

NOV. 72

GRAVEL AND BEDROCK BORROW PROSPECTS

PHYSIOGRAPHIC DIVISION XVI

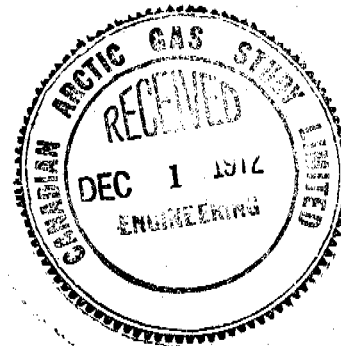
(Elliot Creek to Richards Island and
Travaillant Lake to the NWT/Yukon Border)



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CONSULTING CIVIL ENGINEERS AND ENGINEERING GEOLOGISTS

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PHYSIOGRAPHIC DIVISION XVI

(Elliot Creek to Richards Island and

Travaillant Lake to the NWT/Yukon Border)

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GRAVEL AND BEDROCK BORROW PROSPECTS
ALONG ROUTE ALIGNMENT IN PHYSIOGRAPHIC DIVISION XVI
(Elliot Creek to Richards Island and Travaillant Lake
to the NWT/Yukon Border)

PURPOSE

Purpose of this study was to provide an inventory of sand and gravel borrow deposits and bedrock-quarry prospects covered by the terrain-typed alignment mosaics. In addition to preparing an inventory of materials occurring within the limits of the alignment sheets, we have added bedrock and gravel prospects which are known to us and that are located near but lie outside the alignment sheets. Estimates of total quantities are given for all prospects on the alignment sheets and for many of those falling outside the alignment sheets. The thickness of unfrozen materials in most instances will be several inches to a few feet only.

ESTIMATE OF VOLUME OF MATERIALS

An estimate has been made of anticipated volumes of granular and bedrock materials in the prospects mapped from aerial photographs. These estimates are contained in Appendices I and II. In general, the depth of sand and gravel in outwash plains is assumed to be 2 to 3 yards, with kames and eskers somewhat deeper. However, the volume of annual recoverable construction material will be much less than the total volume in the deposit; and at this point it is questionable if any but the largest and highest eskers and kames and gravelly floodplains and south-facing escarpments will be economically developable.

Bedrock sources south of Inuvik and north and south of Fort Good Hope contain unlimited quantities of quarry rock; but the cost of blasting and recovery will be expensive.

It is expected that only a small fraction of the total material mapped as sand and gravel will be available in any year and available then only after stripping and allowing the granular materials to thaw. Annual recoverable volumes may be less than one-third of the total volume estimates except for bedrock sources and those granular deposits along braided rivers (Stony Creek, Rat River), south-facing gravel-bearing escarpments on the west and south side of the Caribou Hills, and the large esker at Fort Good Hope.

We examined gravel recovery operations on Richards Island, at Inuvik, and again west of Arctic Red River as well as quarry-rock operations at Fort McPherson and Campbell Lake. These observations tend to support the notion that large and high gravel ridges, south- and west-facing exposed gravel-bearing escarpments, and the beds of large braided rivers are the chief commercial gravel sources -- especially where large quantities of construction materials are required within a very short period of time.

BETTER GRAVEL PROSPECTS

(See Appendices I and II)

The better gravel prospects occur at Swimming Point (56), in kames north of the Caribou Hills (54 and 101), in south-facing exposed gravel bluffs along meltwater channels crossing the Caribou Hills (103), in the Caribou Hills escarpment on the East Channel of the Mackenzie River (106 and 107), in gravel terraces along rivers leading to the Eskimo Lakes (94), in the gravel deposit at the mouth of Boot Creek south of Inuvik (127), gravel deposits at Sunny Lake (47) and Sandy Lake (45, 46), outwash gravel between Travaillant Lake and the Mackenzie River crossing to the west (74), the mouth of Stony Creek (82A), outwash at the mouth of the Rat River (77), along the upper reaches of Stony Creek (131), and the large esker-kame complex at Fort Good Hope (10, 11, 12).

BETTER BEDROCK PROSPECTS

The better bedrock sources occur between Inuvik Airport and Campbell Lake (125), in the escarpment southeast of Little Chicago (129), along the Mackenzie River at the proposed pipeline crossing (130), sandstone west of Fort McPherson (75), and on the west side of the Peel River south of Fort McPherson (83), the foothill rock ridges along Stony Creek (76), the west side of the Ramparts Plateau north of Fort Good Hope (19), exposed limestone south of Fort Good Hope (9), rock outcrops north of Chick Lake (8), and rock in the Franklin Range extending to Elliot Creek (8).

SUMMARY AND CONCLUSIONS

The accompanying key maps showing prospect locations should be correlated with Appendices I and II showing terrain types and corresponding volumes of material, also along with the xeroxed photos included in this report, showing the individual prospects. These show areas that may be visited and tested in more detail, if necessary.

Development of small sources of sand and gravel in the continuous permafrost region remains a genuine concern. It is possible that only about 25 or 30 selected gravel deposits and bedrock sources may yield economically developable pits in Physiographic Division XVI. In some cases this means relatively long dead-haul distances to the pipeline route and then long haul distances along the route.

The total quantities of materials in prospects are given in Appendix I and Appendix II. In Appendix II, small clusters of esker segments and/or kame hillocks lying outside the alignment sheets probably contain between 50,000 and 100,000 cubic yards whereas the outwash and active floodplain deposits probably range up to one million cubic yards

APPENDIX I

SUMMARY OF BEDROCK AND GRANULAR MATERIALS ALONG PROPOSED
PIPELINE ROUTE BETWEEN ELLIOT CREEK AND RICHARDS ISLAND AND
BETWEEN TRAVAILLANT LAKE AND THE YUKON BORDER -- PHYSIOGRAPHIC DIVISION XVI

<u>Prospect number</u>	<u>Mosaic strip number</u>	<u>Airphoto number</u>	<u>Terrain unit</u>	<u>Estimated volume (yd³)</u>
1	1	NW 72772-129	Kame (K)	89,000
2	1	NW 72772-129	Talus (TS)	400,000
3	1	NW 72772-129	Bedrock (BR)	Unlimited
4	3	NW 72772-135	Outwash (O)	1.1 million
5	3	NW 72772-135	Talus (TS)	1 3/4 million
6	3	NW 72772-136	Outwash (O)	3.9 million
7A-7D	5	NW 69772-6,8,10,12	Talus (TS)	Unlimited
8	6	NW 73772-5	Bedrock (BR)	Unlimited
9	8	NW 68772-105	Bedrock (BR)	Unlimited
10	8	NW 68772-103	Esker-Kame (E-K)	80 million
11	8	NW 68772-103	Outwash (O)	5½ million
12	8	NW 68772-101	Outwash (O)	6½ million
13	8	NW 68772-97	Esker (E)	158,000
14	9	NW 72772-113	Esker (E)	80,000
15	9	NW 72772-113	Kame (K)	100,000
16	9	NW 72772-109	High terrace (HT)	1.8 million
17	9	NW 72772-107	Kame (K)	44,000
18	9	NW 72772-105	Kame (K)	60,000
19	9	NW 72772-101	Bedrock (BR)	Unlimited
20	10	NW 73772-25	Esker (E)	100,000
21	10	NW 73772-29	Esker (E)	20,000
22	12	NW 72772-95	Kame (K)	4,000
23	13	NW 71772-118	Kame (K)	106,000
24	13	NW 71772-121	Bedrock (BR)	Unlimited
25	13	NW 71772-121	Kame (K)	185,000
26	13	NW 71772-123	Esker (E)	215,000
27	13	NW 71772-125	Esker (E)	0.9 million
28	13	NW 71772-125	Deltaic sands (DLc)	4.4 million
29	14	NW 71772-99	Deltaic sands (DLc)	7 million
30	14	NW 71772-97	Deltaic sands (DLc)	2.6 million
31	14	NW 71772-99	Deltaic sands (DLc)	4 million
32	14	NW 71772-95	Kame (K)	50,000
33	14	NW 71772-97	Deltaic sands (DLc)	5 million
34	14	NW 71772-95	Esker (E)	25,000
35	14	NW 71772-93	Kame (K)	1.95 million
36	15	NW 71772-89	Kame (K)	509,000
37	15	NW 71772-87	Bedrock (BR)	Unlimited
38	15	NW 71772-85	Kame terrace (KT)	200,000
39	17	NW 72772-5	Bedrock (BR)	Unlimited
40	18	NW 72772-39	Kame (K)	44,000
41	19	NW 71772-71	Kame (K)	44,000
42	24	NW 71772-57	Kame (K)	310,000
43	25	NW 70772-185	Kame (K)	65,000
44	26	NW 70772-191	Outwash (O)	11 million
45	26	NW 70772-193	Outwash (O)	6 million
46	26	NW 70772-194	Outwash (O)	23.8 million
47A-C	28	NW 70772-199,201, 203	Outwash (O)	58 million

