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Canadian Javelin Ltd. (1962)

The Julian Deposit, Trench Stripping Project

SCANNED IMAGE

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THE JULIAN DEPOSIT

TRENCH STRIPPING PROJECT

Dec. 20, 1962

Canadian Javelin Limited

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INTRODUCTION

The Julian Deposit trench stripping project was undertaken, upon completion of the Julian road project, in order to obtain the detailed technical data necessary for the mining of ore representative of the deposit for a large scale test run in the Wabush pilot plant. The project was completed in three days, November 11-14, 1962.

The area stripped was selected so as to expose as much of a central cross section of the deposit as possible in the shortest distance considering accessibility, topography, and the need for more exposure on the top of the hill.

The distribution of the various mineralogic varities of the iron formation across the stripped area was determined from the field examination and subsequent office studies. Six pit locations have been selected from which, on the basis of geologic-mineralogic evidence, a bulk sample can be procured which should be representative of the deposit as a whole.

In recognition of the fact that the metallurgical characteristics of the ore may not vary in the same manner as the mineralogy, further testing of the samples is recommended prior to final selection of pit locations and their relative sizes.

CLEARING-STRIPPING

The center line was cut northwest and southeast of a point (station 13) 330 feet south of the co-ordinate post on a bearing N44W (471/2 degrees west of north on the 1956 baseline).

The clearing of trees from the 300 foot wide clearing began Sunday night, November 11. Clearing and stripping proceeded towards the northwest. The road and examination trench were build on the return to complete the southeast end where the stripping was completed Wednesday afternoon. The section north of 22 + 00 was not stripped due to the time factor and no stripping was done south of 2400 because of the very rough ground.

The maximum depth of overburden encountered was about 18 inches, which occured only near stations 22 + 00 and 15 + 00. It has been estimated that an average depth of overburden figure for the entire stripped area would be approximately 3/4 of a foot.

The rock surface was found to be somewhat rough, such that the flat bulldozer blade bottomed on rocky bumps a few inches high, thus leaving a thin skin of soil and crushed rock fragments over most of the stripped area, especially in surficially altered areas.

A face 2-3 feet high was made with the angeled blade along the flanks of small rises along the stripped area for the purpose of geologic mapping and sampling. In hard, flat areas, as much soil and debris was removed as possible using the blade in a flat position.

GEOLOGIC EXAMINATION

The physical and geological features of the stripped area were mapped at a scale of 20 feet to the inch, using two tapes and the station posts for control. Geological mapping was concentrated in the diggings and faces in order to complete the job before snow fell, thus there are more outcrops of rock than are shown on the map, all parts of the stripped area were carefully examined however.

Each outcrop mapped was cleared or broken, examined for geological information, a specimen taken and material taken for the composite sample from each 100 feet.

OFFICE STUDY

All specimens were examined megascopically and microscopically for hardness, mineralogy, and minimum size of most free grains. The results of the office examination were plotted graphically, the curves smoothed out and boundaries picked at significant inflection points. Comparison of various areas against each other led to the recognition of six basic mineralogic varieties of the iron formation.

These results were compared with the field classification, slight differences reconciled and the final interpretations made as shown on the combined plan and geological map.

MINERALOGY

The two outstanding variable observeable characteristics are the hardness and mineralogy of the iron formation. Changes in minimum size of free particles and other features were more subtle, but nevertheless supported the recognized variety changes. The identification of stratigraphic units by a change in character in nearly all cases rested upon the distinction between specular hematite and granular hematite.

The specular hematite is easily recognizeable because it is platey and the rock sparkles due to the reflection of light from the flat basal surface of the crystals. The granular hematite on the other hand is microscopically observed to consist of more or less equidimensional, sharp cornered crystals which do not reflect light, such that the quartz-granular hematite rock has a dull appearance. The granular hematite grains are also noticeably smaller than the specular hematite grains. The estimated average size of the smallest free grains of specular hematite is around .3 mm or in the 35-48 mesh size, while the granular hematite tends to be around .2 mm or in the 48-80 mesh size.

These two types of hematite often occur together in a somewhat dull rock exhibiting local concentrations of specular hematite. The variety designation used for such mixed material is quartz-spec. granular hematite.

