KOTZEBUE

AGGREGATE EXPLORATION

DREDGE SITES

FINAL REPORT

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Prepared for

City of Kotzebue
P.O. Box 46
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September 1984

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FIGURES AND EXHIBITS

ACKNOWLEDGMENTS

I wish to thank the City of Kotzebue staff for their assistance on this project. Particularly of help were City Managers Gene Moore and Bruce Kovarik, Planning Director Carol Delahante and Public Works Director John Ward.

Willie Goodwin, Jr. of KIC was the coordinator for the entire project and was of great help throughout the three phases of the work and in arranging for the participation of all of the agencies and organizations that will benefit from the new source of aggregate for development of projects in Kotzebue.

Assistance in professional and technical fields during this project were of great help in field work and preparation of the final report. I wish to thank Dredge Resources - Mike Weston, LGL- Dr. Peter Craig, AK DOT/PF - Henry Springer and Steve Lee and the Drafting Company for their help.

The field crews for the Summer Phase were Len Nelson - Geologist, Richard Simeonoff - Geologic Assistant and Louis Garfield - Deckhand. The winter crew was Nick Nicholas - Driller, John Goodwin Sr. and Warren Coffin were Assistant Drillers.

FINAL REPORT

KOTZEBUE MATERIALS EXPLORATION

PHASE I - III

1983 - 1984

1.0 INTRODUCTION

1.1 GENERAL Continued development in Kotzebue has created a need for expansion of public services with need for aggregate of varying quality. Need for fill material by the public on private property has also increased significantly.

This continued development has created a drain on the very limited availability of suitable embankment material. This shortage of aggregate prompted investigation of other sources available by the Kotzebue City Administration.

GEODE Exploration was commissioned to conduct a thorough aggregate resource study in 1983, the results of which are included in this report.

This study was coordinated and administered by the City of Kotzebue and the study was funded and sponsored by the City of Kotzebue, Kiniktagruk Inupiat Corporation, NANA Regional Corporation, Inc. and the State of Alaska, Department of Transportation and Public Facilities.

Inquiries and preliminary reconnaissance indicated potential in the areas of Cape Blossom, Sadie Creek, Kotzebue Lagoon and upland deposits at Little Noatak-Shiliak. Cape Blossom, Sadie Creek and the Kotzebue Lagoon were wash sampled during the summer of 1984 under Phase II of the exploratory effort. Cape Blossom and Sadie Creek were eliminated as potential dredge sites. Phase III of the program was conducted during March through June 1984. This included drilling, sampling and testing of Kotzebue Lagoon for dredging aggregate and selected areas in the Little Noatak-Shiliak as an upland aggregate source.

Necessary dredging permits for work in the Kotzebue Lagoon were applied for from the U.S. Army, Corps of Engineers. Dredge sites I, II and III, Settling Pond-Stockpile Nos. 1, 2 and alternate settling pond-stockpile were approved with various stipulations. A copy of this permit is attached to this report. (Exhibit A).

This report describes subsurface conditions at these sites together with calculated quantities and qualities of material expected to be available at each site.

1.2 SCOPE OF WORK The "Kotzebue Aggregate Inventory" was conducted as outlined in our proposal to the City of Kotzebue, dated June 7, 1983. The inventory project consisted of studies of available material reports; selection and recon of most potential sites; preparation and processing of necessary permits; wash sampling summer exploration; drilling, sampling and testing of selected areas and preparation of this report.

The field exploration was done in two phases. Phase II, summer exploration was done during Aug.-Sep. 83 using a work skiff, barge, 3" Wisconson Trash Pumps

and 4" Rigid PVD. Test holes were washed over the entire Kotzebue Lagoon on a 500' grid and at Sadie Creek and Cape Blossom as shown on the plats. Areas I, II and III were selected in the Lagoon for further exploration. Sadie Creek and Cape Blossom were not recommended for further exploration.

Phase III was conducted during Mar.-Apr. 84. Drilling was done by the firm of Dredge Tech utilizing an RN110 Nodwell mounted Mobile B-61 drill. Marine samples were taken with 3-1/2" split spoon sampler with a 300 lb. drive hammer.

2.0 GEOLOGIC SETTING AND HISTORY

The City of Kotzebue is located at the northerly end of the Baldwin Peninsula at approximately North 66° 53' Lat, West 162° 28' Long. Kotzebue is bordered on the west by the Kotzebue Sound of the Chukchi Sea and to the north by Hotham Inlet. The sediments investigated are in the Yukon-Koyukuk Province. Quaternary Recent unconsolidated sediments are ancestral re-worked beach deposits and lagoonal deposits in Kotzebue Lagoon and alluvial glacial deposits in the Quick Sites explored.

2.1 Soil units - Primarily marine beach deposits composed of course to fine sand, sandy and pebbly gravel and gravel. Cobbles up to 4 inches in diameter occur as surface lag. Beds or lenses of useable aggregate material are found in thicknesses of up to 6 feet. No useable material was encountered in marine dredge sites in depths greater than 25 feet from the floor of the Lagoon.

2.2 Test Boring Soil Descriptions -

2.2.1 Gravel - More than 50% larger than #4 sieve (1/4" approx.)

2.2.2 Sandy Gravel - Majority of finer fraction larger than #200 Sieve (sand - silt limit)

2.2.3 Gravelly Sand - Majority of coarse fraction larger than 1/4 inch.

2.2.4 Organic Soil - High majority of organic material by volume. Generally mixed with silt or sand fraction.

2.2.5 Sand - Minurs #4 Sieve (1/4 in.) to #200 Sieve % by weight.

2.2.6 Silt - Majority by weight will pass through #200 sieve. Generally about 10% desireable in aggregate.

2.2.7 Clay - Majority by weight will pass through the #200 sieve and has a high plasticity. Generally very undesireable if encountered in volume while dredging.

3.0 MATERIAL SITE EXPLORATION

3.1 Phase II - Summer Wash Sampling

3.1.1 Sadie Creek This area has been used in the past as a source of aggregate material. The deposit is exposed beach sand and gravel. The deposit is surficial and underlain by fine sand and silt. A very minimum of material remains on this beach. Removal of any additional material

may endanger the stability of the existing stream mouth and protective spit.

This area offshore was explored by wash sampling during the summer-fall of 1983. Nine test holes were washed located at the mouth of Sadie Creek extending 1/2 mile along the beach to the north and south and offshore 1/4 and 1/2 mile from the beach. See plat attached. (Figure 1). No useable material was found. No further exploration of this area offshore is recommended.

3.1.2 Cape Blossom This area has an extensive beach deposit of gravel and sand. Inspection of the upland and adjacent lake showed no evidence of an extensive extent of the beach nor an upland source for the material.

Offshore wash sampling of 12 test holes was conducted. See attached plat. (Figure 2). These sites (TH4-1/4-3) indicate some seaward extension of good useable material. Sites TH1-1 through TH3-3 did not contain an adequate quantity of useable material to be of further interest.

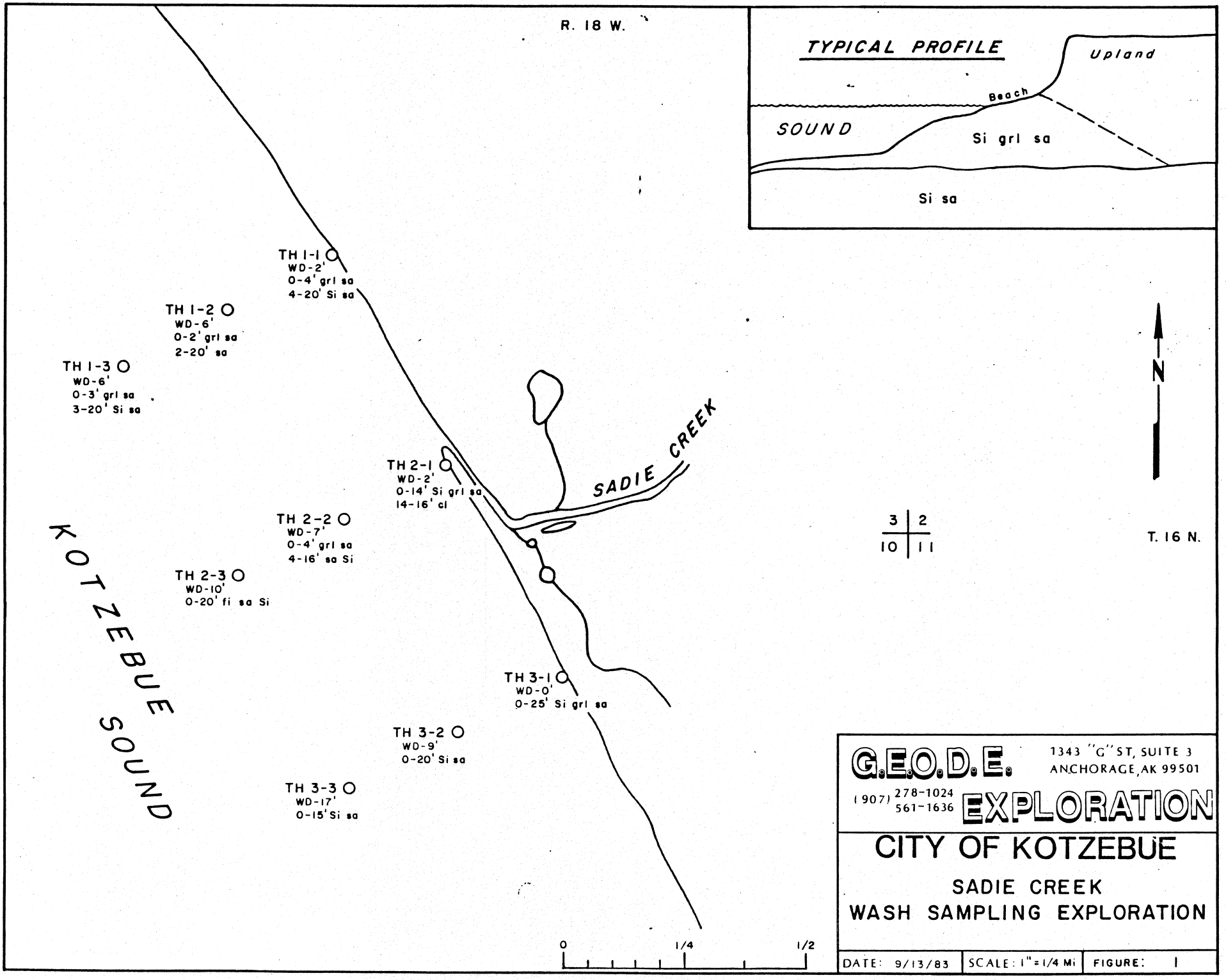
The long haul distance from Kotzebue prompted a recommendation that no further exploration of the Cape Blossom area was merited. Future construction in the vicinity of Cape Blossom may make further exploration worth while. Drilling would be necessary to do any proving of material available.

3.1.3 Kotzebue Lagoon The entire Lagoon was wash sampled on a 500 ft. grid. A large portion of the Lagoon was eliminated from any further exploration because of excessive organic silty overburden. This overburden makes dredging economically impossible.

Additionally, large areas of the Lagoon show abundant "Eel Grass" growth. This Eel Grass is significant as an area used by herring during the spawning period. Though not a commercial herring fishery, the herring population contribute to the "Shee Fish" growth cycle. Shee Fish are an important subsistance fishery. The areas of most abundant Eel Grass growth were therefore excluded from further consideration as dredge sites.

Areas I, II, III and the Settling Pond - Stockpile Area 1 were selected as having most potential as dredge sites and recommended for further exploration.

3.1.4 Summary and Conclusions The Phase II Wash Sampling gave an indication of the presence of desireable material on which to base future exploration. More significant was the elimination of large areas that have no mining potential. This elimination of areas results in considerable reduction of expensive drilling exploration.



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1343 "G" ST, SUITE 3
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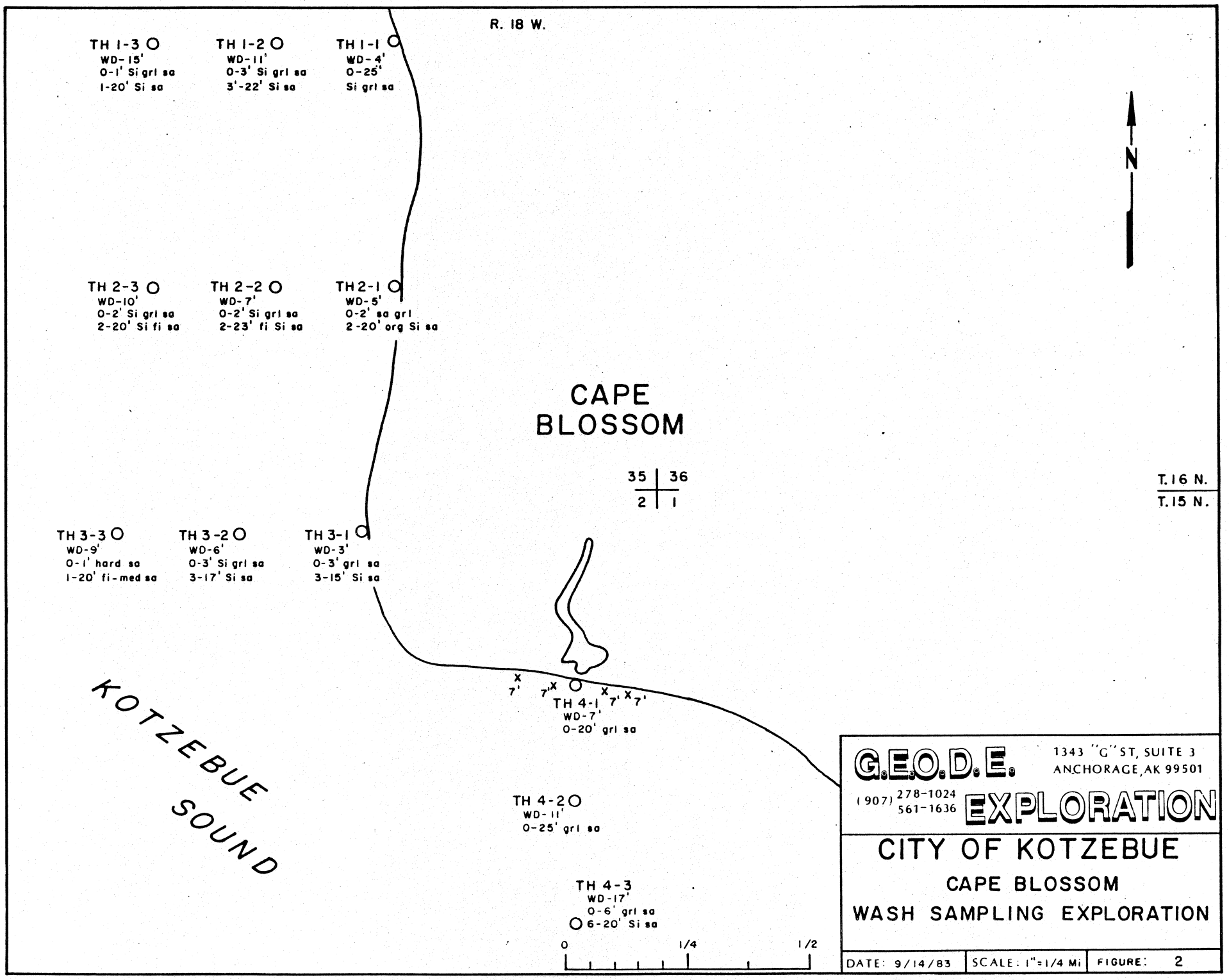
(907) 278-1024
561-1636

CITY OF KOTZEBUE

SADIE CREEK WASH SAMPLING EXPLORATION

DATE: 9/13/83 | SCALE: 1" = 1/4 Mi | FIGURE: 1


R. 18 W.
TH 1-3
WD-15'
0-1' Si grl sa
1-20' Si sa
TH 1-2
WD-11'
0-3' Si grl sa
3'-22' Si sa
TH 1-1
WD-4'
0-25'
Si grl sa
TH 2-3
WD-10'
0-2' Si grl sa
2-20' Si fi sa
TH 2-2
WD-7'
0-2' Si grl sa
2-23' fi Si sa
TH 2-1
WD-5'
0-2' sa grl
2-20' org Si sa
CAPE
BLOSSOM
35 | 36
2 | 1
T. 16 N.
T. 15 N.
TH 3-3
WD-9'
0-1' hard sa
1-20' fi-med sa
TH 3-2
WD-6'
0-3' Si grl sa
3-17' Si sa
TH 3-1
WD-3'
0-3' grl sa
3-15' Si sa
7'
7'
TH 4-1
WD-7'
0-20' grl sa
7'
7'
KOTZEBUE
SOUND
TH 4-2
WD-11'
0-25' grl sa
TH 4-3
WD-17'
0-6' grl sa
6-20' Si sa
N
0
1/4
1/2
G.E.O.D.E.
EXPLORATION
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636
CITY OF KOTZEBUE
CAPE BLOSSOM
WASH SAMPLING EXPLORATION
DATE: 9/14/83
SCALE: 1"=1/4 Mi
FIGURE: 2

3.2 Phase III - Winter Drilling Exploration

3.2.1 Little Noatak-Shiliak Surface indications of gravelly material of this KIC owned land prompted visual aerial reconnaissance of this area in Sept. 83 and it was decided to conduct a limited exploratory effort during Phase III. This upland exploration was done to develop an alternate material source to dredging planned for Kotzebue Lagoon. The subsequent drilling, sampling and testing proved a large quantity of good quality aggregate. Winter haul of 15-17 miles adds to the cost of this material but its discovery provides a reliable known source of aggregate material. (See plat. Figures 3 and 4).

Drilling in this area was done by Dredge Tech utilizing an RN110 Nodwell mounted Mobile B-61. Solid Flight 6" augers were used to obtain grab samples from the test holes. Transportation to this area from Kotzebue was by pick-up truck over an ice road. Winds were calm for the entire 10 days of drilling and no snow drifting on the ice road was encountered.

AREAS EXPLORED

3.2.1.1

Quick Site	T.19N.R. 16W. KRM	See attached plat (Fig.5) and drill logs Q-1 thru 9 and Q-27 thru 32 (Figs. 5a-5e)
Estimated Quantity - 80,000 yards		Ground Cover: brush, grass and spruce trees to 6".
Estimated Quality - A-1-a NFS		Land Classification - Arctic Foothillls
Average Overburden -		Land Ownership - KIC Selected
Depth 1 ft.		Permits necessary - none
Quantity 4,500 Cu. Yd.		Monuments and Quick Triangulation Station and Witness corners. Avoid disturbance.

Haul distance to L. Noatak Slough - 3,700 ft.

Material at this site has very little overburden and is bare to sparsely covered with spruce trees to 6" diameter. Stripping this site will present no problem. Waste can be bermed and used for restoration of the pit when worked out.

Gravel is partially frozen, but not bonded. No problem seen in working the pit.

Care must be taken in the vicinity of TH-Q-4 (see log). Free water was encountered at 13 ft. Drainage to avoid glaciering must be provided.

3.2.1.2

Quick West Site — T.19N. R.16W. KRM Sec. 6: SW 1/4 SE 1/4 — See attached plat (Fig. 6) and drill logs Q-12 thru 17 and Q-21 thru 26 (Figs. 6a - 6d)

Estimated Quantity - 23,000 Cu. Yd.

Ground Cover: brush, spruce to 6".

Estimated Quality - A-1-a NFS

Land Classification - Arctic Foothills

Average Overburden -

Land Ownership - KIC Selected.

Depth 1 ft.

Permits Necessary - none

Quantity 2,000 Cu. Yd.

Haul distance to L. Noatak Slough - 3,800 ft.

Material at this site has little overburden and is sparsely covered with spruce trees to 6" diameter. Stripping this pit will present no problem. Waste can be bermed and used for restoration of the pit when worked out.

Gravel is frozen, but not bonded. No problem in working this material.

3.2.1.3

Quick South Site — T.19N. R.16W. KRM Sec. 7: N 1/2 NE 1/4 — See attached plat (Fig. 7) and drill logs L-1 thru L-5 (Figs. 7a and 7b)

Estimated Quantity - 45,000 Cu. Yd.

Ground Cover: spruce to 8', brush

Estimated Quality - A-1-a

Land Classification - Arctic Foothills

Average Overburden -

Land Ownership - KIC Interim Conveyance

Depth 1-1/2 ft.

Permits Necessary - none

Quantity 3,700 Cu. Yd.

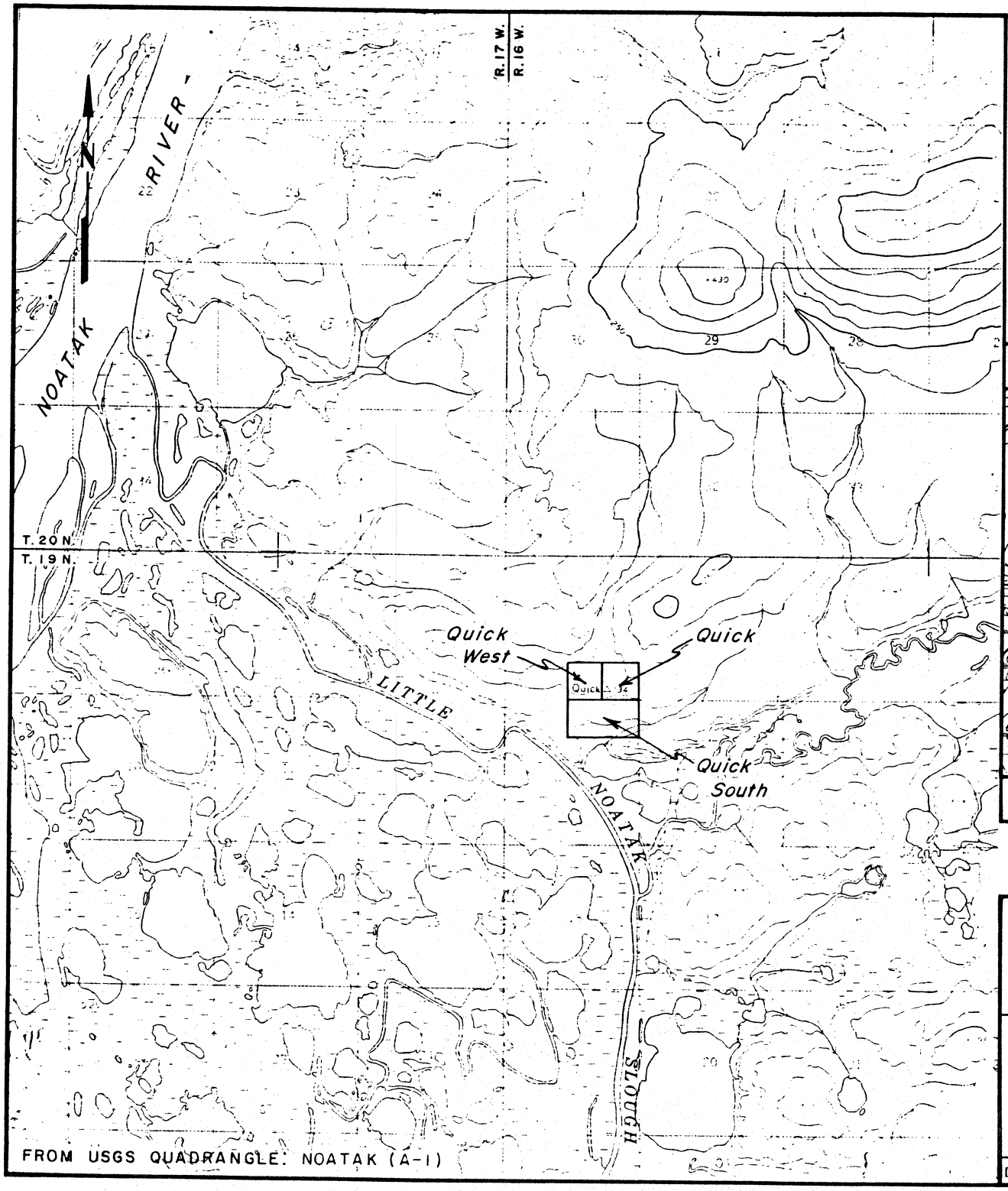
Haul distance to L. Noatak Slough - 2,100 ft.

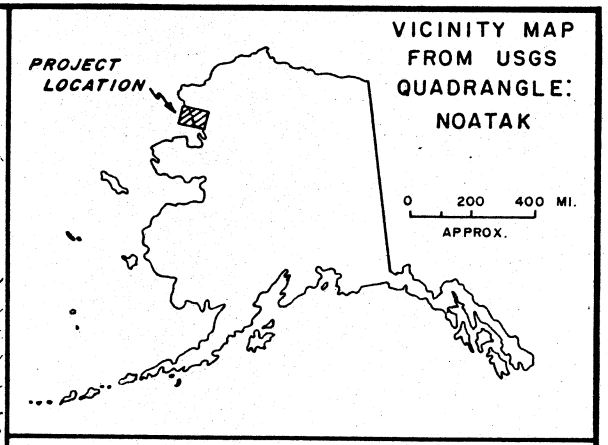
This site has little overburden and sparse spruce to 8" diameter. Pit can be striped and overburden bermed for restoration when pit is depleted. Gravel is uniformly distributed from West to East where sampled. Overburden increases in depth as excavation will proceed northerly. Silt content in the gravel is estimated at 10-15%. With mixing while mining all material included in the estimated quantity above will be suitable for embankment works. Material can be screened for crushing with approximately 20%, 3/4" plus rock.

This site is the most accessible and easiest to mine of the three sites included in this report. The site also represents no problems in land ownership nor permitting. This is wet wetland.

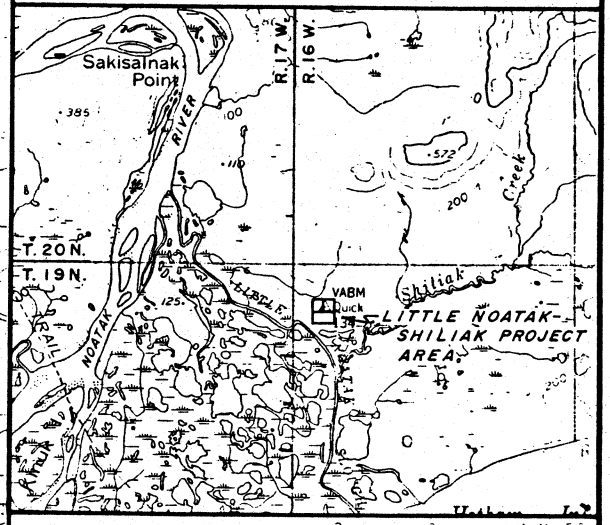
Access and haul route are shown on the attached map. Consideration should be given to preparation of the access point at the northerly entry from the lake to Little Noatak Slough. This 750 ft. portion of the haul route may require some filling to allow heavy traffic crossing.

The haul road from Kotzebue to the mouth of the Little Noatak Slough will require 2-3 days preparation with the use of a water truck, Cat and grader to increase hauling efficiency.





STATE OF ALASKA



0 1/4 1/2 1 1 1/2 2 1/2 Miles

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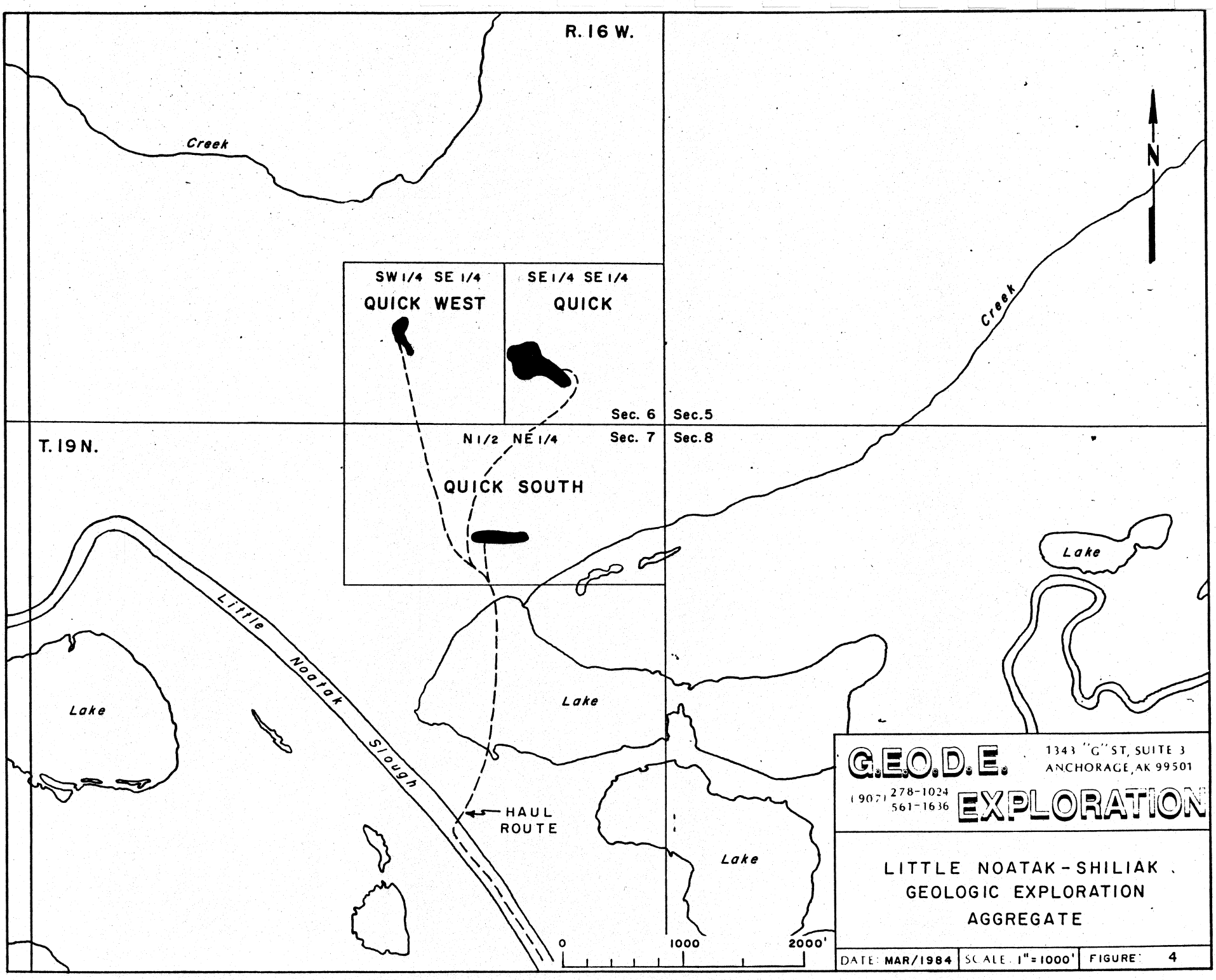
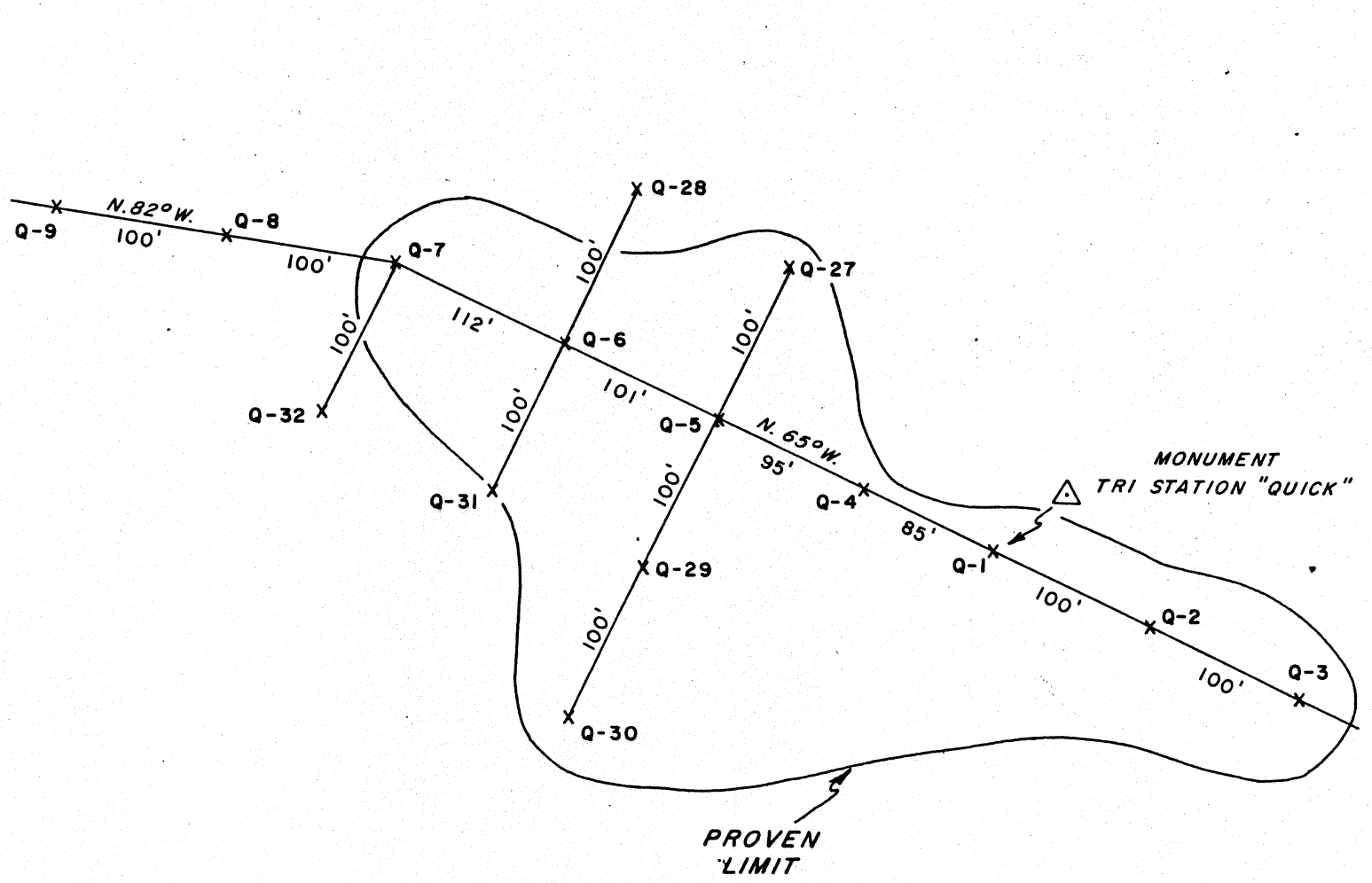
LITTLE NOATAK – SHILIAK UPLAND MATERIAL EXPLORATION

– INDEX MAP –

DATE: 8/15/84	SCALE: AS SHOWN	FIGURE 3


R. 16 W.
Creek
SW 1/4 SE 1/4
QUICK WEST
SE 1/4 SE 1/4
QUICK
Sec. 6
Sec. 5
Creek
T. 19 N.
N 1/2 NE 1/4
Sec. 7
Sec. 8
QUICK SOUTH
Lake
Little Noatak Slough
Lake
Lake
HAUL ROUTE
Lake
0
1000
2000'
N
G.E.O.D.E.
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636
EXPLORATION
LITTLE NOATAK - SHILIAK
GEOLOGIC EXPLORATION
AGGREGATE
DATE: MAR/1984
SCALE: 1" = 1000'
FIGURE: 4



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ANCHORAGE, AK 99501
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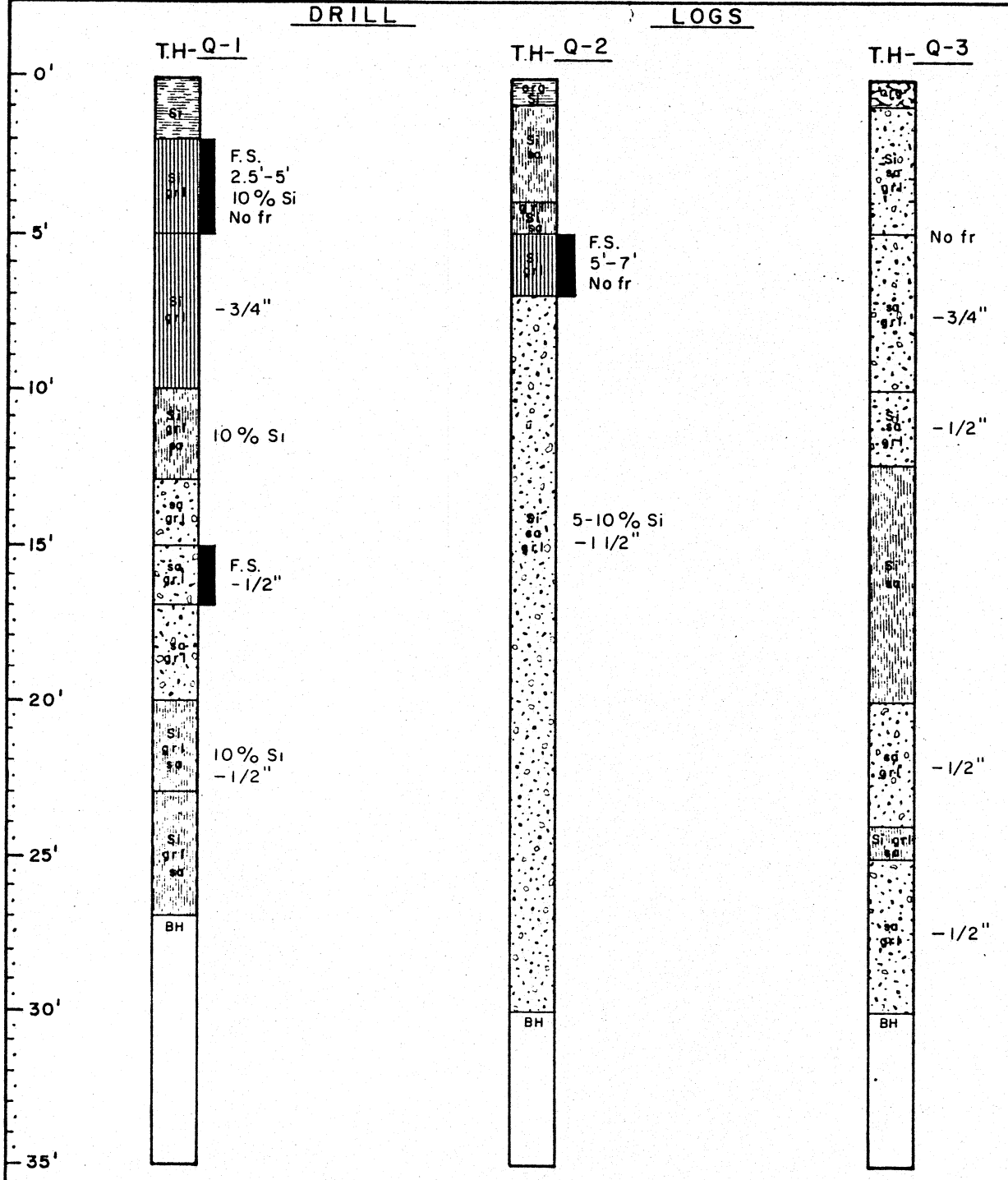
561-1636