<u>Prospect number</u>	<u>Mosaic strip number</u>	<u>Airphoto number</u>	<u>Terrain unit</u>	<u>Estimated volume (yd³)</u>
48	30	NW 67772-171	Kame(K)	141,000
			Esker(E)	
49	31	NW 67772-149	Esker (E)	15,000
50	32	NW 67772-59	Esker (E)	44,000
51	32	NW 67772-61	Kame (K)	13,000
52	33	NW 67772-69	Bedrock (BR)?	?
53	33	NW 67772-77	Outwash (O)	140,000
54	37	NW 68772-27	Kame (K)	39,000
55	38	NW 68772-37	Deltaic sands (DLc)	1.1 million
56	38	NW 68772-39	High terrace(HT)	3 million
57	38	NW 68772-39	Outwash (O)	408,000
58	39	NW 70772-177	Kame (K)	244,000
59	39	NW 70772-177	Outwash (O)	16.8 million
60	39	NW 70772-175	Kame (K)	106,000
61	40	NW 70772-169	Kame (K)	40,000
62	41	NW 70772-165	Kame (K)	44,000
63	41	NW 70772-165	Outwash (O)	208,000
64	41	NW 70772-167	Esker (E)	13,000
65	41	NW 70772-163	Kame (K)	8,600
66	41	NW 70772-163	Kame terrace (KT)	230,000
67	42	NW 70772-161	Kame (K)	52,000
68	42	NW 70772-157	Esker (E)	13,000
69	42	NW 70772-157	Esker (E)	533,000
70	42	NW 70772-157	Outwash (O)	1.1 million
71	42	NW 70772-157	Kame (K)	130,000
72	42	NW 70772-155	Kame (K)	18,000
73	43	NW 70772-109	Kame (K)	141,000
74	43	NW 70772-109	Outwash (O)	4.1 million
75	49	NW 69772-157	Bedrock (BR)	Unlimited
76	49	NW 69772-145	Bedrock (BR)	Unlimited

APPENDIX II

SUMMARY OF SOME OF THE LARGER BEDROCK AND GRANULAR DEPOSITS OFF-LINE BUT IN GENERAL VICINITY OF PIPELINE ROUTE

<u>Prospect number</u>	<u>Terrain unit</u>	<u>Estimated volume (yd³)</u>	<u>Remarks</u>
77	Outwash-delta (O-DL) Terraces (HT) and Eskers (E)		North side of river at mouth of Rat River
78	Floodplain (FFP)		On floodplain of Rat River
79	Terrace (HT)		East side Rat River
80	Terrace (HT)		Small terraces along Rat River
81	Kames (K)		
82	Kames (K)		Check for small pits in kame knolls
82-A	Floodplain (FFP)		Very coarse gravel on both active and fossil floodplain
83	Bedrock (BR)	Unlimited	Bedrock debris. Shiltee Rock
84	Esker (E)		East Ft McPherson
85	Esker (E)		West Frog Creek
86	Kame (K)		Large hill at 400 ft elevation
87	Kames (K)		
88	Kames (K)		
89	Esker (E)		
90	Esker (E)		
91	Kames (K)		
92	Esker (E)		Small esker
93	Esker (E)		
94	Terraces (HT)	15 million	
95	Outwash (O)	12 million	
96	Outwash (O)	Unlimited	Sands only
97	Terraces (HT)	8 million	Sandy
98	Tertiary gravel (T)	10 million	Sandy
99	Tertiary gravel (T)	2 million	Sandy
100	Esker-Kame (E-K)	2 million	
101	Kames (K)	2 million	
102	Outwash (O)	8 million	
103	Fan-delta	80 million	
104	Kames (K)	5 million	Sandy
105	Outwash (O)	5 million	Sandy
106	Fan-delta	1½ billion	Tertiary age
107	Fan-delta	120,000,000	Tertiary age
108	Outwash-delta (OW-DL)	25,000,000	
109	Terrace (HT)	10 million	Sands
110	Terrace (HT)	7 million	Sands
111	Terrace (HT)	1½ million	Sandy
112	Terrace (HT)	1½ million	
113	Terraces (HT)	15 million	
114	Esker-Kame (E-K)	2 million	Sandy
115	Esker (E)	6 million	

<u>Prospect number</u>	<u>Terrain unit</u>	<u>Estimated volume (yd³)</u>	<u>Remarks</u>
116	Esker-Kame (E-K)	6 million	Sandy
117	Kame moraine	5 million	
118	Kame (K)	2 million	
119	Esker (E)	2½ million	
120	Kame-esker (K-E)	2 million	Sandy
121	Terrace (HT)	180,000	
122	Esker (E)		Sandy
123	Bedrock (BR)		Doubtful prospect
124	Bedrock or esker (E) or (BR)		
125	Bedrock (BR)		Limestone quarry (D.P.W.)
126	Esker (E)		
127	Delta (DL)		Open pit
128	Alluvial fan (AFD)		Poor prospect
129	Bedrock (BR)	Unlimited	Southeast of Little Chicago
130	Bedrock (BR)	Unlimited	Mackenzie River banks
131	Floodplain (FFP)		Floodplain of upper reaches of Stony Creek
132	Bedrock (BR)	Unlimited	Just west Arctic Red River Village
133	Bedrock (BR)	Unlimited	Just east of Fort McPherson

REFERENCES FOR PROPOSED STUDY IN VICINITY OF
PROPOSED PIPELINE RIGHT-OF-WAY IN
PHYSIOGRAPHIC DIVISION XVI
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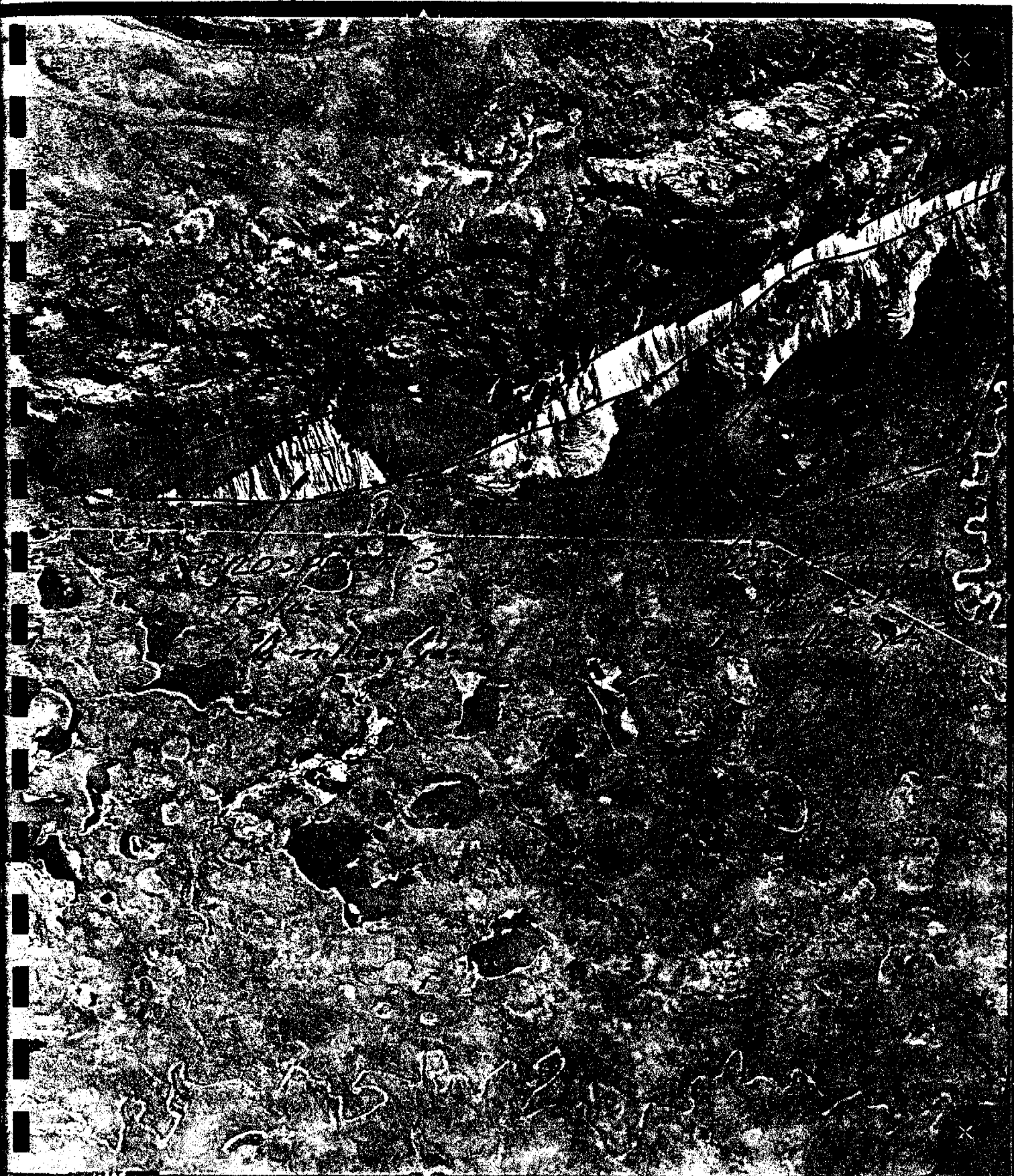
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PROSPECT 2