The question as to what is the ratio of specular to granular in a qtz-spec. gran. rock can only be determined by a grain count. However, in the microscopic examination, 40% of the specimens exhibited spec. and gran. in roughly equal proportions, 40% exhibited granular in excess of spec. and 20% exhibited spec. in excess over granular. If we arbritrarily say that the ratio is 3 parts granular to 1 part specular in rock exhibiting granular in excess of specular, and similarily for excess specular, and average these specular-granular horizons with the spec and the granular horizons, the indicated ratio for the entire trench area is that about 50% of the iron occurs as specular hematite and 50% as granular hematite. Ore of roughly equal proportions is shown on the map as qtz.-gran spec. more specular than granular as qtz-gran Spec., and more granular than specular hematite as qtz-spec. Gran.

There are six basic varities of the iron formation exposed across the trench as described below.

Quartz-Specular Hematite, (silicates). This material consists of foliated quartz-specular hematite with variable amounts of a white to cream colored material dispersed through the rock. This cream colored material is apparently the altered remains of a silicate mineral which has been leached out. The unweathered crystals have not yet been found in the Julian deposit, but similarily occuring material in the Wapussakatoo Mountains contains anthopholite. Its distinctive appearance may also be due to intense shearing.

Quartz-Specular Hematite. This material consists of massive to foliated quartz-specular hematite. It is generally quite free of alteration products but is often leached and friable.

Quartz-Specular Granular Hematite. This variety of iron formation is generally hard and massive, consisting of quartz, specular hematite and granular hematite in various proportions. The material is often somewhat limonitic.

Quartz-Granular Hematite. This variety is usually hard, massive, fine grained, and limonitic. It consists of quartz and granular hematite which is probably martite, representing an oxidized quartz-magnetite.

Ferruginous Quartzite. This variety is actually lean iron formation, consisting of quartz with small amounts of granular hematite, limonite, and goethite. It is brownish, light colored and generally friable.

Manganiferous Variety. The manganiferous bearing material occurs in two forms; hard, fine grained, manganiferous, cherty hematite and or specular hematite; and soft, earthy, manganese oxides, mostly pyrolusite. The hard, cherty variety occurs in discrete layers while the secondary pyrolusite may have permeated into other rock types.

Besides these six basic varieties, there are other modifying features as described below, which occur indiscriminetly and in minor proportions.

Soft, clay like, sericitic seams representing altered metamorphic injections.

Siliceous Goethite, a brown, hard, porous material consisting of silica and goethite, entirely secondary in nature.

Introduced Hematite, a sponge like, red-brown material containing goethite, hematite, sometimes specular hematite and large octahedrons of martite, and with or without quartz. This material has penetrated through the iron formation during metamorphism and settled in fractures and other porous parts of the body, particularly towards the south side.

Secondary Iron Oxides, a red hematitic or yellow-brown limonitic impregnation of the rock which locally may be very strong.

GEOLOGY

The six basic varieties occur in 76 distinct bands across the trench. The exposure widths of these bands vary as follows. 25 are 3-12 feet wide, 27 are 12-27 feet, 14 are 27-52 feet, 6 are 52-67 feet and 4 are 120 feet wide. While 68% of the number of bands are less than 27 feet wide, 70% of the total footage across the trench consists of bands greater than 27 feet wide.

The major stratigraphic units observed in the stripped area are as follows, described in order of appearance from SE to NW.

2 + 00 to 3 +60. Hard, massive qtz-spec gran with spec rich areas around 2 + 00 and west of 3 + 25. The proportion of spec/gran. appears to decrease from 50-50 south of 2 + 70 to around 30-70 north of 3 + 00. The interval locally exhibits introduced hematite as well as limonitic and goethitic sections.

3 + 60 to 4 + 70. Hard, qtz-gran exhibiting two lean zones containing secondary manganese.

4 + 70 to 6 + 05. Hard, qtz-spec gran. hematite. Introduced hematite occurs locally with considerable red hematitic alteration in other places.

6 + 05 to 7 + 60. Several varieties occur in this interval, two lean bands, 10 and 25 feet wide, three occurances of qtz-gran, one of qtz-spec with the remaining being hard qtz-spec Gran. The section north of 7 + 00 is considerably surficially altered.