LITTLE NOATAK - SHILIAK
QUICK
MATERIAL SITE

DATE: MAR/1984 | SCALE: 1"=100' | FIGURE: 5

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Mod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer-	Field Book- 84-101
Land Descn.- T. 19N., R. 16W., KRM	
Sec : 6 SE 1/4 SE 1/4	
Ground Cover- Spruce to 8", Willow & Grass	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

grl - gravel	grn - green	fr - frost
sd - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H Test Hole No.
FS Field Sample
BC Blow Count (--)
BH Bottom Hole

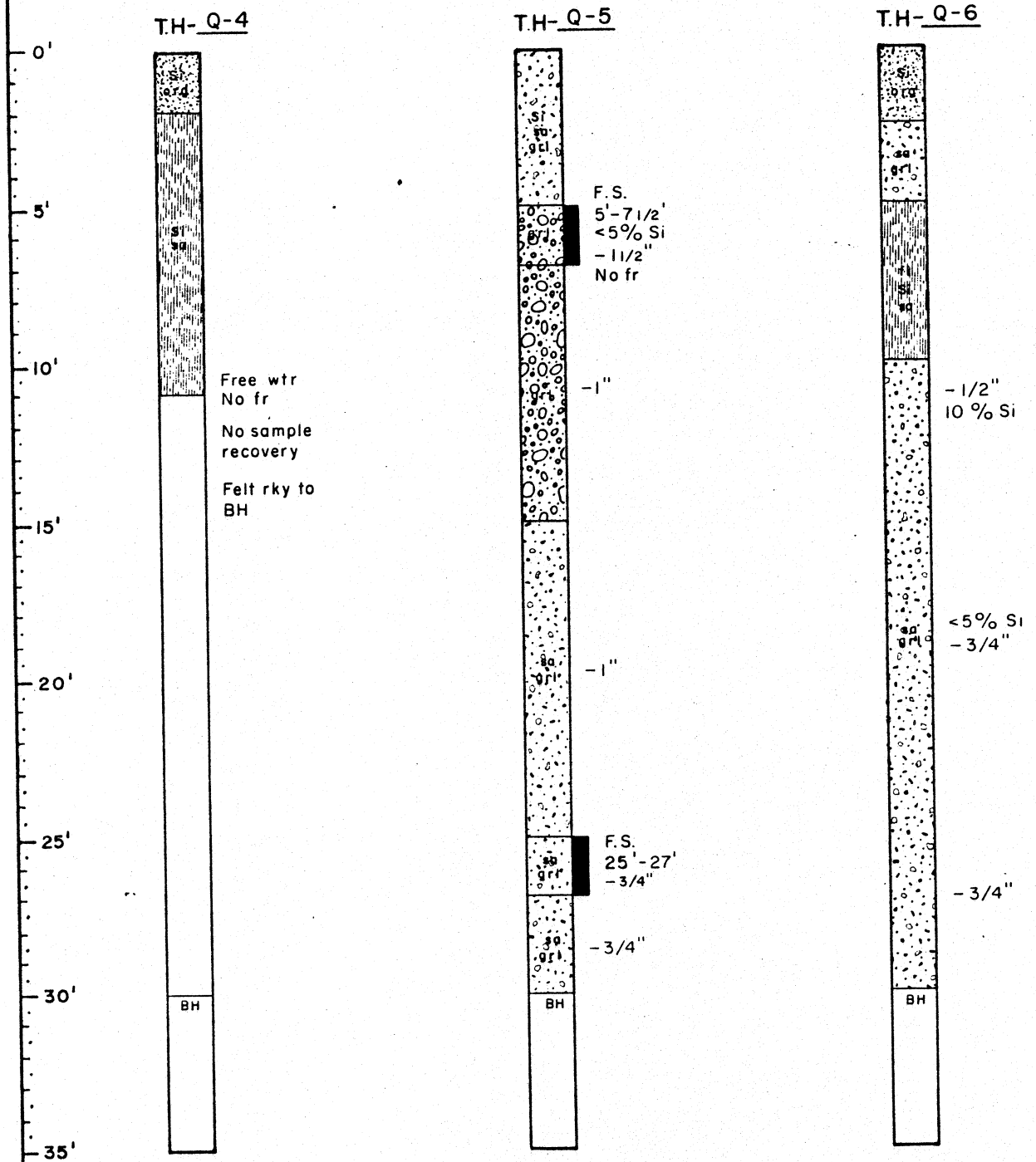
G.E.O.D.E. EXPLORATION
1343 G ST SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1636

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK

DATE 6-1-84 | SCALE 1" = 5' | FIGURE: 5a

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Nod.	Temp- 0 to -25°F
Sampler- 6" S.F. Grab	Wind- 0 to 10 Mph NE
Hammer-	Field Book- 84-101

Land Descn.- T. 19N., R. 16 W., KRM
Sec : 6 SE 1/4 SE 1/4

Ground Cover- Spruce to 8", Willow & Grass

Test Hole Locater- Len Nelson

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

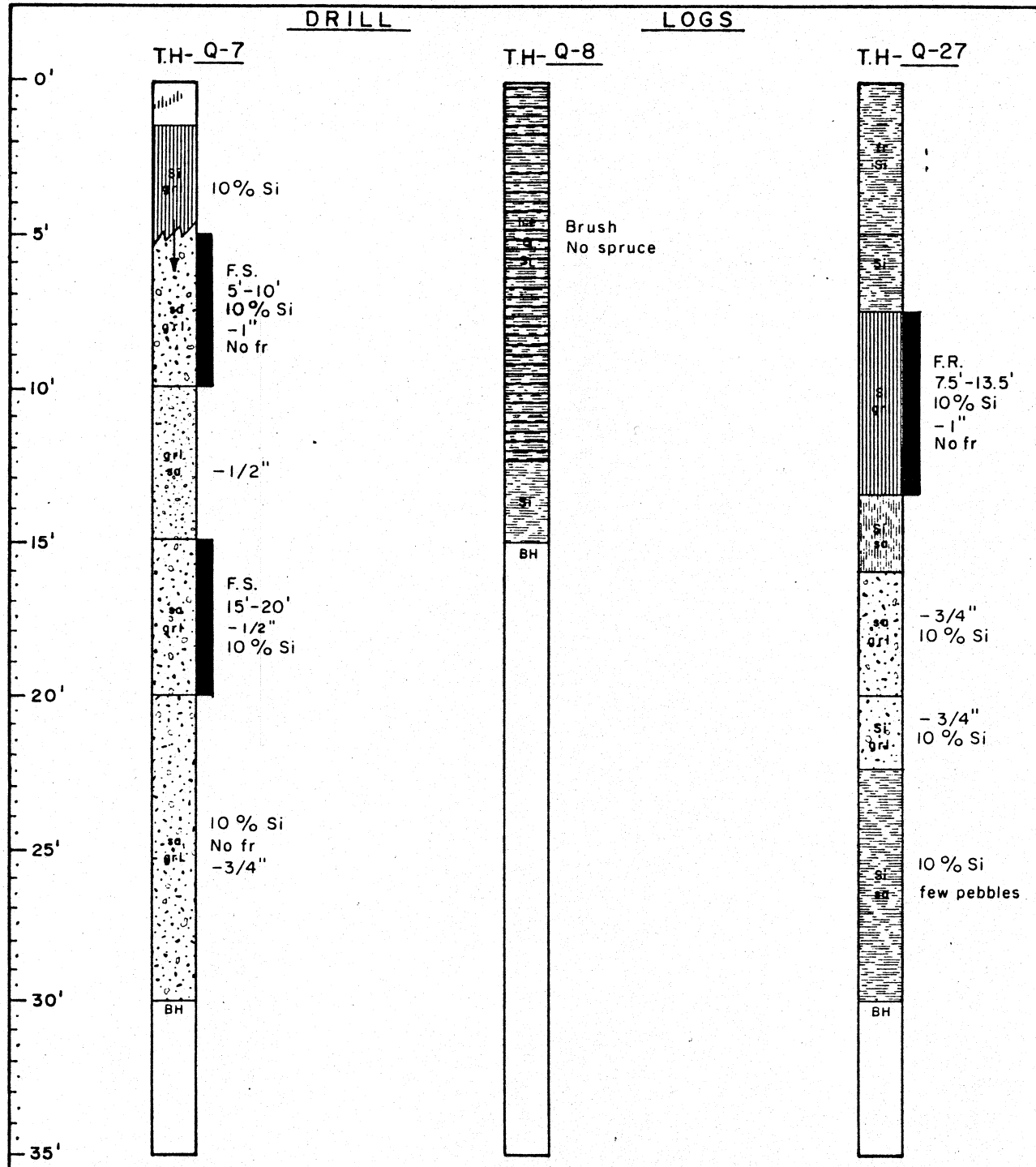
T.H Test Hole No.
Field Sample FS
Blow Count BC (--)
Bottom Hole BH

G.E.O.D.E. EXPLORATION
1348 G ST SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1646

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK

DATE 6-1-84 | SCALE [illegible] | FIGURE 5b



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Nod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer-	Field Book- 84-101

Land Descn.- T. 19N., R. 16W., KRM
Sec 6 SE 1/4 SE 1/4

Ground Cover- Spruce to 8", Willow & Grass

Test Hole Locater- Len Nelson

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

grl - gravel	grn - green	fr - frost
sd - sand	bl - blue	pfr - permafrost
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coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 G ST SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
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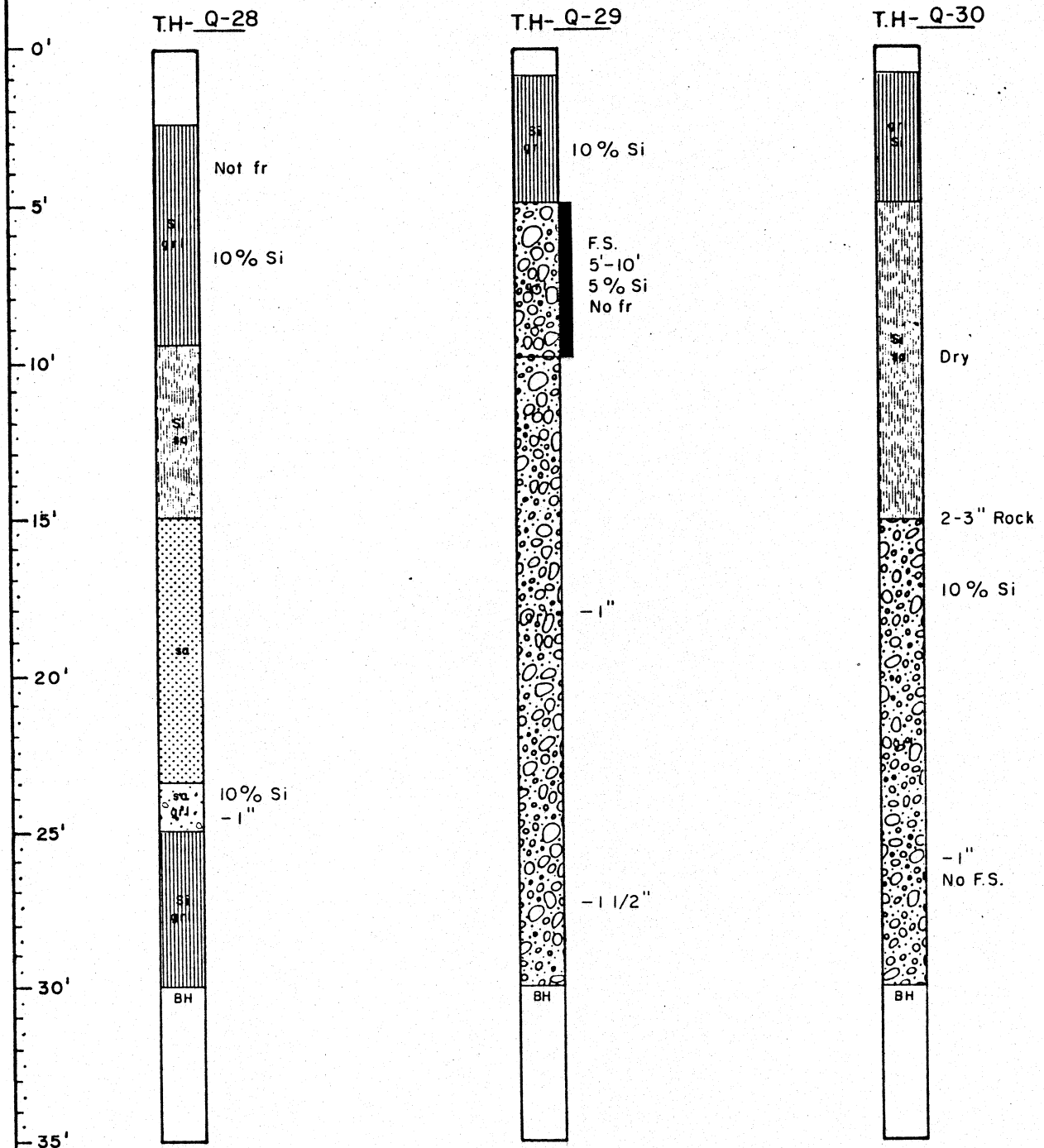
LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK

DATE 6-1-84	SCALE Vert. 1"=5'	FIGURE 5c

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Mod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer-	Field Book- 84-101
Land Descn.- T. 19N., R. 16W., KRM	
Sec : 6 SE 1/4 SE 1/4	
Ground Cover- Spruce to 8", Willow & Grass	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder
grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic
fr - frost
pfr - permafrost
bd - bonded

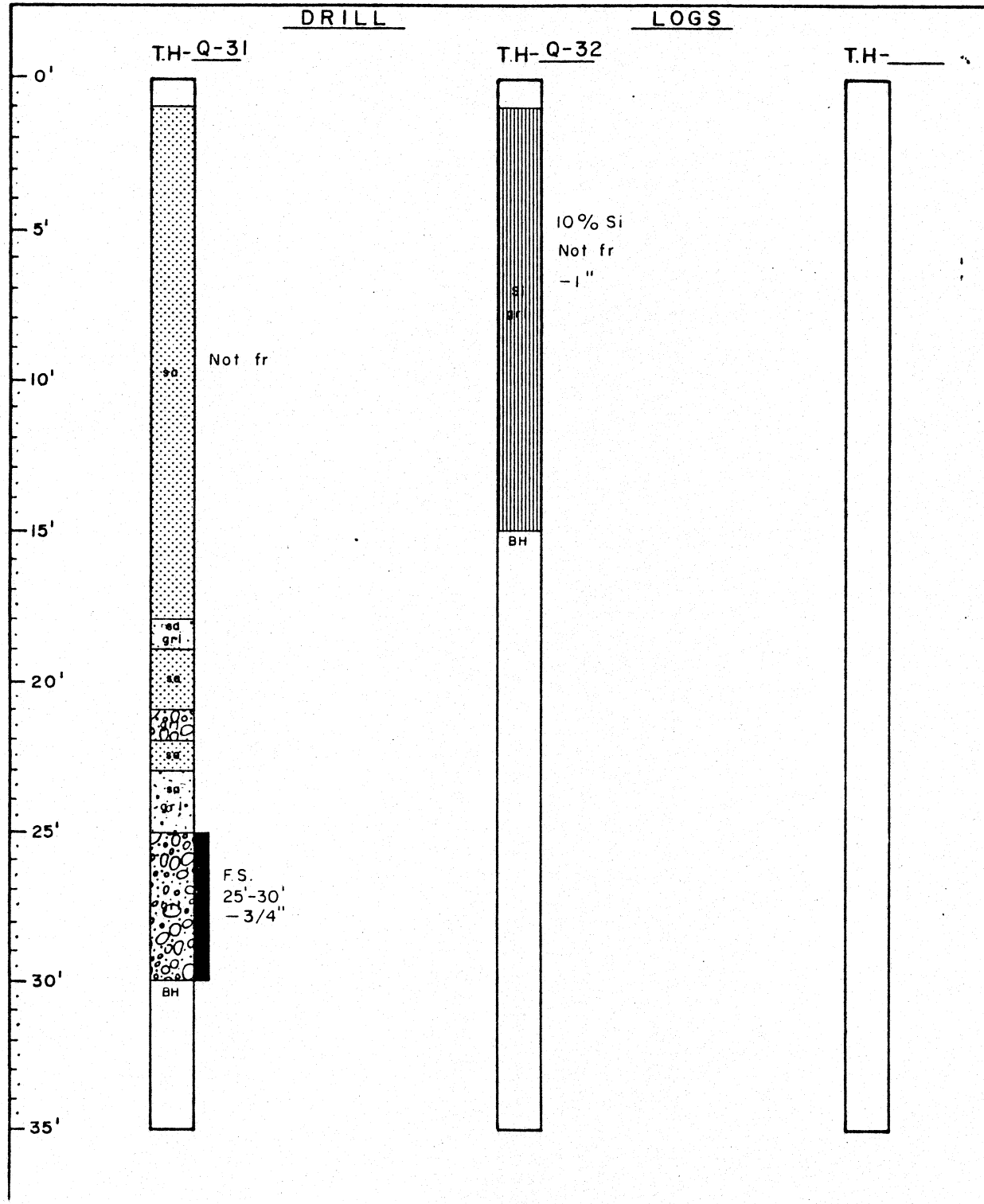
T.H
Test Hole No.
Field Sample
FS
Blow Count
BC (--)
Bottom Hole
B H

G.E.O.D.E. EXPLORATION
1343 G ST SUITE 3
ANCHORAGE AK 99501
907 278-1024
561 1616

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK

DATE 6-1-84 | SCALE Vert. 1"=5' | FIGURE 5d



FIELD TEST HOLE

Geologist - Len Nelson	Date - March 20-29, 1984
Driller - Nick Nichols	Weather - Clear
Drill - Mob B-61 on RN-110 Nod.	Temp - 0 to -25°F
Sampler - 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer -	Field Book - 84-101
Land Descn. - T. 19N., R. 16W., KRM	
Sec : 6 SE 1/4 SE 1/4	
Ground Cover - Spruce to 8", Willow & Grass	
Test Hole Locater - Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr - Frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

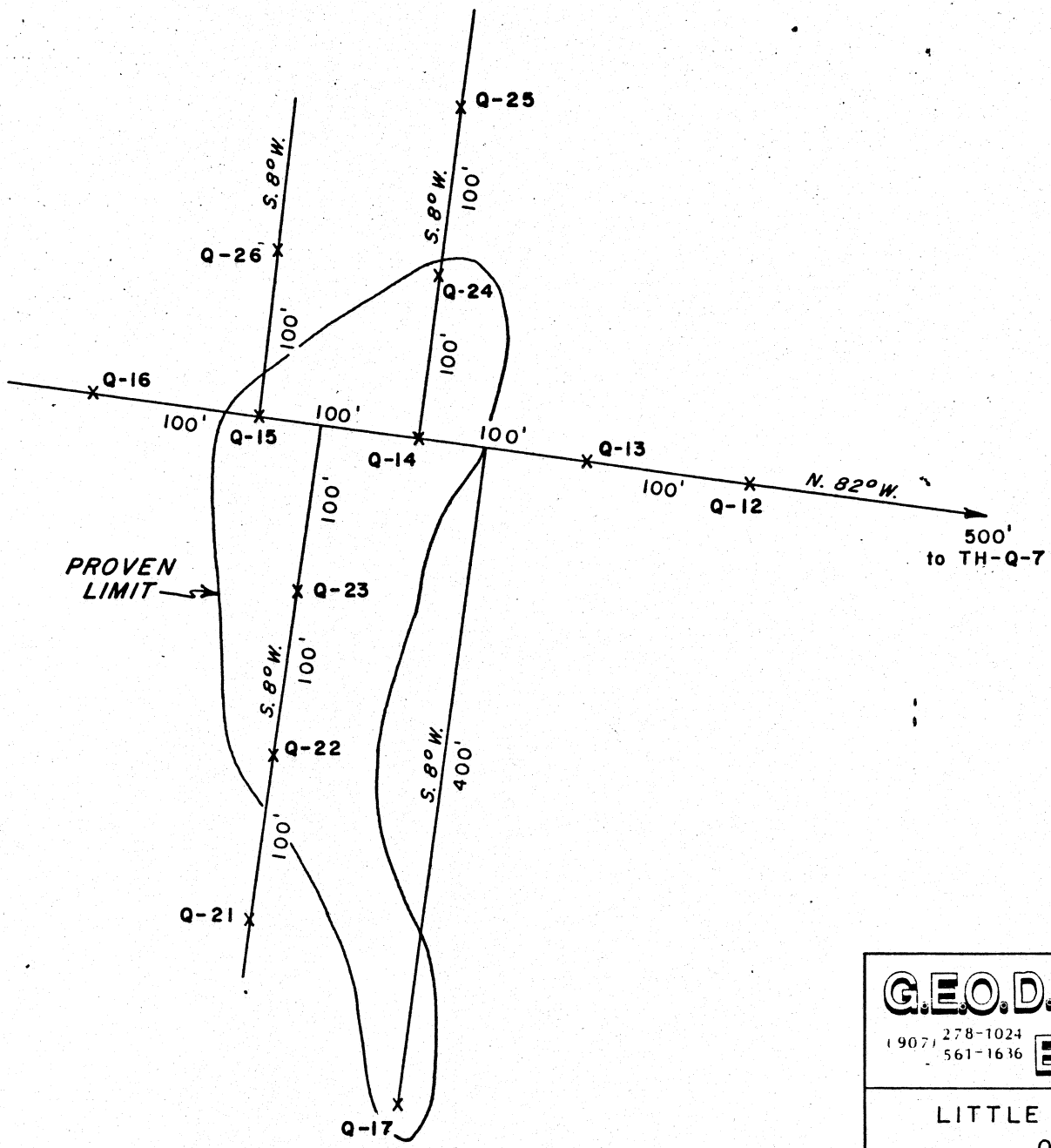
T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1443 C ST SUITE A
ANCHORAGE AK 99501
(907) 278-1024
561-1636

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK

DATE 6-1-84 | SCALE Vert. 1"=5' | FIGURE: 5e

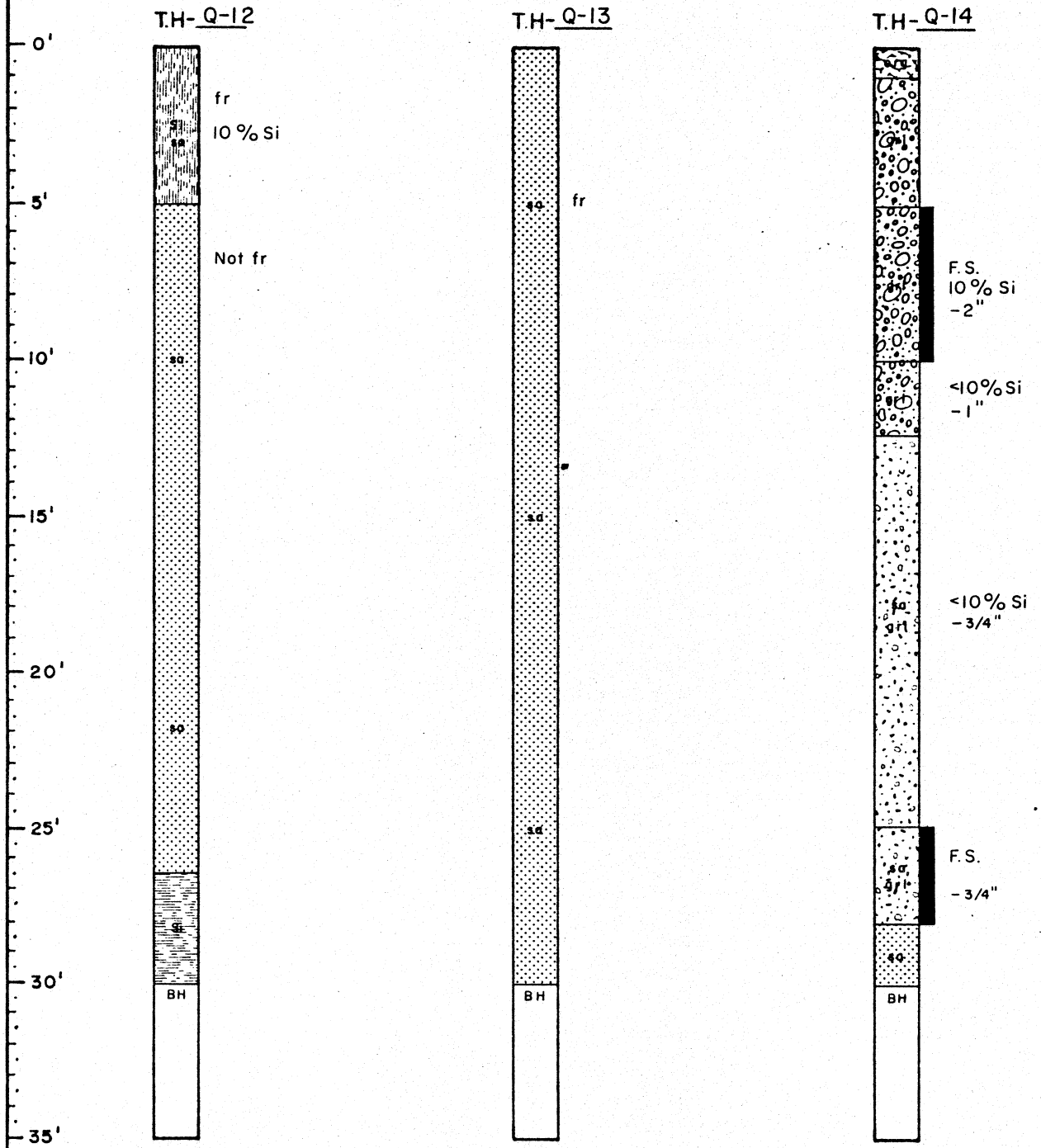


G.E.O.D.E.
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636
EXPLORATION

LITTLE NOATAK - SHILIAK
QUICK WEST
MATERIAL SITE

DATE MAR/1984 | SCALE 1"=100' | FIGURE: 6

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Nod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind- 0 to 10 Mph NE
Hammer-	Field Book- 84-101

Land Descn.- T. 19 N., R. 16 W., KRM
Sec : 6 SW 1/4 SE 1/4

Ground Cover- Spruce to 8", Willow & Grass

Test Hole Locater- Len Nelson

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H Test Hole No.
Field Sample FS
Blow Count BC (--)
Bottom Hole B H

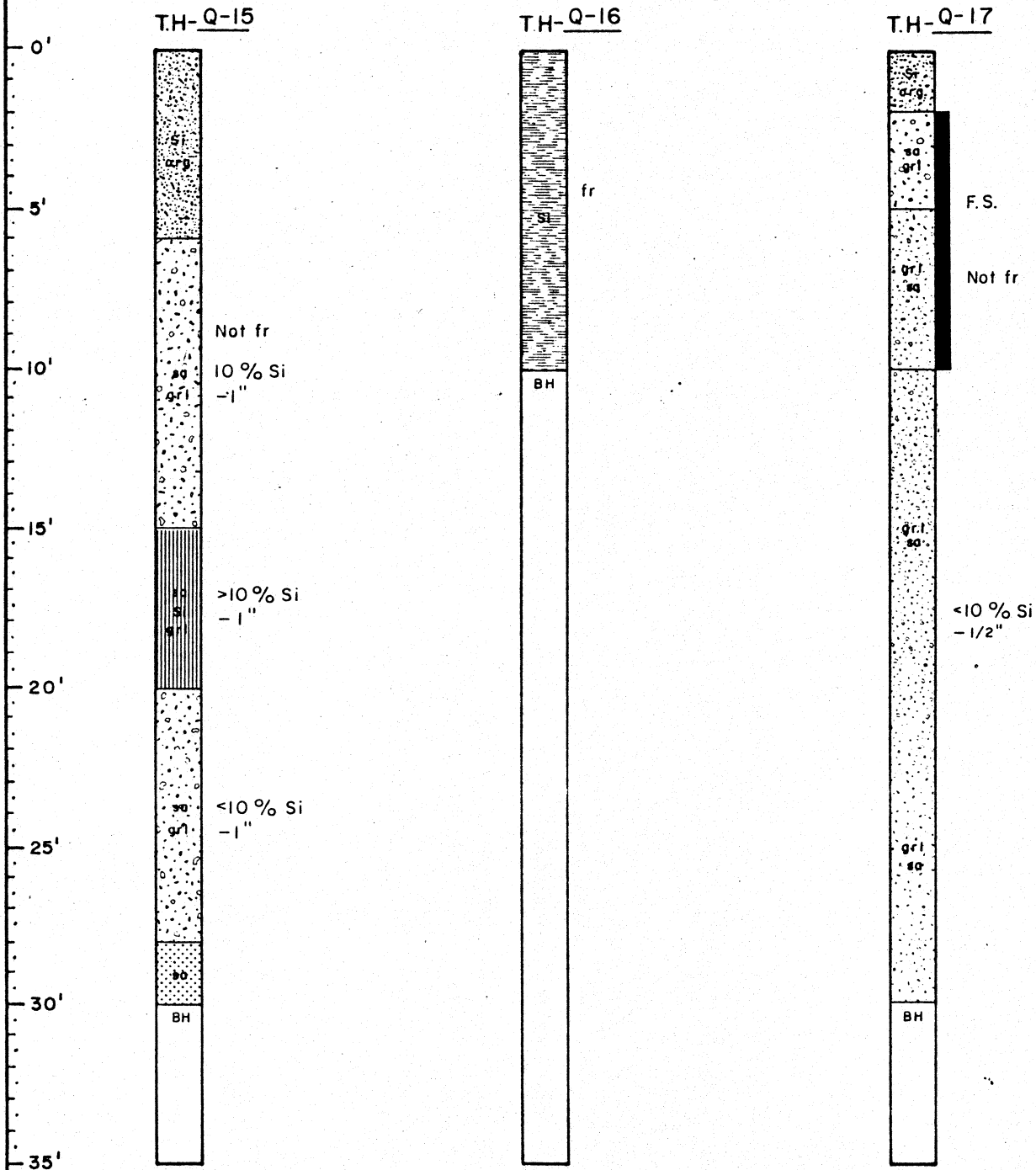
G.E.O.D.E. EXPLORATION
3333 C ST SUITE 3
ANCHORAGE AK 99501
(907) 278 1024
561 1636

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK WEST

DATE 6-1-84 | SCALE 1" = 5' | FIGURE: 6a

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Nod.	Temp.- 0 to -25°F
Sampler- 6" S.F. Grab	Wind- 0 to 10 Mph NE
Hammer-	Field Book- 84-101
Land Descn.- T. 19N., R. 16W., KRM	
Sec : 6 SW 1/4 SE 1/4	
Ground Cover- Spruce to 8", Willow & Grass	
Test Hole Locater- Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder
grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic
fr - frost
pfr - permafrost
bd - bonded

T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

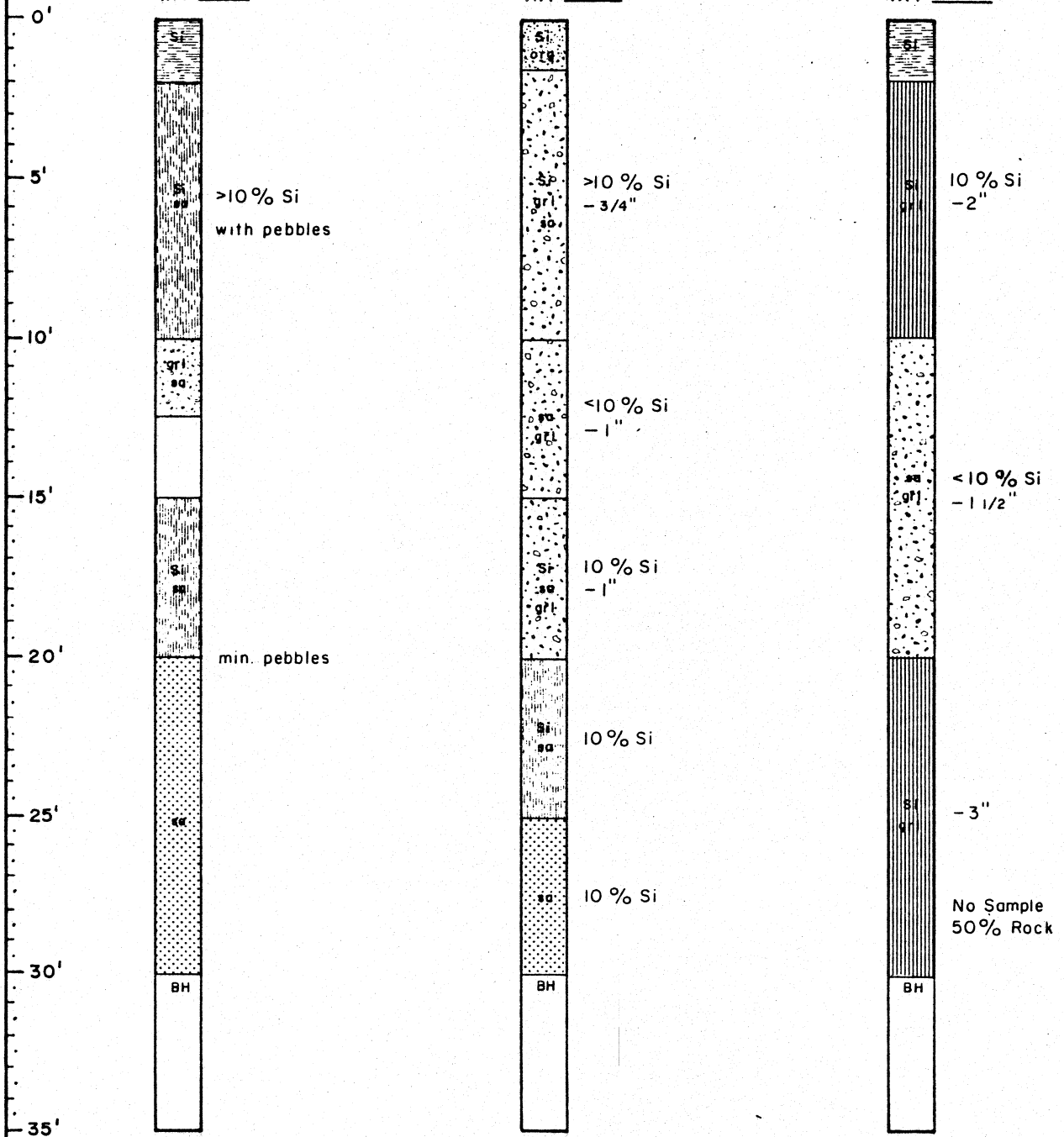
G.E.O.D.E. EXPLORATION
1343 G ST. SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1616

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK WEST

DATE 6-1-84 | SCALE Vert. 1"=5' | FIGURE 6b

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Mod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer-	Field Book- 84-101
Land Descn.- T. 19N., R. 16W., KRM	
Sec : 6 SW 1/4 SE 1/4	
Ground Cover- Spruce to 8", Willow & Grass	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder
grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic
fr - frost
pfr - permafrost
bd - bonded

T.H Test Hole No.
FS Field Sample
BC Blow Count (--)
BH Bottom Hole

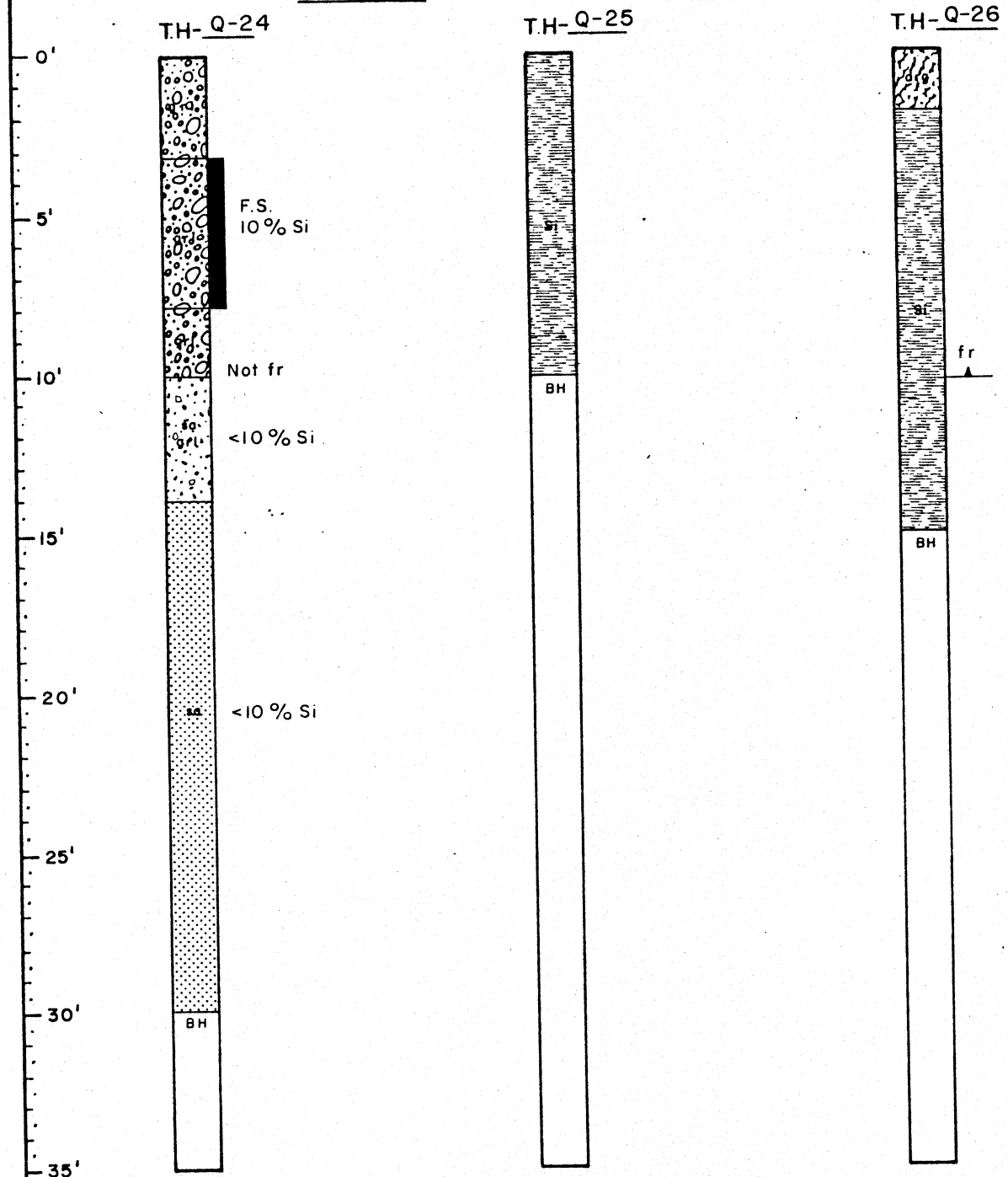
G.E.O.D.E. EXPLORATION
1343 G. ST. SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1646