PROSPECT

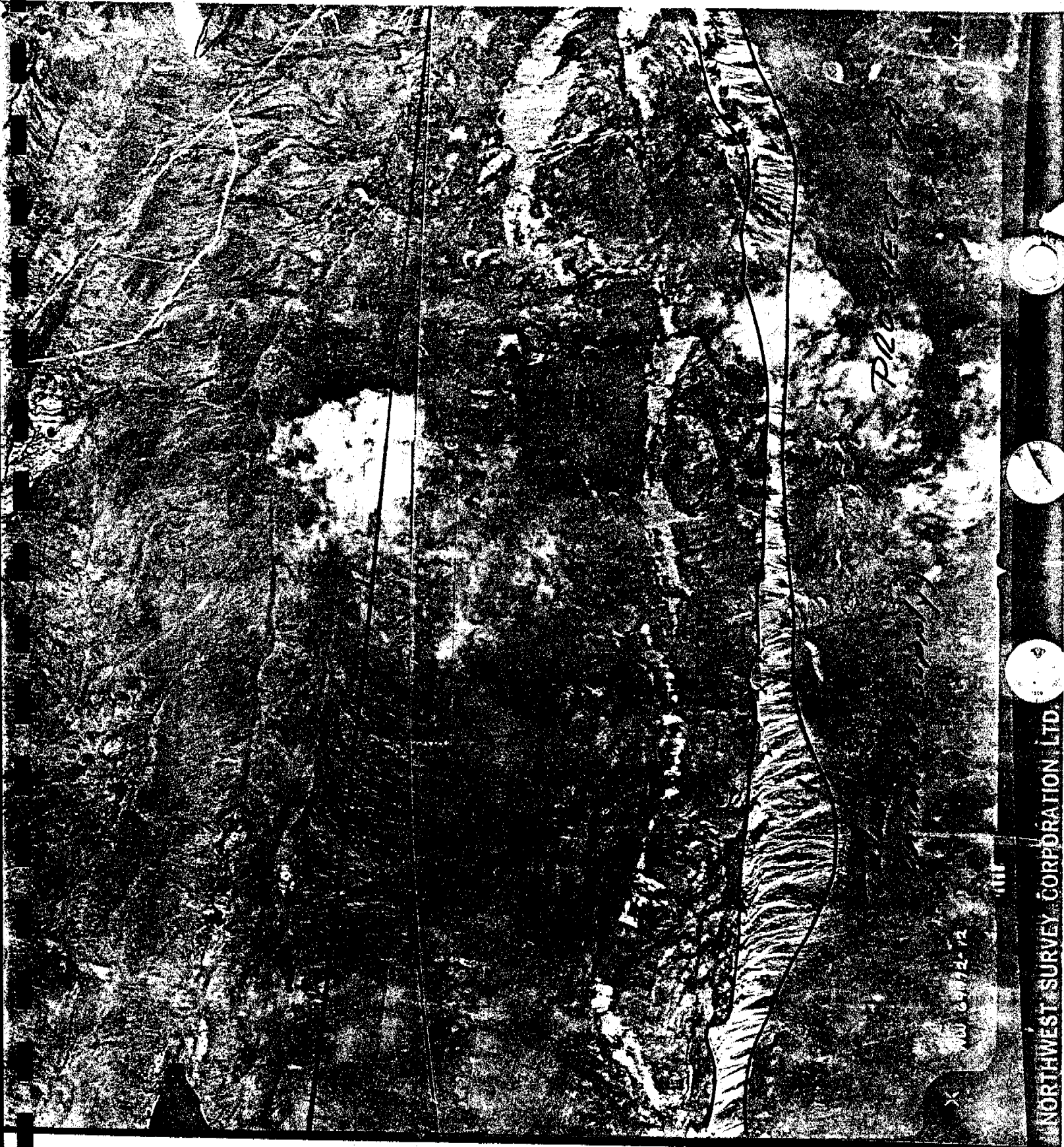
Bedrock

Quartzite



SURVEY CORPORATION LTD.





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NORTHWEST SURVEY CORPORATION LTD.



X NW 69772-10

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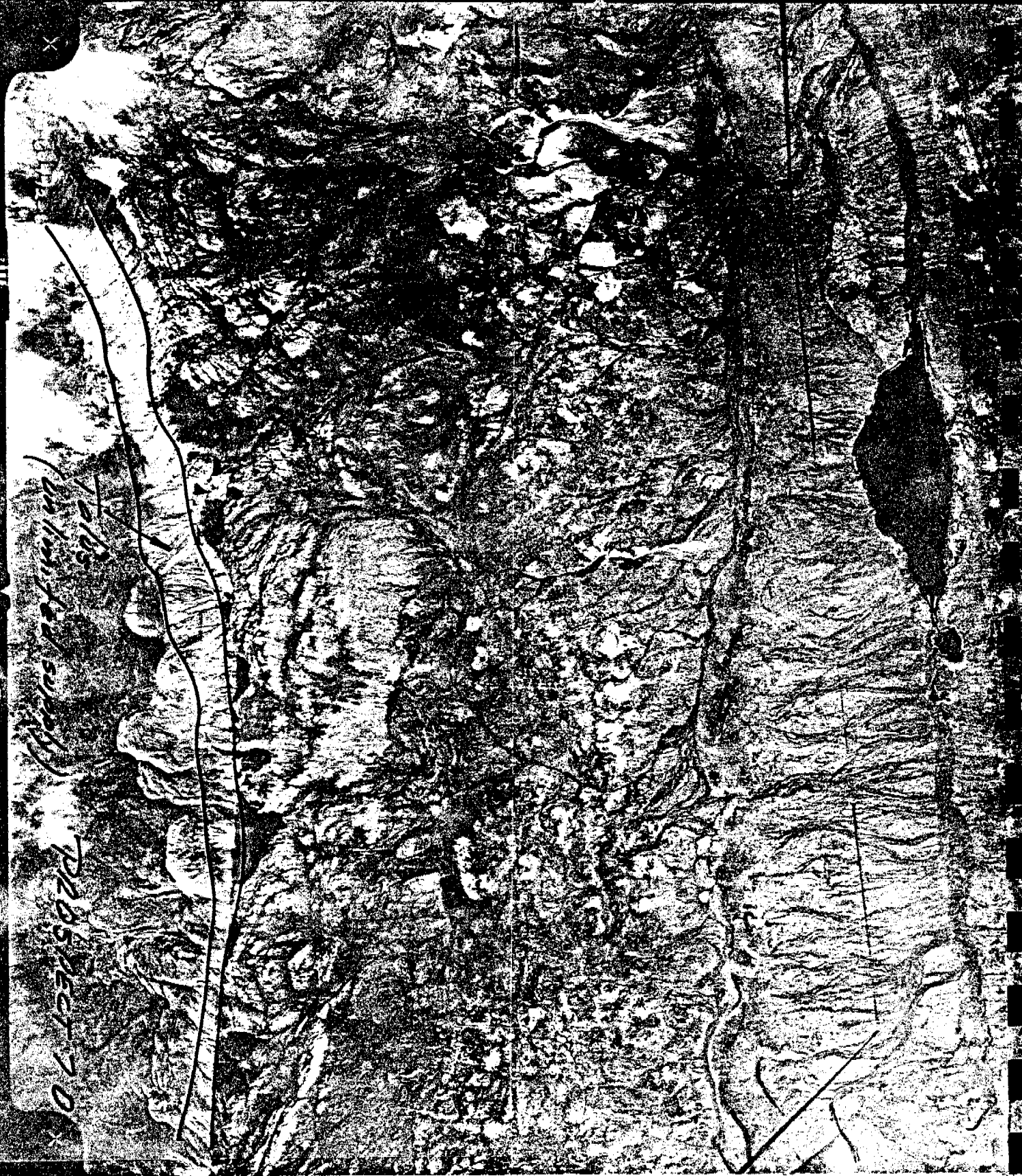