7 + 60 to 8 + 70. Moderately hard, qtz-spec hem, fine grained with evidence of granular hematite at outcrop 8-2.

8 + 70 to 9 + 45. Moderately hard, qtz-gran. a lot of red hematite is in the soil east of the base line.

9 + 45 to 9 + 80. Moderately hard, qtz-spec Gran with some introduced hematite, locally limonitic and hematitic stained.

9 + 80 to 10 + 10. Lean, ferruginous quartzite, weathered at least 5 feet deep near 10 + 00. The spec. bearing outcrop at 10-2 shows how rapidly the lean zones can change character.

10 + 10 to 10 + 95. Basically hard qtz-spec gran with a spec. rich zone near 10 + 15 and a lean zone near 10 + 70.

10 + 95 to 11 + 70. Hard qtz-gran hematite with introduced hematite and a lot of red and brown secondary oxides.

11 + 70 to 12 + 90. Basically qtz-spec Gran hematite with qtz-gran at 12-7, qtz spec at 12-1 and 2, and two ferruginous quartzite bands.

12 + 90 to 13 + 43. Hard qtz-spec Gran with a qtz spec horizon near 12 + 95.

13 + 43 to 13 + 68 Hard, qtz-gran.

13 + 68 to 13 + 95. Moderately hard, qtz-gran. Spec.

13 + 95 to 14 +20. Hard, blocky, fine grained, qtz-spec. hematite.

14 + 20 to 16 + 55. Hard, qtz-spec Gran, locally qtz-gran spec, with four bands of hard, cherty, manganiferous hematite. Parts of the band at 15 + 40 exhibits soft pyrolusite. The black pyrolusite is mixed with the sand throughout much of the area east of the baseline between outcrops 15-6 and 16-2. This area may be nearly a dip slope.

16 + 55 to 17 + 10. Moderately hard, qtz-spec, blocky, fine grained.

17 + 10 to 17 + 35. Hard qtz-spec Gran. blocky, fine grained.

17 + 35 to 18 + 00. Moderately hard, qtz-spec, medium grained.

18 + 00 to 18 + 27. Friable qtz-spec gran, massive.

18 + 27 to 19 + 48. Very friable, qtz-spec hematite. Three vertical seams 6 inches to 2 feet wide of sericitic clay.

19 + 48 to 19 + 73. Moderately hard, qtz-gran hematite.

19 + 73 to 21 + 50. Friable, qtz-spec hematite with leached silicate remains, coarse grained: silicates lacking at outcrops 20-9 and 21-1.

21 + 50 to 21 + 65. Moderately hard, qtz-spec hematite.

21 + 65 to 21 + 90. Qtz-spec-gran and gran hematite plus a 6 foot seam of soft pyrolusite.

21 + 90 to 22 + 25. Friable qtz-spec, evidence of leached silicates at outcrops 22-1 and 22-4.

22 + 25 to 22 + 80. Hard, cherty, manganiferous hematite, fine grained qtz-gran hematite at outcrop 22-10.

22 + 80 to 23 + 40. Moderately hard to friable qtz-spec hematite, evidence of silicates at 23-4.

23 + 40 to 24 + 20. Moderately hard qtz-spec silicate with mostly qtz-spec granular north of 24 + 00.

Certain relationships are clear from the geologic evidence. The qtz-spec hematite bands are characteristically the more friable and coarse grained while the qtz-spec granular bands are harder, finer grained, and often somewhat oxidized, exhibit the presence of limonite and goethite. The indications are that the manganiferous and lean horizons tend to be associated with the granular hematite variety.

Of the entire trench length of 2225 feet, the qtz-spec silicate variety accounts for 10%, the qtz-spec 24%, qtz-spec granular 40%, qtz-granular 14%, ferruginous quartzite 6%, and manganiferous bands 6%. About 50% of the rock is considered to be hard, 32% moderately hard and 18% friable.

Interpretation of the trench geology with respect to the various submembers recognized in 1959 has involved some modification of the criterea used to define the submembers.

Submember "A" is recognized in the internal 9 + 80 to 12 + 90, where it consists of qtz-spec granular hematite iron formation containing several lean, ferruginous quartzite horizons.