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK WEST

DATE 6-1-84 | SCALE Vert. 1"=5' | FIGURE: 6c

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Nod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer-	Field Book- 84-101

Land Descn.- T. 19N., R. 16W., KRM
Sec : 6 SW 1/4 SE 1/4
Ground Cover- Spruce to 8", Willow & Grass
Test Hole Locater- Len Nelson

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frozen
pfr - permafrost
bd - bonded

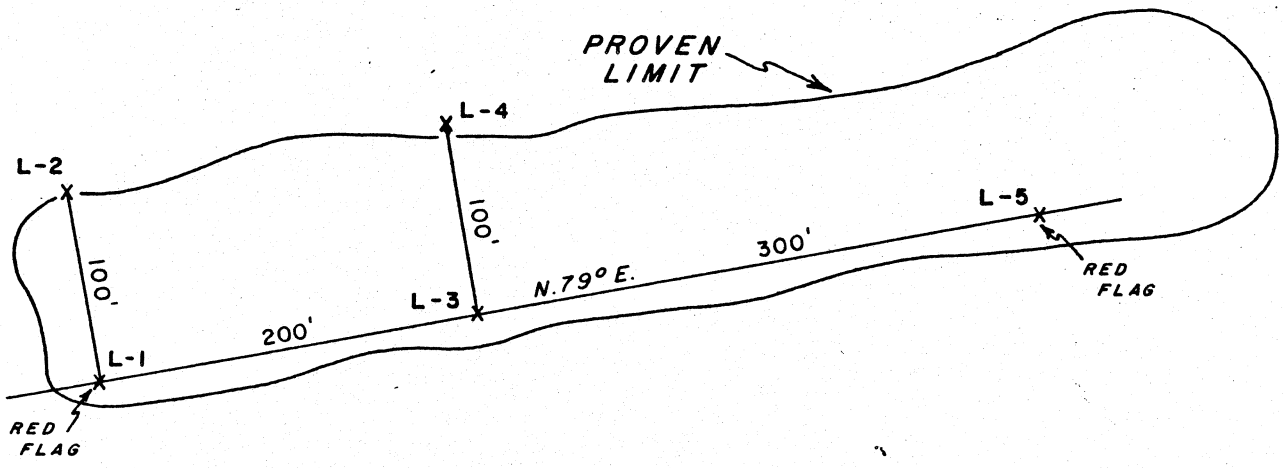
T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 G ST SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1636

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK WEST

DATE 6-1-84 | SCALE Vert. 1"=5' | FIGURE. 6d



N

0 20 40 60 80 100 200'

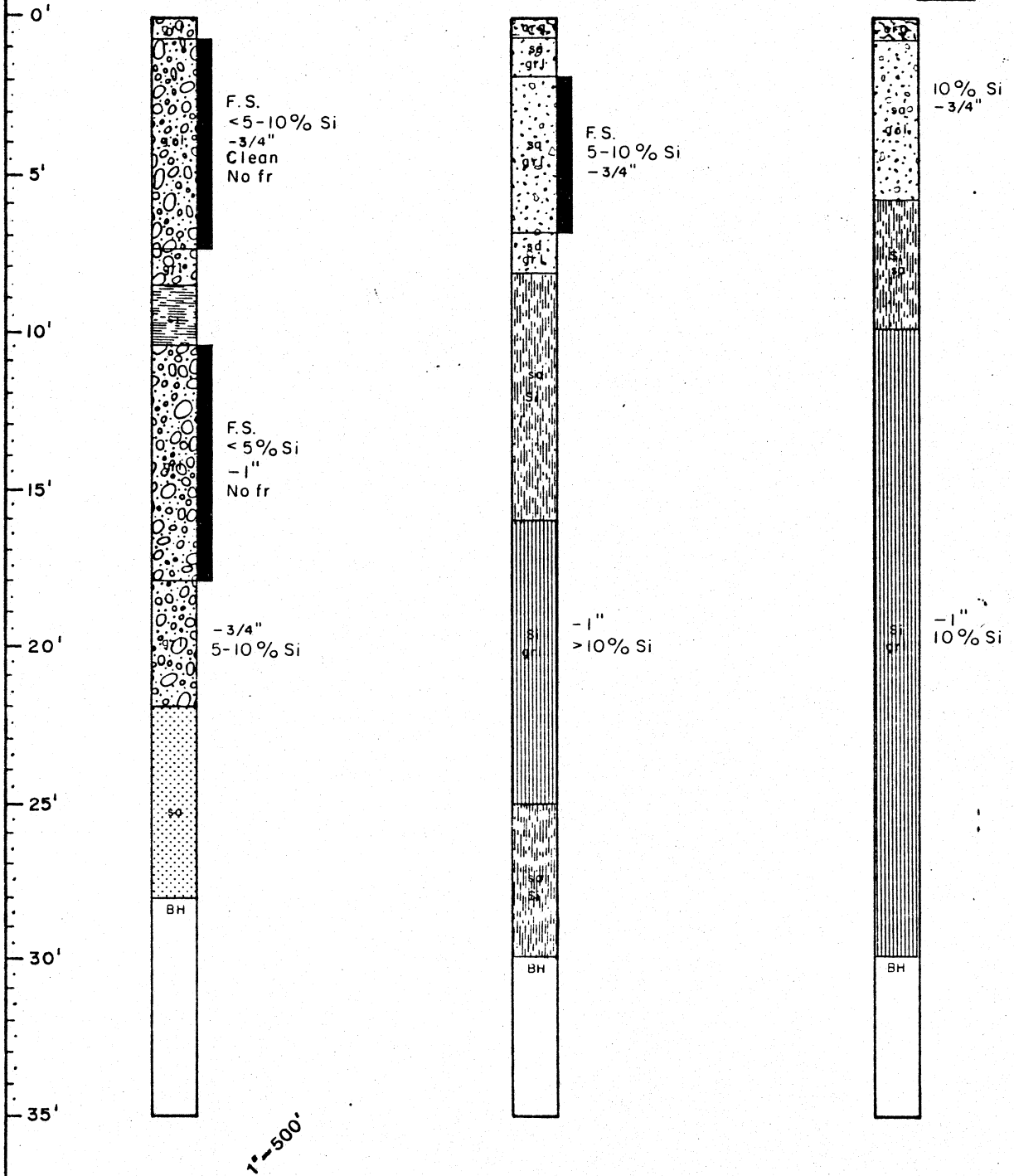
G.E.O.D.E. EXPLORATION

1343 G ST. SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

LITTLE NOATAK - SHILIAK
QUICK SOUTH
MATERIAL SITE

DATE: MAR/1984 | SCALE: 1"=100' | FIGURE: 7

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date- March 20-29, 1984
Driller- Nick Nichols	Weather- Clear
Drill- Mob B-61 on RN-110 Nod.	Temp - 0 to -25°F
Sampler- 6" S.F. Grab	Wind- 0 to 10 Mph NE
Hammer-	Field Book- 84-101
Land Descn.- T. 19N., R. 16W., KRM	
Sec : 7 N.1/2, N.E. 1/4	
Ground Cover- Spruce to 8", Willow & Grass	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri-gravel	grn-green	fr-frost
sa-sand	bl-blue	pfr-permafrost
Si-silt	gr-gray	bd-bonded
cl-clay	blk-black	
pt-peat	br-brown	
fib-fiberous	y-yellow	
coa-coarse	wh-white	
fi-fine	wtr-water	
cob-cobble	bkn-broken	
peb-pebble	rk-rock	
bld-boulder	org-organic	

T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

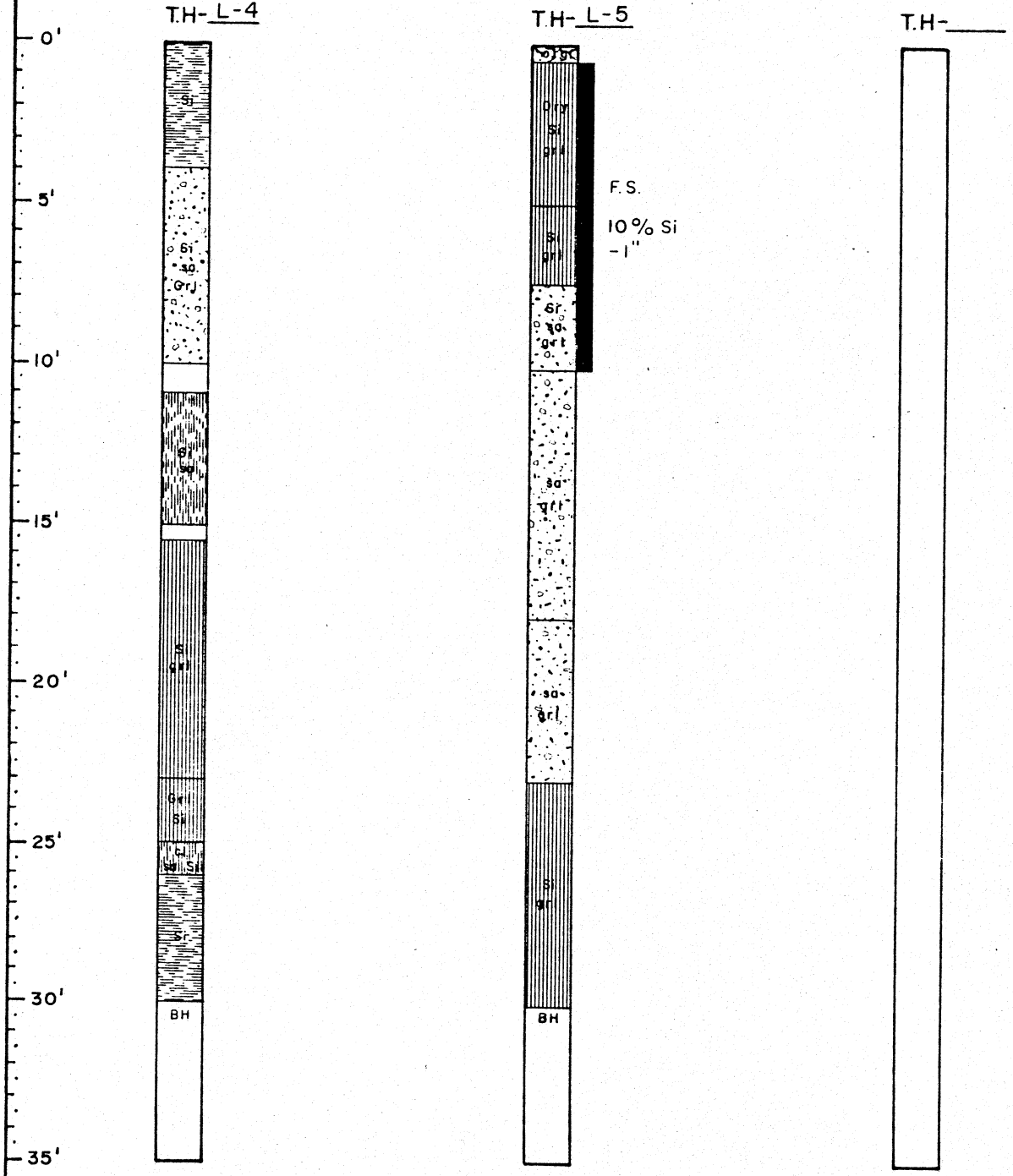
G.E.O.D.E. EXPLORATION
1343 C ST. SUITE 4
ANCHORAGE AK 99501
(907) 278-1024
561-1636

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK SOUTH

DATE 6-1-84 | SCALE 1"=5' | FIGURE: 7a

DRILL LOGS



FIELD TEST HOLE

Geologist - Len Nelson	Date - March 20-29, 1984
Driller - Nick Nichols	Weather - Clear
Drill - Mob 8-61 on RN-110 Nod.	Temp. - 0 to -25°F
Sampler - 6" S.F. Grab	Wind - 0 to 10 Mph NE
Hammer -	Field Book - 84-101

Land Descn. - T. 19N., R. 16W., KRM
Sec : 7 N. 1/2, N.E. 1/4

Ground Cover - Spruce to 8", Willow & Grass

Test Hole Locater - Len Nelson

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

grl - gravel	grn - green	fr - frost
sd - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
f-b - fiberous	y - yellow	
coa - coarse	wh - white	
f - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 G ST SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1636

LITTLE NOATAK-SHILIAK GRAVEL PROJECT

MATERIAL SITE QUICK SOUTH

DATE 6-1-84 | SCALE 1"=5' | FIGURE 7b

3.2.2 Kotzebue Lagoon Based on Phase II Exploration Area's I, II, III and Settling Pond - Stockpile No. 1 were selected for Phase III winter exploration. (Fig. 8 and 9)

Drilling was provided by Dredge Tech utilizing an RN110 Nodwell mounted Mobile B-61 Drill. Samples were taken with 3-1/2" split spoon samplers and a 300 lb. drop hammer. This drilling was done during the period Mar. 1 through Apr. 30, 1983 with a break of 14 days for the L. Noatak-Shiliak upland exporation in March. Six 12 hour shifts per week were worked throughout the project.

The useable aggregate found in the Lagoon is estaurine in nature with lenses of gravel, from re-worked beach deposits, present from a few inches to 6 feet in thickness. No gravel material was encountered at depths to exceed 25 feet. Test holes were drilled to a maximum of 50 feet. The intervals from 25 feet to 50 feet were waste material indicating no feasible way to extract any larger material encountered to depths below 50 feet by dredging.

3.2.2.1

Settling Pond and Stockpile No. 1

T.17N., R.18W., KRM
Sec. 10: SW 1/4 NW 1/4, NW 1/4 SW 1/4

See attached plat (Fig. 10) and drill logs SP-2 thru 8 (Fig. 10a - 10d)

Estimated Quantity - 100,000 Cu. Yd.

Ground Cover: water average - 3'.

Estimated Quality - SaGrl

Land Ownership: State DOT/PF

Average Overburden -

Permits Necessary: State Use. COE - wetlands

Depth - 3'

Quantity 60,000 Cu. Yd.

Pumping Distance to Stockpile - adjacent.

3.2.2.2

Dredge Material Site I

T.17N., R.18.W. KRM
Sec. 9: SE 1/4, SE 1/4 SE 1/4
Sec. 16: E 1/2, NE 1/4 NE 1/4

See attached plat (Fig. 11) and drill logs I-5, 10, 11, 12, 14 and 17. (Figs. 11a - 11g)

Estimated Quantity - 65,000 Cu. Yd.

Ground Cover: water average - 6.5'

Estimated Quality - SaGrl

Average Overburden -

Land Ownership: State DOT/PF

Depth - 3'

Permits Necessary: State use. COE - Wetlands

Quantity 10,000 Cu. Yd.

Pumping Distance to Stockpile - 3,000' maximum

3.2.2.3

Dredge Material Site II

T.17N. R.18W., KRM
Sec. 10: SW 1/4, NW 1/4
NE 1/4 SE 1/4
NE 1/4
NW 1/4 NE 1/4,
SE 1/4
NW 1/4

See attached plat (Fig. 12) and drill logs II-1 (Figs. 12a - 12e)

Estimated Quantity - 100,000 Cu. Yd.

Ground Cover: water, average 6'

Estimated Quality - SiSaGrl

Land Ownership - State DOT/PF

Average Overburden -

Depth - 3'

Permits Necessary: State use. COE - wetlands

Quantity - 15,000 Cu. Yd.

Pumping Distance to Stockpile - 3,200' maximum.

3.2.2.4

Dredge Material Site III

T.17N., R.18W., KRM
Sec.: 2, 3, 10 and 11
Portions of.

See attached plat (Fig. 9) drill logs NL-1 thru NL-10 (Figs. 14a - 14c)

No useable aggregate samples recovered from this area. Recommended removal of this area from permit.

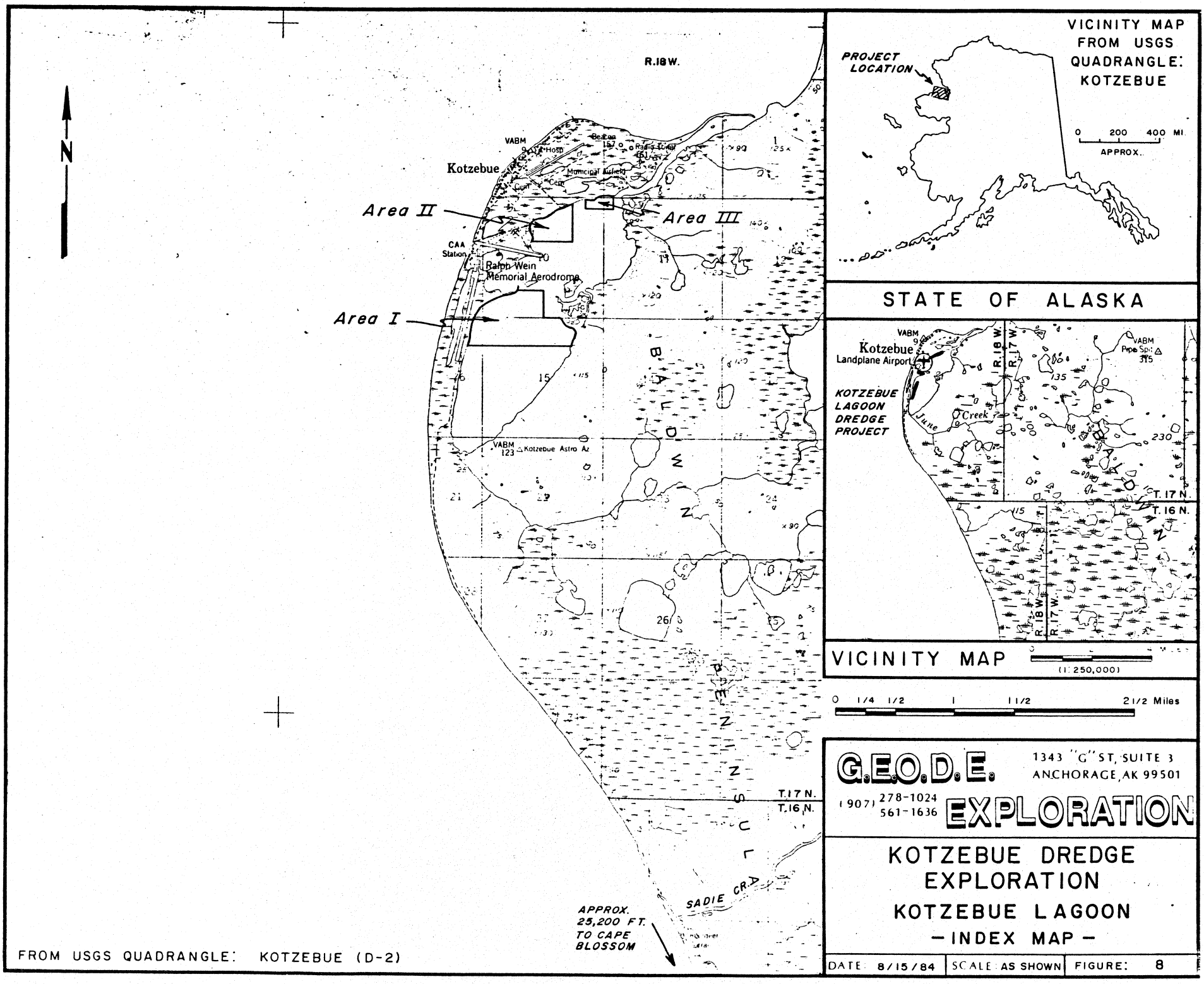
3.2.2.5

Alternate Settling Pond - Base Line Area

T.17N., R.18W., KRM
Sec. 16 Portions of.

See attached plat (Fig. 13) drill logs ASP 1-7 (Figs. 13a - 13c)

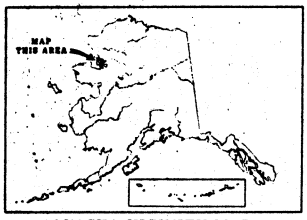
No useable aggregate samples recovered from this area.



G.E.O.D.E. EXPLORATION
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

KOTZEBUE DREDGE EXPLORATION
KOTZEBUE LAGOON
— INDEX MAP —

DATE: 8/15/84 | SCALE: AS SHOWN | FIGURE: 8



ALASKA VICINITY MAP

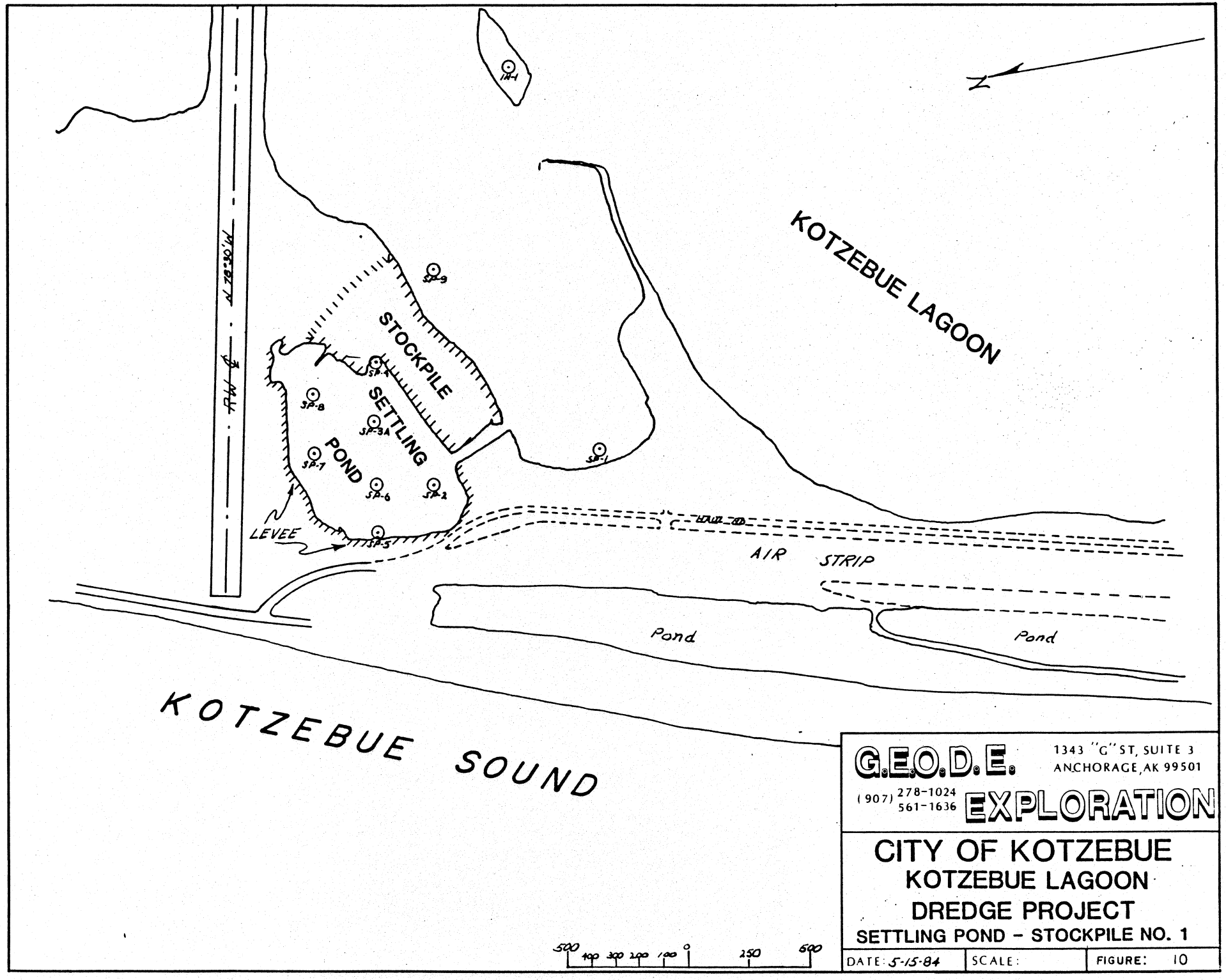
KOTZEBUE SOUND

U.S.S. No. 2863 Tract B
U.S.S. No. 4498 Tract A
U.S.S. No. 2645 Tract 10
U.S.S. No. 2083
U.S.S. No. 2863 Tract C
U.S.S. No. 2407 Vernon Tract
U.S.S. No. 2645 Tract 9
U.S.S. No. 2082
U.S.S. No. 4498 Tract B
17729
AREA III
U.S.S. No. 2645 Tract 5
U.S.S. No. 2863 Tract A
U.S.S. No. 2645 Tract 2
AREA II
17835
U.S.S. No. 3884 Tract A
U.S.S. No. 3884 Tract B
Runway ℄
SETTLING POND
STOCKPILE
POND OUTLET W/ PLANK BOARD RISER
U.S.S. No. 2645 Tract 1
U.S.S. No. 2645 Tract 3
U.S.S. No. 2645 Tract 6
AREA I
15996 7
U.S.S. No. 2645 Tract 8
Runway ℄
ALTERNATE SETTLING POND
U.S.S. No. 3884 Tract C
U.S.S. No. 2645 Tract 7
15994
15995
18436
18445
T 17 N

G.E.O.D.E.
Exploration

KOTZEBUE LAGOON
DREDGING AND STOCKPILE
PERMIT - CORPS OF ENGRS

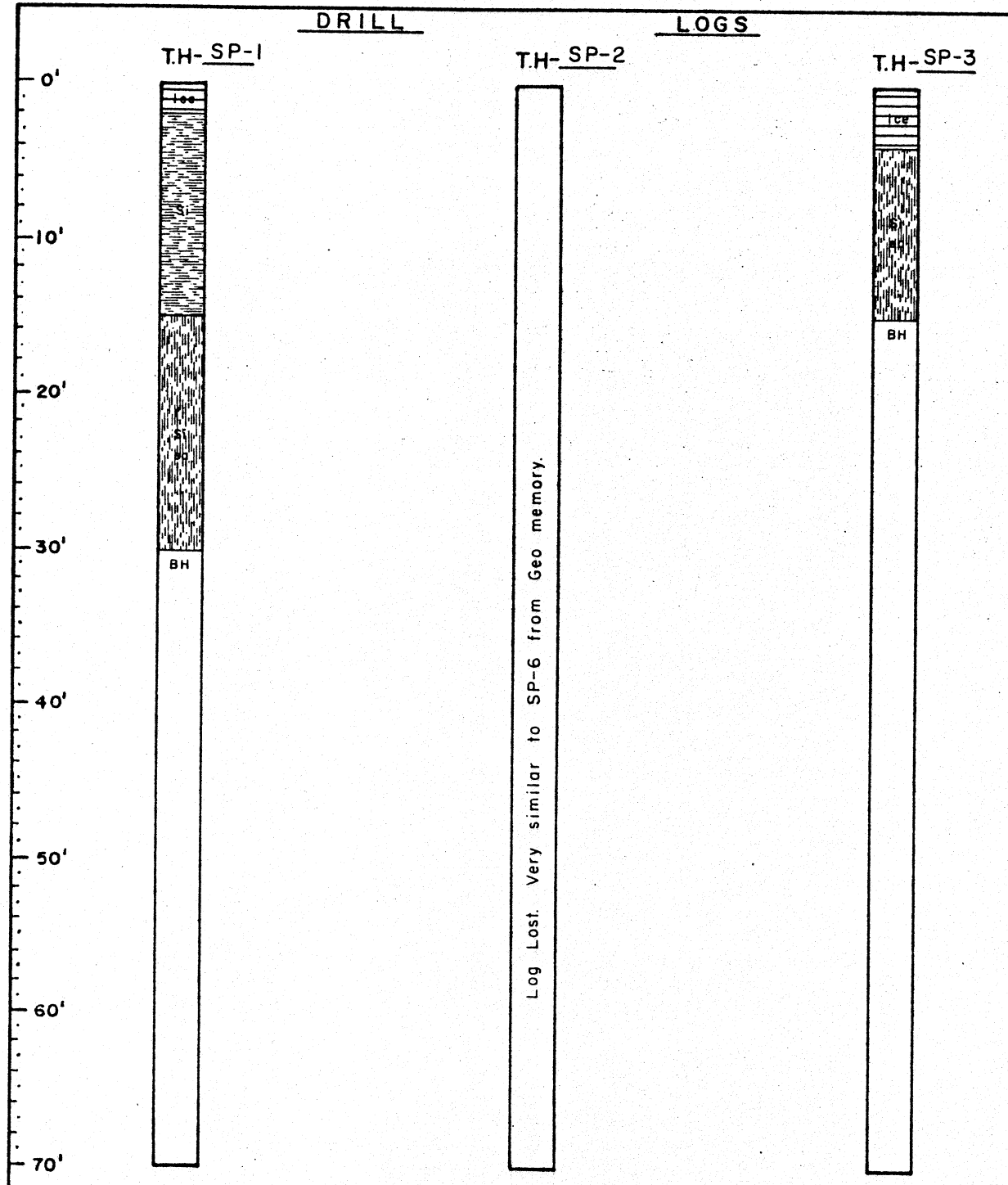
REVISED | SCALE



G.E.O.D.E. EXPLORATION
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

CITY OF KOTZEBUE
KOTZEBUE LAGOON DREDGE PROJECT
SETTLING POND – STOCKPILE NO. 1

DATE: 5-15-84	SCALE:	FIGURE: 10



FIELD TEST HOLE

Geologist- Len Nelson — Date-
Driller- Nick Nichols — Weather-
Drill- Mob B-61 on RN-110 Nod. — Temp -
Sampler- 3 1/2" Split Spoon — Wind -
Hammer- 300 lb — Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM
Sec 10 S.W. 1/4 N.W. 1/4, N.W. 1/4 S.W. 1/4
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson

CLIENT
CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

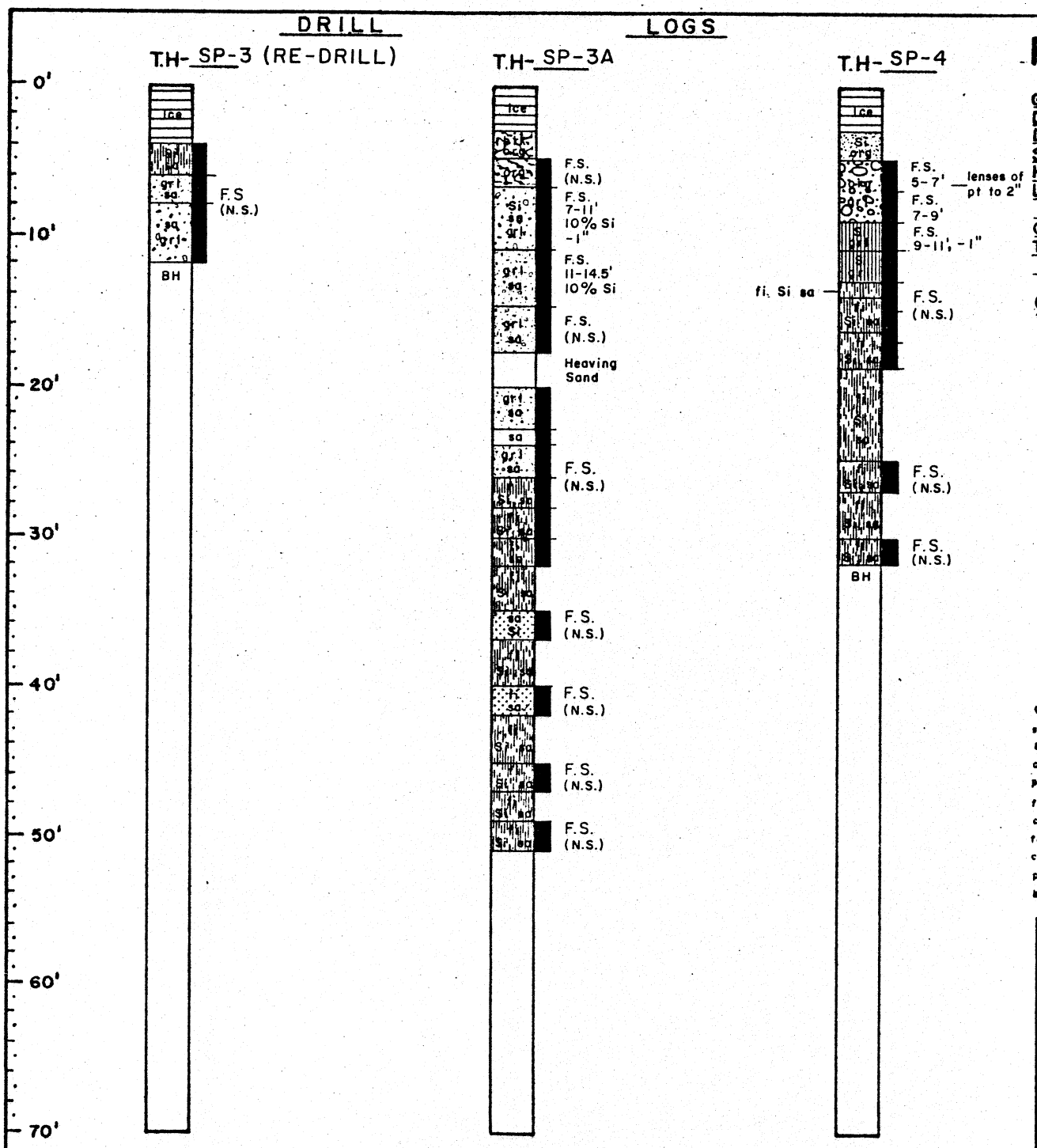
T.H Test Hole No.
FS Field Sample
BC (--) Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 "G" ST, SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

SETTLING POND NO. 1

DATE 6-1-84 | SCALE [illegible] | FIGURE: 10a



FIELD TEST HOLE

Geologist- Len Nelson
Driller- Nick McNeto
Drill- Mob B-61 on RN-110 Mod.
Sampler- 3 1/2" Split Spoon
Hammer- 300 lb
Land Descn.- T. 17 N., R. 18 W., KRM
Sec 10 S.W. 1/4 N.W. 1/4, N.W. 1/4 S.W. 1/4
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson

Date-
Weather-
Temp -
Wind -
Field Book-

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder
grn - green
bl - blue
gy - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic
fr - frost
pfr - permafrost
bd - bonded

T.H Test Hole No.
FS Field Sample
(NS) Not Saved
BC Blow Count (--)
BH Bottom Hole

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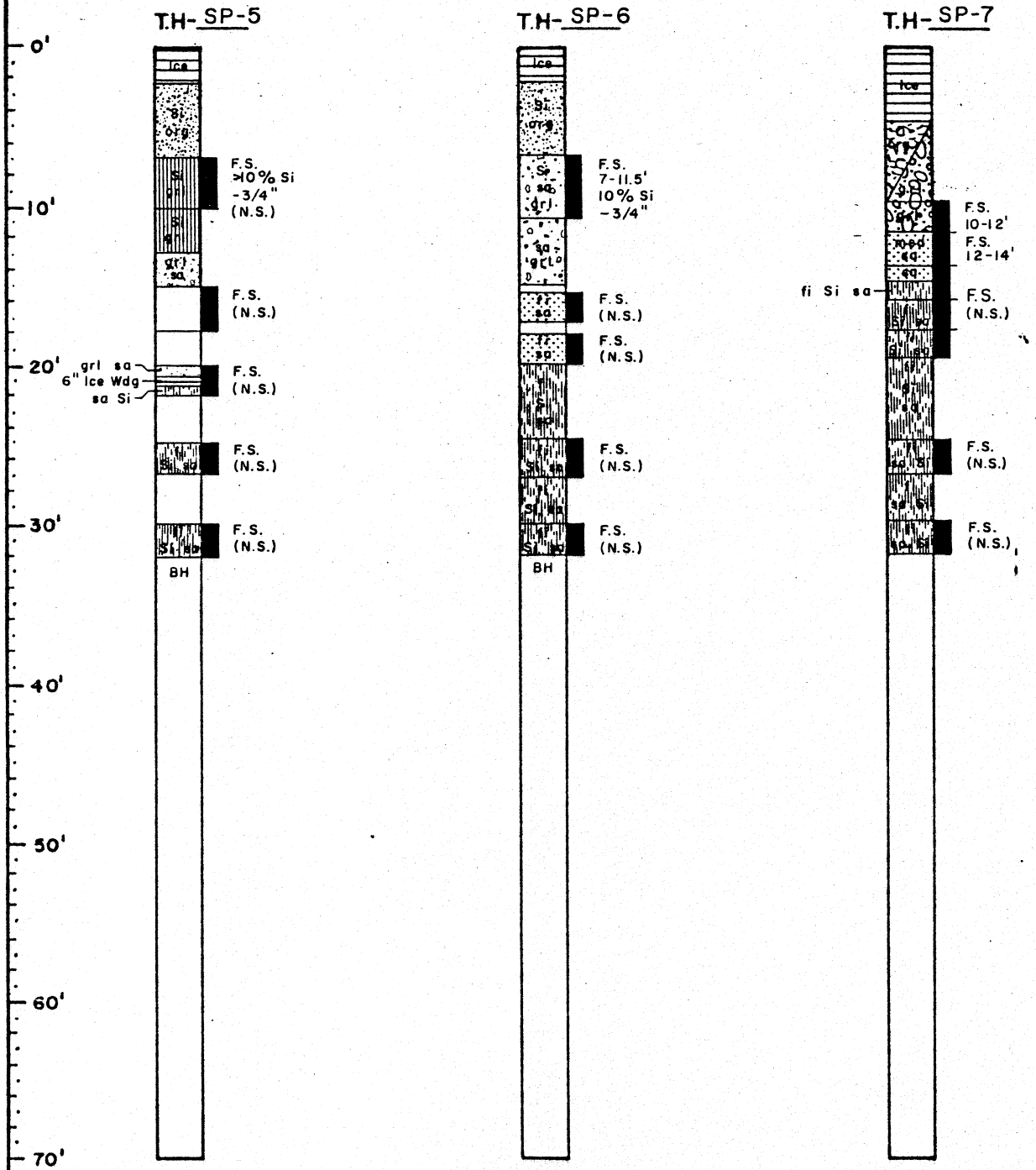
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