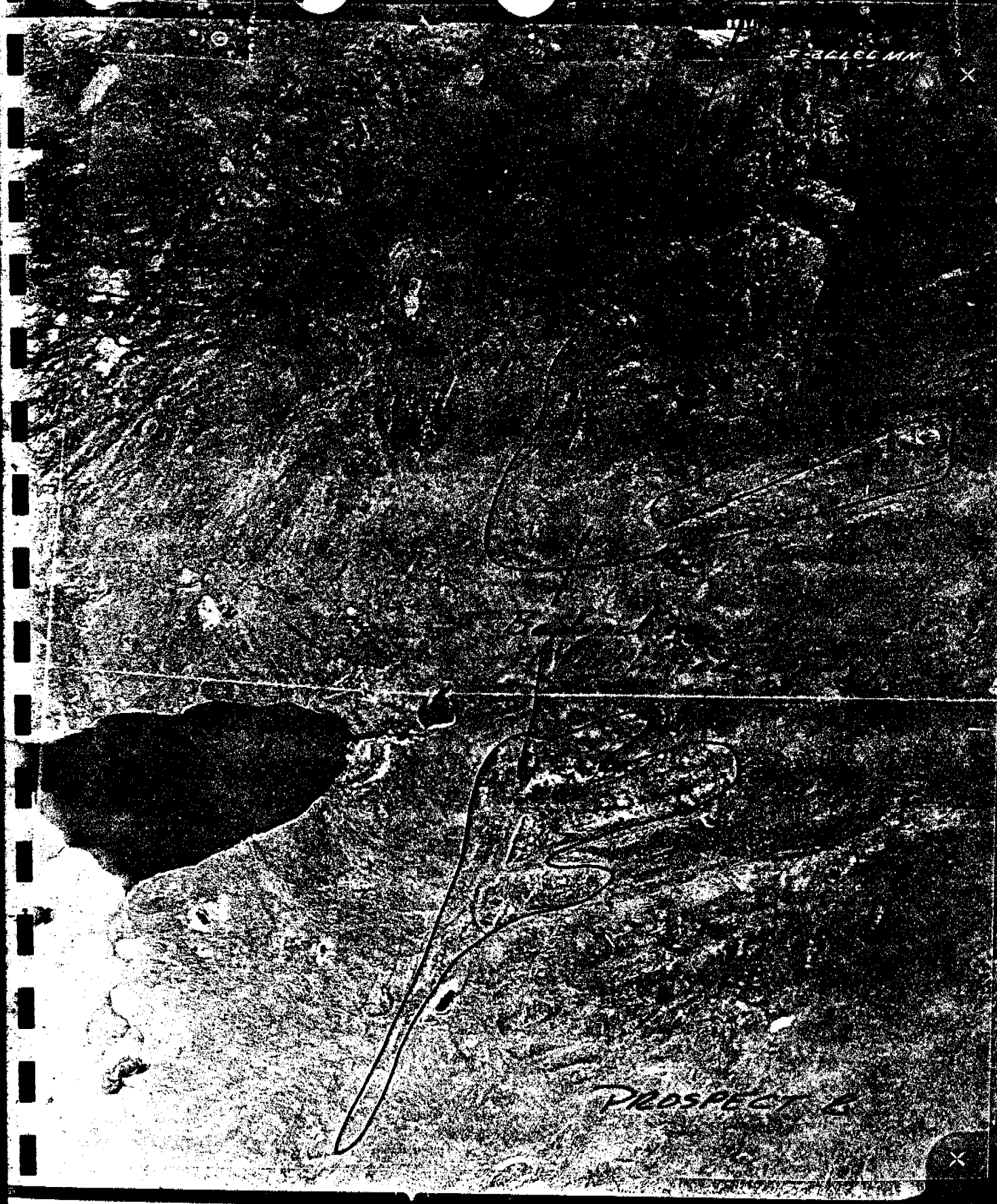
PROSPECT 10

X 10 69772-8

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PROSPECT 6



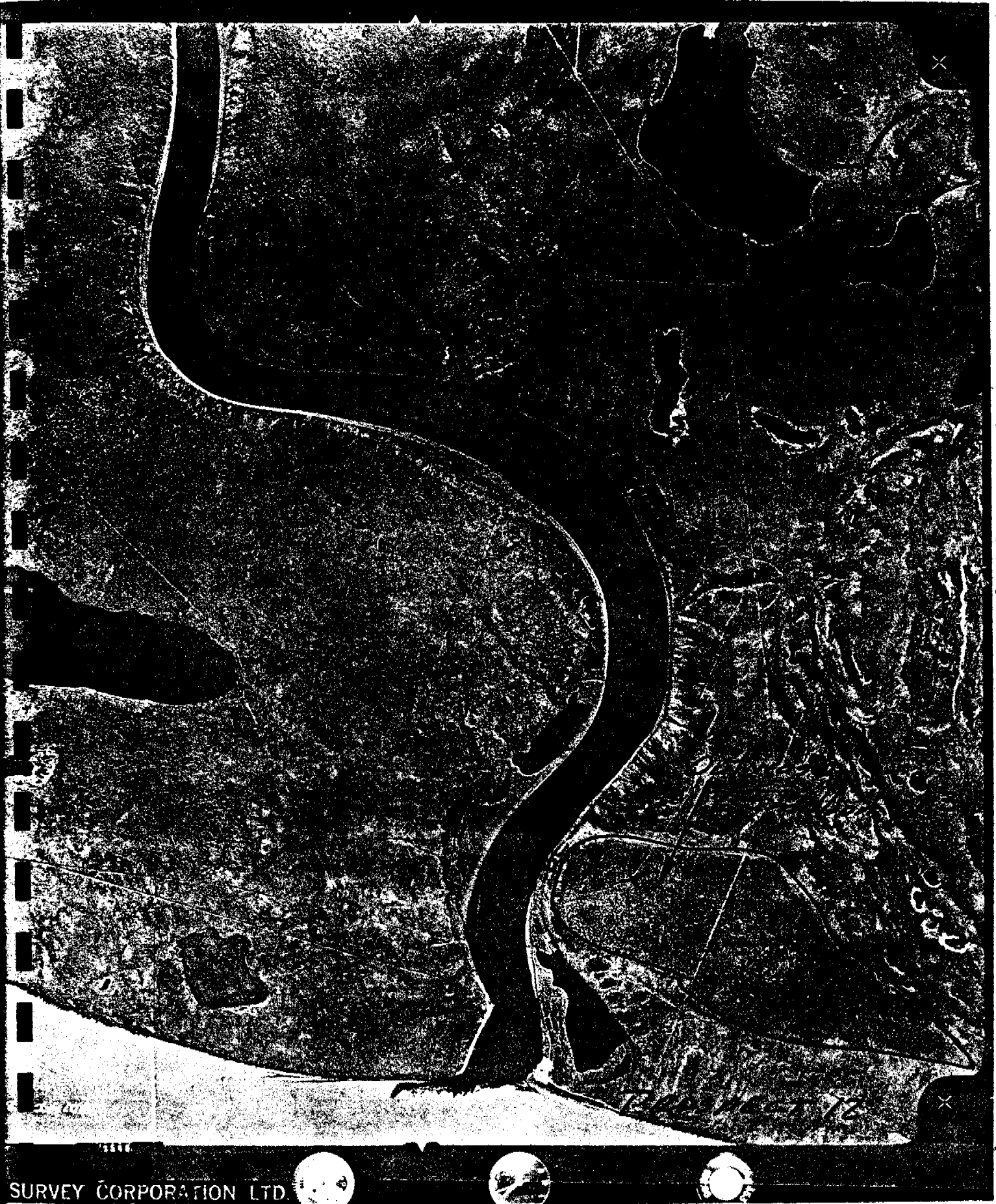
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12

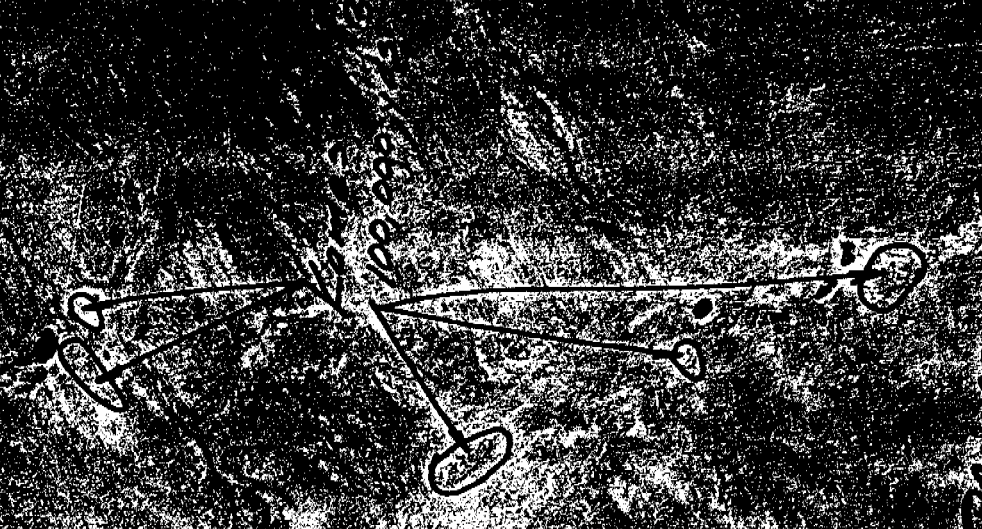
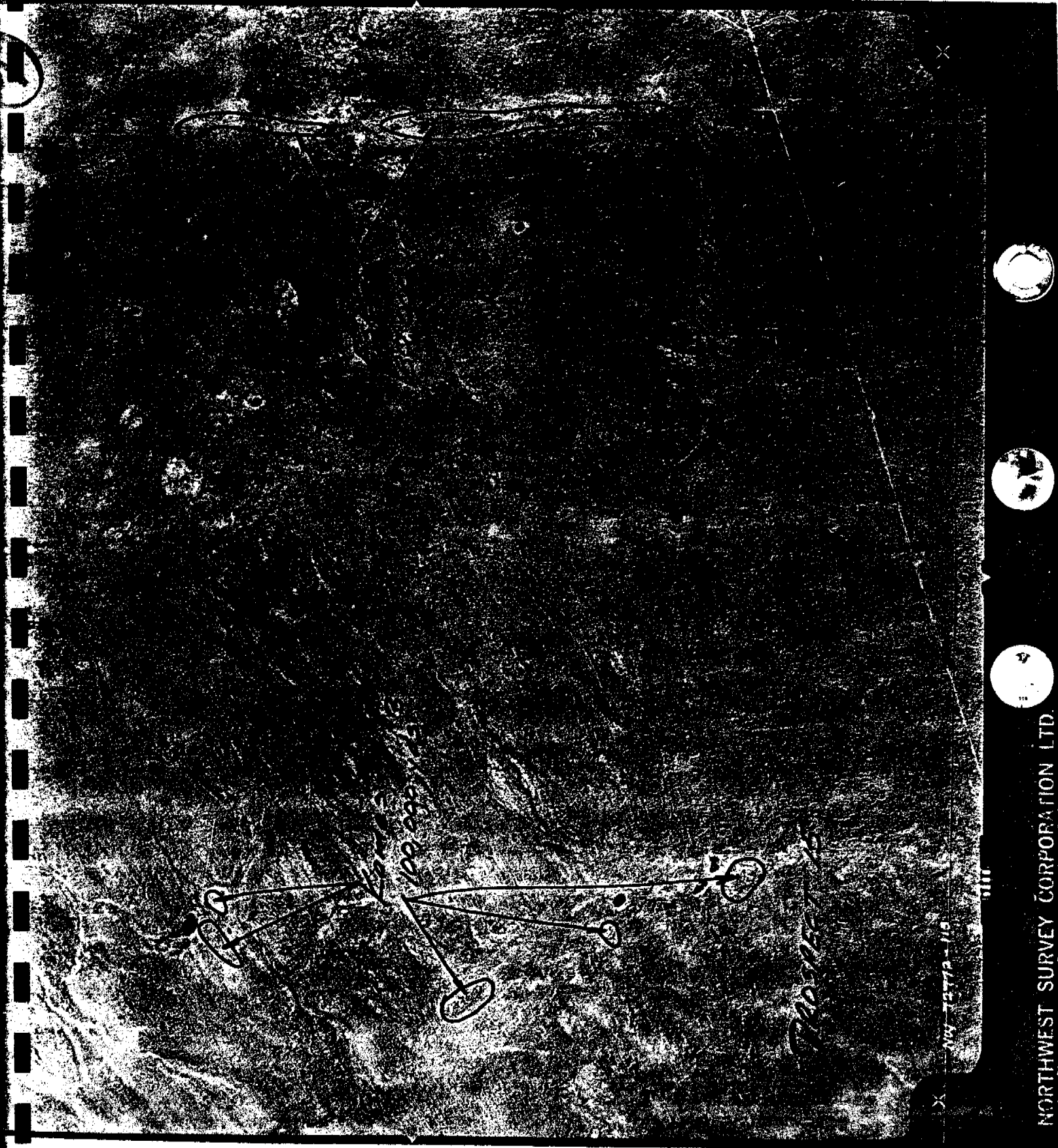
SURVEY CORPORATION LTD.