Submember "B" is seen in the intervals 8 + 70 to 9 + 80 and 12 + 90 to 17 + 35 where it is predominately qtz-gran with some qtz-spec gran bands and contains manganiferous horizons.

Submember "C" is seen in the intervals 7 + 60 to 8 + 70 and 17 + 35 to 19 + 48. The iron formation is predominately coarse grained qtz-spec. hematite--both moderately hard and friable.

Submember "D" has been interpreted in the intervals 4 + 70 to 7 + 60 and 19 + 48 to 21 + 50. The southern interval is a mixture of qtz spec gran, spec Gran., Gran and lean bands, while the northern interval is qtz-gran, and qtz-spec sil. Silicates had previously been seen only in "F".

Submember "E" has been assigned the intervals 2 + 70 to 4 + 70 and 21 + 50 to 22 + 80. In both of these intervals there is a predominance of qtz-gran hematite and includes manganiferous horizons.

Submember "F" has been interpreted to lie south of 2 + 70 and north of 22 + 80 where the percentage of specular hematite increases and silicates are seen. The presence of granular hematite near 24 + 00 may mark the approach to "G". Most of "F" lies to the south of 2 + 00 and the 2' + 70 mark as a "E'F" boundary is subject to change.

All things considered, the trench geology fits the previous interpretation for the area quite well. The somewhat different character of the submembers between the type locality of 1959 (the bench) and the trench is probably due to lack of complete exposure on the bench as well as changes along strike.

Little was learned about the structure of the deposit during the examination because most of the mapped outcrops are broken rock. Those attitudes which were observed are consistent with the general southeasterly dipping foliation. The general trend of the bands at 60-90 degrees from the trench is also consistent with the structural interpretation.

Three vertical joints were found, two at 010 and one at 285 degrees. These would suggest a normal conjugate joint set throughout the deposit. Such joints are common in the orebodies of the area where most joint planes are only a foot or two apart.

SAMPLES

Forty to sixty pound composite samples were collected from each 100 foot interval by the collection of broken rock from each specimen locality and other outcrops not mapped.

The results of the samples for each 100 foot interval are given below.

Interval	Sample Number	Sol. Iron	Phos.	Mang.	Insol.	Sul.
200-300	2231	34.34	.009	0.04	49.74	.004
300-400	2232	36.71	.014	0.14	46.35	.004
400-500	2233	35.51	.005	0.63	47.44	.002
500-600	2234	30.54	.006	0.08	55.35	.004
600-700	2235	39.51	.007	0.06	42.52	.003
700-800	2236	33.18	.006	0.08	51.68	.003
800-900	2237	33.68	.003	0.08	49.48	.003
900-1000	2238	39.84	.005	0.08	42.18	.004
1 000-1100	2239	44.56	.010	0.29	35.12	.012
1 100-1200	2240	35.11	.006	0.08	48.85	.009
1 200-1300	2241	38.31	.006	0.12	44.40	.006
1 300-1400	2242	37.35	.006	0.04	45.40	.003
1 400-1500	2243	33.18	.009	0.98	49.83	.003
* 1 500-1600	2245	43.20	.021	0.25	36.16	.002
			* Excluding manganiferous bands.			
1 600-1700	2246	29.82	.006	1.70	53.53	.002
1 700-1800	2247	36.07	.003	0.06	47.99	.002
1 800-1900	2248	33.50	.006	0.04	51.57	.002
1 900-2000	2249	30.30	.003	0.10	55.74	.001
2 000-2100	2250	31.26	.004	0.04	54.40	.003
2 100-2200	2251	35.51	.009	0.06	48.15	.001
2 200-2425	2252	38.55	.022	0.88	42.02	.001
/ Average		35.71	0.0079	0.32	47.52	0.0035

A Grab sample of only the manganiferous material in the 1500 to 1600 foot interval returned 27.01% iron, .039% phos, 17.36% manganese, 31.09% insoluble and .002% sulphur.

The averages for each submember are as follows, using the intervals shown as the best approximation for each submember.