SETTLING POND NO. 1

DATE 6-1-84 | SCALE Vert 1" = 10' | FIGURE: 10b

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson — Date-
Driller- Nick Nichols — Weather-
Drill- Mob B-61 on RN-110 Mod. — Temp-
Sampler- 3 1/2" Split Spoon — Wind-
Hammer- 300 lb — Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM
Sec 1 10 S.W. 1/4 N.W. 1/4, N.W. 1/4 S.W. 1/4
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri-gravel	grn-green	fr-frost
sa-sand	bl-blue	pfr-permafrost
Si-silt	gr-grey	bd-bonded
cl-clay	blk-black	
pt-peat	br-brown	
fib-fiberous	y-yellow	
coa-coarse	wh-white	
fi-fine	wtr-water	
cob-cobble	bkn-broken	
peb-pebble	rk-rock	
bld-boulder	org-organic	

T.H Test Hole No.
FS Field Sample (NS) Not Saved
BC Blow Count (--)
Bottom Hole B H

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ANCHORAGE, AK 99501
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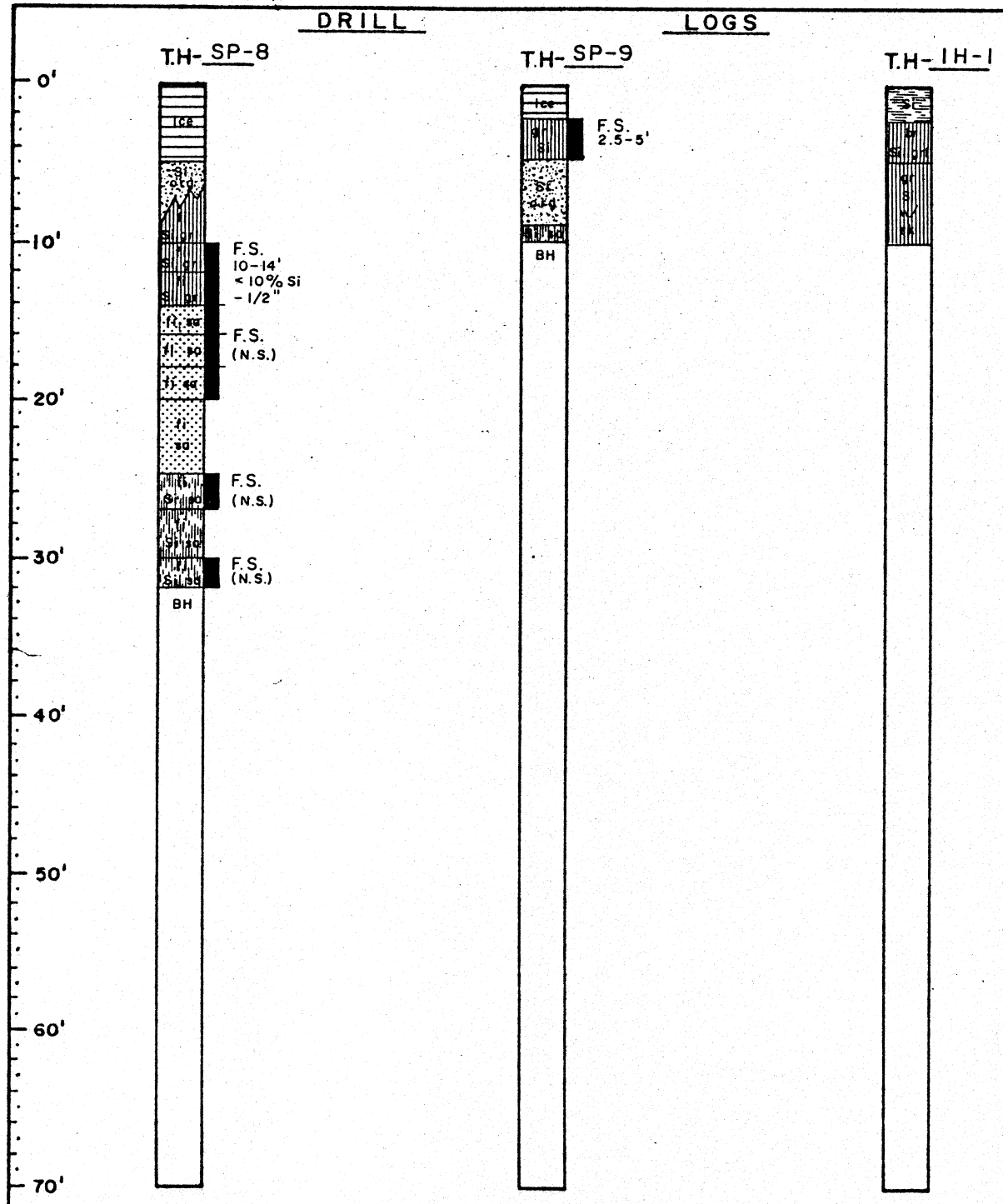
KOTZEBUE LAGOON DREDGE PROJECT

SETTLING POND NO. 1

DATE 6-1-84 | SCALE Vert 1" = 10' | FIGURE: 10c



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp -
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Sec 10 S.W. 1/4 N.W. 1/4, N.W. 1/4 S.W. 1/4	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS
(NS)
BC
(--)
B H

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ANCHORAGE, AK 99501
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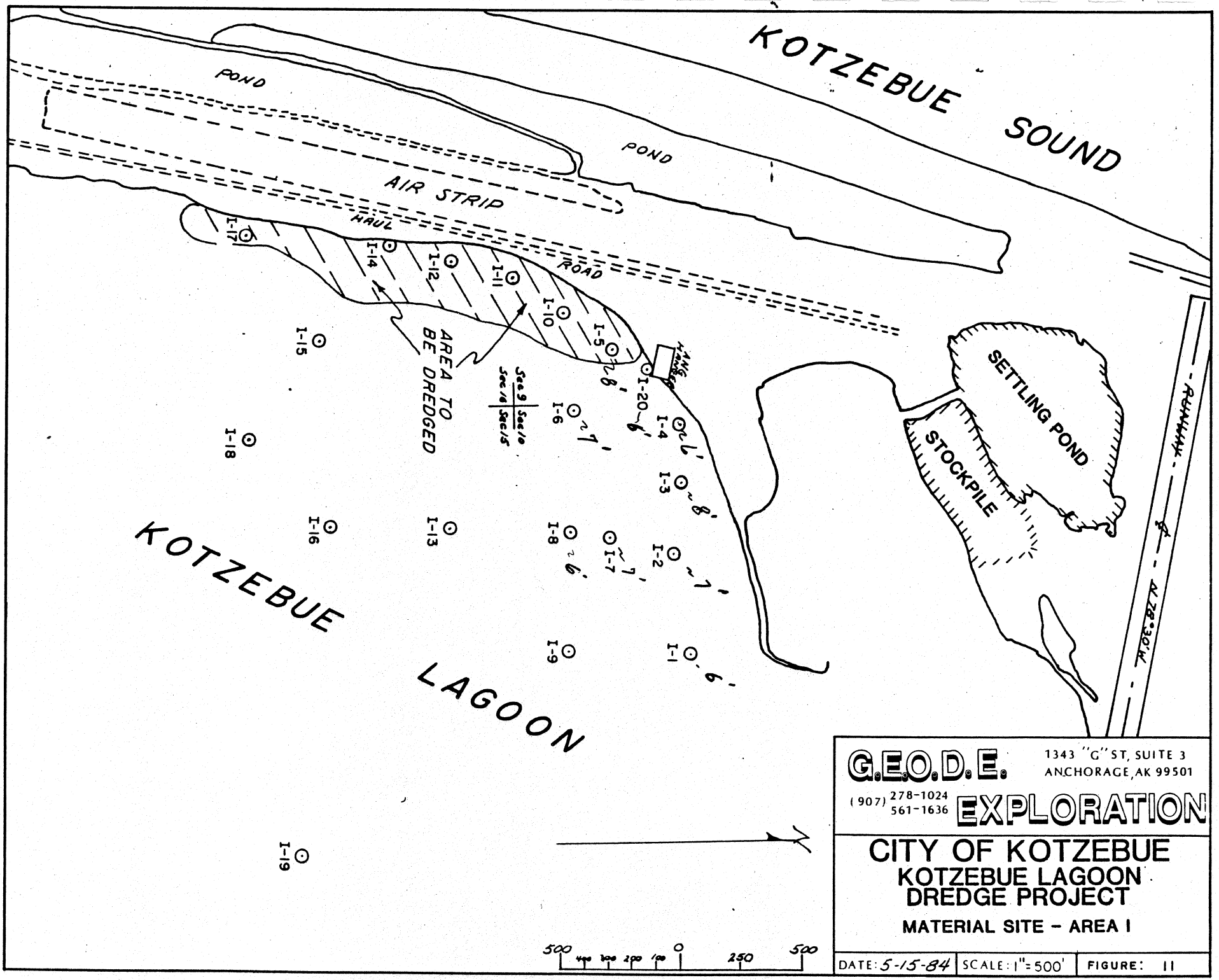
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

SETTLING POND NO. 1

DATE 6-1-84 | SCALE Vert. 1" = 10' | FIGURE: 10d


KOTZEBUE SOUND
POND
POND
AIR STRIP
HAUL ROAD
I-17
I-14
I-12
I-11
I-10
I-5
I-20
I-15
I-18
I-16
I-13
I-6
I-8
I-9
I-4
I-3
I-2
I-7
I-1
I-19
AREA TO BE DREDGED
Sec 9 | Sec 10
Sec 16 | Sec 15
8'
6'
7'
8'
7'
6'
6'
7'
SETTLING POND
STOCKPILE
KOTZEBUE LAGOON
RUNWAY - N 31° 28' 30" W
500 400 300 200 100 0 250 500
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ANCHORAGE, AK 99501
(907) 278-1024
561-1636
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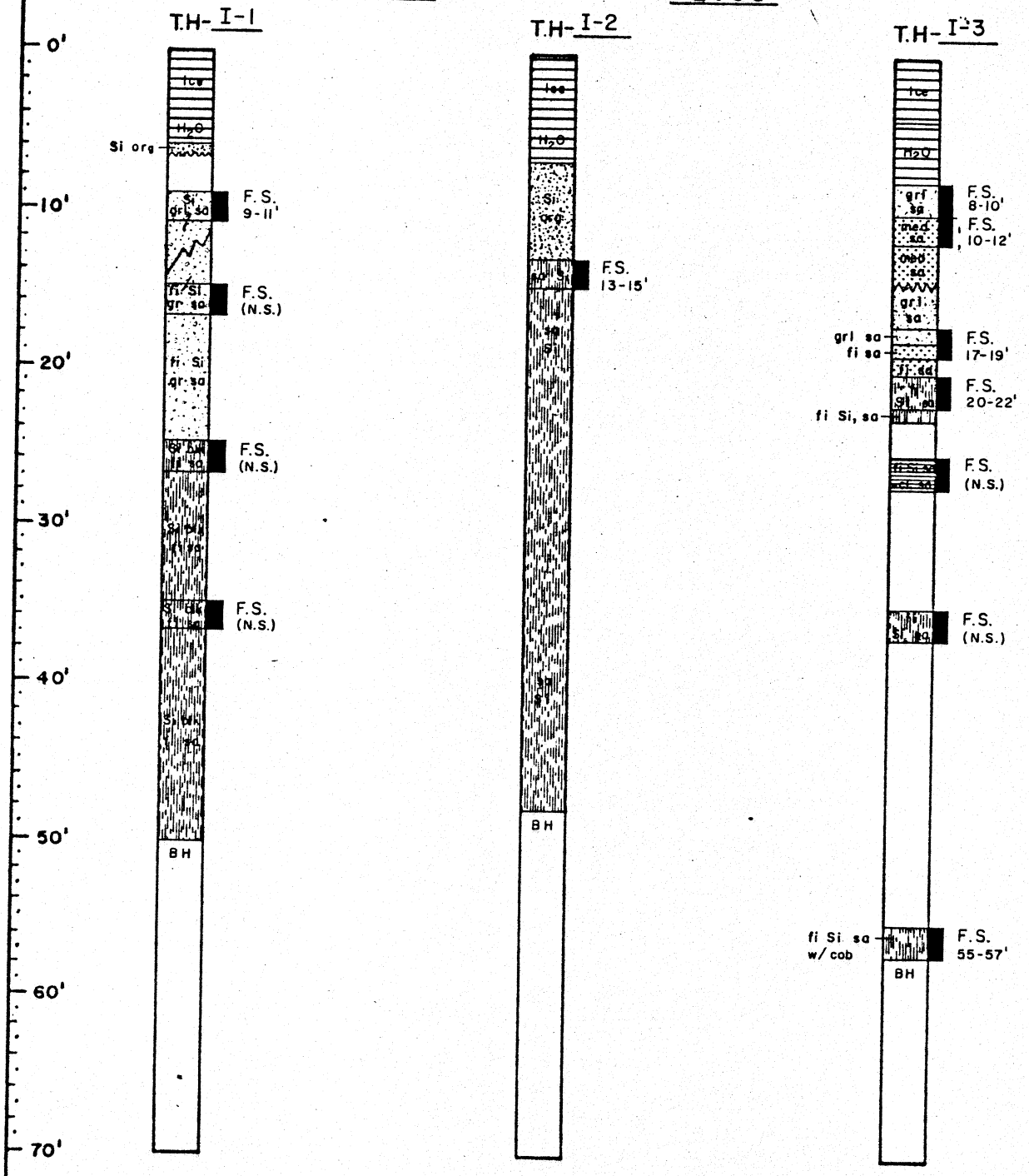
CITY OF KOTZEBUE
KOTZEBUE LAGOON
DREDGE PROJECT
MATERIAL SITE - AREA I
DATE: 5-15-84
SCALE: 1" = 500'
FIGURE: 11

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson
Driller- Nick Nichols
Drill- Mob B-61 on RN-110 Mod.
Sampler- 3 1/2" Split Spoon
Hammer- 300 lb
Land Descn.- T. 17 N., R. 18 W., KRM
Ptn. Sec. 9, 10, 15 & 16
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson

Date-
Weather-
Temp-
Wind-
Field Book-

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H. Test Hole No.
FS Field Sample
(NS) Not Saved
BC (---) Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 "G" ST, SUITE 3
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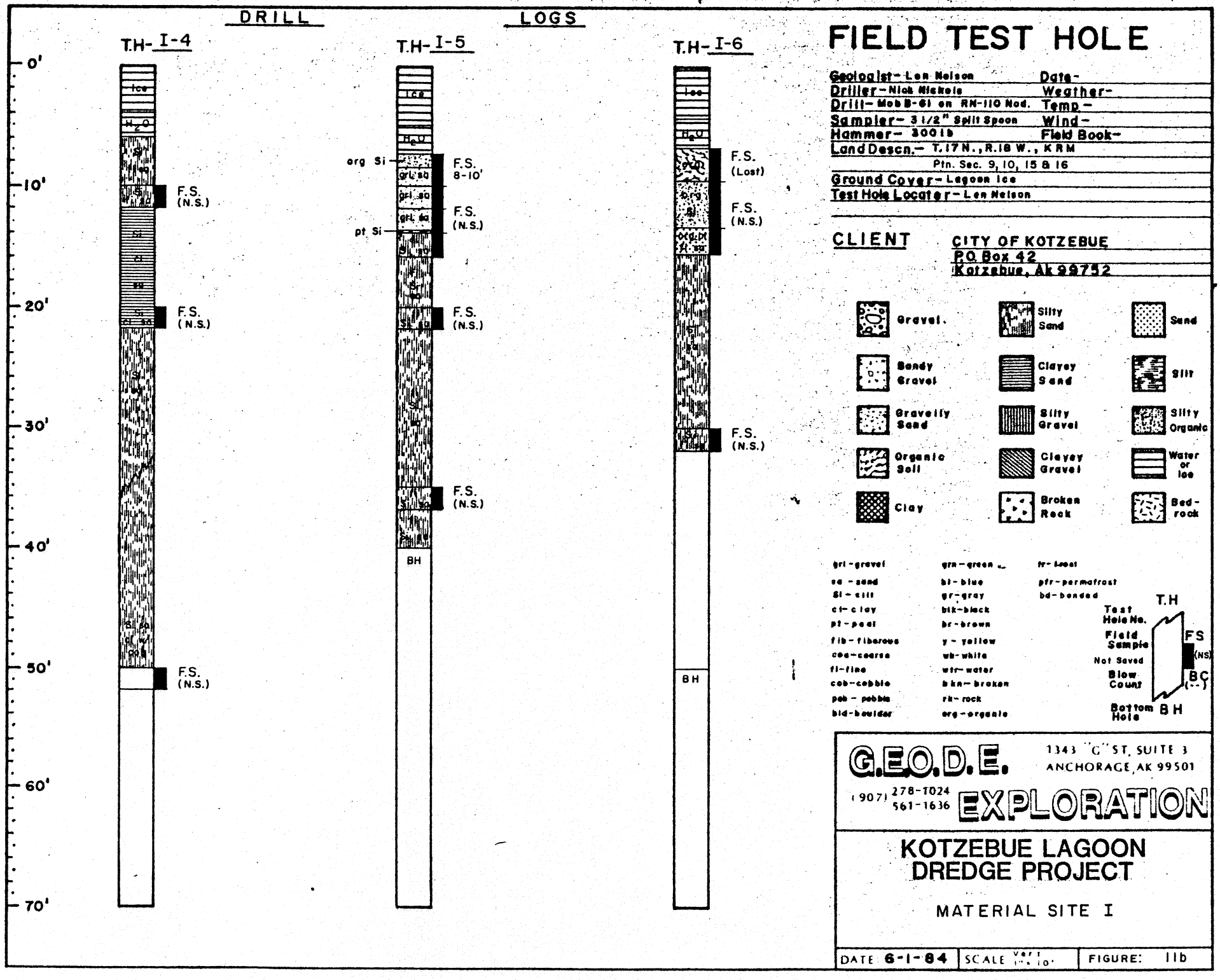
KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE I

DATE 6-1-84 | SCALE | FIGURE: IIa


DRILL LOGS
T.H-I-4
T.H-I-5
T.H-I-6
0'
10'
20'
30'
40'
50'
60'
70'
F.S. (N.S.)
org Si
pt Si
F.S. 8-10'
BH
F.S. (Lost)
FIELD TEST HOLE
Geologist- Len Nelson
Date-
Driller- Nick Nichols
Weather-
Drill- Mob B-61 on RN-110 Mod.
Temp -
Sampler- 3 1/2" Split Spoon
Wind -
Hammer- 300 lb
Field Book-
Land Descn.- T.17N., R.18 W., KRM
Ptn. Sec. 9, 10, 15 & 16
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson
CLIENT
CITY OF KOTZEBUE
PO Box 42
Kotzebue, Ak 99752
Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock
gri-gravel
sa-sand
si-silt
cl-clay
pt-peat
fib-fiberous
coa-coarse
fi-fine
cob-cobble
peb-pebble
bld-boulder
grn-green
bl-blue
gr-gray
blk-black
br-brown
y-yellow
wh-white
wtr-water
bkn-broken
rk-rock
org-organic
fr-frost
pfr-permafrost
bd-bonded
T.H
Test Hole No.
Field Sample
FS
(NS)
Not Saved
Blow Count
BC
(--)
Bottom Hole
B H
G.E.O.D.E.
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
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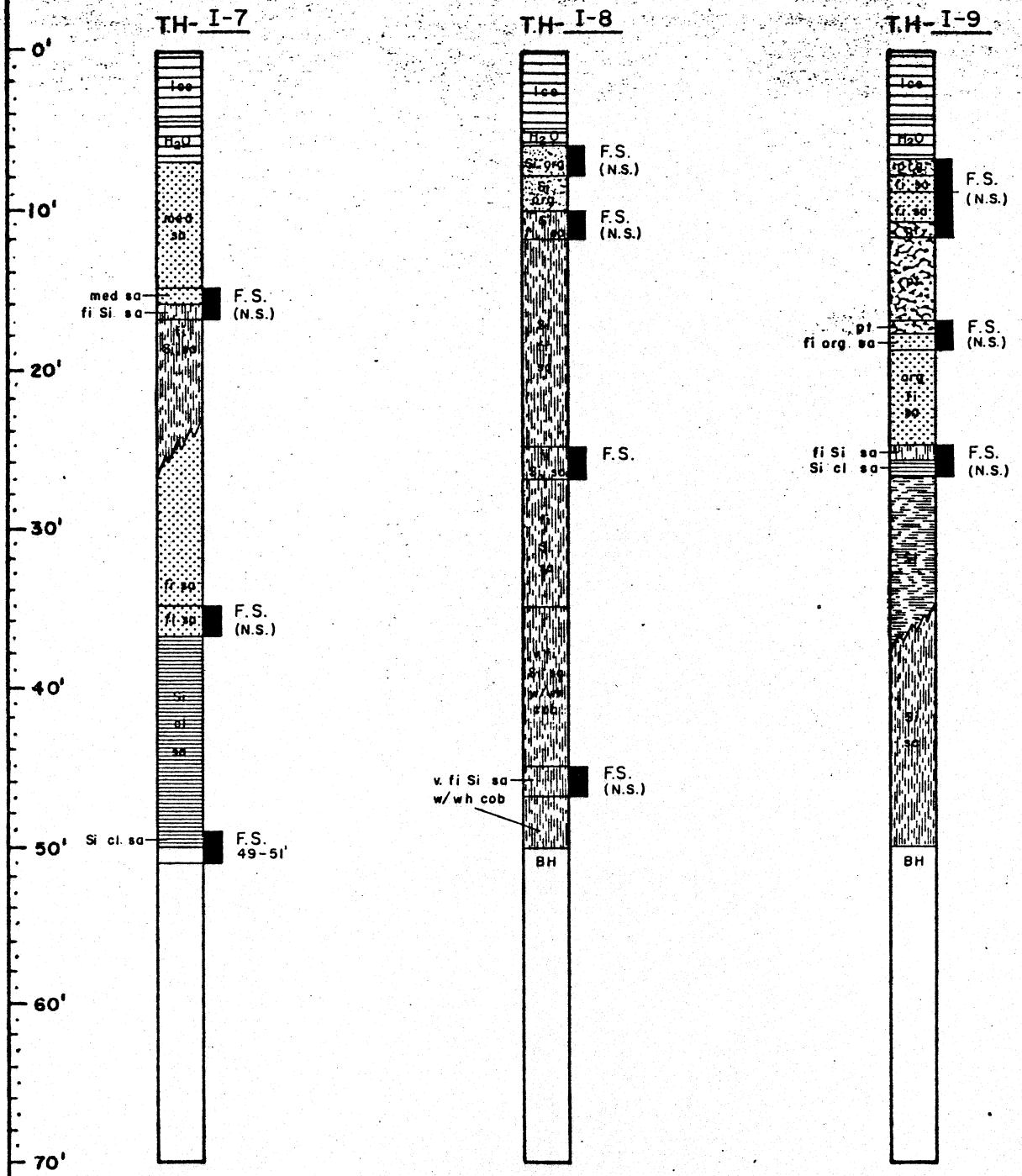
EXPLORATION
KOTZEBUE LAGOON
DREDGE PROJECT
MATERIAL SITE I
DATE 6-1-84
SCALE Vert 1" = 10'
FIGURE: 11b

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelsen	Date-
Driller- Nick Nickols	Weather-
Drill- Mob B-61 on RN-110 Mod.	Temp -
Sampler- 3 1/2" Split Spoon	Wind -
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM Ptn Sec. 9, 10, 15 & 16	
Ground Cover- Lagoon Ice	
Test Hole Locator- Len Nelsen	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

grl - gravel	grn - green	fr - frost
sd - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fibrous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	brk - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H — Test Hole No.
FS — Field Sample (NS) Not Saved
BC (--) Blow Count
BH — Bottom Hole

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1343 G ST, SUITE 3
ANCHORAGE AK 99501
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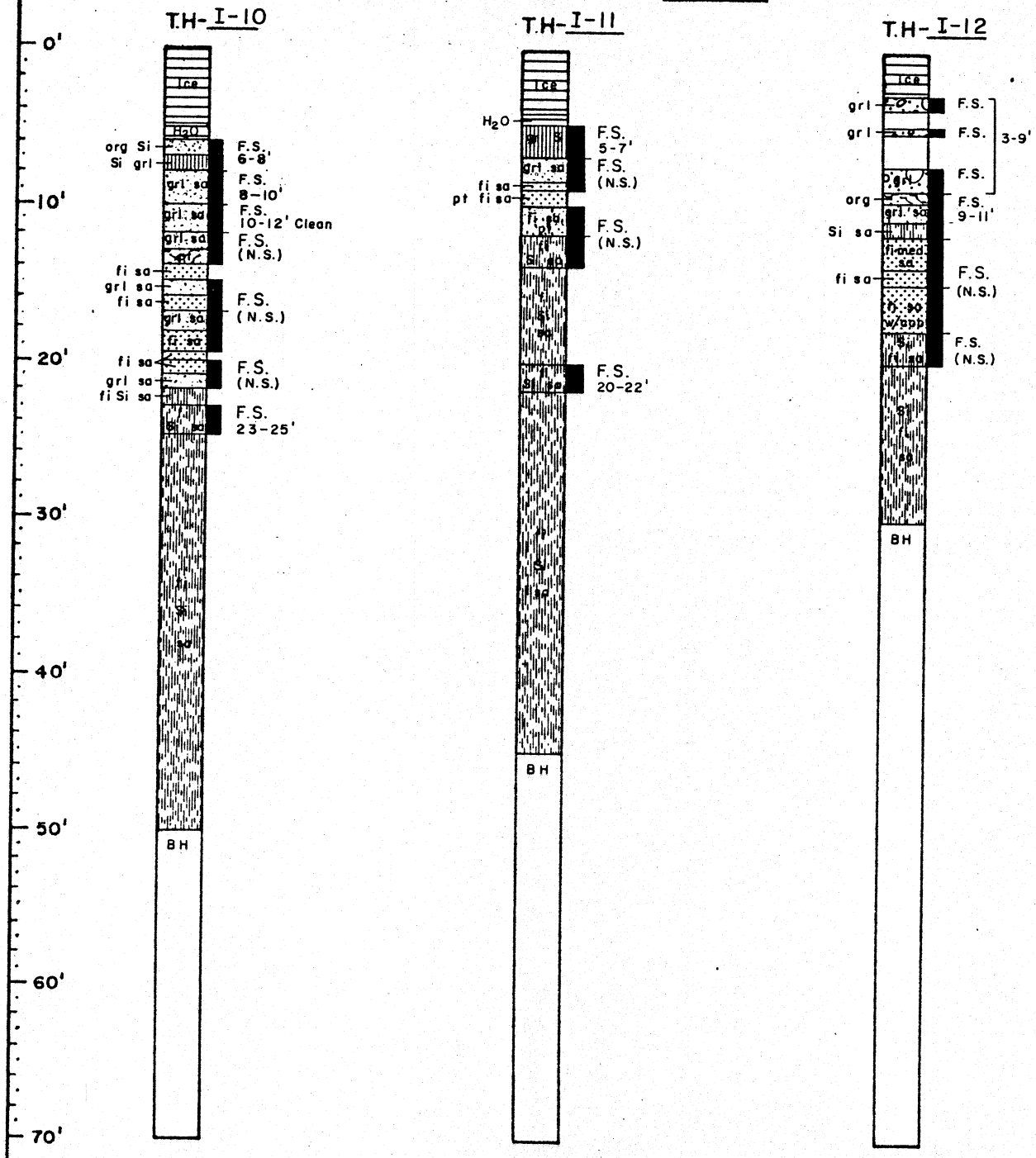
KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE I

DATE 6-1-84 | SCALE Vert 1" = 10' | FIGURE: IIc

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Mod.	Temp.-
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Ptn. Sec. 9, 10, 15 & 16	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

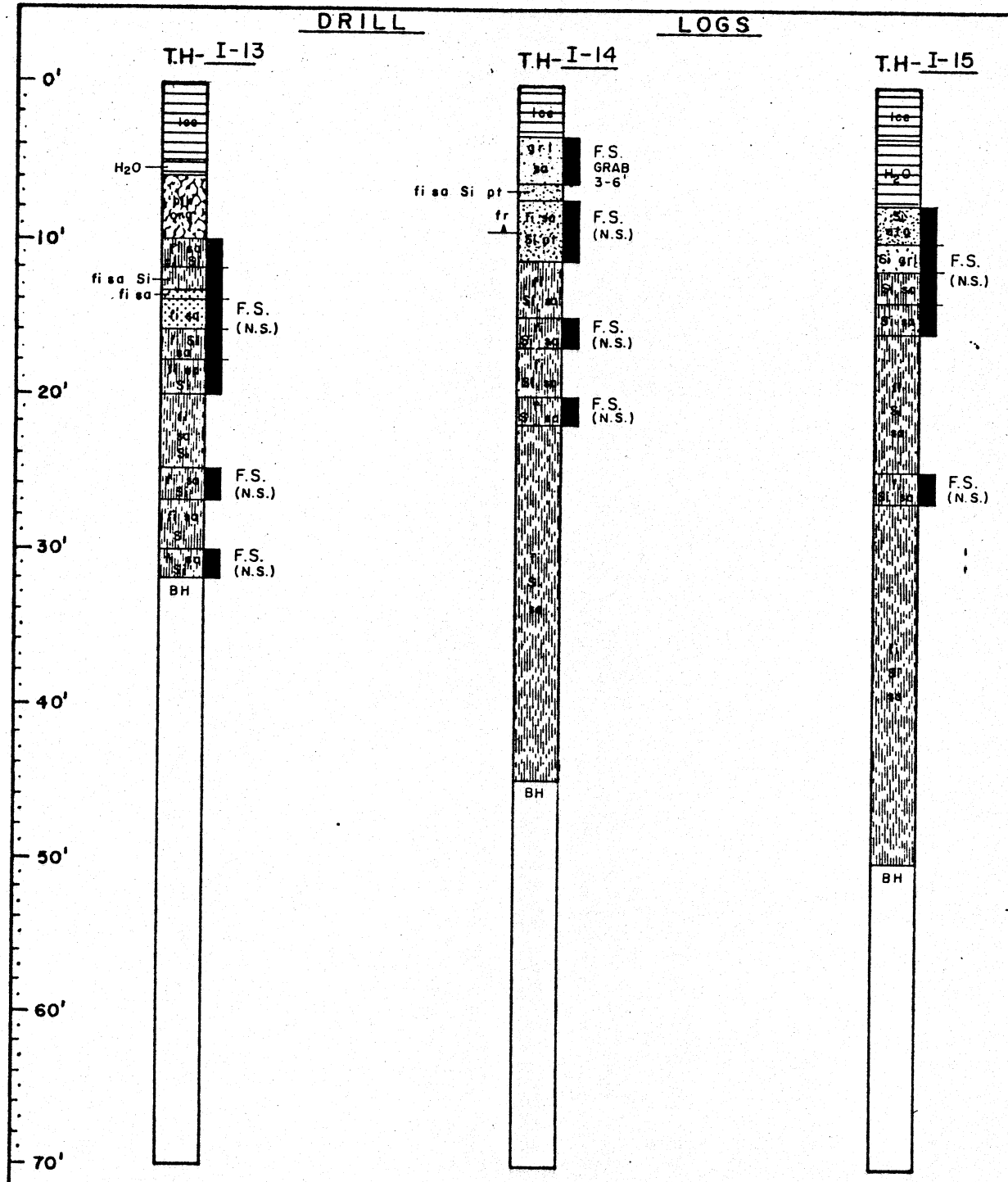
T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS
(NS)
BC
(--)
BH

G.E.O.D.E.
1343 'G' ST SUITE 3
ANCHORAGE AK 99501
907 278-1024
561-1636
EXPLORATION

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE I

DATE 6-1-84 | SCALE [illegible] | FIGURE: IId



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Mod.	Temp -
Sampler- 3 1/2" Split Spoon	Wind -
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Ptn. Sec. 9, 10, 15 & 16	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - grey	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
BH
FS
(NS)
BC
(--)

G.E.O.D.E. EXPLORATION
1343 "G" ST. SUITE 3
ANCHORAGE, AK 99501
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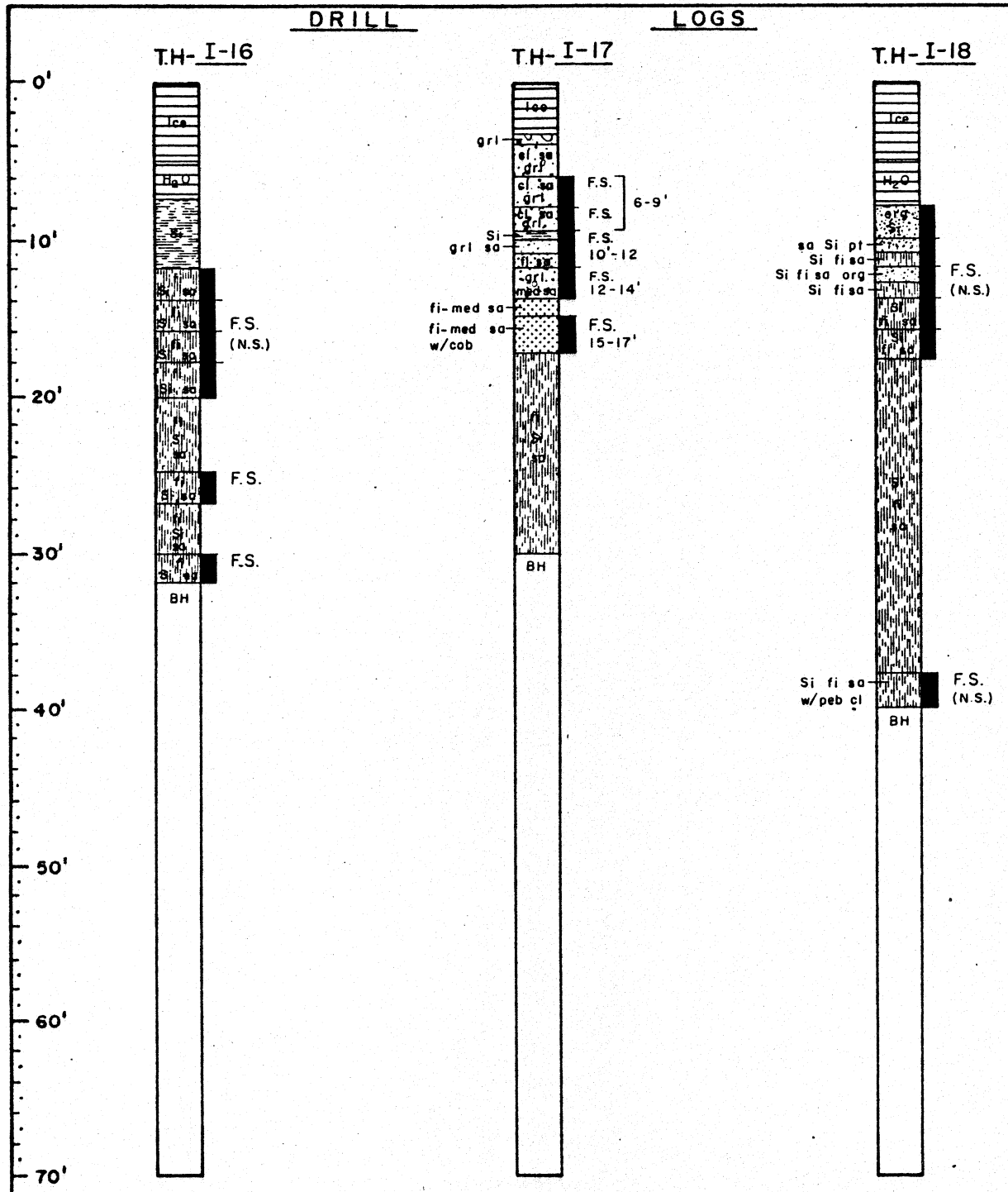
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE I

DATE 6-1-84 | SCALE Vert. 1in. | FIGURE: IIe



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp-
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Ptn. Sec. 9, 10, 15 & 16	
Ground Cover- Lagoon Ice	
Test Hole Locator- Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri-gravel
sa-sand
Si-silt
cl-clay
pt-peat
fib-fiberous
coa-coarse
fi-fine
cob-cobble
peb-pebble
bld-boulder

grn-green
bl-blue
gr-gray
blk-black
br-brown
y-yellow
wh-white
wtr-water
bkn-broken
rk-rock
org-organic

fr-Frost
pfr-permafrost
bd-bonded

T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS
(NS)
BC
(--)
BH

G.E.O.D.E. EXPLORATION
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
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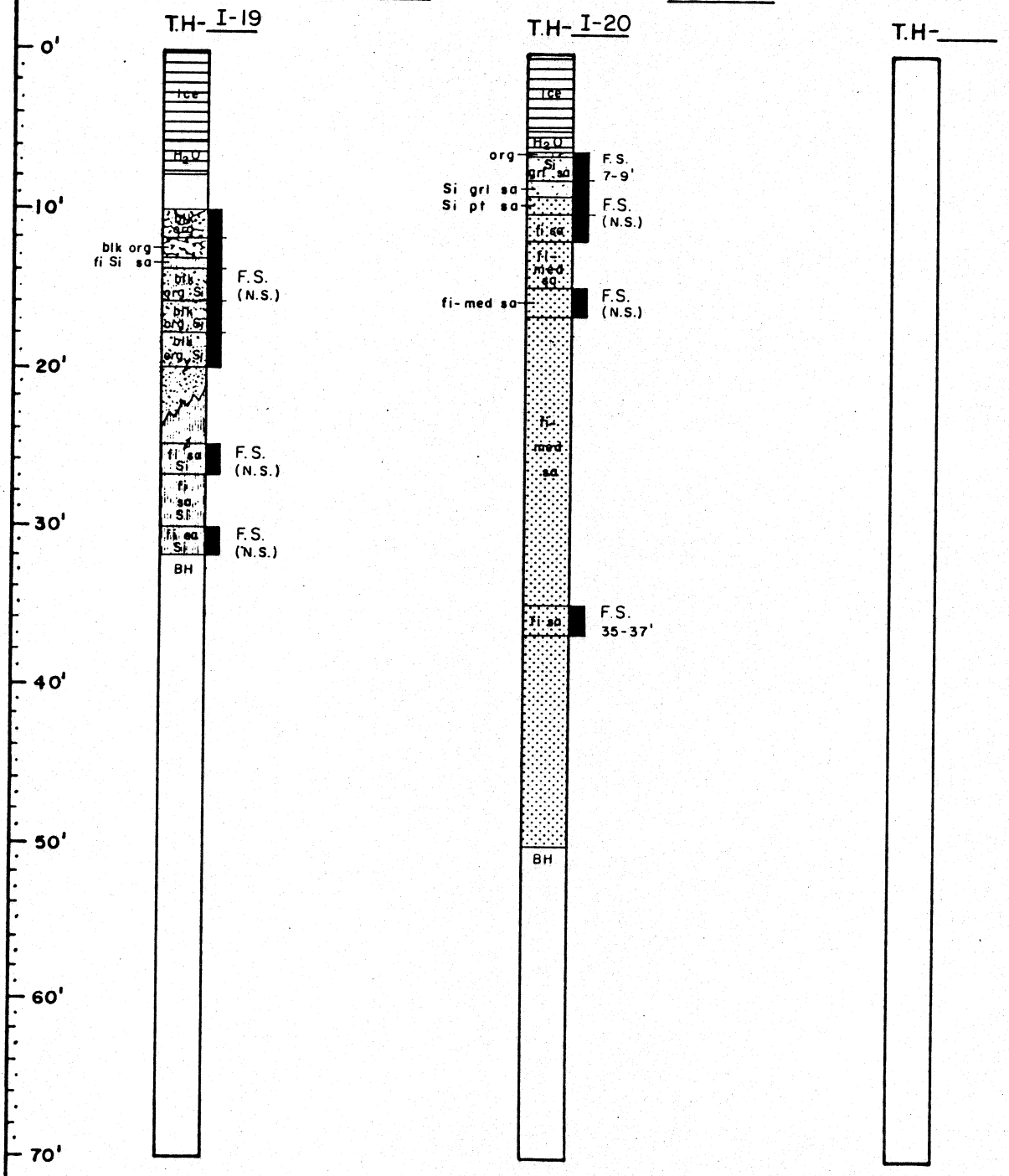
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE I