18

Esker

158,000 yds

PROSPECT 13



NORTHWEST SURVEY CORPORATION LTD.



REY CORPORATION LTD



107
1080
LEY CORPORATION LTD

Comer
A. 60,000 yd

PROSPECT 1B



Project 19

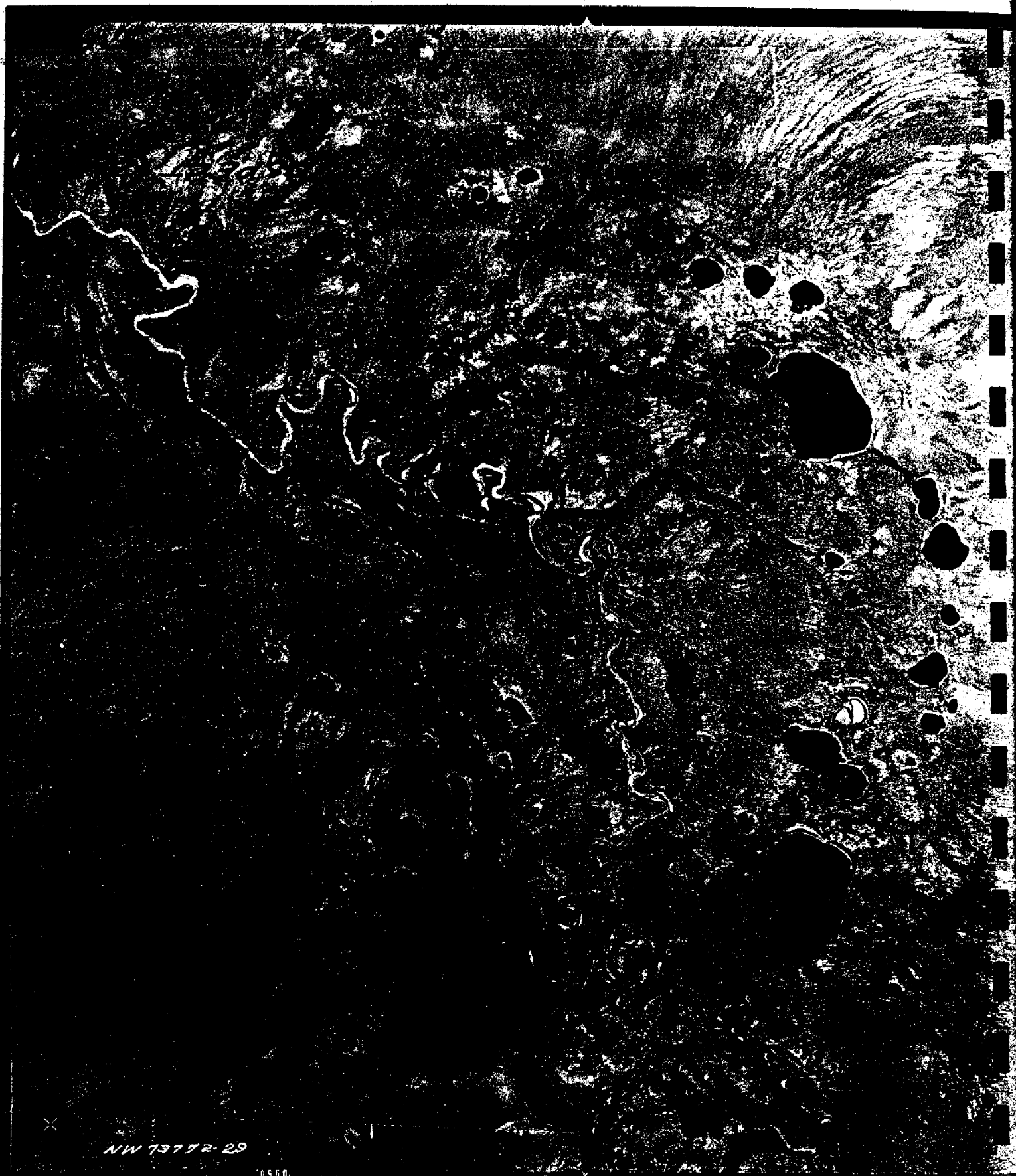
GRVEY CORPORATION LTD.

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52-279-25



PROSPECT 20



NW 73772-29

0560

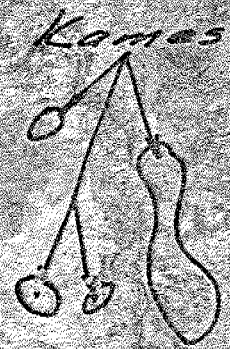
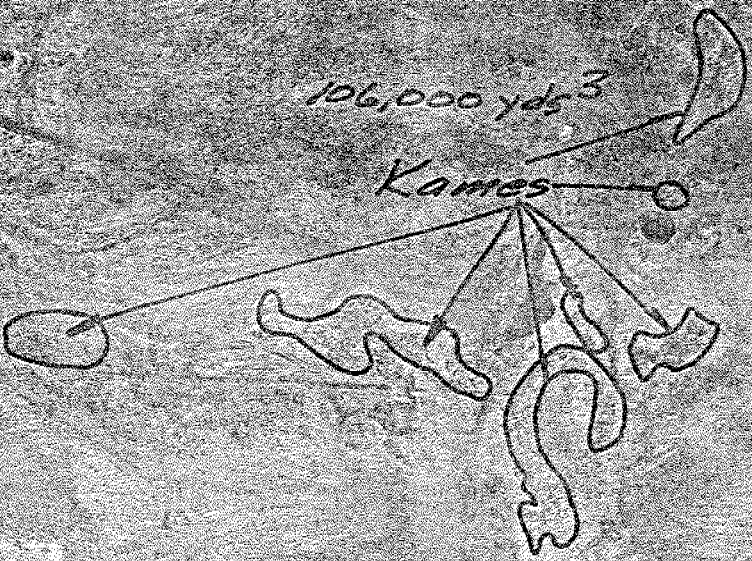
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Q Kame
4000 yds³

PROSPECT 22

NO. 7177-18
LINE 16 NW (117-126) 12,900 ASL
8-1-12



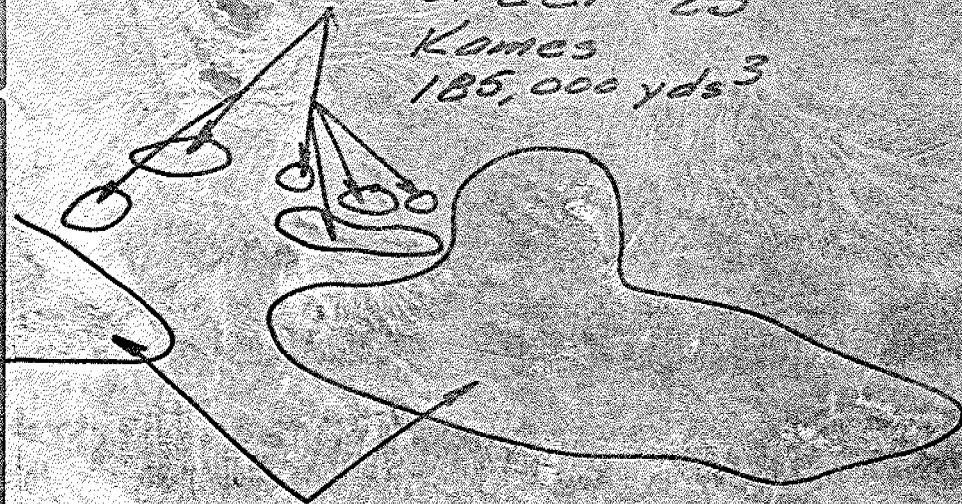
PROSPECT 23

23

PROSPECT 25

Kames

185,000 yds³



PROSPECT 24

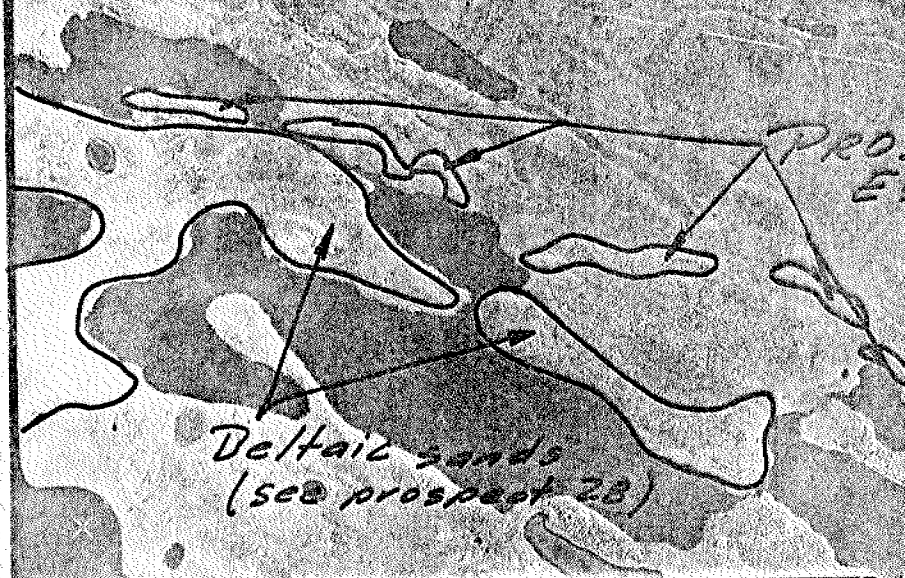
Bedrock unlimited supply

Bedrock
(see prospect 24)