"A"	39.32% Fe	10 to 13
"B"	36.68	9 to 10, 13 to 17
"C"	33.35	7 to 9, 17 to 20
"D"	34.20	5 to 7, 20 to 22
"E"	36.92	3 to 5, 22 to 23
"F"	36.44	2 to 3, 23 to 2245

The unusual feature of these results is that where submember "A" had been expected to be lower than others, it is actually the highest. A plot of iron analysis versus estimated specular granular hematite ratios was made to investigate this oddity. While the points are scattered, there definitely is a trend which shows that the grade increases from around 30-31% iron for virtually all qtz-specular hematite rock to around 40 plus per cent iron for virtually all qtz-granular hematite rock.

The 35.71% iron average cuts the curve at a composition of approximately 55% specular and 45% granular hematite, which is only 5% different than the ratio estimated visually.

A generalization concerning the bulk iron mineral composition can be readily made from the results of the geologic and sampling investigation. About 50-55% of the iron values in the rock (ignoring limonite etc) occurs as coarse grained (35-48 mesh plus) specular hematite in friable to moderately hard qtz-spec and qtz-spec gran horizons assaying in the 30-34% iron range, and about 45-50% occurs as finer grained (48-80 mesh plus) granular hematite in moderately hard to hard qtz-spec gran and qtz-gran horizons assaying in the 36-low 40% iron range.

PILOT PLANT FEED MINING AREAS

The number, location and size of pits to be opened for pilot plant feed in the stripped area depends upon several factors, such as the amount of ore desired, whether specific mineralogic varieties or ore representative of the whole deposit is desired, the physical features of the pit locality and also the metallurgical characteristics of the ore.

The selection of mining sites based upon a consideration of the visible mineralogic varities is presented below. The final selection of sites should properly be deferred until the results of table test metallurgical investigations on the composite samples and specimens is conducted.

The six basic varities are available from 17 general areas in the stripped area with their relative proportions as follows.

Ferrugnious quartzite--2 ratio	6%
manganiferous material-3	6%

qtz-granular hematite--2 14%
qtz-spec-gran hematite--5 40%
qtz-specular hematite--4 24%
qtz-spec hematite, sil--1 10%

It would require eleven pits to sample all varieties and have the pits well distributed. By excluding the Ferrugnious quartzite and manganiferous horizons, there would be nine pits covering 4 varieties, eight pits also excluding the very friable qtz-spec material.

In that pits initially started for mineralogic variety control would probably expand into the tonnage sample, they should be located for this purpose also. It is suggested that the desired information and purposes of the pits could be met by six pits located as follows:

Number	Location	Variety	Grade	Ratio
1	near 20 + 50	qtz-spec sil	31.26	11%
2	near 18 + 00	qtz-spec sil	34.79	15%
3	near 14 + 70	qtz-spec gran	33.18	15%
4	near 10 + 70	qtz-spec gran & gran	44.56	29%
5	near 8 + 00	qtz-spec	33.43	15%
6	near 6 + 00	qtz-spec gran	35.02	15%
		approximately	36%	100%

These sites are recommended on the basis of varieties and distribution. The material south of 3 + 60 appears to be virtually identical with that expected from pit six. The ratios shown for each pit should be approximately maintained in order to preserve the observed ratios between varieties observed in the bulk of the deposit.

A sample truly representative of the trench would naturally have to extend from one end of the trench to the other, but there seems little question that representativeness of the stripped area on the basis of the mineralogic varieties can be obtained from individual pits.

CONCLUSIONS

The stripping of the overburden from the trench area permitted a comprehensive geologic examination of over 2200 feet across the strike of the Julian Lake Deposit. The study has confirmed the previously made interpretations concerning the character of the deposit. Four of the six varities of iron formation found account for about 90% of the trench area and virtually 100% of the recoverable iron values, which mineralogicaly are about equally distributed between specular hematite and granular hematite.

The qtz-specular hematite rock is generally friable, coarse grained and in the 30-34% iron range while the qtz granular hematite rock is generally hard, fine grained and around 40% iron. Roughly 40% of the trench exhibits qtz-spec gran hematite rock which is a mixture of the two basic types.

Each variety can easily be identified in the trench area and pits initially started for mineralogic variety testing purposes can easily be expanded to obtain pilot plant feed representative of the bulk of the trench, and most probably of the deposit itself.