DATE 6-1-84 | SCALE Vert 1"=10' | FIGURE: IIf

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson
Driller- Nick Nichols
Drill- Mob B-61 on RN-110 Nod.
Sampler- 3 1/2" Split Spoon
Hammer- 300 lb
Land Descn.- T. 17 N., R. 18 W., KRM
Ptn. Sec. 9, 10, 15 & 16
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson

Date-
Weather-
Temp.-
Wind-
Field Book-

CLIENT
CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - grey
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS
(NS)
BC
(--)
BH

G.E.O.D.E.
1343 "G" ST. SUITE 3
ANCHORAGE, AK 99501
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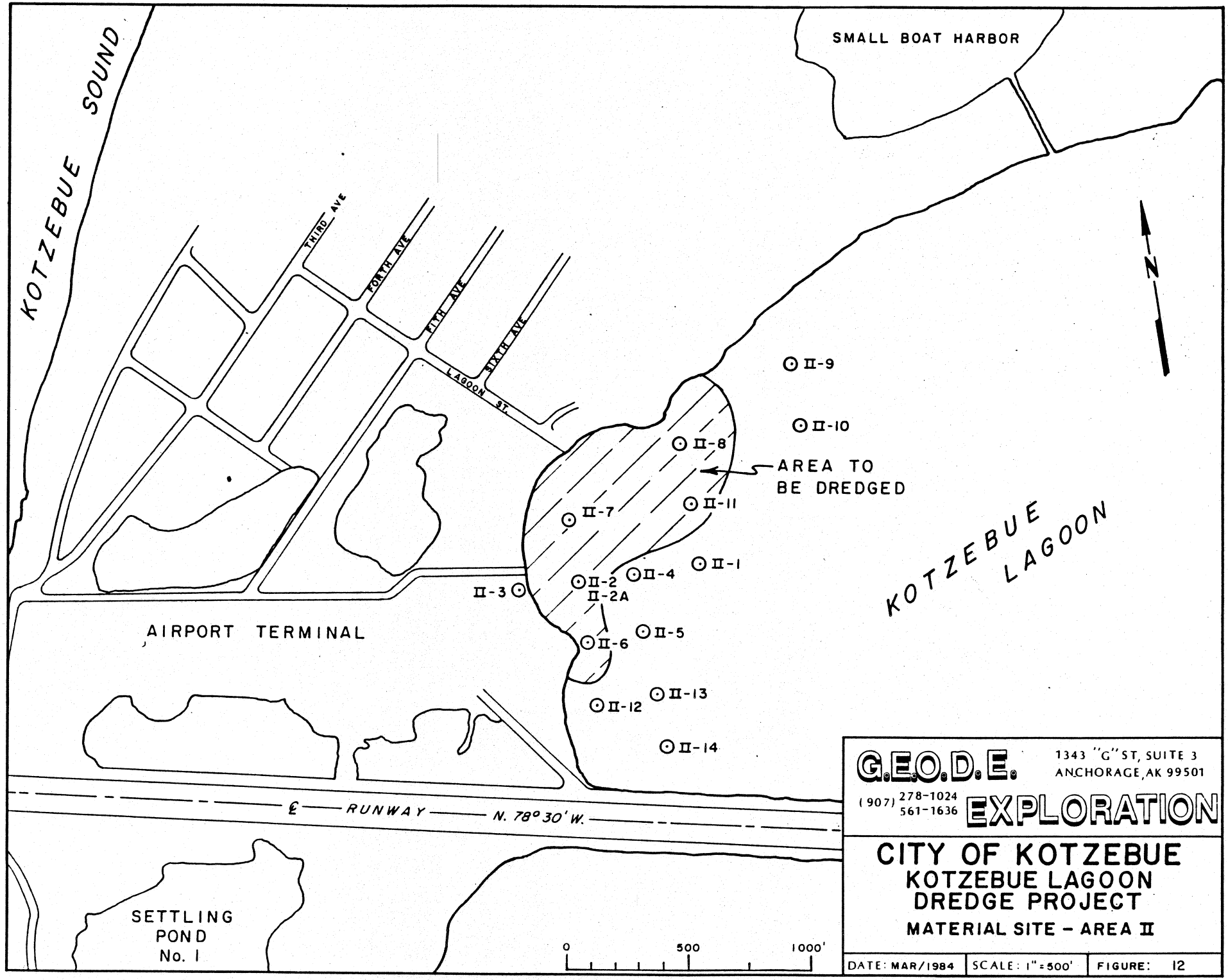
561-1636
EXPLORATION

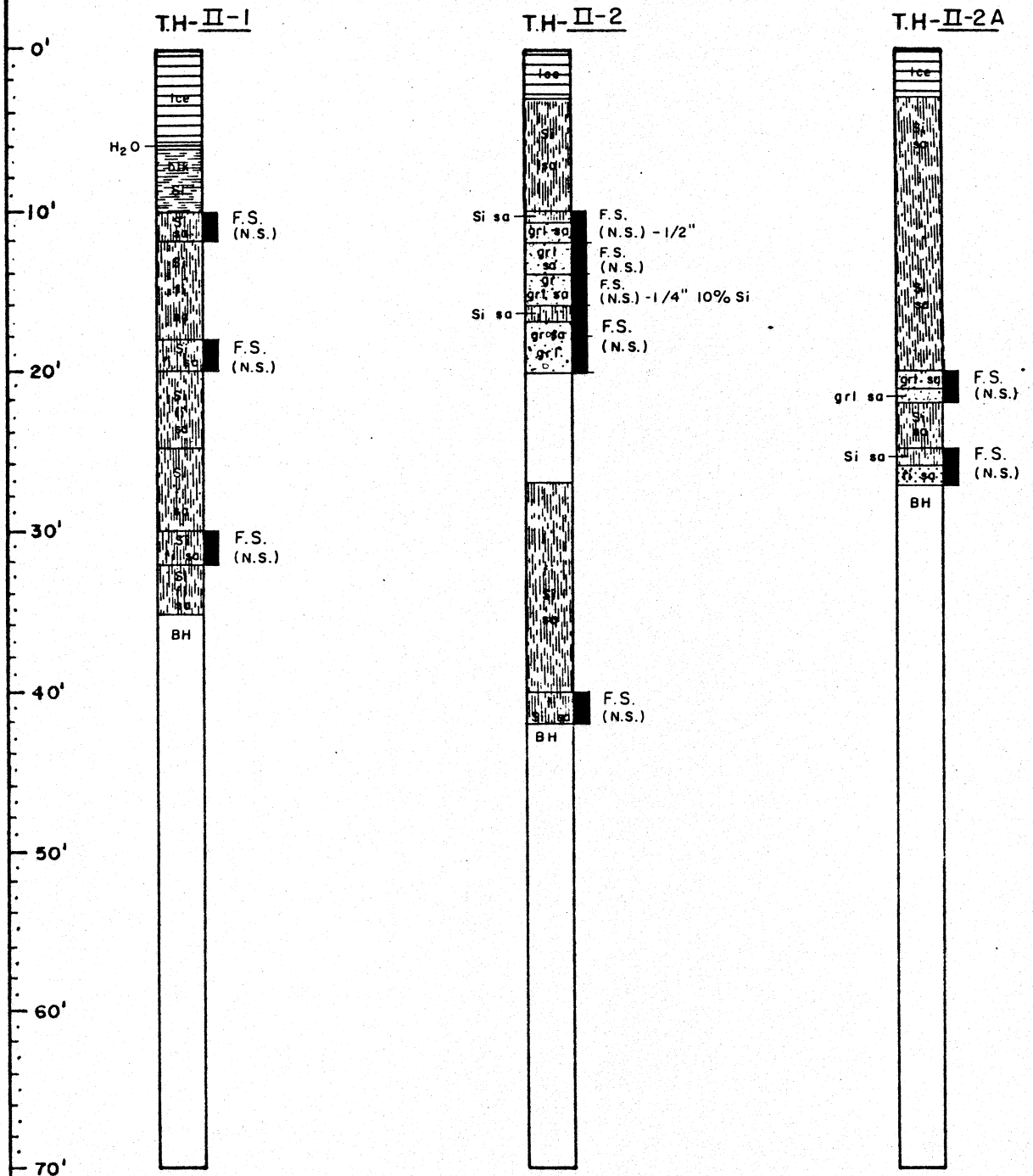
KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE I

DATE 6-1-84 | SCALE Very little | FIGURE: 11g


KOTZEBUE SOUND
SMALL BOAT HARBOR
THIRD AVE
FOURTH AVE
FIFTH AVE
SIXTH AVE
LAGOON ST.
N
II-9
II-10
II-8
AREA TO BE DREDGED
II-11
II-7
II-1
II-4
II-2
II-2A
II-3
AIRPORT TERMINAL
II-5
II-6
II-13
II-12
II-14
KOTZEBUE LAGOON
℄ RUNWAY N. 78° 30' W.
SETTLING POND No. 1
0
500
1000'
G.E.O.D.E.
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636
EXPLORATION
CITY OF KOTZEBUE
KOTZEBUE LAGOON
DREDGE PROJECT
MATERIAL SITE – AREA II
DATE: MAR/1984
SCALE: 1"=500'
FIGURE: 12

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp -
Sampler- 3 1/2" Split Spoon	Wind -
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Sec : 10	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

grl - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H Test Hole No.
FS Field Sample
(NS) Not Saved
BC Blow Count
(---) Bottom Hole
B H

G.E.O.D.E. EXPLORATION
1343 'G' ST. SUITE 3
ANCHORAGE AK 99501
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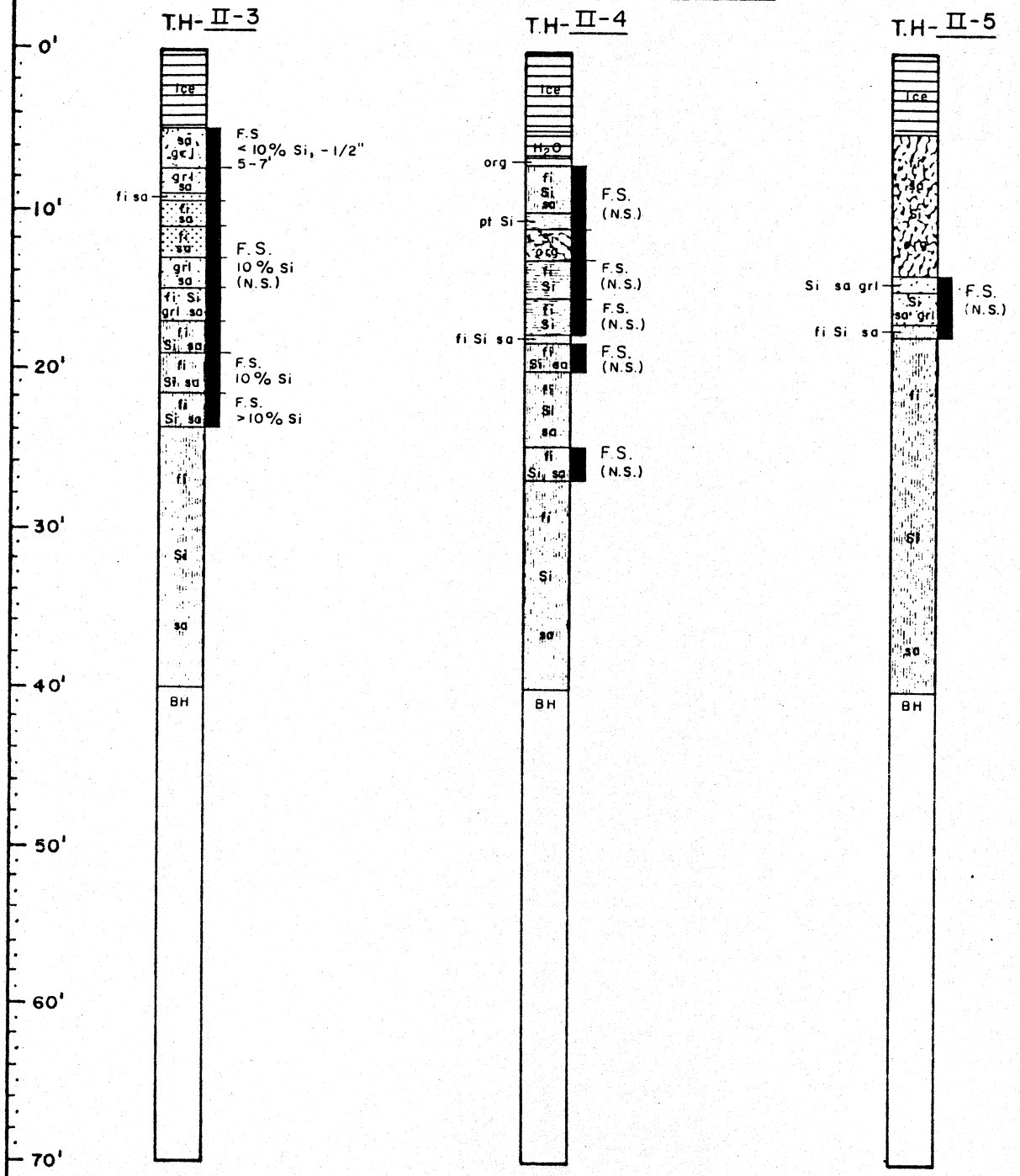
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE II

DATE 6-1-84 | SCALE Vert. 1" = 10' | FIGURE: 12a

DRILL LOGS



FIELD TEST HOLE

Geologist - Len Nelson — Date -
Driller - Nick Nichols — Weather -
Drill - Mob B-61 on RN-110 Nod. — Temp -
Sampler - 3 1/2" Split Spoon — Wind -
Hammer - 300 lb — Field Book -
Land Descn. - T. 17 N., R. 18 W., KRM
Sec 10
Ground Cover - Lagoon Ice
Test Hole Locater - Len Nelson

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel | Silty Sand | Sand
Sandy Gravel | Clayey Sand | Silt
Gravelly Sand | Silty Gravel | Silty Organic
Organic Soil | Clayey Gravel | Water or Ice
Clay | Broken Rock | Bed-rock

grl - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
f - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

T.H — Test Hole No.
FS — Field Sample
(NS) — Not Saved
BC (--) — Blow Count
BH — Bottom Hole

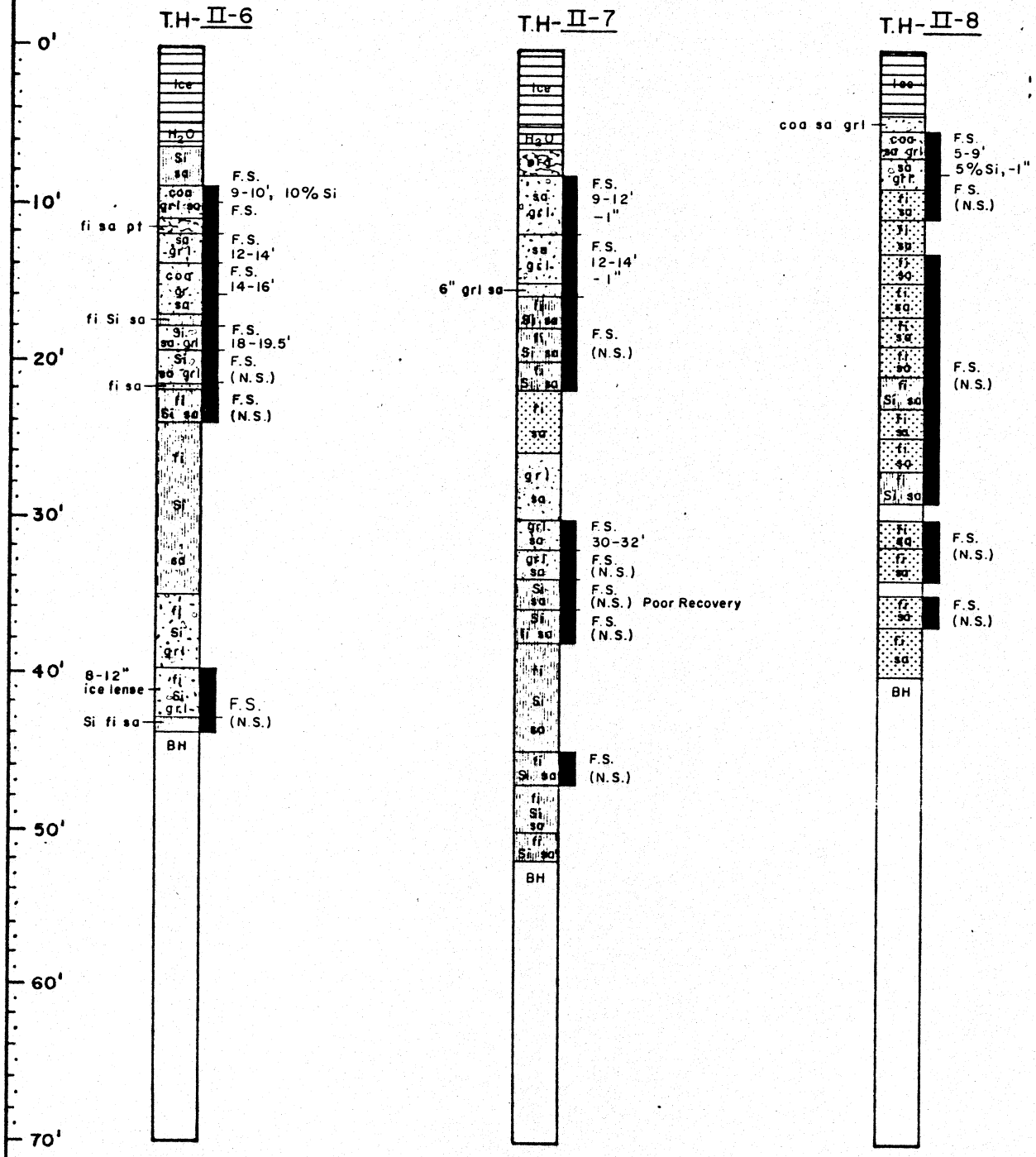
G.E.O.D.E.
3340 C ST SUITE 3
ANCHORAGE AK 99501
907-278-1024
561-1636
EXPLORATION

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE II

DATE 6-1-84 | SCALE Vert. | FIGURE: 12b

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson — Date-
Driller- Nick Nichols — Weather-
Drill- Mob B-61 on RN-110 Nod. — Temp-
Sampler- 3 1/2" Split Spoon — Wind-
Hammer- 300 lb — Field Book-
Land Descn.- T. 17 N., R. 18 W., K R M
Sec 10
Ground Cover- Lagoon Ice
Test Hole Locater- Len Nelson

CLIENT
CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

grl - gravel	grn - green	fr - frost
sa - sand	bl - blue	ptr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

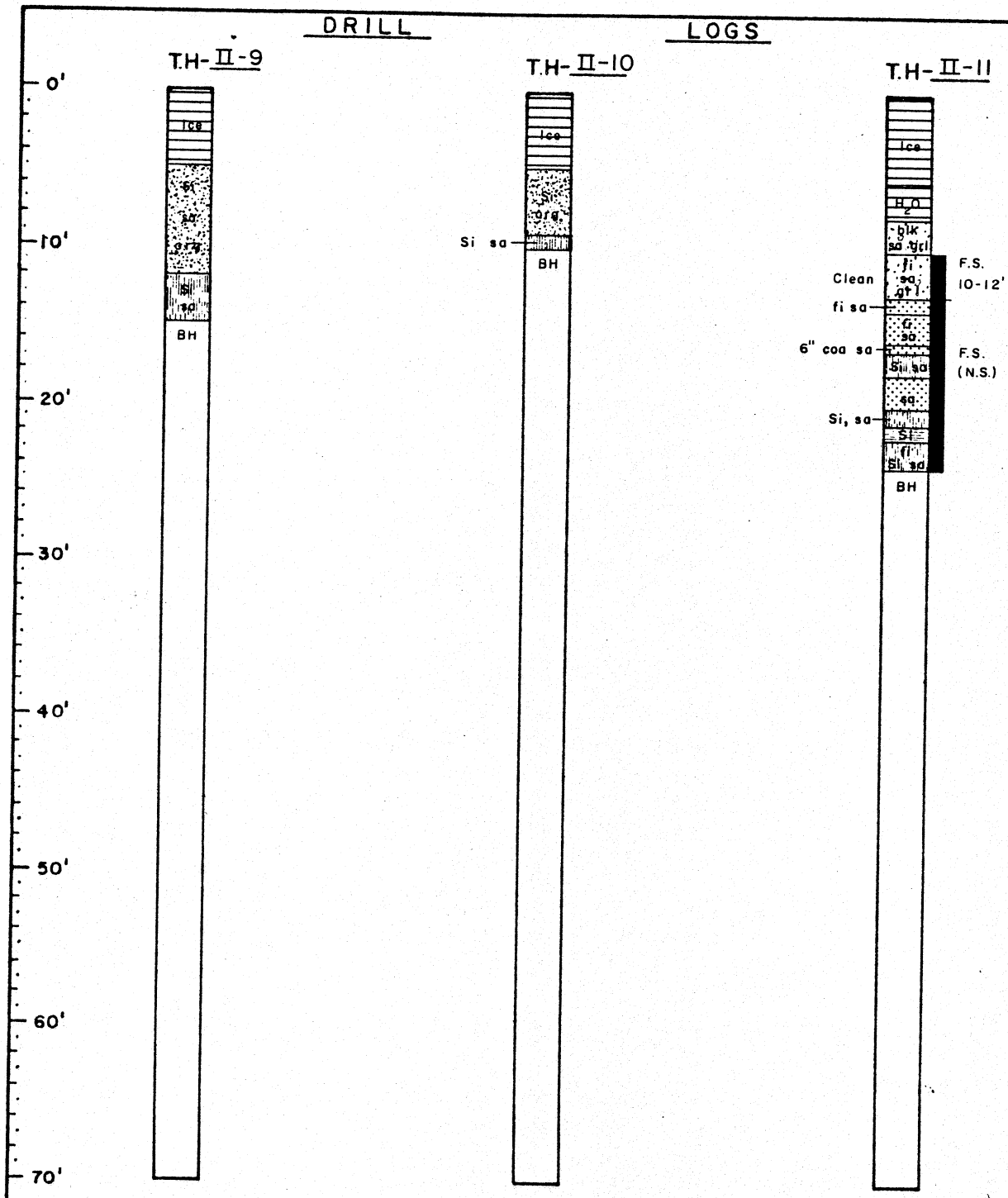
T.H — Test Hole No.
Field Sample — Not Saved
Blow Count
Bottom Hole B H
FS (NS)
BC (--)

G.E.O.D.E. EXPLORATION
1343 'C' ST. SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE II

DATE 6-1-84 | SCALE [illegible] | FIGURE: 12c



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Michels	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp -
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM Sec 10	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS
(NS)
BC
(--)
B H

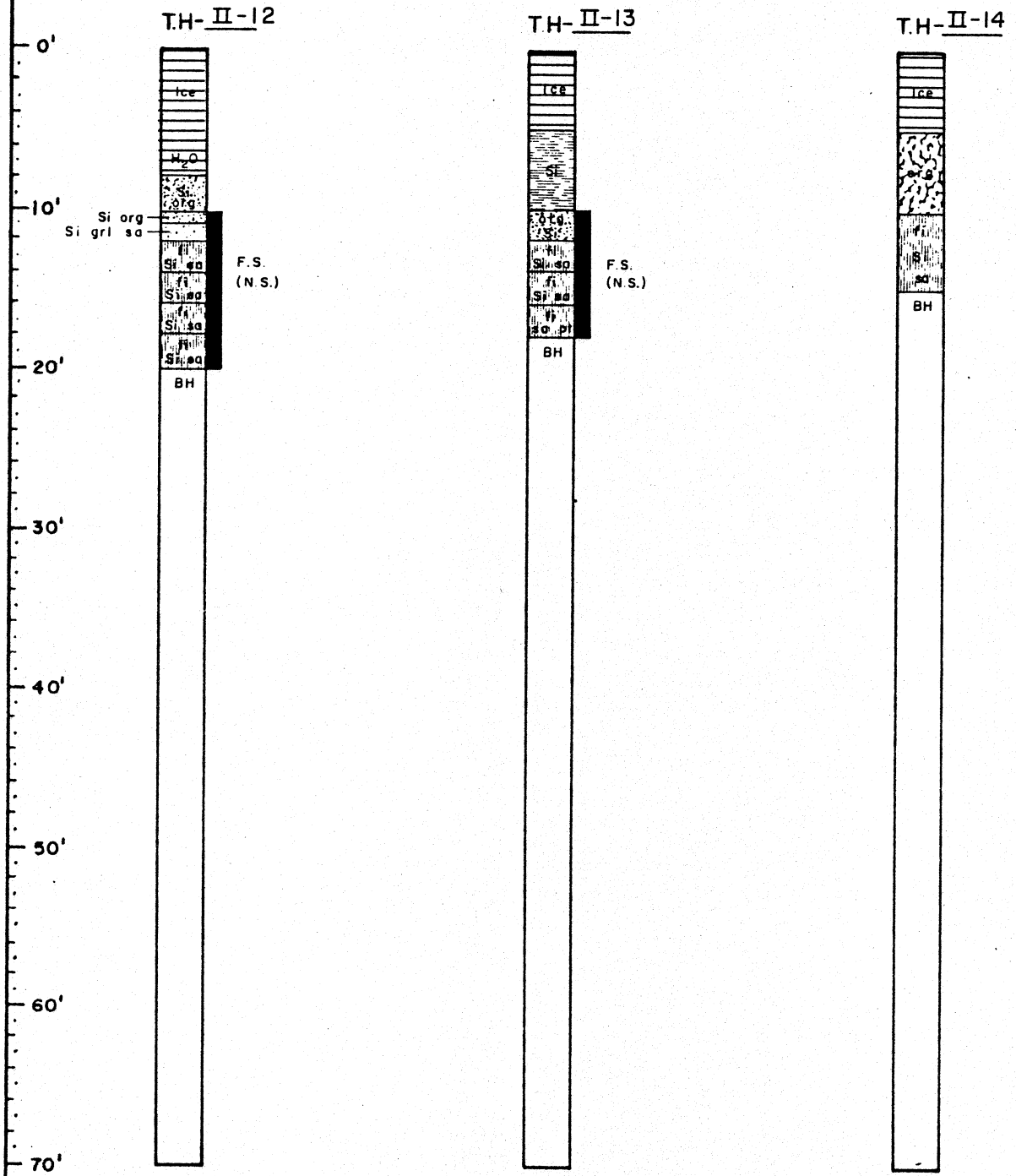
G.E.O.D.E. EXPLORATION
1343 'G' ST. SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1616

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE II

DATE 6-1-84 | SCALE Vert. | FIGURE: 12d

DRILL LOGS



FIELD TEST HOLE

Geologist - Len Nelson	Date -
Driller - Nick Nichols	Weather -
Drill - Mob B-61 on RN-110 Nod.	Temp -
Sampler - 3 1/2" Split Spoon	Wind -
Hammer - 300 lb	Field Book -
Land Descn. - T. 17 N., R. 18 W., KRM	
Sec 10	
Ground Cover - Lagoon Ice	
Test Hole Locater - Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

grl - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

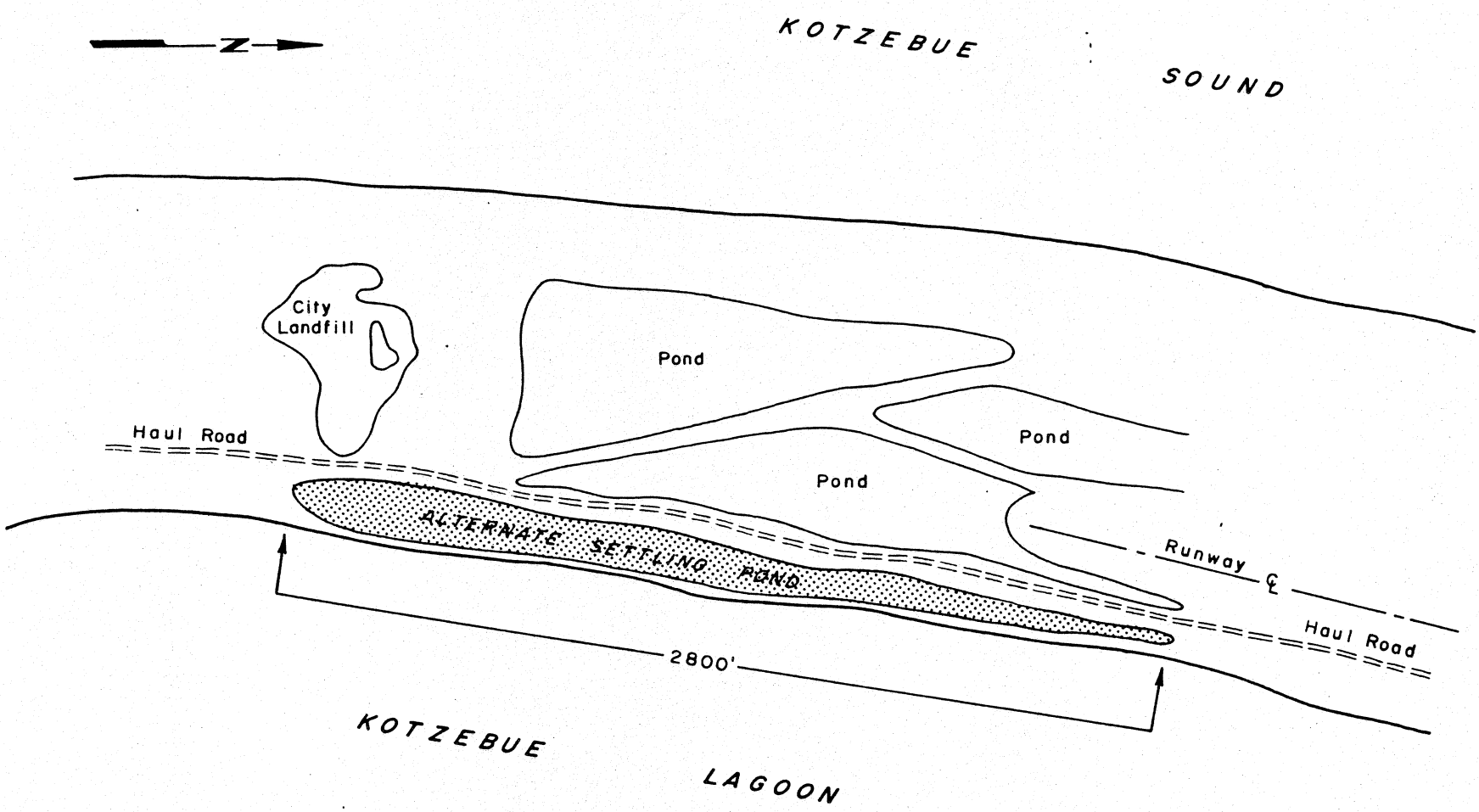
T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
BH
FS
(NS)
BC
(--)

G.E.O.D.E. EXPLORATION
1343 'G' ST SUITE 3
ANCHORAGE AK 99501
907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE II

DATE 6-1-84 | SCALE Vert 1"=10' | FIGURE: 12e



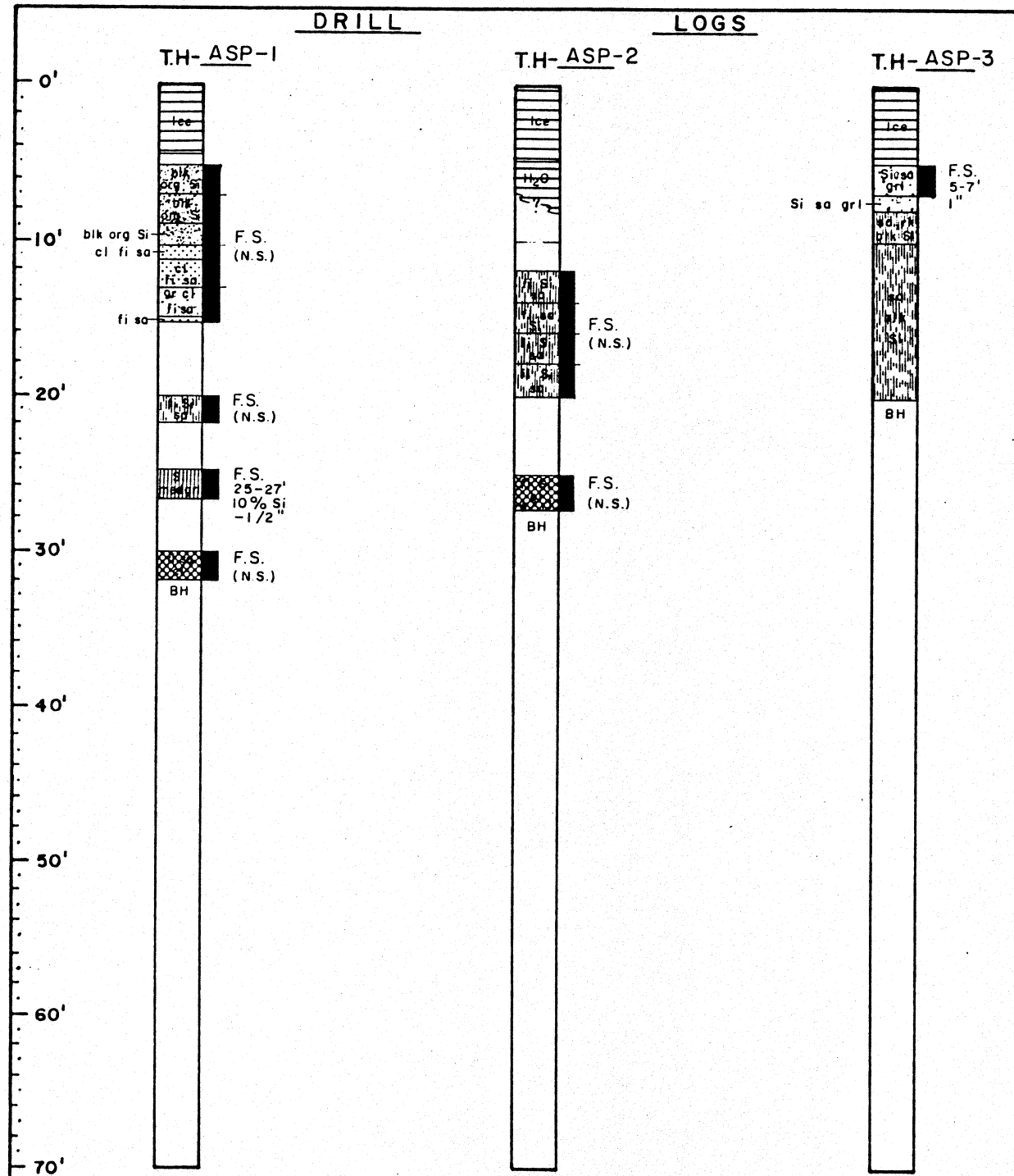
Sec. 21	Sec. 16
Sec. 22	Sec. 15

0 500 1000'

G.E.O.D.E. EXPLORATION
1343 "G" ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

CITY OF KOTZEBUE
KOTZEBUE LAGOON DREDGE PROJECT
ALTERNATE SETTLING POND

DATE: 5/15/84 | SCALE: 1"=500' | FIGURE: 13



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp-
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM Sec 16	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

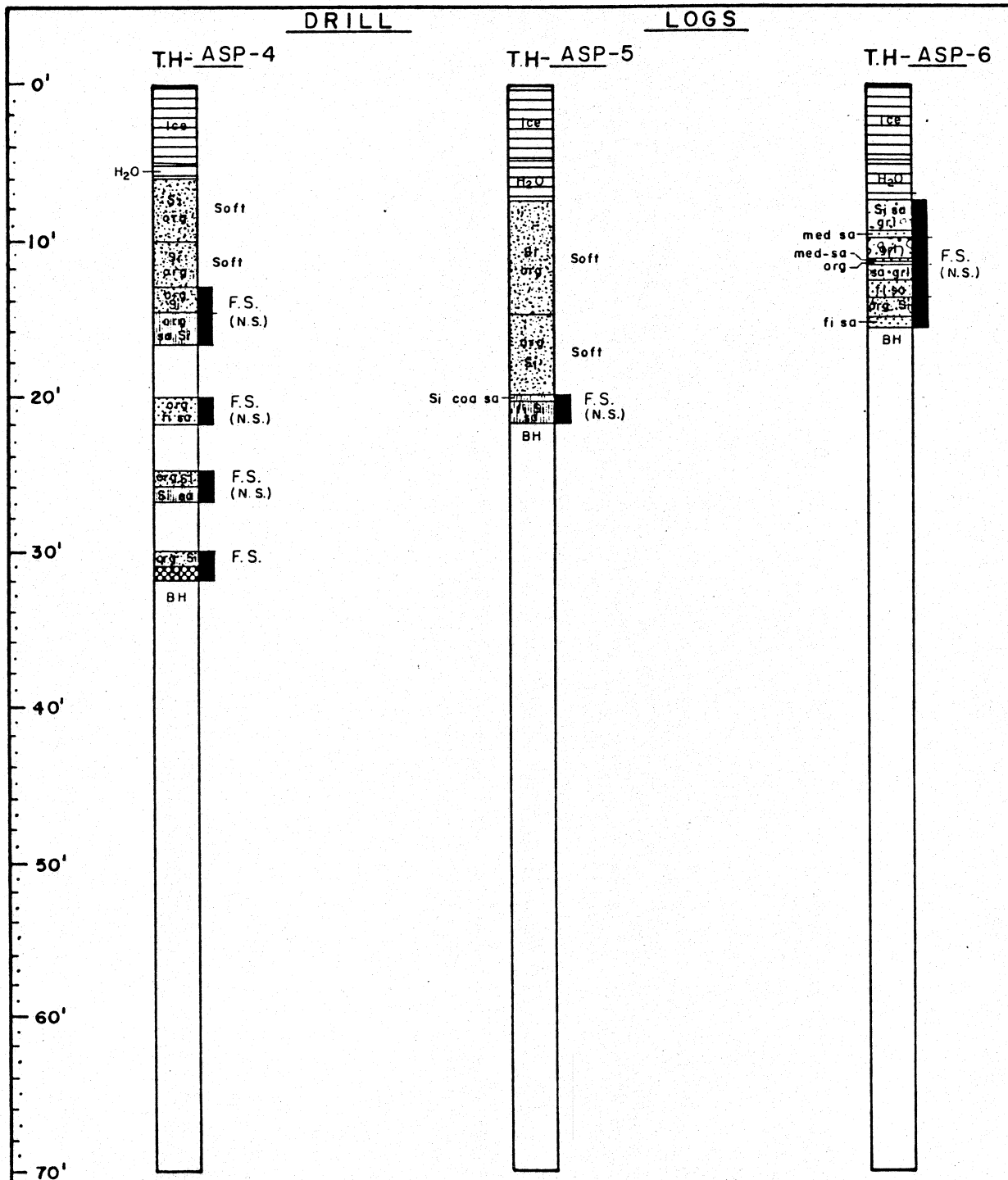
T.H Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS (NS)
BC (--)
BH