PROSPECT 26
Eskers
215,000 yds. 3

Deltail sands
(see prospect 28)



NO. 71772-123

PROSPECT 27
Esker complex
0.9 million yds³

PROSPECT 28
Deltaic sands
4.4 million yds³
(see 71772-123 for
remainder of area)

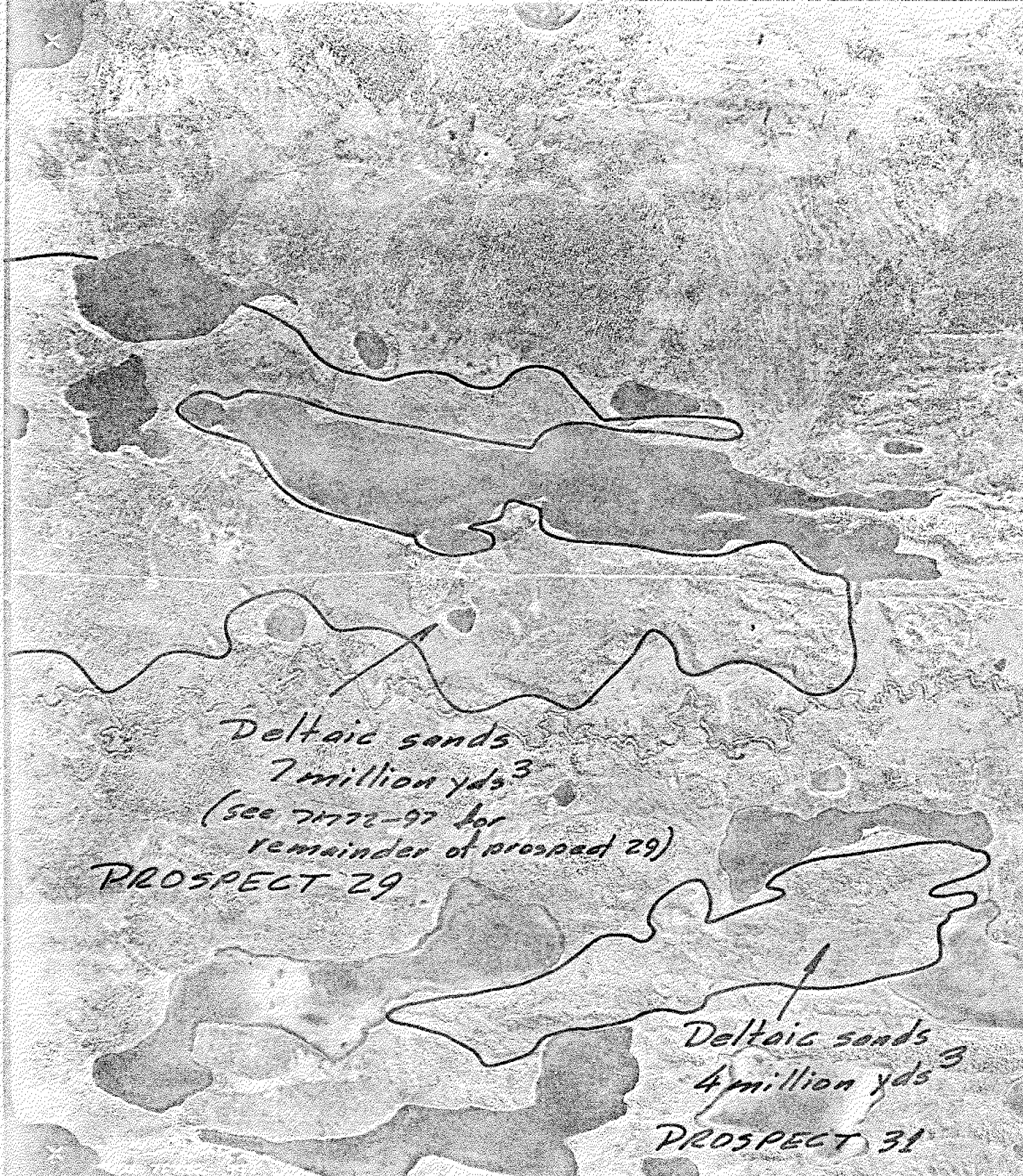
14

PROSPECT 33
Deltaic sands
5 million yds³

PROSPECT 29
See 71772-99

Deltaic sands
2.6 million yds³

PROSPECT 30



Deltaic sands
7 million yds³
(see 71772-97 for
remainder of prospect 29)
PROSPECT 29

Deltaic sands
4 million yds³
PROSPECT 31

14
Kames

50,000 yds³

Esker

25,000 yds³

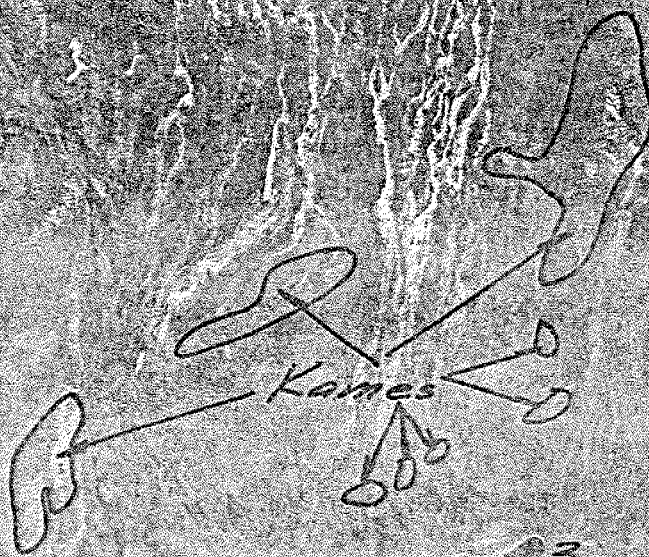
PROSPECT 32

PROSPECT 34



1.95 million yds

PROSPECT 35



509,000 yds 3

PROSPECT 36

7772-29

Bedrock scarp
unlimited supply

PROSPECT 37

157



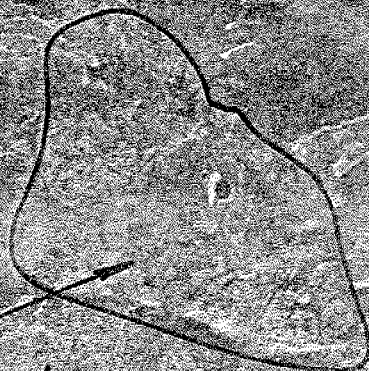
Kame terrace

200,000 yds³

PROSPECT 38

100-11112-5

X



Bedrock

unlimited supply

PROSPECT 39

0 Komes

0

44,000 yds

PROSPECT 40

NW 70712-39

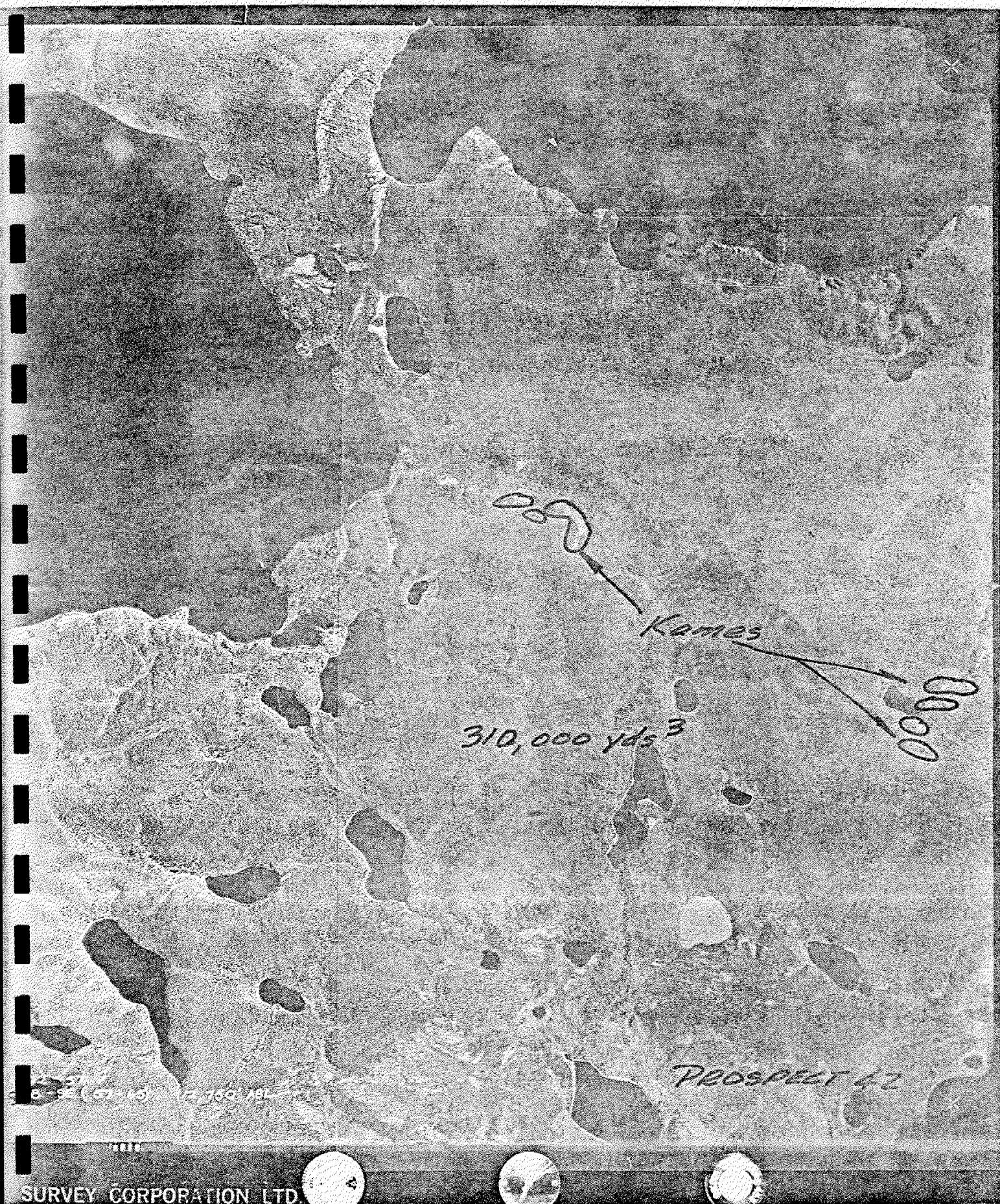
Kame

44,000 yds³

PROSPECT 41

No. 11442-11

NORTHWEST SURVEY CORPORATION LTD.



