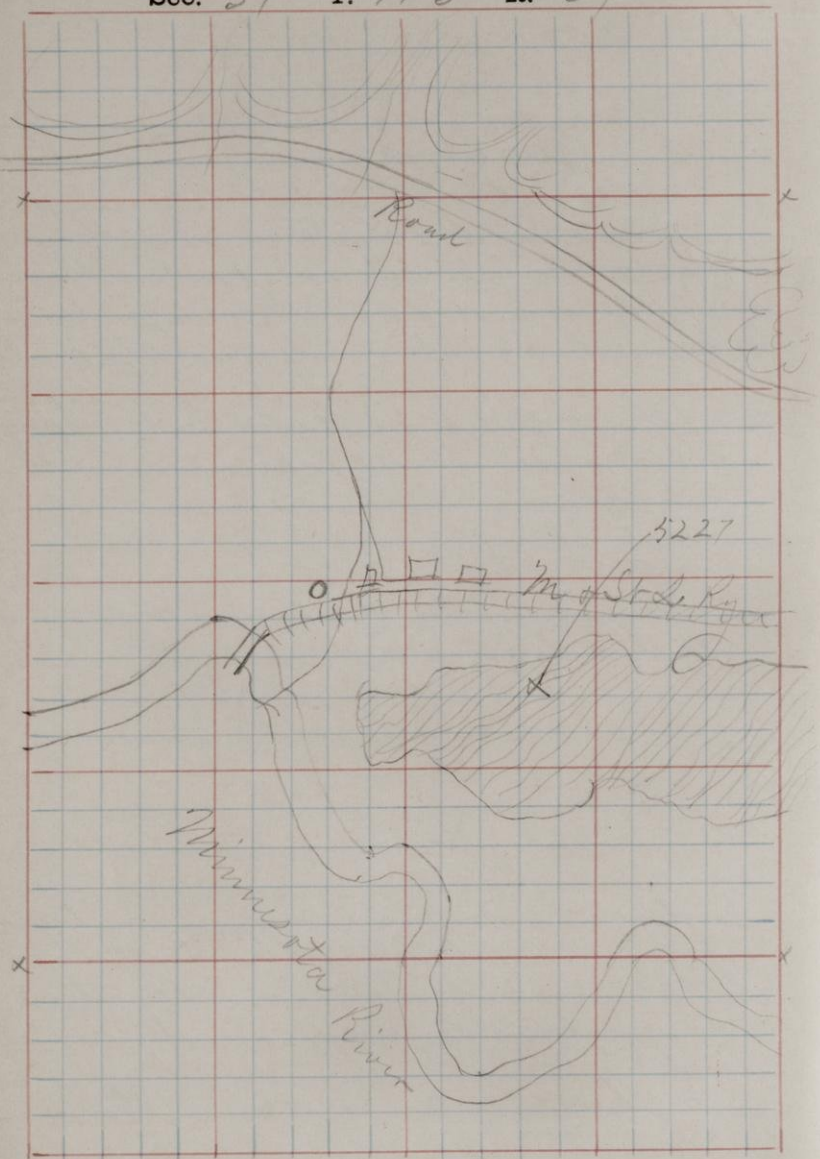
250 N; 400 W

Is a micaceous inclusion taken from the rock below the mill.

It seems to be identical with those seen at other places in the vicinity.

This is more weathered than in some other places.

Sec. 31 T. 113 R. 34



5227

700 N; 650 W.

From the top of the rock east of the depot at Morton

Several large knobs stand up from the bottom to 75 feet or more above the river. The laminations of the rock seem to have the same direction as those near the railway cut viz N.E. & S.W. In some places there is a dip eastward; in others westward. The contortation of the strata seems to be as pronounced here as at the railway cut near the bridge.