G.E.O.D.E. EXPLORATION
1343 'G' ST. SUITE 3
ANCHORAGE, Ak 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

ALTERNATE SETTLING POND

DATE 6-1-84 | SCALE Vert. 1"=10' | FIGURE: 13a



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp-
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM Sec 16	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

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blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

T.H
Test Hole No.
Field Sample
Not Saved
Blow Count
Bottom Hole
FS
(NS)
BC
(--)
B H

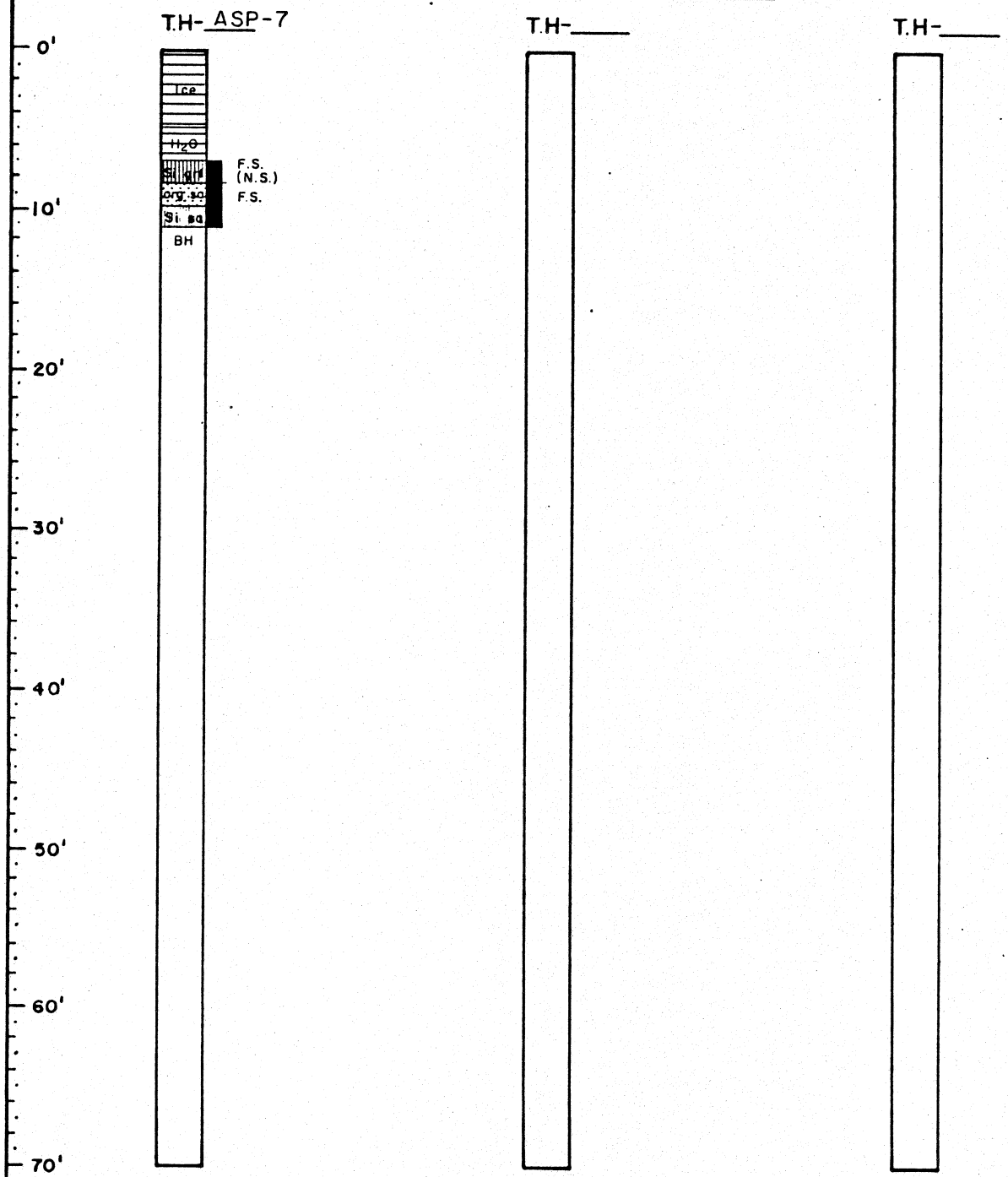
G.E.O.D.E. EXPLORATION
1343 'G' ST. SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

ALTERNATE SETTLING POND

DATE 6-1-84 | SCALE Vert. 1"=10' | FIGURE: 13b

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp-
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Sec 16	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel	Silty Sand	Sand
Sandy Gravel	Clayey Sand	Silt
Gravelly Sand	Silty Gravel	Silty Organic
Organic Soil	Clayey Gravel	Water or Ice
Clay	Broken Rock	Bed-rock

gri - gravel	grn - green	fr- frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

T.H Test Hole No.
FS Field Sample
(NS) Not Saved
BC Blow Count (--)
BH Bottom Hole

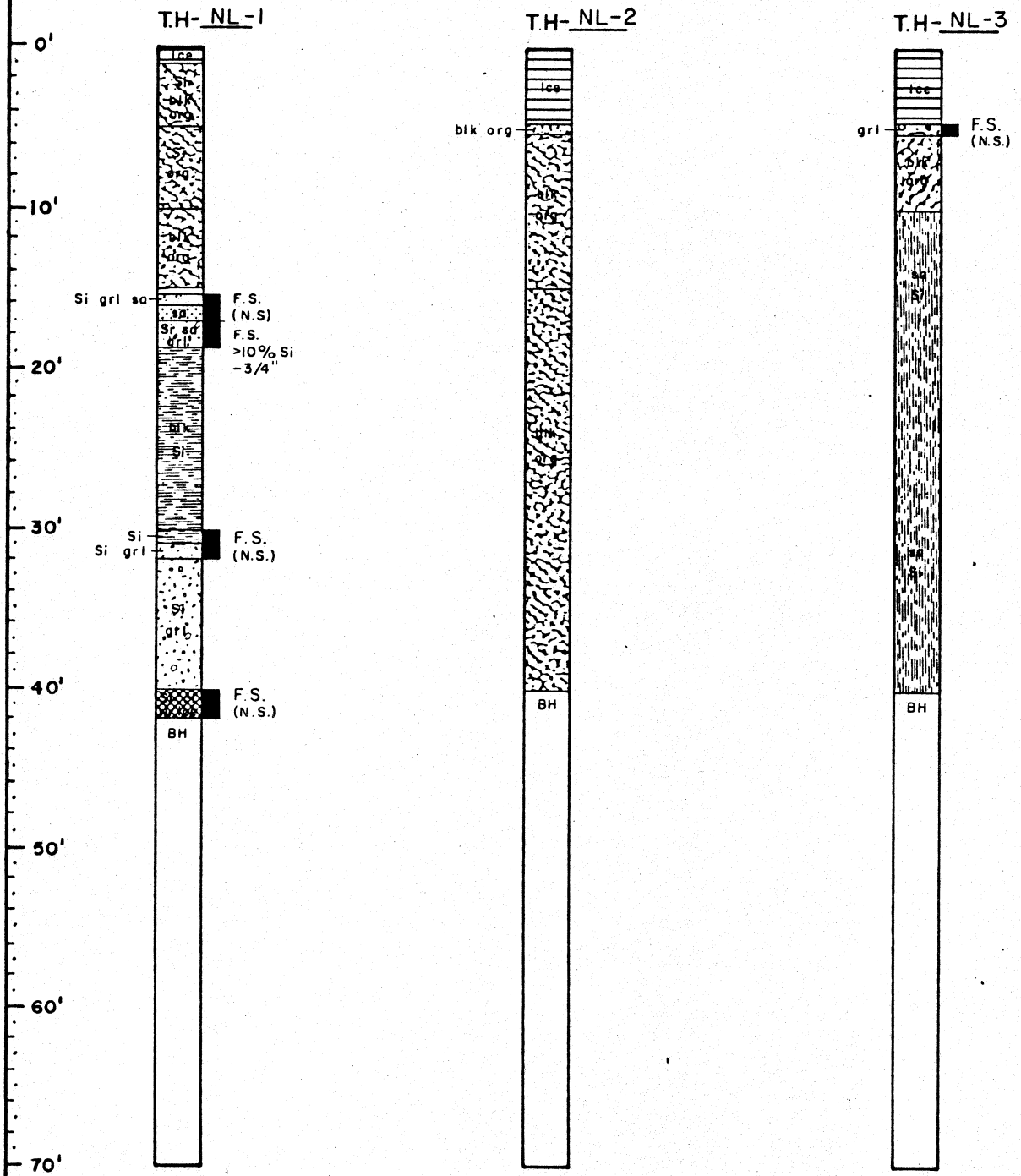
G.E.O.D.E. EXPLORATION
1343 G. ST SUITE 3
ANCHORAGE AK 99501
907 - 278-1024
561-1616

KOTZEBUE LAGOON DREDGE PROJECT

ALTERNATE SETTLING POND

DATE 6-1-84 | SCALE VERT. NO. | FIGURE: 13c

DRILL LOGS



FIELD TEST HOLE

Geologist - Len Nelson — Date -
Driller - Nick Nichols — Weather -
Drill - Mob B-61 on RN-110 Mod. — Temp -
Sampler - 3 1/2" Split Spoon — Wind -
Hammer - 300 lb — Field Book -
Land Descn. - T. 17 N., R. 18 W., KRM
Ptn. Sec. 2, 3, 10 & 11
Ground Cover - Lagoon Ice
Test Hole Locater - Len Nelson

CLIENT — CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel | Silty Sand | Sand
Sandy Gravel | Clayey Sand | Silt
Gravelly Sand | Silty Gravel | Silty Organic
Organic Soil | Clayey Gravel | Water or Ice
Clay | Broken Rock | Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
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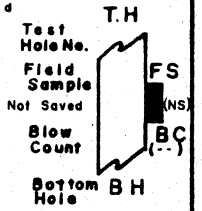
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder
grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic
fr - frost
pfr - permafrost
bd - bonded



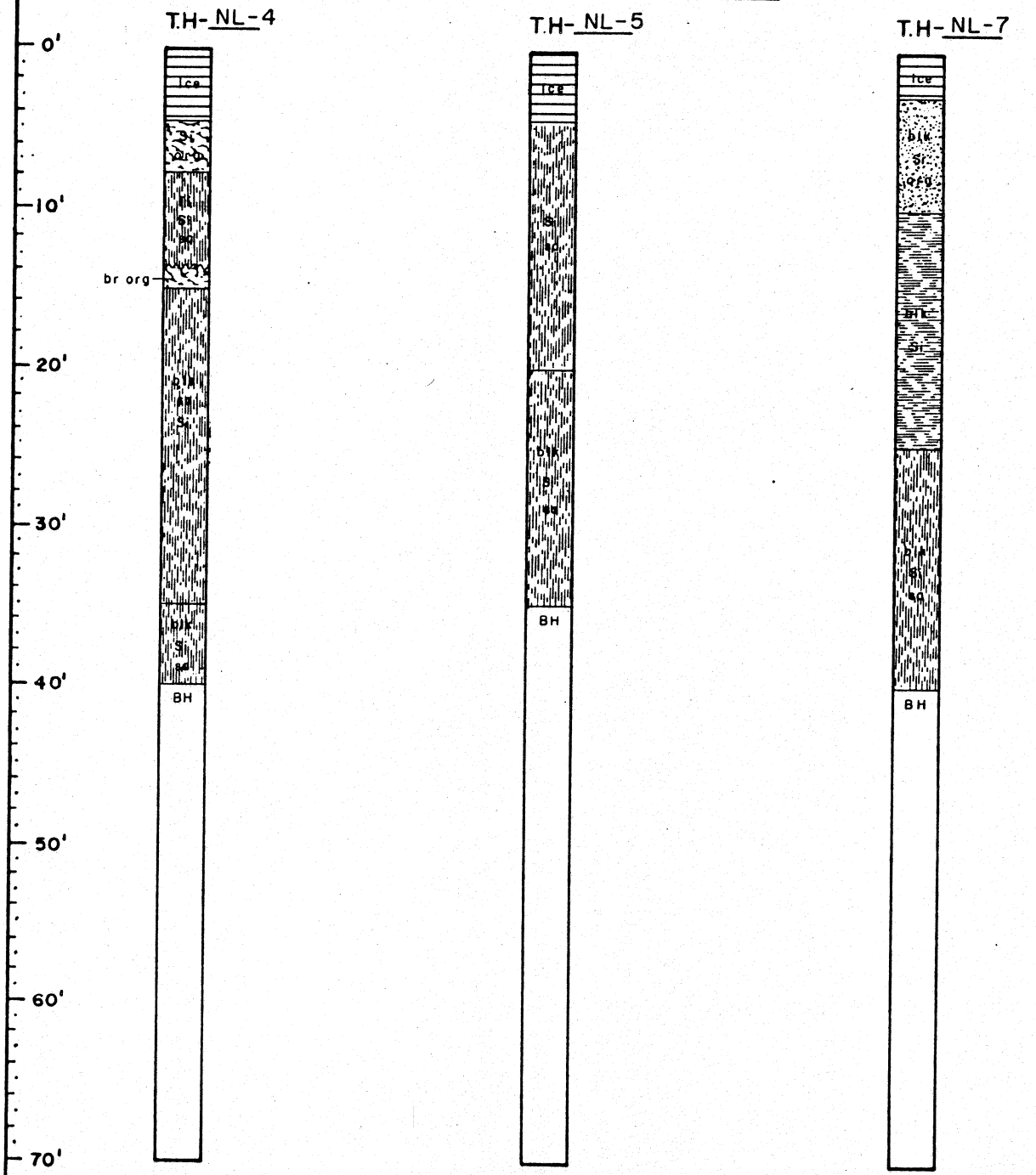
G.E.O.D.E. EXPLORATION
1343 G ST, SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE III

DATE 6-1-84 | SCALE Vert 1:0 | FIGURE: 14a

DRILL LOGS



FIELD TEST HOLE

Geologist- Len Nelson	Date-
Driller- Nick Nichols	Weather-
Drill- Mob B-61 on RN-110 Nod.	Temp-
Sampler- 3 1/2" Split Spoon	Wind-
Hammer- 300 lb	Field Book-
Land Descn.- T. 17 N., R. 18 W., KRM	
Ptn. Sec. 2, 3, 10 & 11	
Ground Cover- Lagoon Ice	
Test Hole Locater- Len Nelson	

CLIENT CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

grl - gravel	grn - green	fr - frost
sa - sand	bl - blue	pfr - permafrost
Si - silt	gr - gray	bd - bonded
cl - clay	blk - black	
pt - peat	br - brown	
fib - fiberous	y - yellow	
coa - coarse	wh - white	
fi - fine	wtr - water	
cob - cobble	bkn - broken	
peb - pebble	rk - rock	
bld - boulder	org - organic	

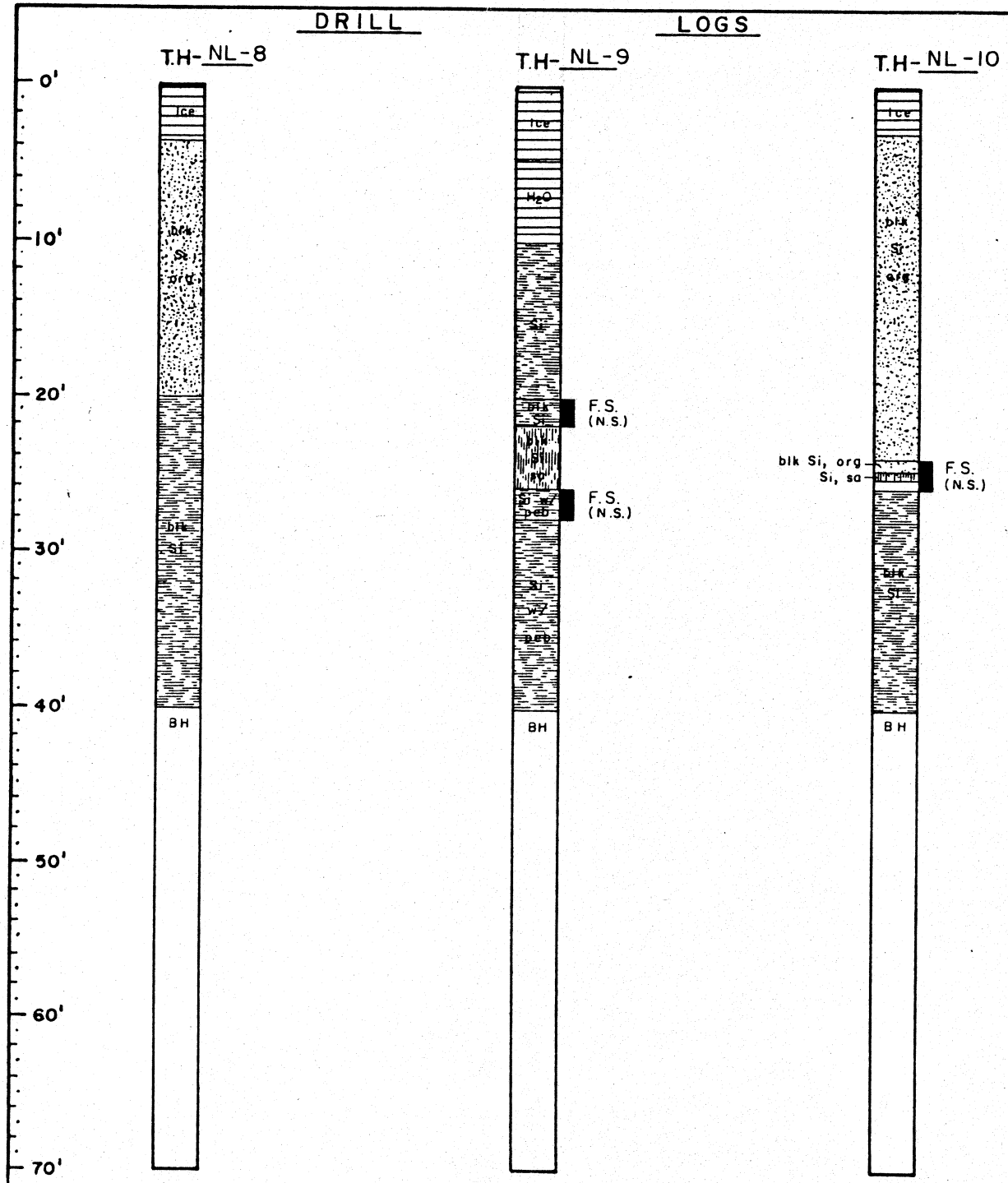
T.H Test Hole No.
FS Field Sample
BC Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 G ST SUITE 3
ANCHORAGE AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE III

DATE 6-1-84 | SCALE Vert 1" = 10' | FIGURE: 14b



FIELD TEST HOLE

Geologist - Len Nelson
Driller - Nick Nichols
Drill - Mob B-61 on RN-110 Mod.
Sampler - 3 1/2" Split Spoon
Hammer - 300 lb
Land Descn. - T.17N., R.18W., KRM
Ptn. Sec. 2, 3, 10 & 11
Ground Cover - Lagoon Ice
Test Hole Locater - Len Nelson

Date -
Weather -
Temp -
Wind -
Field Book -

CLIENT

CITY OF KOTZEBUE
P.O. Box 42
Kotzebue, Ak 99752

Gravel
Silty Sand
Sand
Sandy Gravel
Clayey Sand
Silt
Gravelly Sand
Silty Gravel
Silty Organic
Organic Soil
Clayey Gravel
Water or Ice
Clay
Broken Rock
Bed-rock

gri - gravel
sa - sand
Si - silt
cl - clay
pt - peat
fib - fiberous
coa - coarse
fi - fine
cob - cobble
peb - pebble
bld - boulder

grn - green
bl - blue
gr - gray
blk - black
br - brown
y - yellow
wh - white
wtr - water
bkn - broken
rk - rock
org - organic

fr - frost
pfr - permafrost
bd - bonded

T.H Test Hole No.
FS Field Sample
(NS) Not Saved
BC (--) Blow Count
BH Bottom Hole

G.E.O.D.E. EXPLORATION
1343 'G' ST. SUITE 3
ANCHORAGE, AK 99501
(907) 278-1024
561-1636

KOTZEBUE LAGOON DREDGE PROJECT

MATERIAL SITE III

DATE 6-1-84 | SCALE Vert 1" = 10' | FIGURE: 14c

4.0 SUMMARY

This project was successfully concluded with the goals for Phases I, II and III accomplished. All of the prospective aggregate producing areas selected for exploration during Phases I and II were inspected and explored. The selection of some areas for further exploration and elimination of other areas for various reasons was accomplished with Phase II summer wash sampling.

Phase III was conducted in those areas selected as possible material sites and drilling exploration developed both upland aggregate and marine aggregate material sites.

Total proven aggregate Quantities were developed from the drilling exploration and the following quantities are shown to be available for mining.

Upland Aggregate Deposits -

Quick Site	80,000 Cu. Yds.
Quick West Site	23,000 Cu. Yds.
Quick South Site	45,000 Cu. Yds.
TOTAL PROVEN:	148,000 Cu. Yds.

Marine Dredge Aggregate Deposits

Settling Pond - Stockpile No. 1	100,000 Cu. Yds.
Dredge Site I	65,000 Cu. Yds.
Dredge Site II	100,000 Cu. Yds.
TOTAL PROVEN:	265,000 Cu. Yds.

The proven yardage is based on the results of drilling, sampling and testing. The areas shown on the attached plats as productive areas contain at least the quantities indicated above. Sand as fill material is abundant and review of the logs indicate areas that can be dredged for A-3 fill materials.

5.0 RECOMMENDATIONS

As previously recommended in progress reports, the Settling Pond - Stockpile No. 1 should produce at least 100,000 Cu. Yds. of sandy gravel, Ala, NFS material. This area is ideal for a point to begin dredging as it presents no problems with discharge water turbidity and is close to the projects on which the material is needed.

After depletion of the settling pond production, dredging operations can be commenced in either Site I or Site II. Site I is recommended as the most logical next dredge site as the availability of settling pond and stockpile facilities that have been prepared during the initial dredging operation.

Dredging production in Areas I and II will be more difficult to maintain at a high level as the gravel deposits are of lesser thickness than the settling pond and pumping distance to the stockpile area is greater.

Additionally, the dredging in Area II will require construction of settling pond and stockpile facilities as required by the Corps of Engineers Permit attached to this report.

EXHIBIT "A"

Application No. 071-OYD-30544

Name of Applicant City of Kotzebue

Effective Date 10 JUL 1984

Expiration Date (*If applicable*)

File No. Kotzebue Sound 33

DEPARTMENT OF THE ARMY
PERMIT

Referring to written request dated ~~November 28, 1983~~ for a permit to:

(X) Perform work in or affecting navigable waters of the United States, upon the recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (*33 U.S.C. 403*);

(X) Discharge dredged or fill material into waters of the United States upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 404 of the Clean Water Act (*33 U.S.C. 1344*);

( ) Transport dredged material for the purpose of dumping it into ocean waters upon the issuance of a permit from the Secretary of the Army acting through the Chief of Engineers pursuant to Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (*86 Stat. 1052; P.L. 92-532*);

City of Kotzebue
Post Office Box 46
Kotzebue, Alaska 99752

is hereby authorized by the Secretary of the Army:

to

dredge approximately 1,000,000 cubic yards of gravel and to place the material into approximately 30 acres of wetlands for the purpose of providing a material source for construction projects

in

below the high tide line of and in wetlands adjacent to Kotzebue Lagoon, at sec. 10, 11, 15, 16 and 21, T. 17 N., R. 18 W., K.R.M.,

at

Kotzebue, Alaska

in accordance with the plans and drawings attached hereto which are incorporated in and made a part of this permit (*on drawings, give file number or other definite identification marks.*)

"PROPOSED: KOTZEBUE DREDGE; STOCKPILE AND SETTLING POND; IN: WETLANDS ADJACENT TO KOTZEBUE LAGOON; AT: KOTZEBUE, ALASKA; APPLICATION BY: CITY OF KOTZEBUE; DATED NOVEMBER 28, 1984; 5 SHEETS; ALSO SUBJECT TO ADEC SPECIAL CONDITIONS."

subject to the following conditions:

I. General Conditions:

a. That all activities identified and authorized herein shall be consistent with the terms and conditions of this permit; and that any activities not specifically identified and authorized herein shall constitute a violation of the terms and conditions of this permit which may result in the modification, suspension or revocation of this permit, in whole or in part, as set forth more specifically in General Conditions j or k hereto, and in the institution of such legal proceedings as the United States Government may consider appropriate, whether or not this permit has been previously modified, suspended or revoked in whole or in part.

b. That all activities authorized herein shall, if they involve, during their construction or operation, any discharge of pollutants into waters of the United States or ocean waters, be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, pretreatment standards and management practices established pursuant to the Clean Water Act (*33 U.S.C. 1344*), the Marine Protection, Research and Sanctuaries Act of 1972 (*P.L. 92-532, 86 Stat. 1052*), or pursuant to applicable State and local law.

c. That when the activity authorized herein involves a discharge during its construction or operation, or any pollutant (*including dredged or fill material*), into waters of the United States, the authorized activity shall, if applicable water quality standards are revised or modified during the term of this permit, be modified, if necessary, to conform with such revised or modified water quality standards within 6 months of the effective date of any revision or modification of water quality standards, or as directed by an implementation plan contained in such revised or modified standards, or within such longer period of time as the District Engineer, in consultation with the Regional Administrator of the Environmental Protection Agency, may determine to be reasonable under the circumstances.

d. That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

e. That the permittee agrees to make every reasonable effort to prosecute the construction or operation of the work authorized herein in a manner so as to minimize any adverse impact on fish, wildlife, and natural environmental values.

f. That the permittee agrees that he will prosecute the construction or work authorized herein in a manner so as to minimize any degradation of water quality.

g. That the permittee shall allow the District Engineer or his authorized representative(s) or designee(s) to make periodic inspections at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.

h. That the permittee shall maintain the structure or work authorized herein in good condition and in reasonable accordance with the plans and drawings attached hereto.

i. That this permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

j. That this permit does not obviate the requirement to obtain state or local assent required by law for the activity authorized herein.

k. That this permit may be either modified, suspended or revoked in whole or in part pursuant to the policies and procedures of 33 CFR 325.7.

l. That in issuing this permit, the Government has relied on the information and data which the permittee has provided in connection with his permit application. If, subsequent to the issuance of this permit, such information and data prove to be materially false, materially incomplete or inaccurate, this permit may be modified, suspended or revoked, in whole or in part, and/or the Government may, in addition, institute appropriate legal proceedings.

m. That any modification, suspension, or revocation of this permit shall not be the basis for any claim for damages against the United States.

n. That the permittee shall notify the District Engineer at what time the activity authorized herein will be commenced, as far in advance of the time of commencement as the District Engineer may specify, and of any suspension of work, if for a period of more than one week, resumption of work and its completion.

o. That if the activity authorized herein is not completed on or before _____ day of _____, 19 _____, (*three years from the date of issuance of this permit unless otherwise specified*) this permit, if not previously revoked or specifically extended, shall automatically expire.

p. That this permit does not authorize or approve the construction of particular structures, the authorization or approval of which may require authorization by the Congress or other agencies of the Federal Government.

q. That if and when the permittee desires to abandon the activity authorized herein, unless such abandonment is part of a transfer procedure by which the permittee is transferring his interests herein to a third party pursuant to General Condition t hereof, he must restore the area to a condition satisfactory to the District Engineer.

r. That if the recording of this permit is possible under applicable State or local law, the permittee shall take such action as may be necessary to record this permit with the Register of Deeds or other appropriate official charged with the responsibility for maintaining records of title to and interests in real property.

s. That there shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein.

t. That this permit may not be transferred to a third party without prior written notice to the District Engineer, either by the transferee's written agreement to comply with all terms and conditions of this permit or by the transferree subscribing to this permit in the space provided below and thereby agreeing to comply with all terms and conditions of this permit. In addition, if the permittee transfers the interests authorized herein by conveyance of realty, the deed shall reference this permit and the terms and conditions specified herein and this permit shall be recorded along with the deed with the Register of Deeds or other appropriate official.

u. That if the permittee during prosecution of the work authorized herein, encounters a previously unidentified archeological or other cultural resource within the area subject to Department of the Army jurisdiction that might be eligible for listing in the National Register of Historic Places, he shall immediately notify the district engineer.

II. Special Conditions: (*Here list conditions relating specifically to the proposed structure or work authorized by this permit*):

a. That if cultural resources are located during activities associated with the project, all work which may disturb these resources shall be discontinued until the State Historic Preservation Officer is notified.

b. That all areas within the proposed dredge sites which are herring spawning areas shall be identified in coordination with the Alaska Department of Fish and Game. Dredging in such areas shall be prohibited.

c. That dredging within Area I shall not be conducted prior to July 1, 1984. Operations after this date shall be initiated only after consultation with the Corps of Engineers and the U.S. Fish and Wildlife Service.

d. That movement of truck traffic across any runway shall be coordinated with the appropriate airport personnel.

e. The following conditions shall apply to the stockpile for Dredge Area I.

I. That the northern edge of the stockpile shall not be located within 500' of the centerline of the east-west runway.

II. That the elevation of the northern edge of the stockpile shall not be higher than the elevation of the centerline of the east-west runway.

III. That no part of the stockpile shall be higher than 10' above the elevation of the centerline of the east-west runway and that this elevation shall not occur closer than 570' from the centerline of the east-west runway and that no part of the stockpile shall extend above a 7' horizontal/vertical line from that point to the northern edge of the stockpile.

f. That an undisturbed buffer at least 50' in width shall be maintained between the mean high water mark of Kotzebue Lagoon and any dredge cut.

The following Special Conditions will be applicable when appropriate:

STRUCTURES IN OR AFFECTING NAVIGABLE WATERS OF THE UNITED STATES:

a. That this permit does not authorize the interference with any existing or proposed Federal project and that the permittee shall not be entitled to compensation for damage or injury to the structures or work authorized herein which may be caused by or result from existing or future operations undertaken by the United States in the public interest.

b. That no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized by this permit.

c. That if the display of lights and signals on any structure or work authorized herein is not otherwise provided for by law, such lights and signals as may be prescribed by the United States Coast Guard shall be installed and maintained by and at the expense of the permittee.

d. That the permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the authorized structure or work, shall, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the waterway to its former conditions. If the permittee fails to comply with the direction of the Secretary of the Army or his authorized representative, the Secretary or his designee may restore the waterway to its former condition, by contract or otherwise, and recover the cost thereof from the permittee.

e. Structures for Small Boats: That permittee hereby recognizes the possibility that the structure permitted herein may be subject to damage by wave wash from passing vessels. The issuance of this permit does not relieve the permittee from taking all proper steps to insure the integrity of the structure permitted herein and the safety of boats moored thereto from damage by wave wash and the permittee shall not hold the United States liable for any such damage.

MAINTENANCE DREDGING:

a. That when the work authorized herein includes periodic maintenance dredging, it may be performed under this permit for _____ years from the date of issuance of this permit (*ten years unless otherwise indicated*);

b. That the permittee will advise the District Engineer in writing at least two weeks before he intends to undertake any maintenance dredging.

DISCHARGES OF DREDGED OR FILL MATERIAL INTO WATERS OF THE UNITED STATES:

a. That the discharge will be carried out in conformity with the goals and objectives of the EPA Guidelines established pursuant to Section 404(b) of the Clean Water Act and published in 40 CFR 230;

b. That the discharge will consist of suitable material free from toxic pollutants in toxic amounts.

c. That the fill created by the discharge will be properly maintained to prevent erosion and other non-point sources of pollution.

DISPOSAL OF DREDGED MATERIAL INTO OCEAN WATERS:

a. That the disposal will be carried out in conformity with the goals, objectives, and requirements of the EPA criteria established pursuant to Section 102 of the Marine Protection, Research and Sanctuaries Act of 1972, published in 40 CFR 220-228.

b. That the permittee shall place a copy of this permit in a conspicuous place in the vessel to be used for the transportation and/or disposal of the dredged material as authorized herein.

This permit shall become effective on the date of the District Engineer's signature.

Permittee hereby accepts and agrees to comply with the terms and conditions of this permit.

Bruce K. CITY MANAGER — June 25, 1984

PERMITTEE & TITLE — DATE

BY AUTHORITY OF THE SECRETARY OF THE ARMY:

FOR David B. Barrows Chief, Regulatory Branch — July 10, 1984

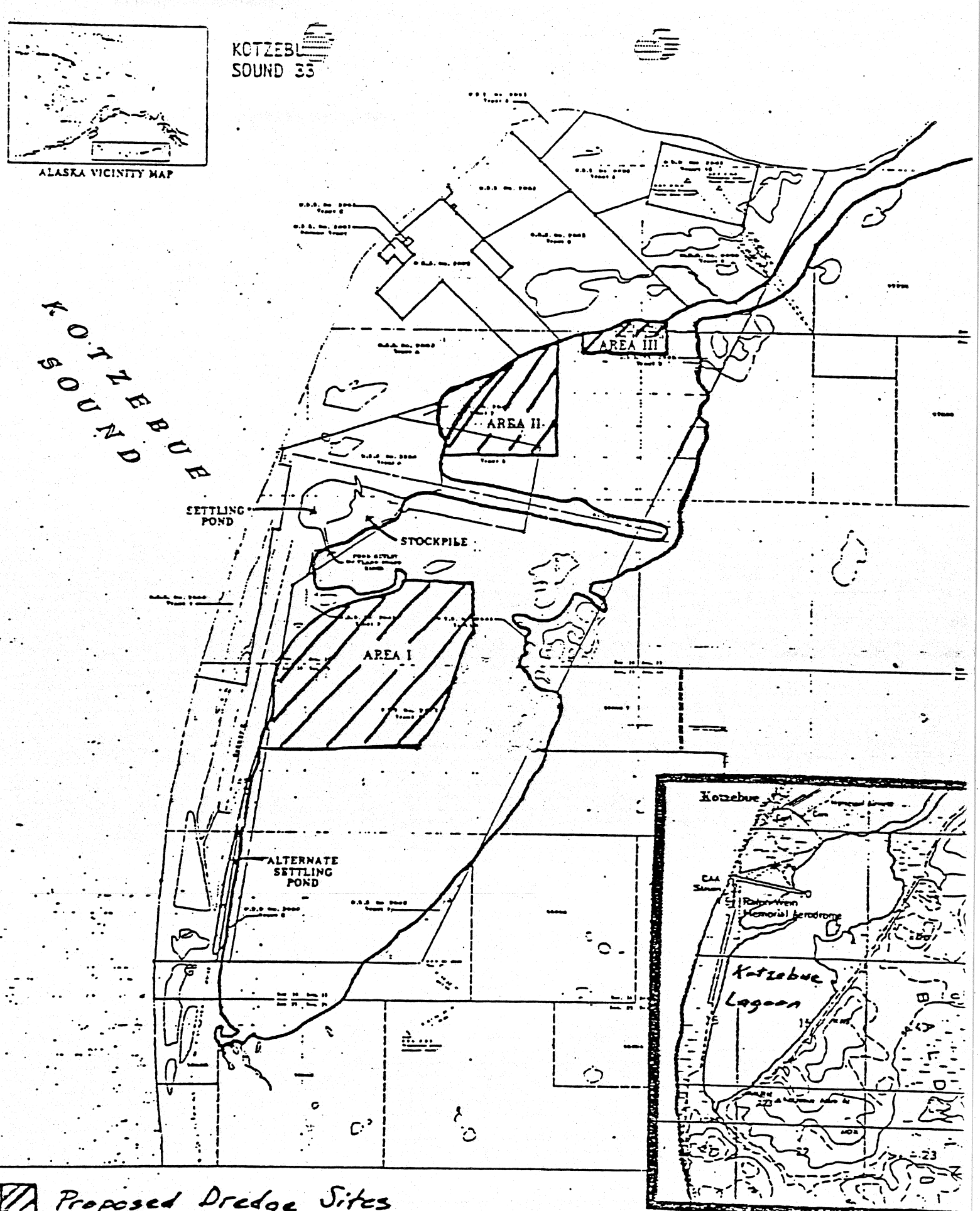
DISTRICT ENGINEER, U.S. ARMY, CORPS OF ENGINEERS Colonel Neil E. Saling — DATE

Transferee hereby agrees to comply with the terms and conditions of this permit.