CANADIAN JAVELIN LTD.

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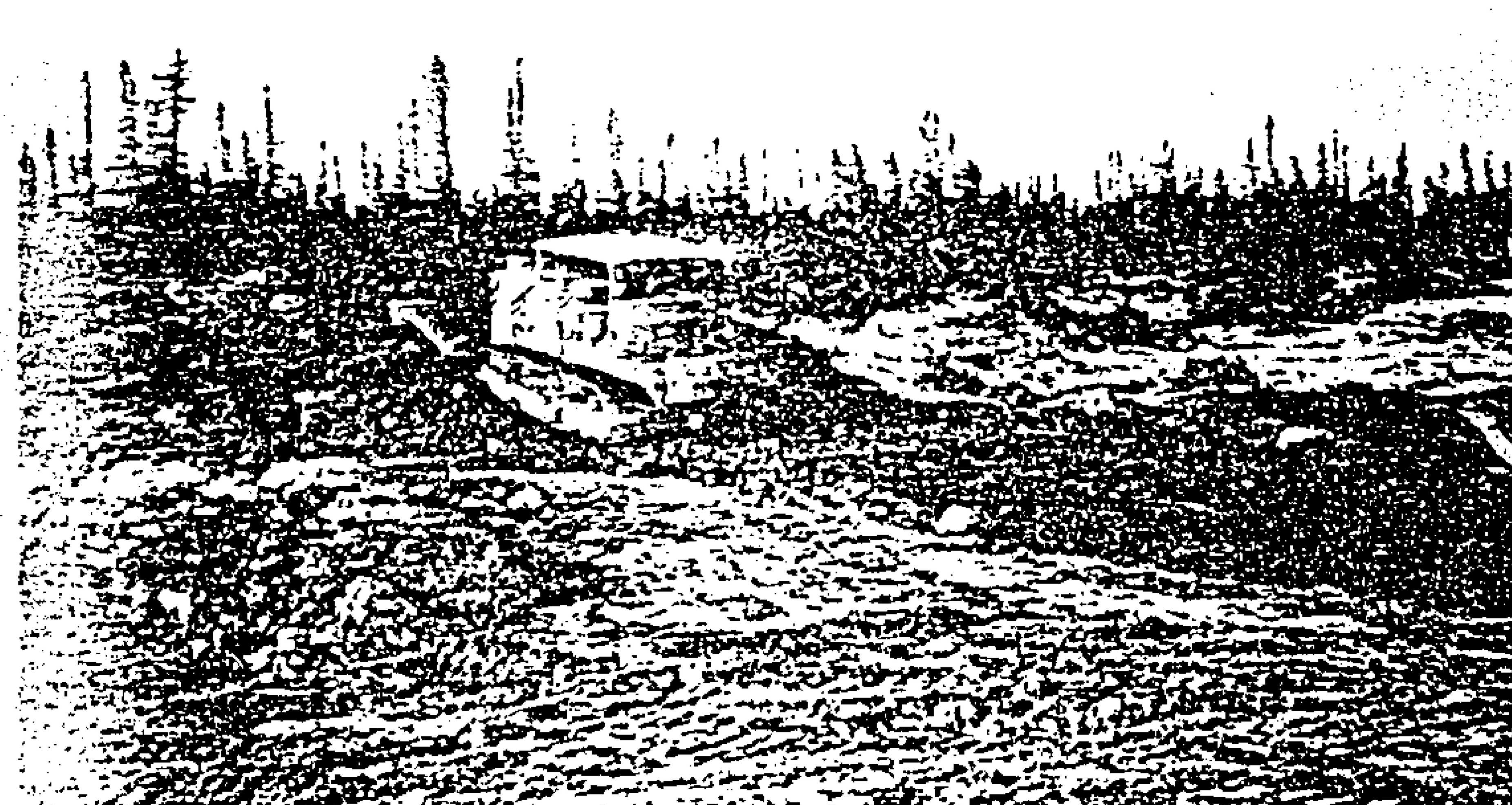
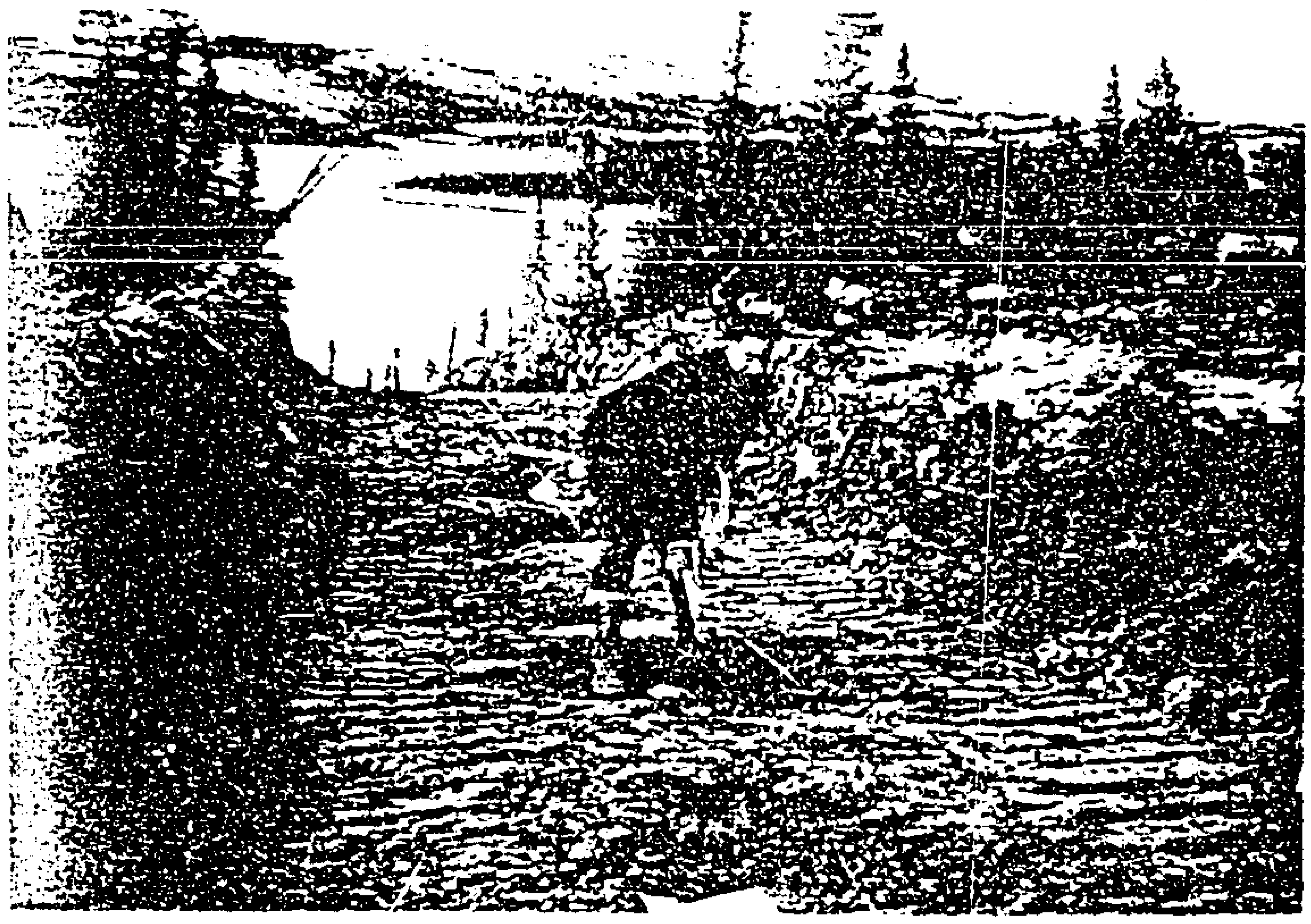
P. La Rush, "

Overburden depth
test trench
13" station 22+00
Nov.10,1962
D.Knowles

Stripping
overburden
Nov.12,1962





Exploration trench
Station 23
Preparation for
mapping
James Crocker
Nov.13,1962

Geologic mapping
and sampling
Face near 30+50
Nov.12,1962
R.Knowles
J.Crocker

Julian Deposit
Stripped Area
Nov.25,1962
Taken from hill
east of 21+00
looking southeast