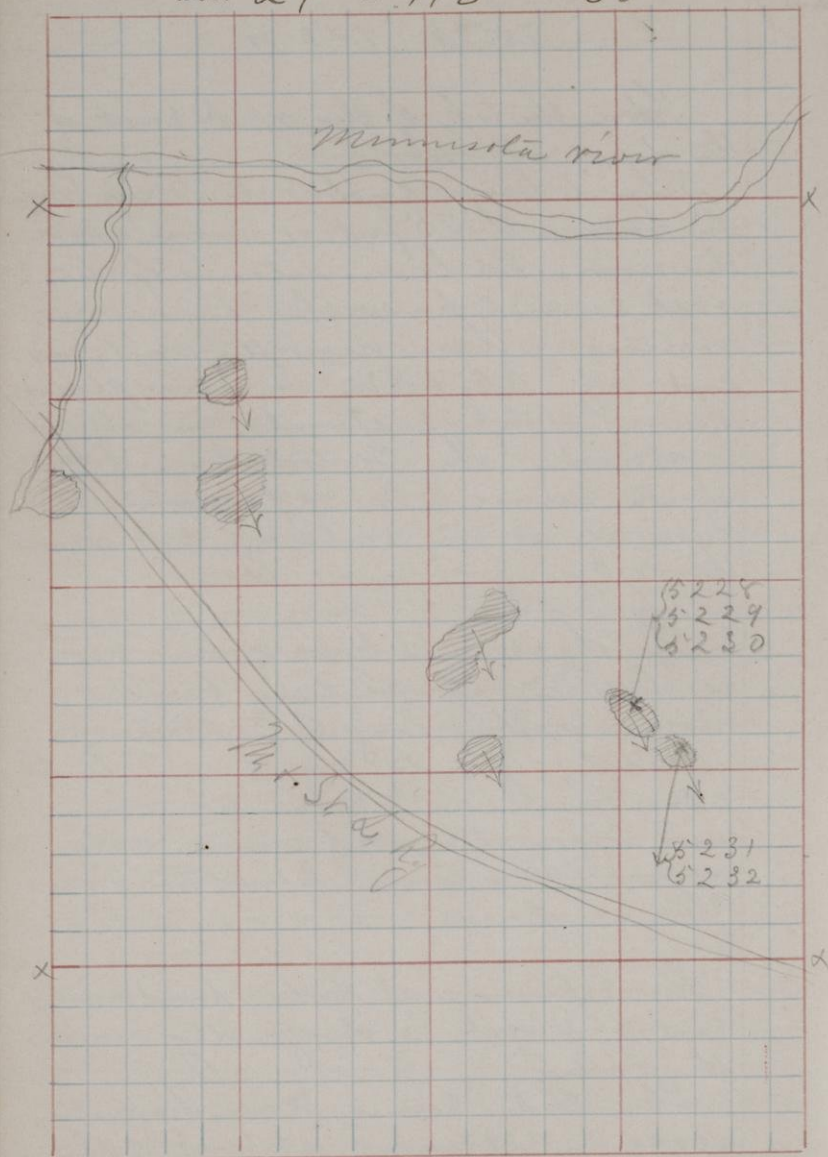
The dark and light occur here as those in alternating bands; Some rather large Crystalline of mica; quartz veins and lenticular masses; granitic veins and Segregations of mica all of which are seen scattered over the surface.

The exposures at Morton trend nearly east and west, i.e. diagonally across the valley.

The strike seems to run diagonally across the exposures at least if the direction of the laminae be taken for strike.

(9-891.)

Sec. 29 T. 113 R. 35



5228

600 ft, 400 ft.

The quarries between the Minneapolis & St. Louis Railway and the river below Redwood Falls show a very interesting kaolinization of the contorted gneiss.

The direction of the jointing, and this is believed to be the bedding also, is $S 20^{\circ} E$ at a rather high angle, say 50° .

The strike of the beds is $N 70^{\circ} E$.

The exposures lie in a ~~northwesterly~~ South easterly direction.

A large area is underlain by this rock as can be seen by the contour of the surface and character of vegetation.

This number represents the gneiss decomposed material seen in all the places where quarrying has been done.

Contortions can be followed nearly as well in this decomposed rock as in the fresher rock at other localities.

Sec. 29 T. 113 R. 35

For plat see opposite #5228

5229

600 N; 400 W.

This is the feldspathic vein material with much kaolin mingled. The kaolin seems to fill spaces or interstices between the more resisting ^{to weathering} feldspathic & quartz granules.

Some of these veins are of great extent - one measured ten (10) feet in width.

They seem to run in various directions.

5230

600 N; 400 W.

This sample is from a fine and rather compact vein with the country rock attached to it.

It is probably the same in age and origin as the preceding but for some reason whatever of position or texture it is better preserved.

Sec. 29 T. 113 R. 35

For plat see opposite #5228

550 N; 300 W.

This is a sample of the gneiss from the east quarry.

It is firmer than the gneiss of the other, west, quarry. The contortions and bandings are very clearly defined. Quite bright white spots are seen over the face of the rock when freshly broken; these seem to be flecks of the Kavalinigt feldspar.

Strike and dip essentially the same as in the west quarry. To wit: Strike N 70° E; dip S 20° E at angle varying from 50° to 70°.

The gneiss is not homogeneous over large areas; it is like that at Norton in this respect.

The contortion is such that uniform texture cannot be followed a great distance i.e. for several feet in any direction.

Sec. 29 T. 113 R. 35

Suplat spp. #5228

550 N ; 300 W.

Feldspathic vein in the quartz.

The peculiar appearance of these veins and their present mineral constituents indicate the former presence of iron pyrites in the rock — at least in the veins.

As a whole these veins dip S.E. at angles varying around 45°

The material is coarse and consists of feldspar quartz and kaolin with here and there relics of other minerals in the green and the brown and the blue on surface.

One vein in the westerly group of the two was at least 10 feet wide and had the dip and direction mentioned above.

It is said that in the banks of the Redwood river a mile or less away there are large quantities of nearly pure kaolin & it has been marketed to some extent.

These rocks # 5228 to 5232 incl come from one of the mounds of the valley.