_____ _____

TRANSFEREE — DATE

U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 404-308



Proposed Dredge Sites

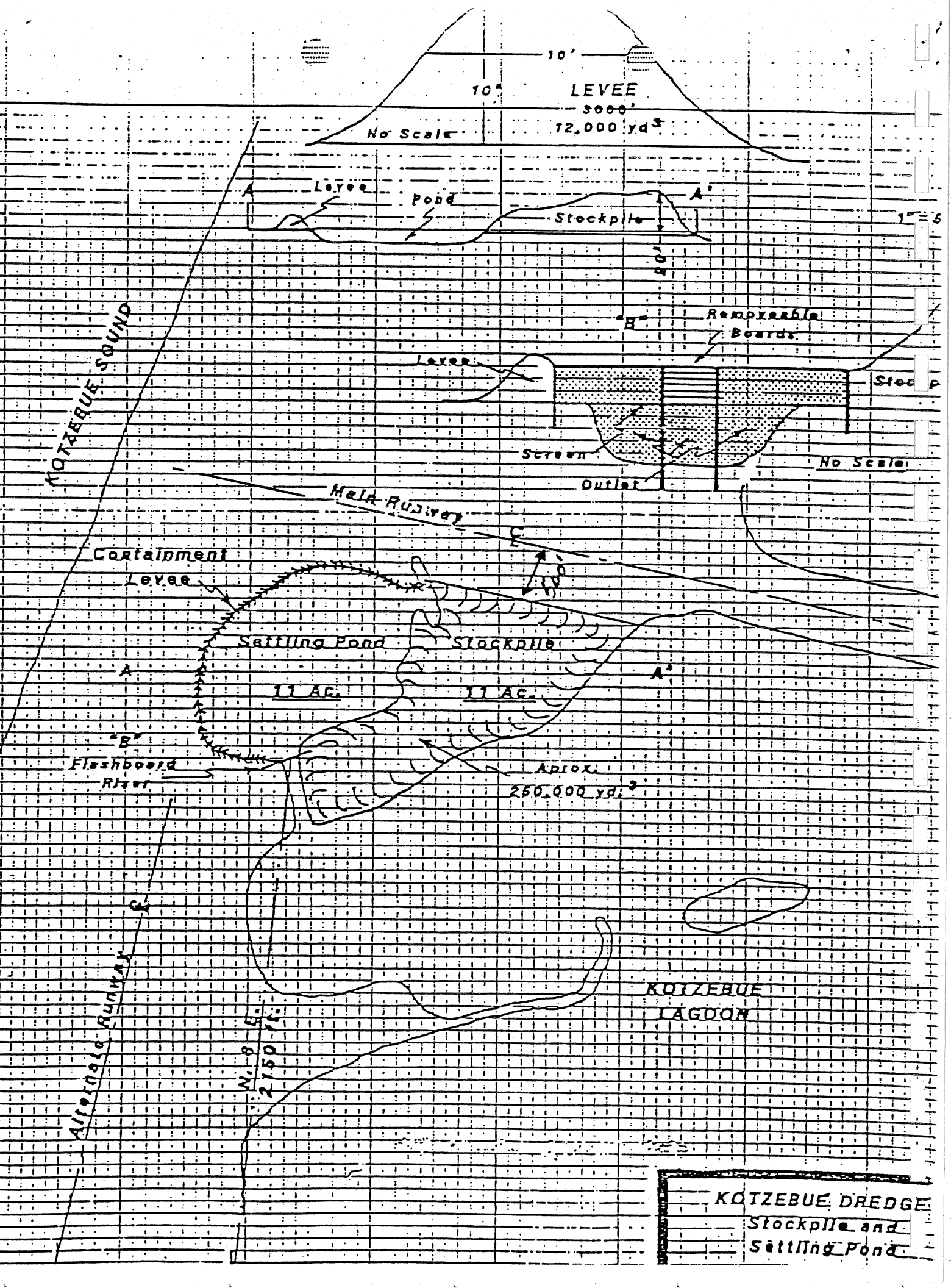
PROPOSED QUANTITIES (cy)

AREA I 650,000

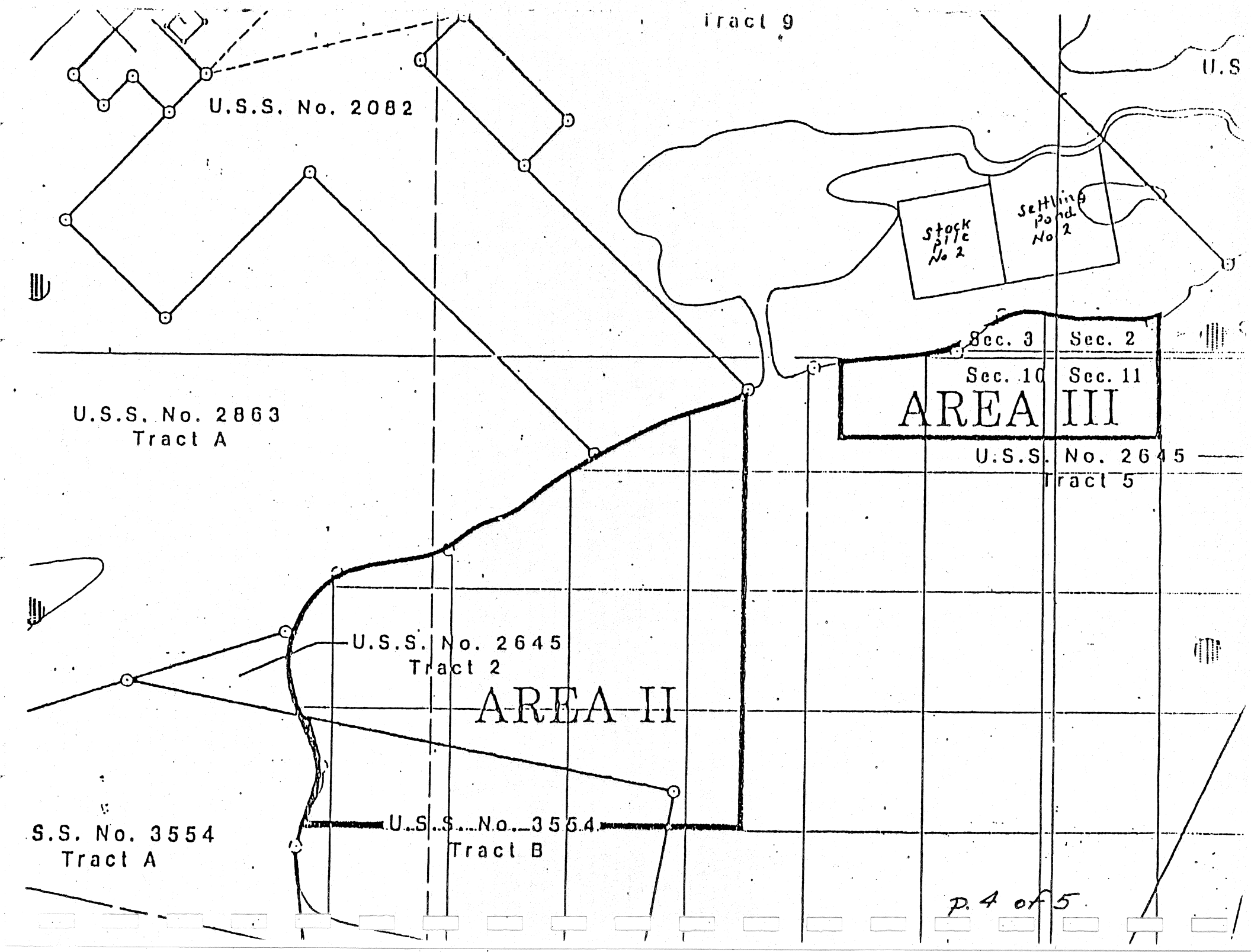
AREA II 250,000

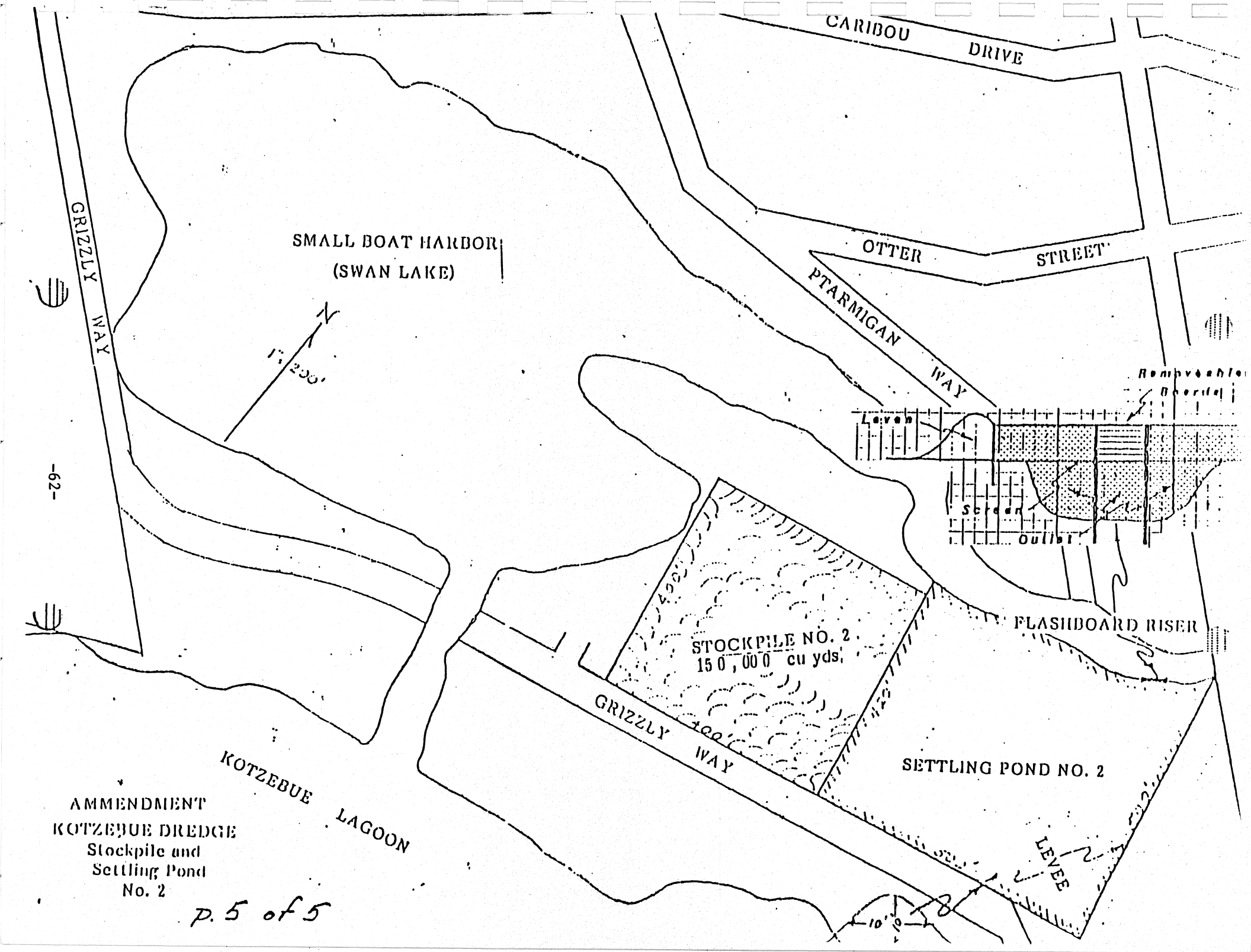
P. 1 of 5

KOTZEBUE LAGOON DREDGING AND STOCKP PERMIT - CORPS OF ENG


10'
10'
LEVEE
3000'
12,000 yd³
No Scale
A
Levee
Pond
A'
Stockpile
1" = 5
B
Removable
Boards
Levee
Stock P
Stream
Outlet
No Scale
KOTZEBUE SOUND
Main Runway
Containment
Levee
Settling Pond
11 AC.
Stockpile
11 AC.
A
A'
"B"
Flashboard
Riser
Approx.
250,000 yd.³
KOTZEBUE
LAGOON
Alternate Runway
N.6 E.
2150'
KOTZEBUE DREDGE
Stockpile and
Settling Pond

KOTZEBUE SOUND
KOTZEBUE LAGOON
Pond
Pond
Pond
Pond
Pond
Haul Road
City Landfill
A
A'
A
Road
OLD PIT EXCAVATION
Berm
30 ft.
160' ±
12 ft.
LAGOON
No Scale
KOTZEBUE DREDGE
Alternate
Settling Pond
Scale: 1"=600'
Date: 11-28-83
EXHI
C
p. 3 of 5
Sec. 16
Sec. 15
Sec. 21
Sec. 22


Tract 9
U.S
U.S.S. No. 2082
Stock Pile No 2
Settling Pond No 2
Sec. 3
Sec. 2
Sec. 10
Sec. 11
AREA III
U.S.S. No. 2645
Tract 5
U.S.S. No. 2863
Tract A
U.S.S. No. 2645
Tract 2
AREA II
U.S.S. No. 3554
Tract B
S.S. No. 3554
Tract A



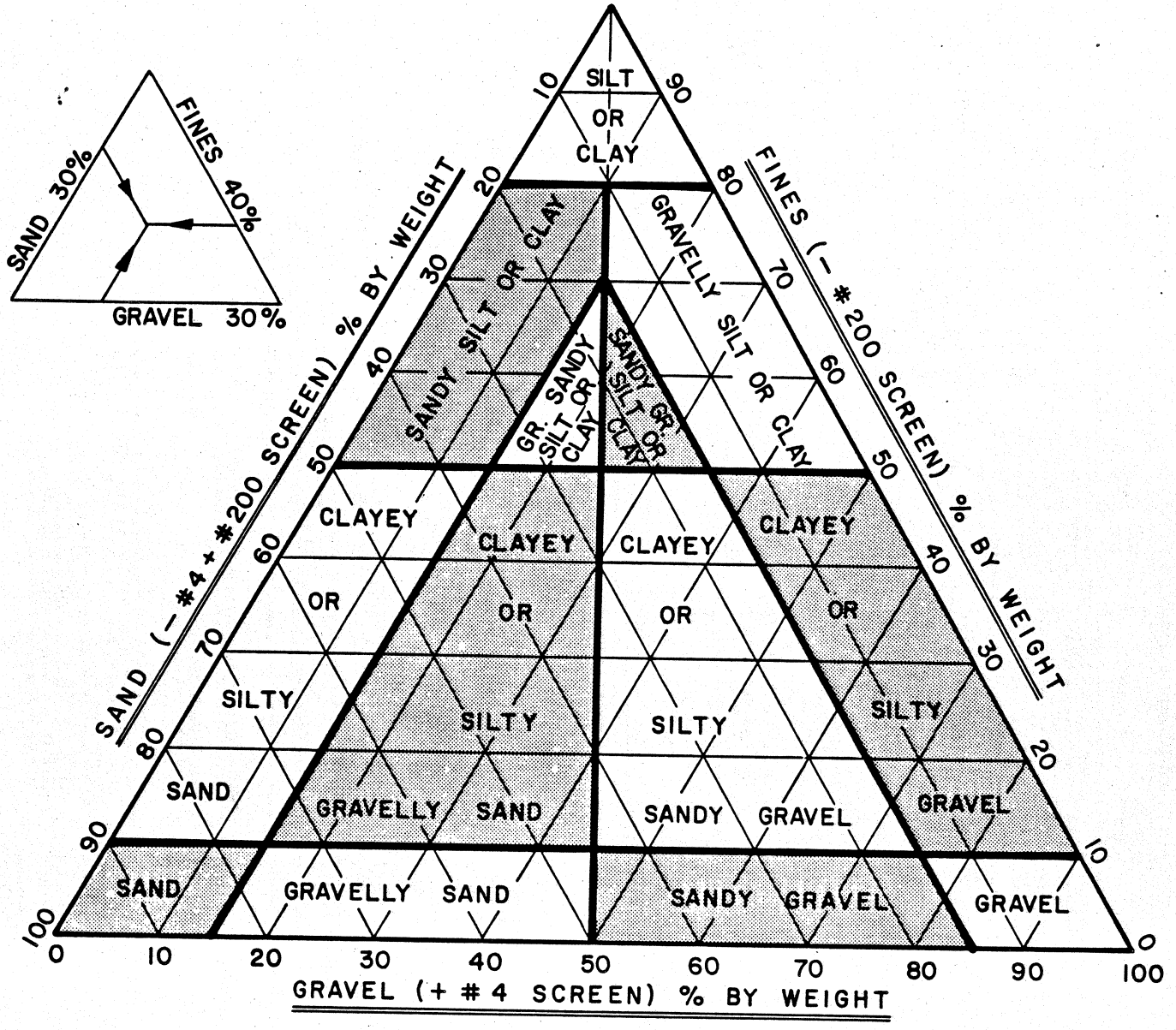
AMMENDMENT
KOTZEBUE DREDGE
Stockpile and
Settling Pond
No. 2

P. 5 of 5

EXHIBIT "B"

TEST REPORT
INDEX

TEXTURAL SOIL CLASSIFICATION CHART



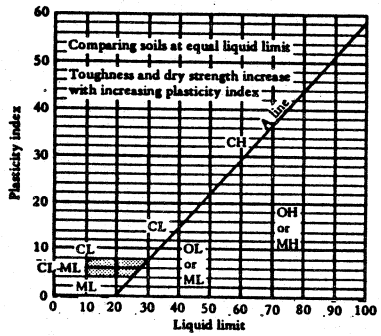
FROST CLASSIFICATION SYSTEM

NONFROST SUSCEPTIBLE SOILS ARE INORGANIC SOILS CONTAINING LESS THAN 3% FINER THAN 0.02 mm.
GROUPS OF FROST-SUSCEPTIBLE SOILS:

- F1 GRAVELLY SOILS CONTAINING BETWEEN 3 AND 20% FINER THAN 0.02 mm.
- F2 SANDY SOILS CONTAINING BETWEEN 3 AND 15% FINER THAN 0.02 mm.
- F3
  - a. GRAVELLY SOILS CONTAINING MORE THAN 20% FINER THAN 0.02 mm. AND SANDY SOILS (EXCEPT FINE SILTY, SANDS) CONTAINING MORE THAN 15% FINER THAN 0.02 mm.
  - b. CLAYS WITH PLASTICITY INDEXES OF MORE THAN 12. EXCEPT VARVED CLAYS.
- F4
  - a. ALL SILTS INCLUDING SANDY SILTS.
  - b. FINE SILTY SANDS CONTAINING MORE THAN 15% FINER THAN 0.02 mm.
  - c. LEAN CLAYS WITH PLASTICITY INDEXES OF LESS THAN 12.
  - d. VARVED CLAYS.

UNIFIED SOIL CLASSIFICATION SYSTEM

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)						Group Symbols a	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is larger than No. 200 sieve sizeb	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes			GW	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the course grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: Silty sand, gravelly; about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM)	Use grain size curve in identifying the fractions as given under field identification Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5% GW, GP, SW, SP More than 12% GM, GC, SM, SC 5% to 12% Borderline cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for GW Atterberg limits below "A" line, or PI less than 4 Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols Atterberg limits above "A" line, with PI greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see ML below)			GM	Silty gravels, poorly graded gravel-sand-silt mixtures		
			Plastic fines (for identification procedures, see CL below)			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes			SW	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for SW Atterberg limits below "A" line or PI less than 5 Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols Atterberg limits above "A" line with PI greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing			SP	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see ML below)			SM	Silty sands, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures, see CL below)			SC	Clayey sands, poorly graded sand-clay mixtures		
Fine-grained soils More than half of material is smaller than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)				
	Silts and clays liquid limit less than 50		None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (ML)	
			Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity		
	Silts and clays liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays		
			Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity		
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			Pt	Peat and other highly organic soils		



Plasticity chart
for laboratory classification of fine grained soils

From Wagner, 1957.

a Boundary classifications. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW – GC, well graded gravel-sand mixture with clay binder.

b All Sieve sizes on this chart are U. S. standard

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics):

After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smoosh surface or between the palms into a thread about one-eight inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407-SE

CLIENT'S No.

LABORATORY No.

June 18, 1984

ORDER No. ANC 244

REPORT
#1

REPORT OF: Sieve Analysis

PROJECT: K~~t~~Z Settling Pond No. 1

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLE NO: SP-3 10'-14'

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 6-12-84

TESTED BY: Don Carlson, Shelly Toll

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Sandy Gravel (GW)
Coefficient of uniformity ASTM D 2487-10.83
Coefficient of curvature ASTM 2487-1.60
Test Method ASTM D-422

TEST RESULTS

Sieves	% Passing	Sieves	% Passing
1	100	16	18
3/4	81	40	7
1/2	77	80	3
3/8	68	100	2
4	44	200	1.4
10	25		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

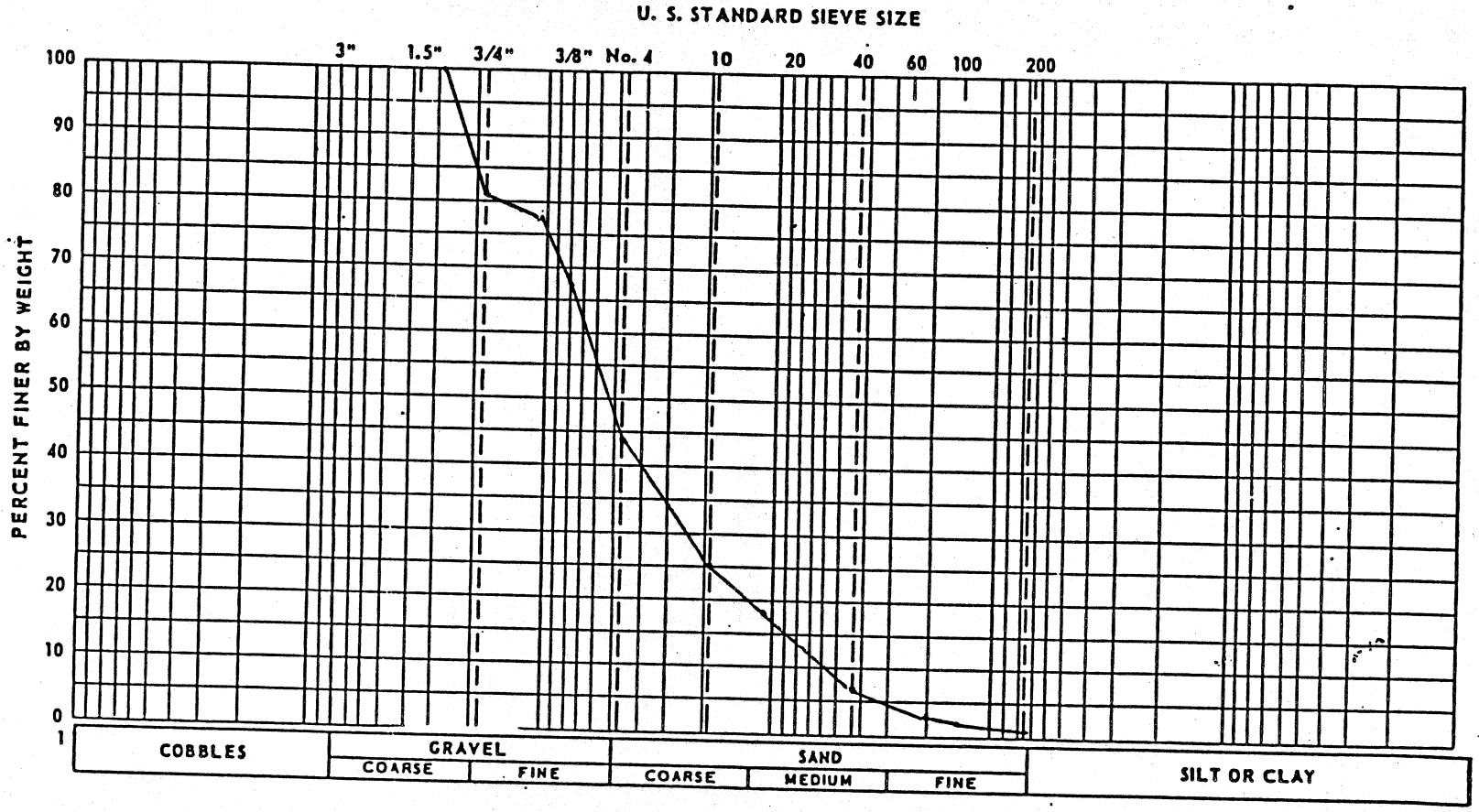
Brian H. Barron, Acting Manager
Anchorage Branch

BHB/lem

Attachments

SP-3 10'-14'

GRAIN SIZE DISTRIBUTION CURVE



PITTSBURGH TESTING LABORATORY

ORDER NO. ANC 244
Report #1
6/12/84

FORM NO. 1135

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407-SE

CLIENT'S No.

LABORATORY No. 166

ORDER No. ANC 244

June 25, 1984

REPORT

#3 - Final

REPORT OF: Sieve Analysis

PROJECT: Ktz Settling Pond No. 1

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLE NO: SP 3A 7'-15'

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 6/12/84

TESTED BY: Ron Carlson, Shelly Toll

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand (SP)
Coefficient of Uniformity - ASTM D2487-7.8
Coefficient of Curvature - ASTM D2487-.63
Test Method - ASTM D422

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#16	52
3/4"	96	#40	25
1/2"	94	#80	8
3/8"	92	#100	6
#4	81	#200	3.8
#10	65		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Brian H. Barron, Acting Manager
Anchorage Branch

klk

Attachment

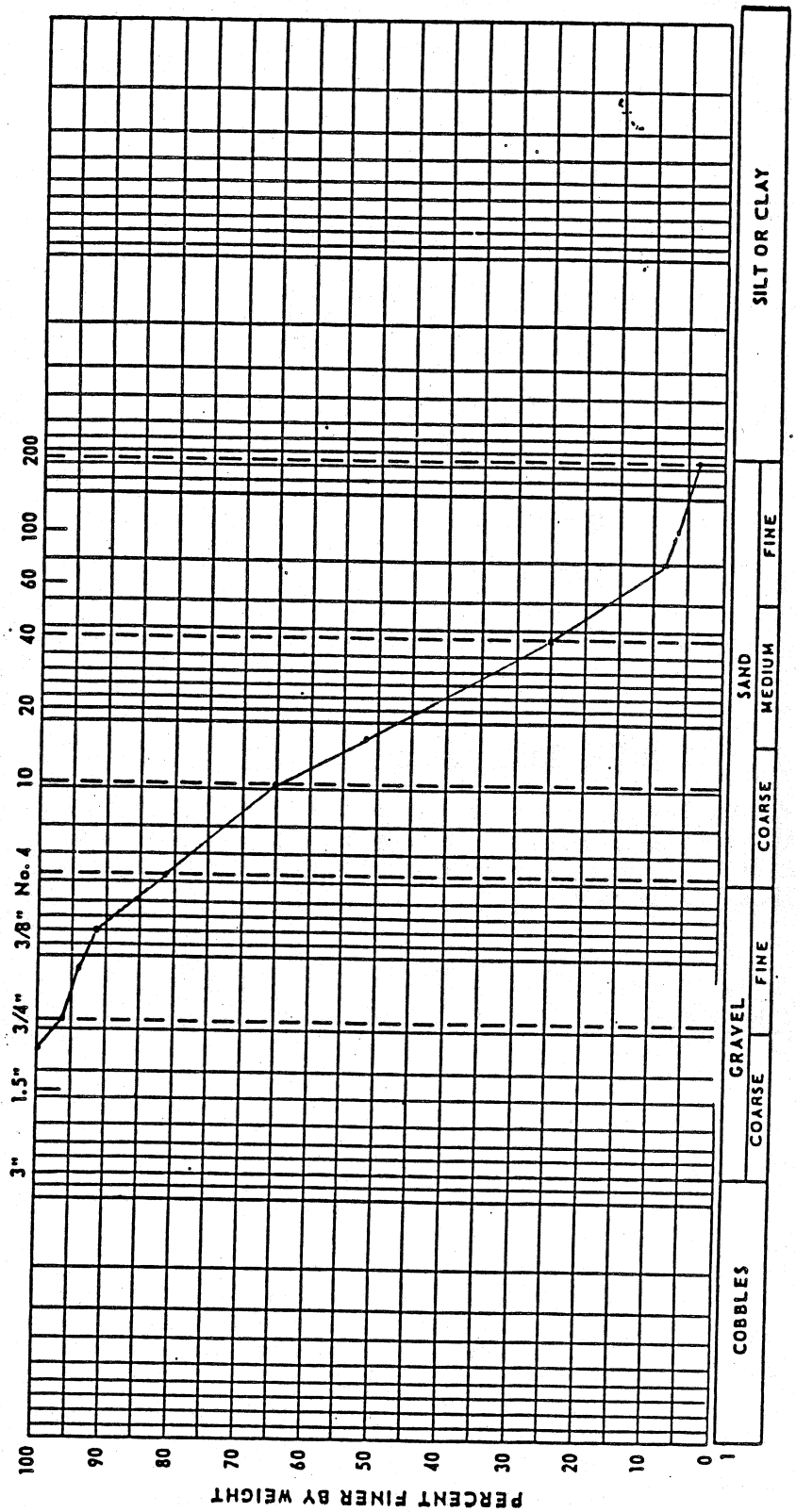
SP-3A 7'-15'

ORDER NO. ANC 244

PITTSBURGH TESTING LABORATORY

Report #3
June 25, 1984

GRAIN SIZE DISTRIBUTION CURVE



FORM NO. 1435

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407-SE

CLIENT'S No.

LABORATORY No. 165

June 25, 1984

ORDER No. ANC 244

REPORT
#4 - Final

REPORT OF: Sieve Analysis

PROJECT: Ktz. Settling

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLE NO: SP-4 5'-7'

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 6/12/84

TESTED BY: Ron Carlson, Shelly Toll

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Sandy Gravel (GP)
Coefficient of Uniformity - ASTM 2487-21.33
Coefficient of Curvature - ASTM 2487-75
Test Method - ASTM D-422

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#16	13
3/4"	74	#40	11
1/2"	45	#80	10
3/8"	30	#100	10
#4	18	#200	8.9
#10	14		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Brian H. Barron, Acting Manager
Anchorage Branch

klk

Attachment

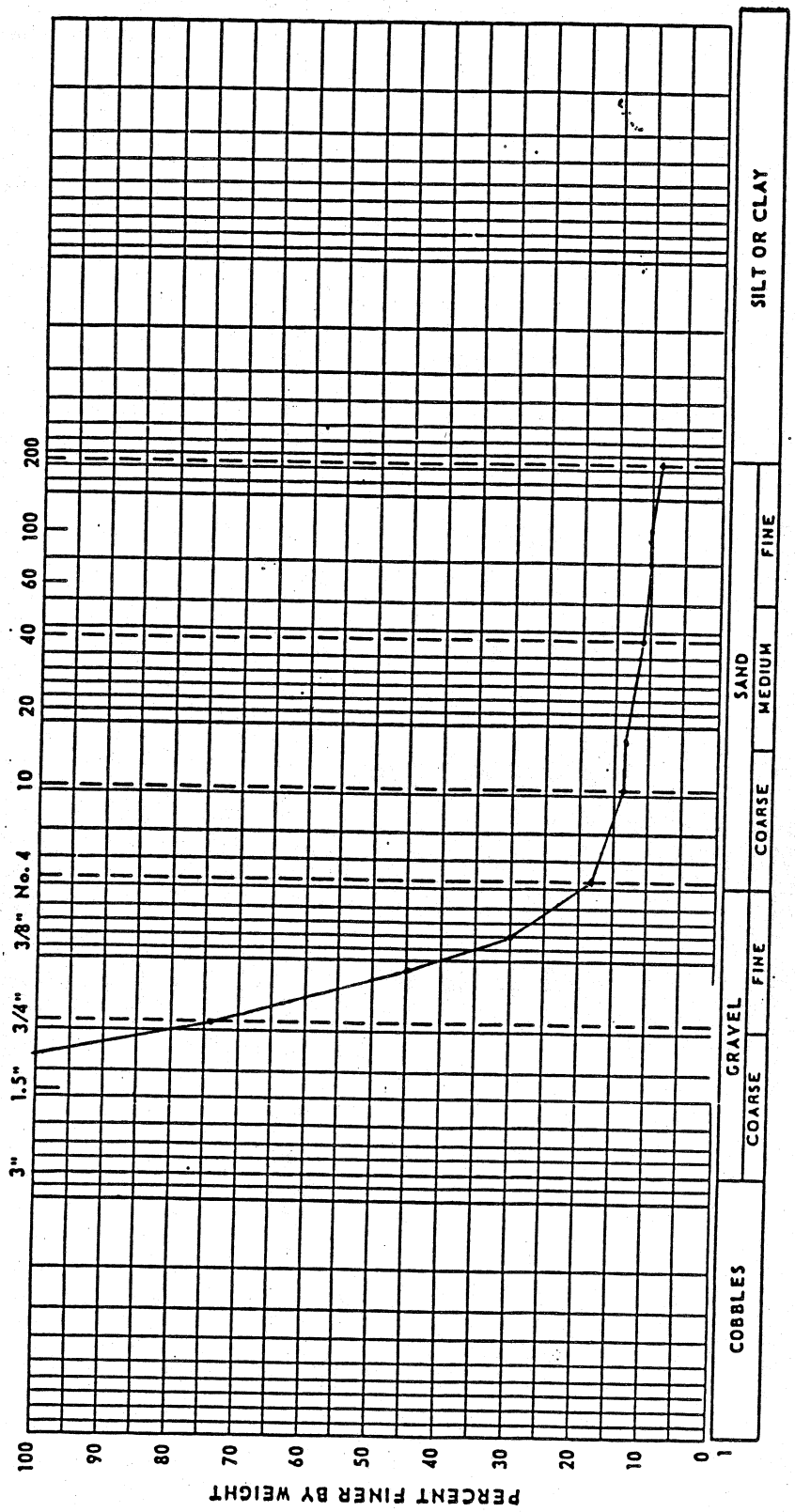
SP-4 5'-7'

ORDER NO. ANC 244

PITTSBURGH TESTING LABORATORY

Report #4
June 25, 1984

GRAIN SIZE DISTRIBUTION CURVE



FORM NO. 1435

FORM 407-SE

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

CLIENT'S No.

LABORATORY No.

June 25, 1984

ORDER No. ANC 244

REPORT
#5 - Final

REPORT OF: Sieve Analysis

PROJECT: Ktz. Settling Pond No. 1

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLE NO: SP-4 9'-11'

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED 6/12/84

TESTED BY: Ron Carlson, Shelly Toll

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand (SW)
Coefficient of Uniformity - ASTM D2487-28.00
Coefficient of Curvature - ASTM D2487-1.41
Test Method - ASTM D-422

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#16	29
3/4"	94	#40	19
1/2"	88	#80	11
3/8"	83	#100	9
#4	59	#200	6.8
#10	36		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Brian H. Barron, Acting Manager
Anchorage Branch

klk

Attachment

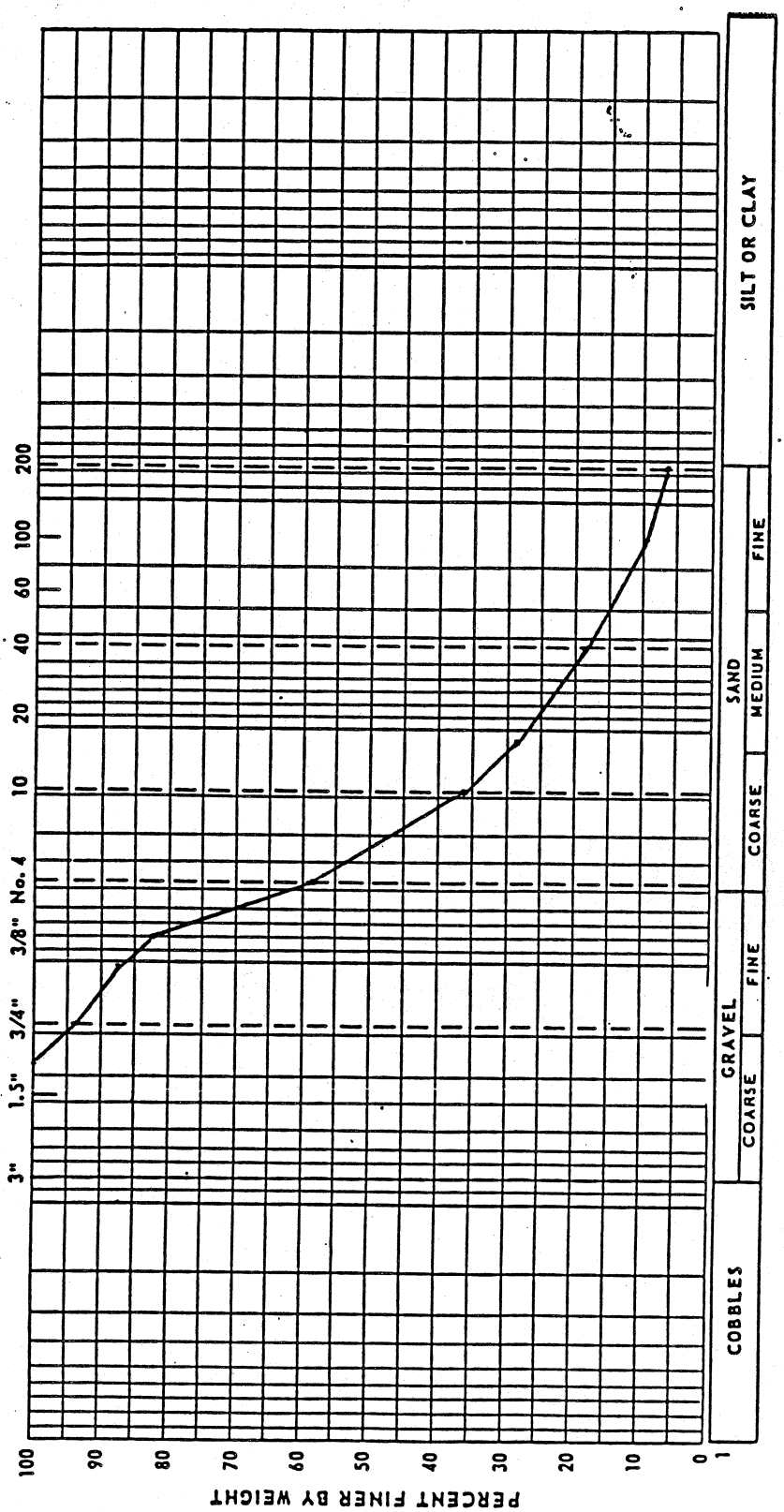
SP-4 9'-11'

ORDER NO. ANC 244

PITTSBURGH TESTING LABORATORY

Report #5
June 25, 1984

GRAIN SIZE DISTRIBUTION CURVE



FORM NO. 1435

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407-SE

CLIENT'S No.