12-57-63
B-35 (53-63)

75,760,180

PROSPECT 42

581-2072-185

25

Kames

65,000 yds³

0 00 0

PROSPECT 43



outwash

outwash

PROSPECT 44

11 million yds

outwash

x

Outwash
6 million yds³

PROSPECT 45

MM 20772-134

Outwash
23.8 million yds³

PROSPECT 46

OW

OW

Outwash
5B million yds³

OW

PROSPECT 47A

OW

OW

OW

OW

PROSPECT 47B

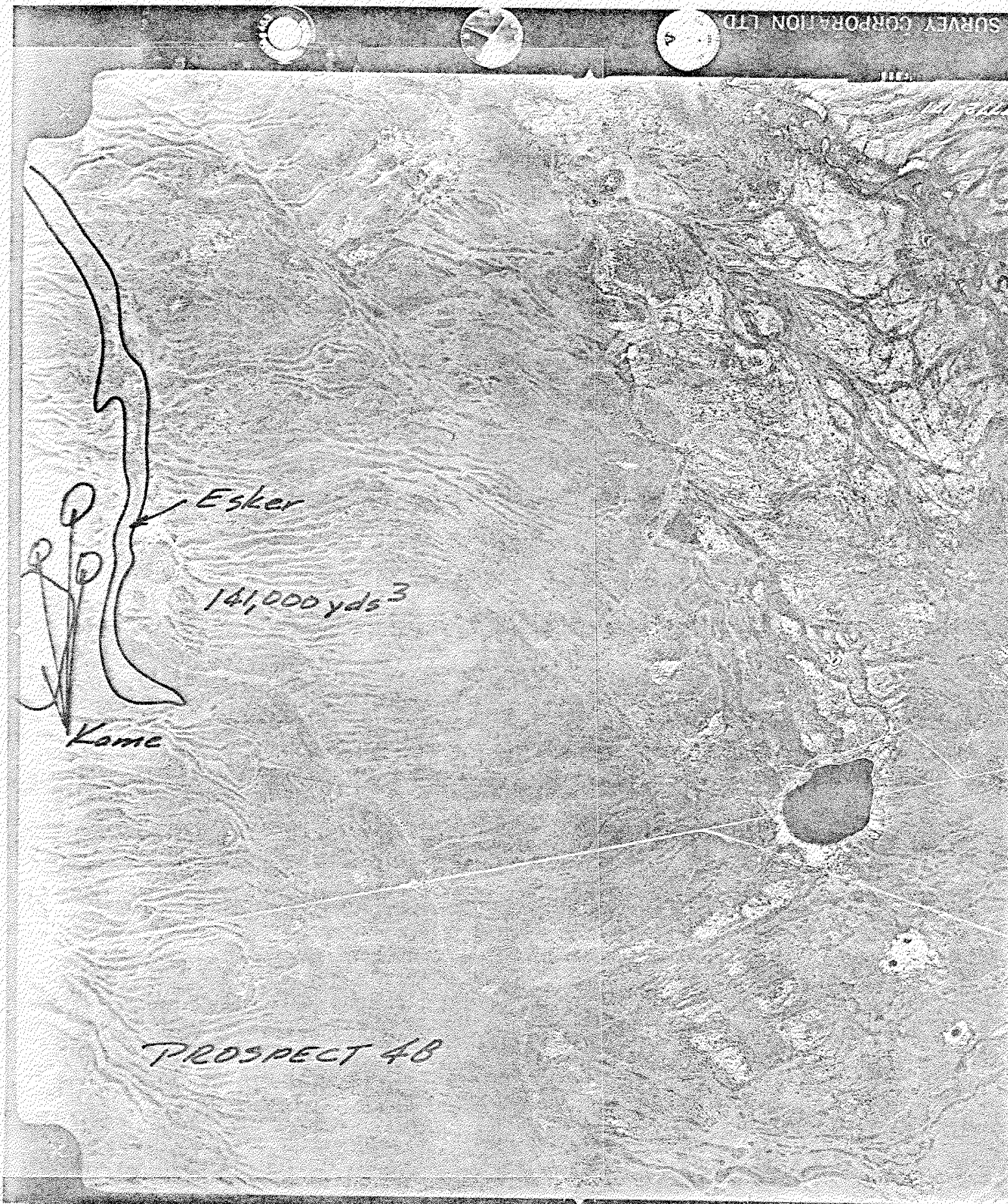
OW

OW

OW

OW

PROSPECT 47 C



Esker
15,000 yds³

PROSPECT 49

NW 5772-145

NW 6772-59

Esker

44,000 yds³

PROSPECT 50

NW 67112-51



Kame

13,000 yds³

PROSPECT 51

AN 5772-69

Shale outcrops?
Quantity?