Sec. 30 T. 113 R. 35

5255

Redwood River

1500 N; 85° W.

This exposure consists of a small knob extending west and north of river from the bridge + track of the railway. It stands 20 or 30 feet above the meadow below and its extension South + East beneath the soil is seen at the abutment of the railway bridge and in the cut to the west of the same.

The surface in sight measures but a few paces each way.

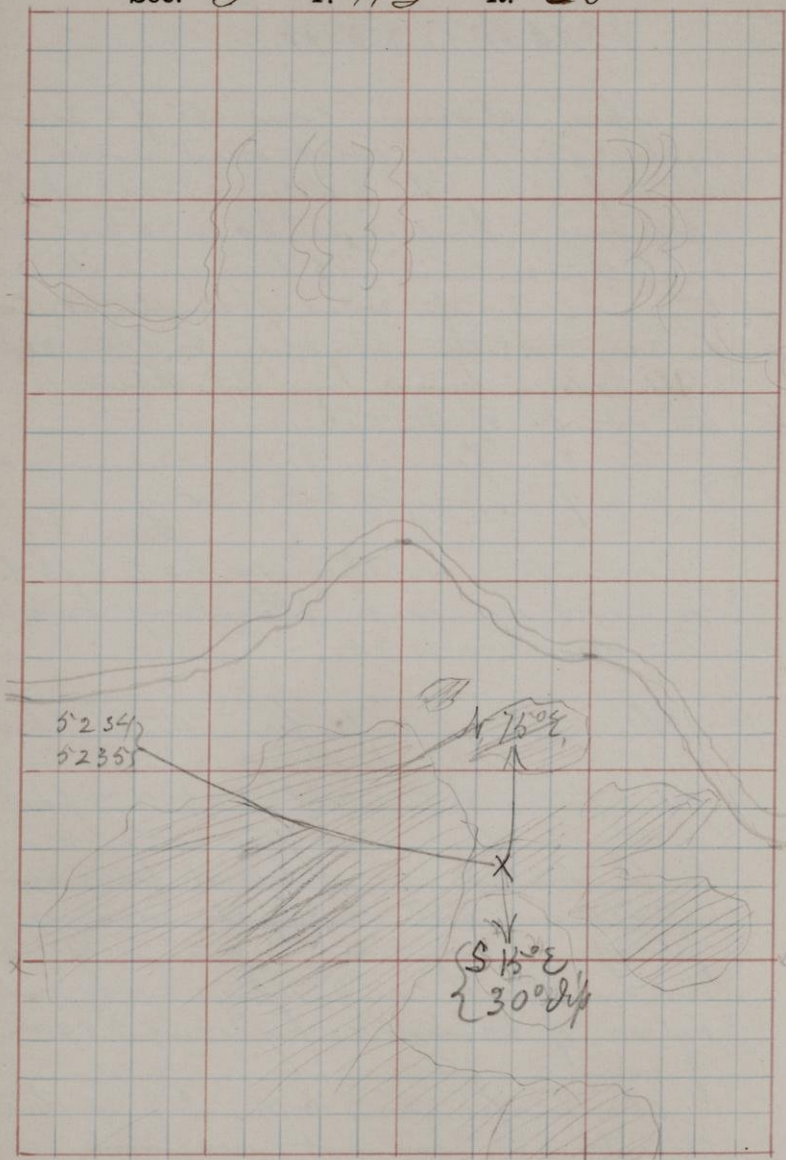
Concentric weathering has left large rounded masses standing out to the North + West.

The rock aside from this shows very complete decomposition — quantities of sand lie at the foot of the bluff.

A dark brown mineral fills many interstices and incrusts many Feldspar crystals. It gives a yellow brown streak and has every indication of being a hydrous oxide of iron.

An inclination to the SE is discernible; it was not measured.

Sec. 3 T. 113 R. 36



5234

250 N; ⁷⁰⁰~~300~~ W.

The South $\frac{1}{2}$ of Sec. 3, 113:36
is pretty thoroughly covered with
rocks.

A large hill rises from the river
to the height of 175 feet or more
which shows the wear of the glacial stream
in its outline.

~~Alternating bands of feldspar & mica~~

Concentric weathering of the gneiss
is frequently to be seen.

This no. is the markedly banded rock.
Alternating feldspar rich & mica rich
bands of varying thickness produce it.
Mica is so abundant in some layers
as to produce a mica schist.

Sec. 3 T. 113 R. 36

Suplat opp. # 5234.

250 N; 700 W;

This is a sample of the feldspar rock just overlying # 5234.

A face of the sample which had been exposed to weathering reminds one of Sorted Sediments and a conglomeratic character and origin of the rock.

In several places feldspar crystals $1\frac{1}{2}$ inches or more in length were observed.

These large crystals seem to be in nests or bands enclosed by the finer textured rock.

The rock often occurs in huge boulders or masses apparently inclosed in the more Schistose or gneissic rock of # 5234.

At this point on the river to wit. Sec. 3, 113:36 to be observed the most pronounced gneissic character and undoubted strike & dip thus far seen in coming up from New Ulm. Compare however the Morton exposure.