PROSPECT 52

80,000 yds 3

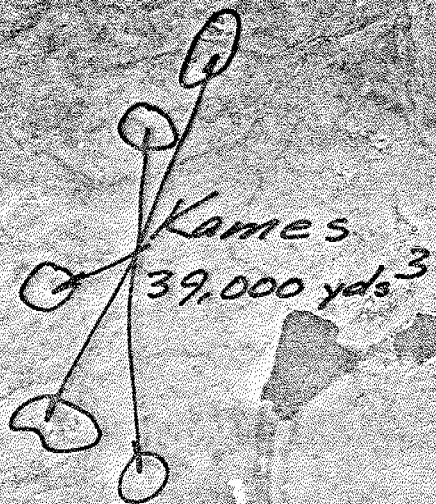
Outwash

160,000 yds

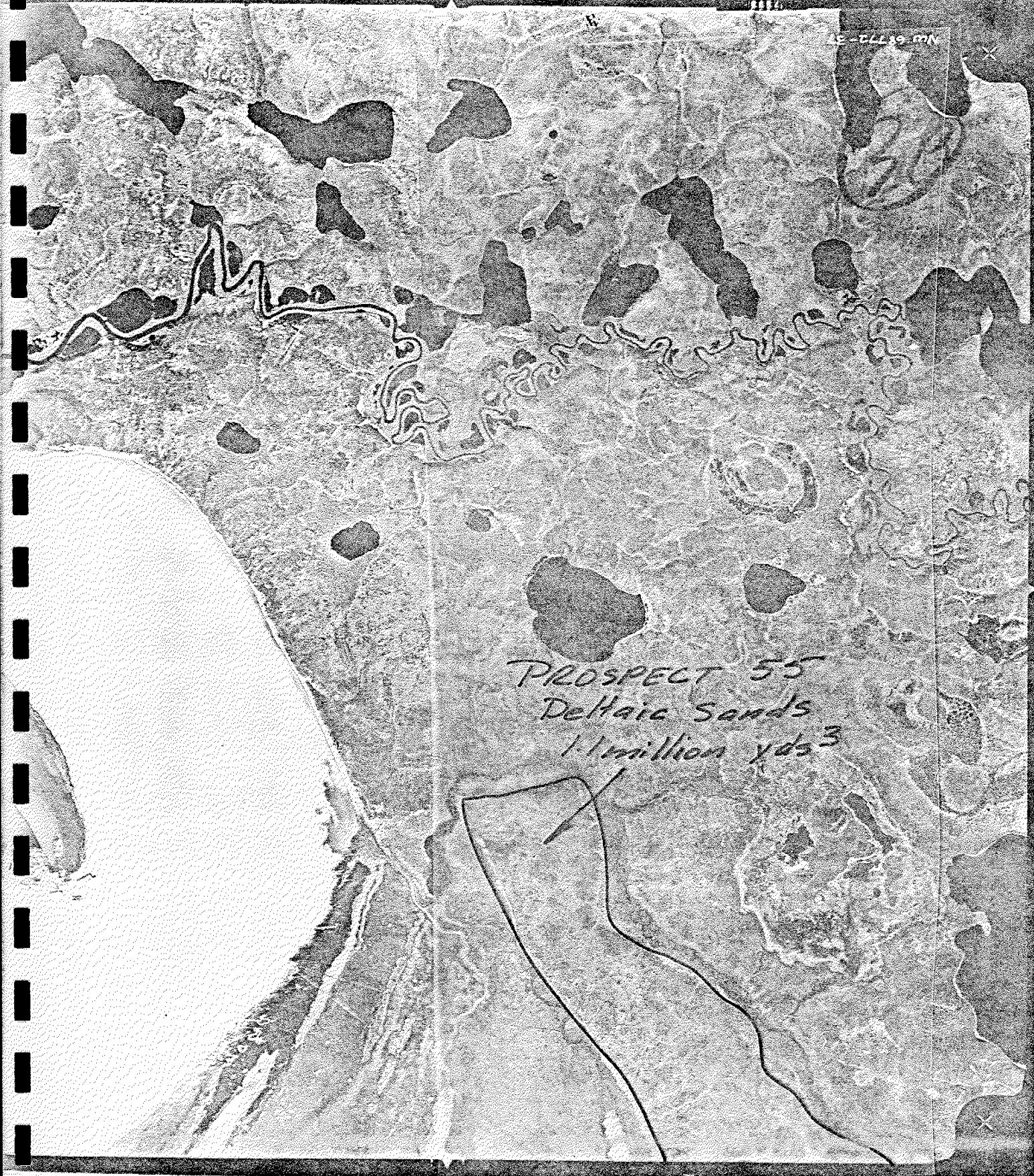
PROSPECT 53

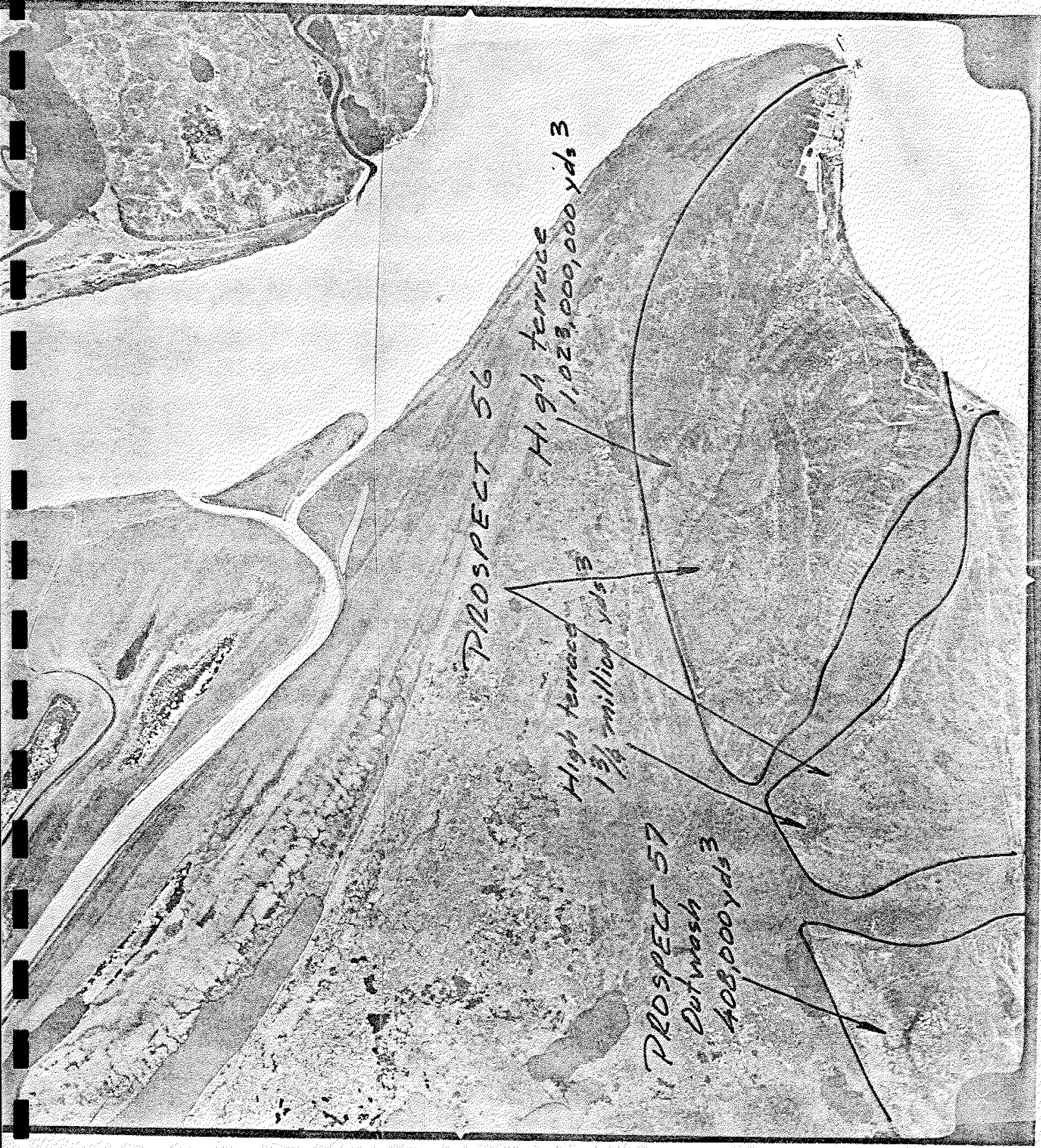
1111

NO 68770-27



PROSPECT 54





PROSPECT 56

High terrace
1,023,000,000 yds 3

High terrace
1 3/4 million yds 3

PROSPECT 57

Outwash
400,000 yds 3

39

PROSPECT 59

Outwash

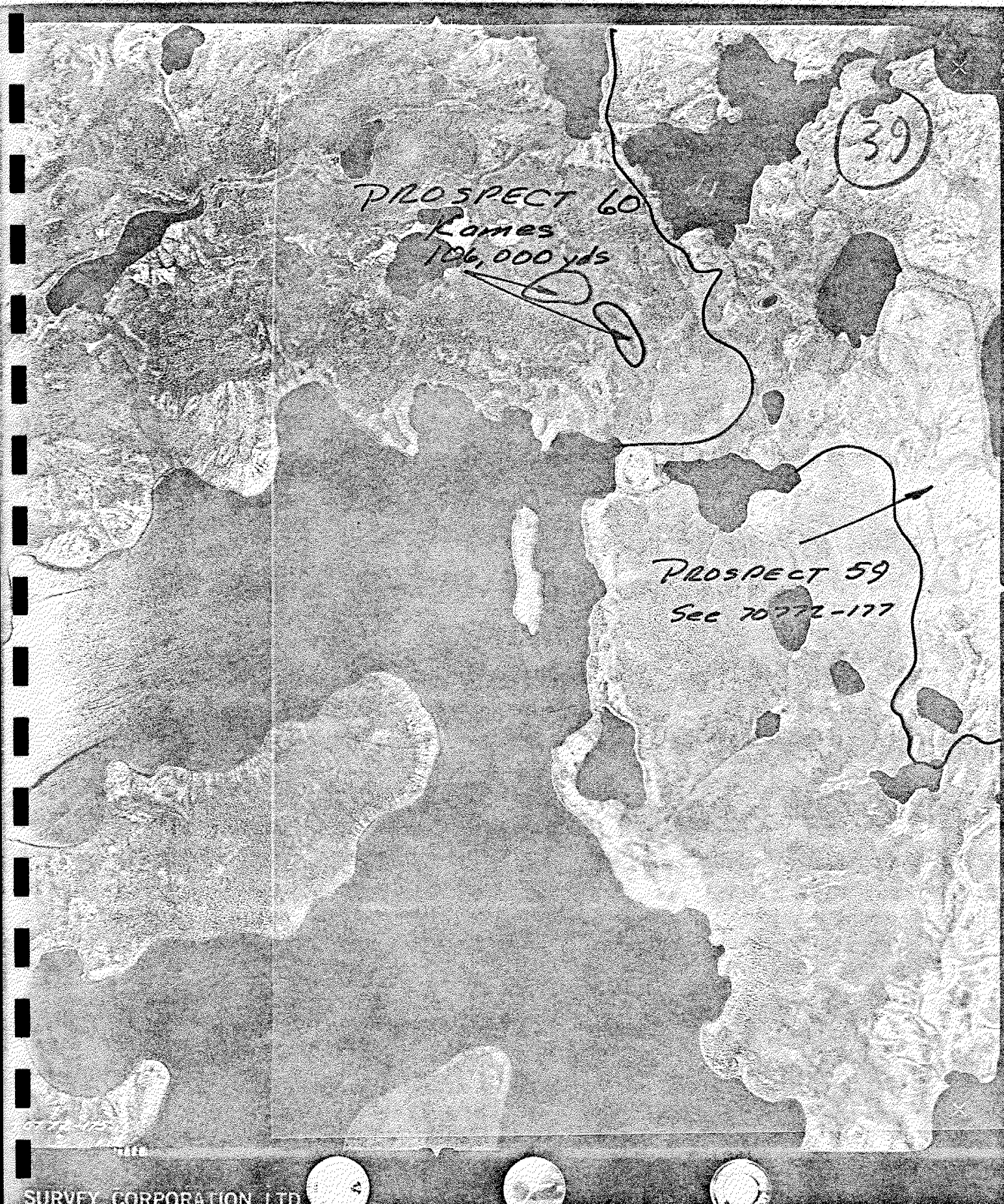
(see 70772-175 for remainder of area)

16.8 million yds³

PROSPECT 58

Kames

244,000 yds³

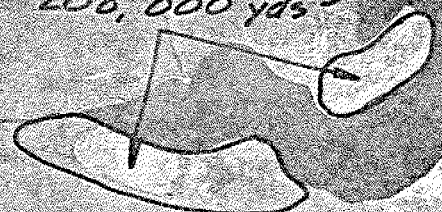


Kame
40,000 yds³

PROSPECT 61

41

PROSPECT 63
Outwash
208,000 yds³



PROSPECT 62
Kame
44,000 yds³



Esker 3
13,000 yds

PROSPECT 64

1000000

41

PROSPECT 65
Kame
8600 yds³

PROSPECT 66
Kame terrace
230,000 yds³

42

Kame
52,000 yds³

PROSPECT 67

(4L)

PROSPECT 68
Eske
13,000 yds³

PROSPECT 69
Eske
533,000 yds³

PROSPECT 70
Outwash
1.1 million yds³

PROSPECT 71
Kame
130,000 yds³

PT

42



Kame
18,000 yds

PROSPECT 72

PROSPECT 74
Outwash
4.1 million yds³

PROSPECT 73
Kames
141,000 yds³

70172-109

49

Bedrock
Fault scarp
(Unlimited
supply)

PROSPECT 75

(49)

Bedrock
(Unlimited supply)

PROSPECT 76

94724 142
37-146 (45-47) 13 1905 ASL
72

1100