LABORATORY No. 163

June 25, 1984

ORDER No. ANC 244

REPORT

#2 - Final

REPORT OF: Sieve Analysis

PROJECT: Ktz Settling Pond No. 1

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLE NO: SP-8 10'-14'

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 6/12/84

TESTED BY: Ron Carlson/Shelly Toll

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand (SW) well graded
Coefficient of Uniformity Cu ASTM D2487-10
Coefficient of Curvature Cz ASTM D2487-1.67
Test Method - ASTM D422

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
3/4"	100	#16	35
1/2"	98	#40	19
3/8"	90	#80	8
#4	77	#100	7
#10	57	#200	4.1

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Brian H. Barron, Acting Manager
Anchorage Branch

klk

Attachment

SP-8 10'-14'

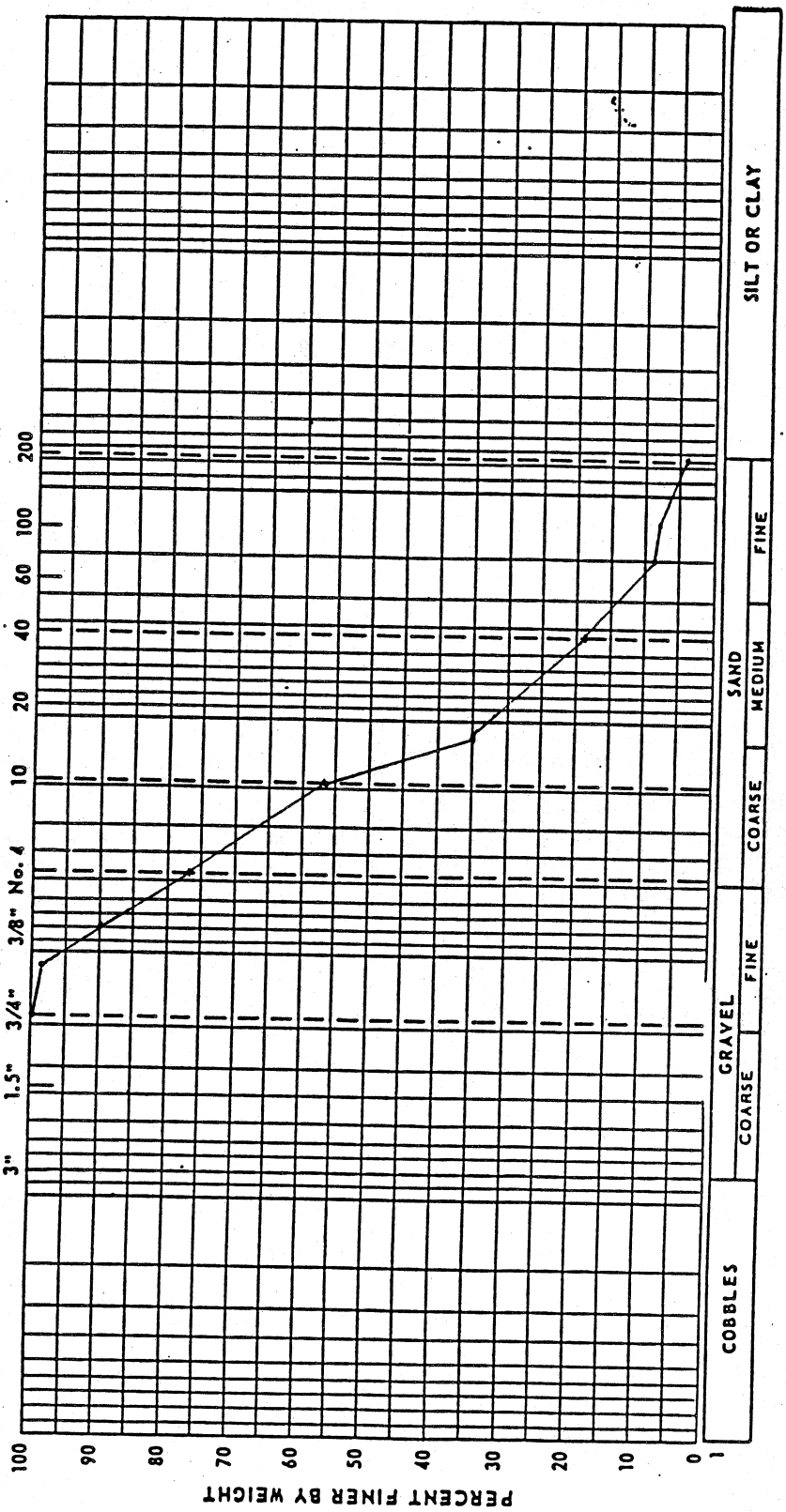
Attachment

ORDER NO. ANC 244

PITTSBURGH TESTING LABORATORY

Report #2
June 25, 1984

GRAIN SIZE DISTRIBUTION CURVE



FORM NO. 1435

Alaska Testlab

4040 "B" Street Anchorage, Alaska 99503 Phone (907) 562-2000 (Telecopier (907) 563-3953)

MECHANICAL GRAIN SIZE ANALYSIS
SHEET 1 OF 7

FOR SAMPLE: 2422.....

WORKORDER NO. A21882 JOB NO. A21882
PROJECT: KOTZEBUE MATERIAL
LOCATION: L-1, 0-7.5'
DATE RECEIVED: 20 APR 1984 DATE TESTED: 20 APR 1984

HYDROMETER MUST BE RUN TO CLASSIFY FROST CLASS.
UNIFIED CLASSIFICATION: GP-GM
TEXTURAL CLASSIFICATION: SANDY GRAVEL
COEFFICIENT OF UNIFORMITY = 49.7 COEFFICIENT OF CONCAVITY = 7.4

SIEVE	PERCENT PASSING
3 INCH	100
2 INCH	100
1 1/2 INCH	100
1 INCH	97
3/4 INCH	95
1/2 INCH	85
3/8 INCH	76
NO 4	50
NO 10	25
NO 20	16
NO 40	13
NO 60	12
NO 100	10
NO 200	8.8

L-1 0'-7.5'

Alaska Testlab

4040 "B" Street Anchorage, Alaska 99503 Phone (907) 562-2000 (Telecopier (907) 563-3953)

MECHANICAL GRAIN SIZE ANALYSIS
SHEET 2 OF 7

FOR SAMPLE: 2423.....

WORKORDER NO. A21882 JOB NO. A21882
PROJECT: KOTZEBUE MATERIAL
LOCATION: L-1 13.0-18.0'
DATE RECEIVED: 20 APR 1984 DATE TESTED: 20 APR 1984

HYDROMETER MUST BE RUN TO CLASSIFY FROST CLASS.
UNIFIED CLASSIFICATION: SP-SM
TEXTURAL CLASSIFICATION: SILTY GRAVELLY SAND

SIEVE	PERCENT PASSING
3 INCH	100
2 INCH	100
1 1/2 INCH	100
1 INCH	99
3/4 INCH	95
1/2 INCH	86
3/8 INCH	78
NO 4	56
NO 10	36
NO 20	24
NO 40	18
NO 60	15
NO 100	13
NO 200	10.8

L-1 13'-18'

Alaska Testlab

4040 "B" Street Anchorage, Alaska 99503 Phone (907) 562-2000 (Telecopier (907) 563-3953)

MECHANICAL GRAIN SIZE ANALYSIS
SHEET 4 OF 7

FOR SAMPLE: 2425.....

WORKORDER NO. A21882 JOB NO. A21882
PROJECT: KOTZEBUE MATERIAL
LOCATION: L-2, 2.5-7.0'
DATE RECEIVED: 20 APR 1984 DATE TESTED: 20 APR 1984

HYDROMETER MUST BE RUN TO CLASSIFY FROST CLASS.
UNIFIED CLASSIFICATION: SM
TEXTURAL CLASSIFICATION: SILTY GRAVELLY SAND

SIEVE	PERCENT PASSING
3 INCH	100
2 INCH	100
1 1/2 INCH	100
1 INCH	100
3/4 INCH	97
1/2 INCH	92
3/8 INCH	88
NO 4	69
NO 10	46
NO 20	31
NO 40	22
NO 60	17
NO 100	15
NO 200	12.1

L-2 2.5'-7'

Alaska Testlab

4040 "B" Street Anchorage, Alaska 99503 Phone (907) 562-2000 (Telecopier (907) 563-3953)

MECHANICAL GRAIN SIZE ANALYSIS
SHEET 3 OF 7

FOR SAMPLE: 2424.....

WORKORDER NO. A21882 JOB NO. A21882
PROJECT: KOTZEBUE MATERIAL
LOCATION: L-3, 2.5-6.0'
DATE RECEIVED: 20 APR 1984 DATE TESTED: 20 APR 1984

HYDROMETER MUST BE RUN TO CLASSIFY FROST CLASS.
UNIFIED CLASSIFICATION: SM
TEXTURAL CLASSIFICATION: SILTY GRAVELLY SAND

SIEVE	PERCENT PASSING
3 INCH	100
2 INCH	100
1 1/2 INCH	100
1 INCH	100
3/4 INCH	99
1/2 INCH	96
3/8 INCH	93
NO 4	83
NO 10	66
NO 20	55
NO 40	46
NO 60	37
NO 100	31
NO 200	26.5

L-3 2.5'-6'

Alaska Testlab

4040 "B" Street Anchorage, Alaska 99503 Phone (907) 562-2000 (Telecopier (907) 563-3953)

MECHANICAL GRAIN SIZE ANALYSIS
SHEET 5 OF 7

FOR SAMPLE: 2426.....

WORKORDER NO. A21882 JOB NO. A21882
PROJECT: KOTZEBUE MATERIAL
LOCATION: L-5, 2.5-10.0'
DATE RECEIVED: 20 APR 1984 DATE TESTED: 20 APR 1984

HYDROMETER MUST BE RUN TO CLASSIFY FROST CLASS.
UNIFIED CLASSIFICATION: SM
TEXTURAL CLASSIFICATION: SILTY GRAVELLY SAND

SIEVE	PERCENT PASSING
3 INCH	100
2 INCH	100
1 1/2 INCH	100
1 INCH	99
3/4 INCH	96
1/2 INCH	86
3/8 INCH	79
NO 4	60
NO 10	41
NO 20	31
NO 40	26
NO 60	22
NO 100	20
NO 200	15.9

L-5 2.5'-10'

PITTSBURGH TESTING LABORATORY
ESTABLISHED 1881
700 West 58th, Unit A, Anchorage, AK 99502

FORM 407

LABORATORY No. 247

CLIENT'S No.

July 31, 1984

ORDER No. ANC 244

REPORT
#6 - Fianl

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 6.1
Coefficient of Curvature - ASTM 2487 - 1.02

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	37
3/4"	96	#40	28
1/2"	85	#80	8
3/8"	77	#100	8
#4	72	#200	4.0
#10	48		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

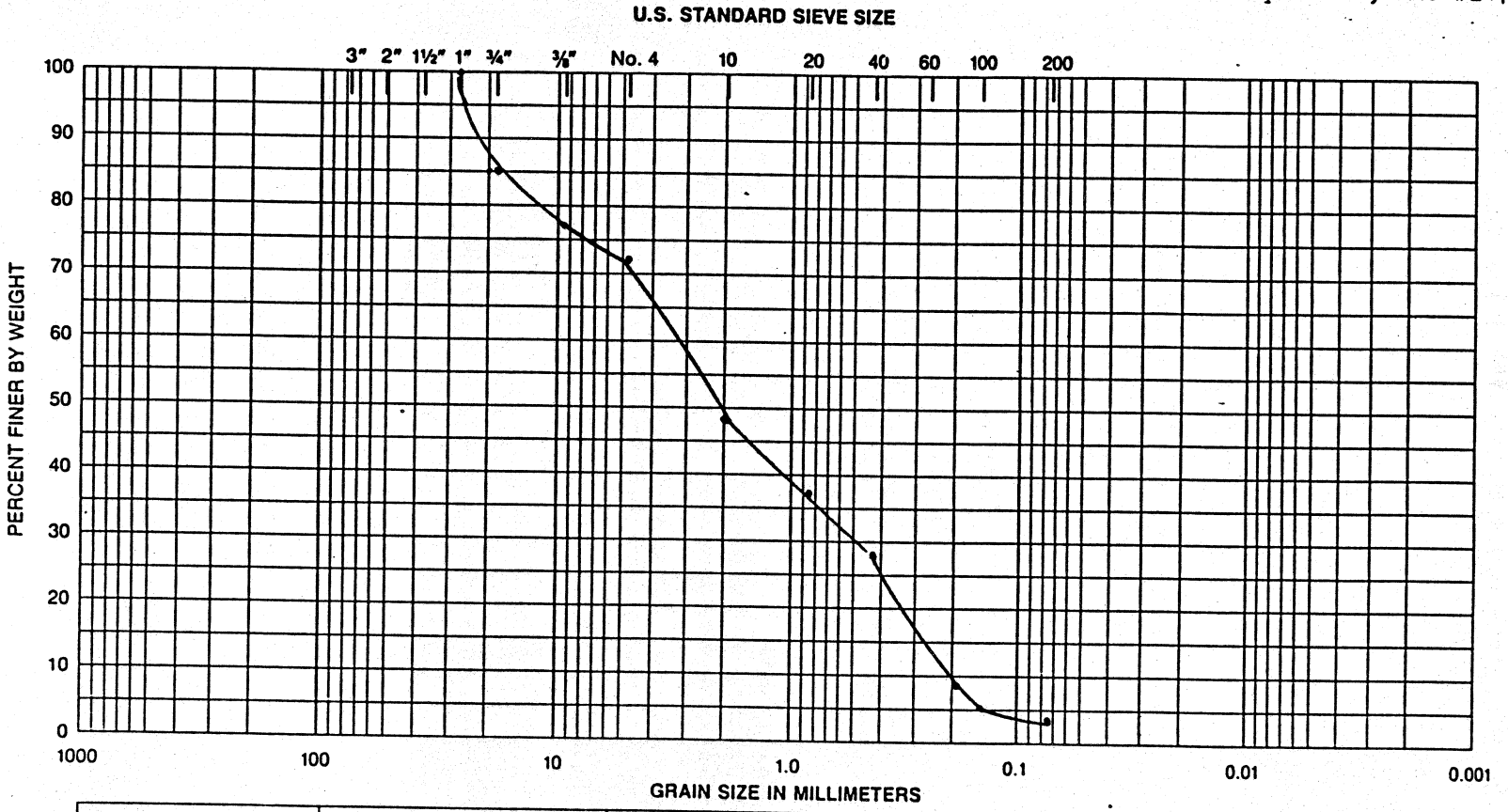
I-5 7'-9'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #6, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
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PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT
#9 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 6.94
Coefficient of Curvature - ASTM 2487 - .514

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	44
3/4"	96	#40	40
1/2"	90	#80	12
3/8"	86	#100	5
#4	83	#200	2.9
#10	54		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

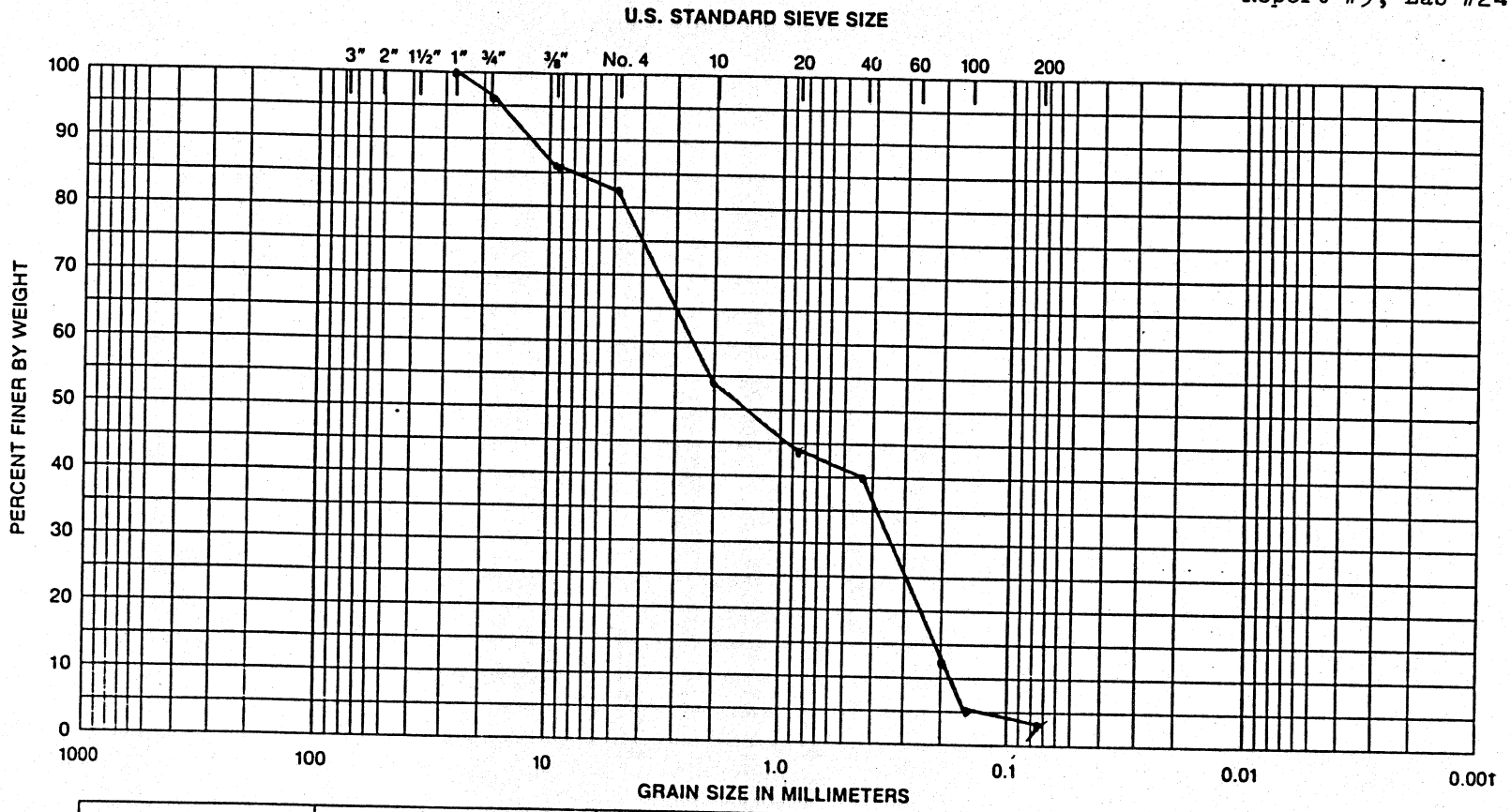
I-10 8'-12'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #9, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
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FORM 407

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

LABORATORY No. 247

CLIENT'S No.

July 31, 1984

ORDER No. ANC 244

REPORT
#8 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Sandy Gravell
Coefficient of Uniformity - ASTM 2487 - 6.4
Coefficient of Curvature - ASTM 2487 - .592

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	22
3/4"	93	#40	17
1/2"	82	#80	9
3/8"	73	#100	8
#4	49	#200	5.7
#10	30		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bandy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

I-11 5'-7'

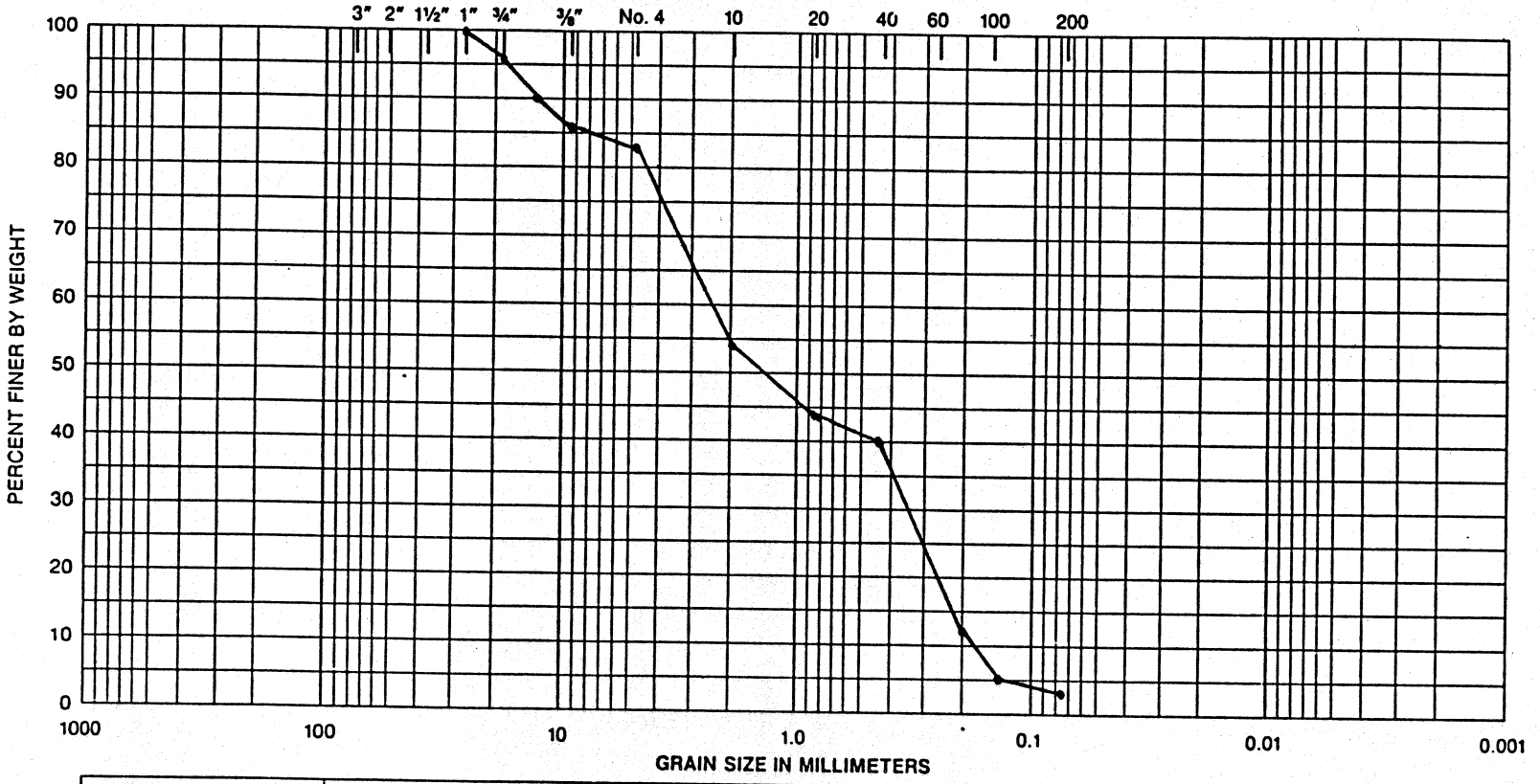
Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 247

CLIENT: G.E.O.D.E. Exploration

Report #8, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			– –									
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FORM 407

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A; Anchorage, AK 99502

LABORATORY No. 247

CLIENT'S No.

July 31, 1984

ORDER No. ANC 244

REPORT

7 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 5.36
Coefficient of Curvature - ASTM 2487 - 1.72

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	30
3/4"	95	#40	20
1/2"	86	#80	6
3/8"	79	#100	5
#4	59	#200	3.7
#10	43		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bandy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

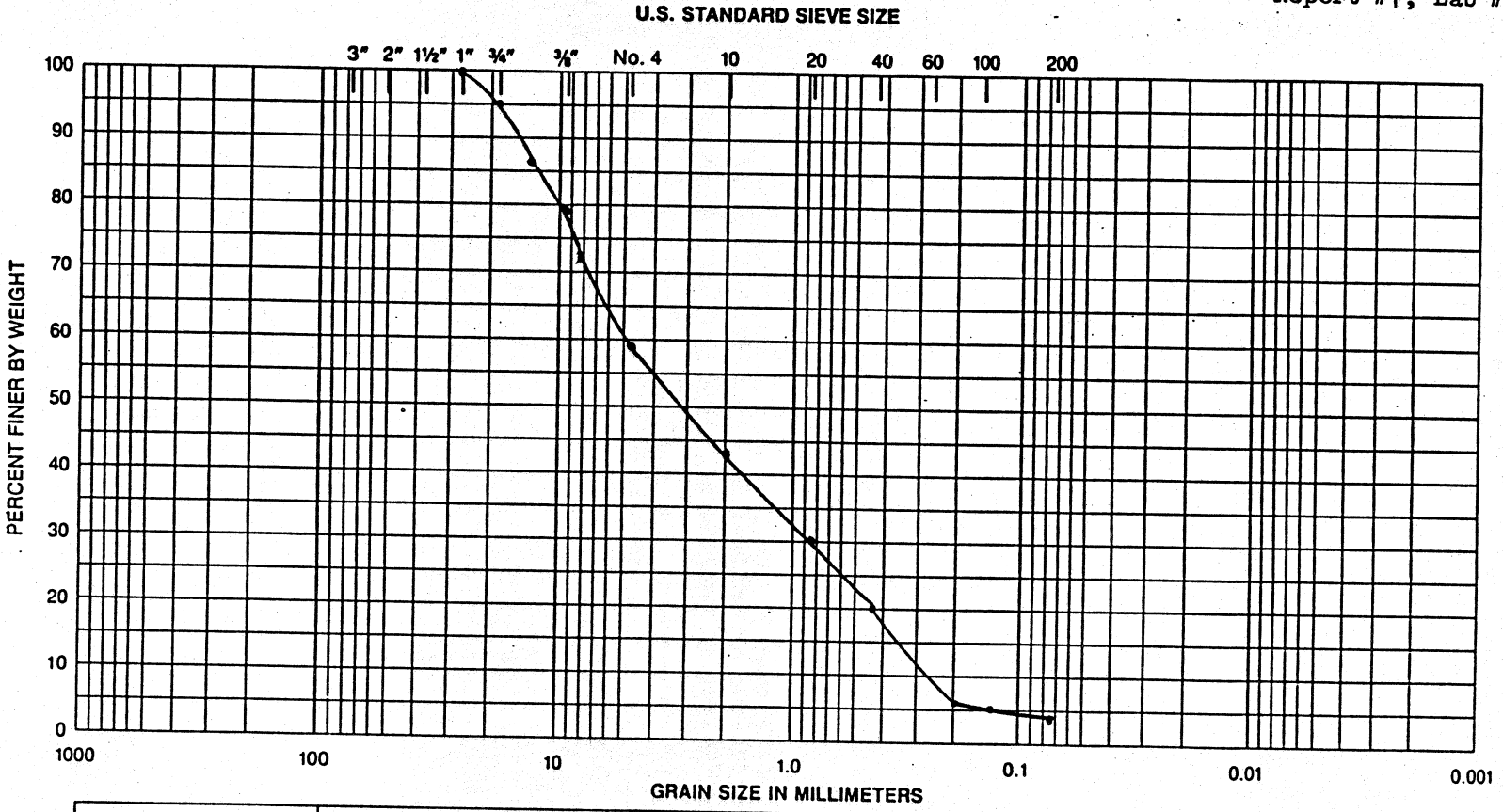
I-12 3'-11'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #7, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			— —									
			—•—									
			—••—									

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT

#10 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 31.77
Coefficient of Curvature - ASTM 2487 - 2.75

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	18
3/4"	84	#40	13
1/2"	76	#80	8
3/8"	66	#100	7
#4	42	#200	5.0
#10	26		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Lundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

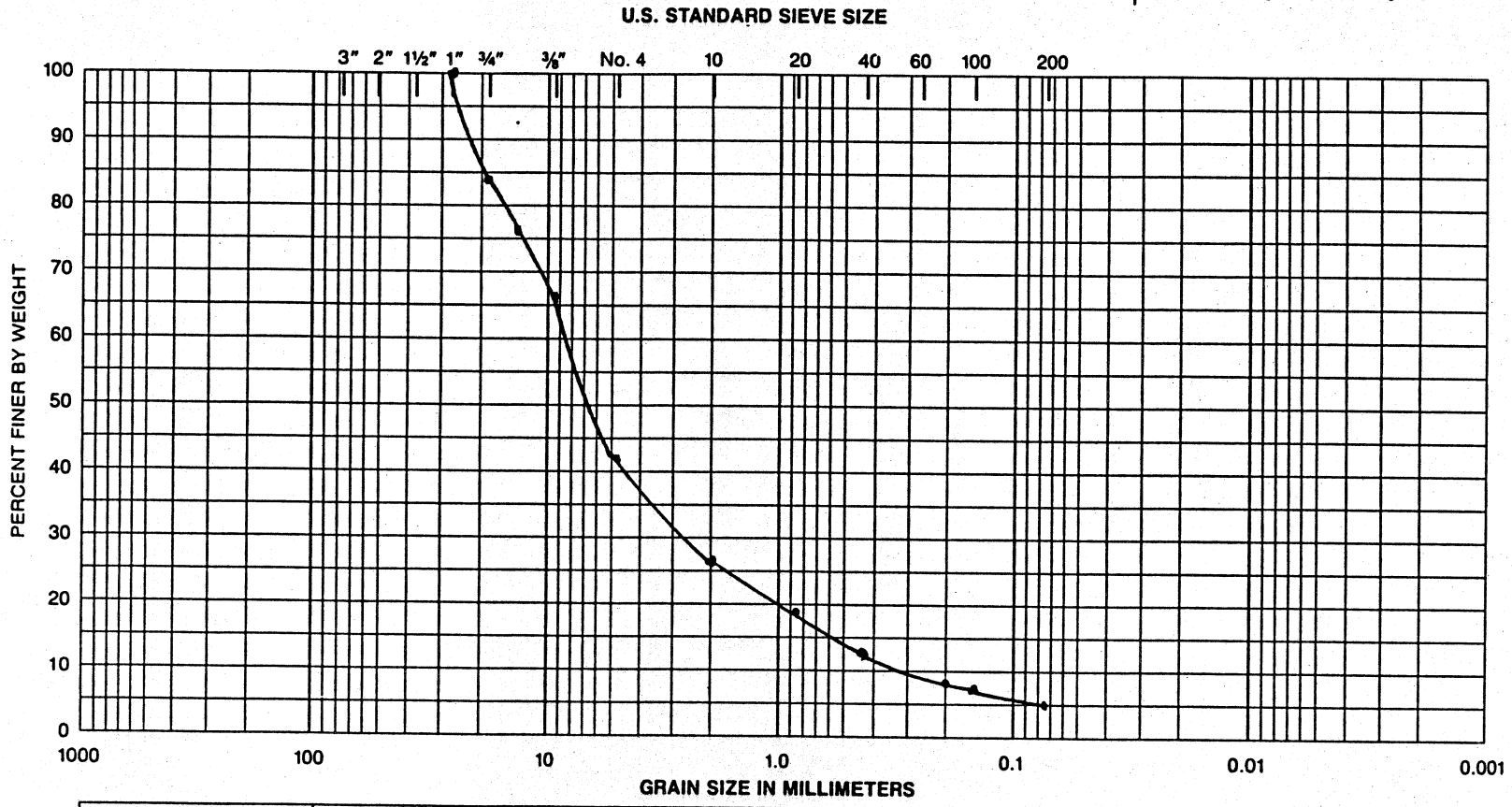
I-14 3'-7'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #10, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			– –									
			—•—									
			—••—									

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT

#11 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 30
Coefficient of Curvature - ASTM 2487 - .675

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	96	#20	29
3/4"	87	#40	21
1/2"	77	#80	10
3/8"	71	#100	8
#4	56	#200	5.3
#10	41		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bandy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

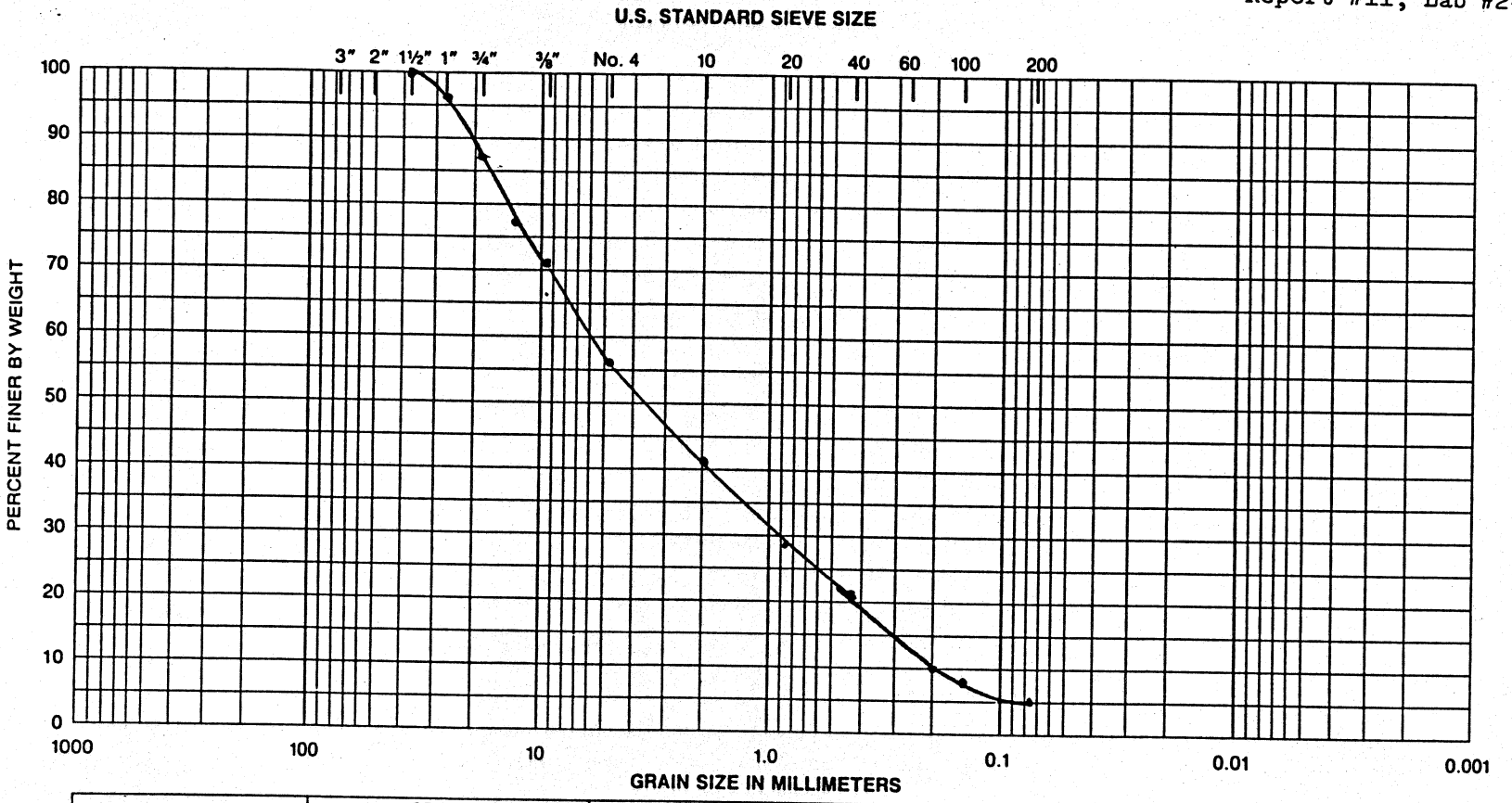
I-17 6'-10'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #11, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			— —									
			—•—									
			—••—									

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT
#12 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Sand
Coefficient of Uniformity - ASTM 2487 - 21.1
Coefficient of Curvature - ASTM 2487 - .211

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	49
3/4"	100	#40	45
1/2"	100	#80	32
3/8"	96	#100	27
#4	85	#200	6.5
#10	62		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

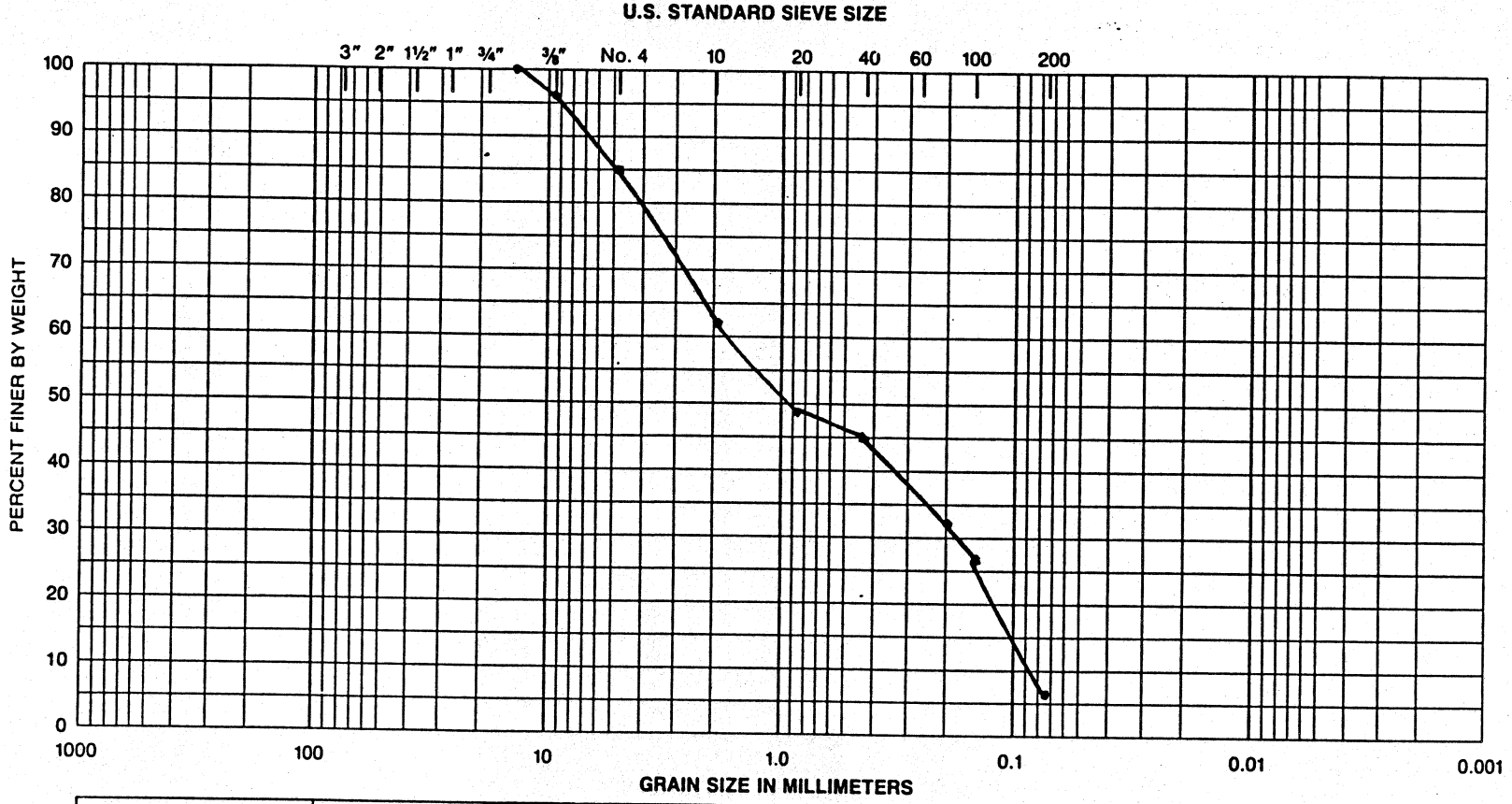
II-2A 14'-17'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #12, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			— —									
			—•—									
			—••—									

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A; Anchorage, AK 99502

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT
#17 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 72.5
Coefficient of Curvature - ASTM 2487 - .0048

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	42
3/4"	99	#40	41
1/2"	89	#80	39
3/8"	79	#100	35
#4	62	#200	8.9
#10	48		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bandy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

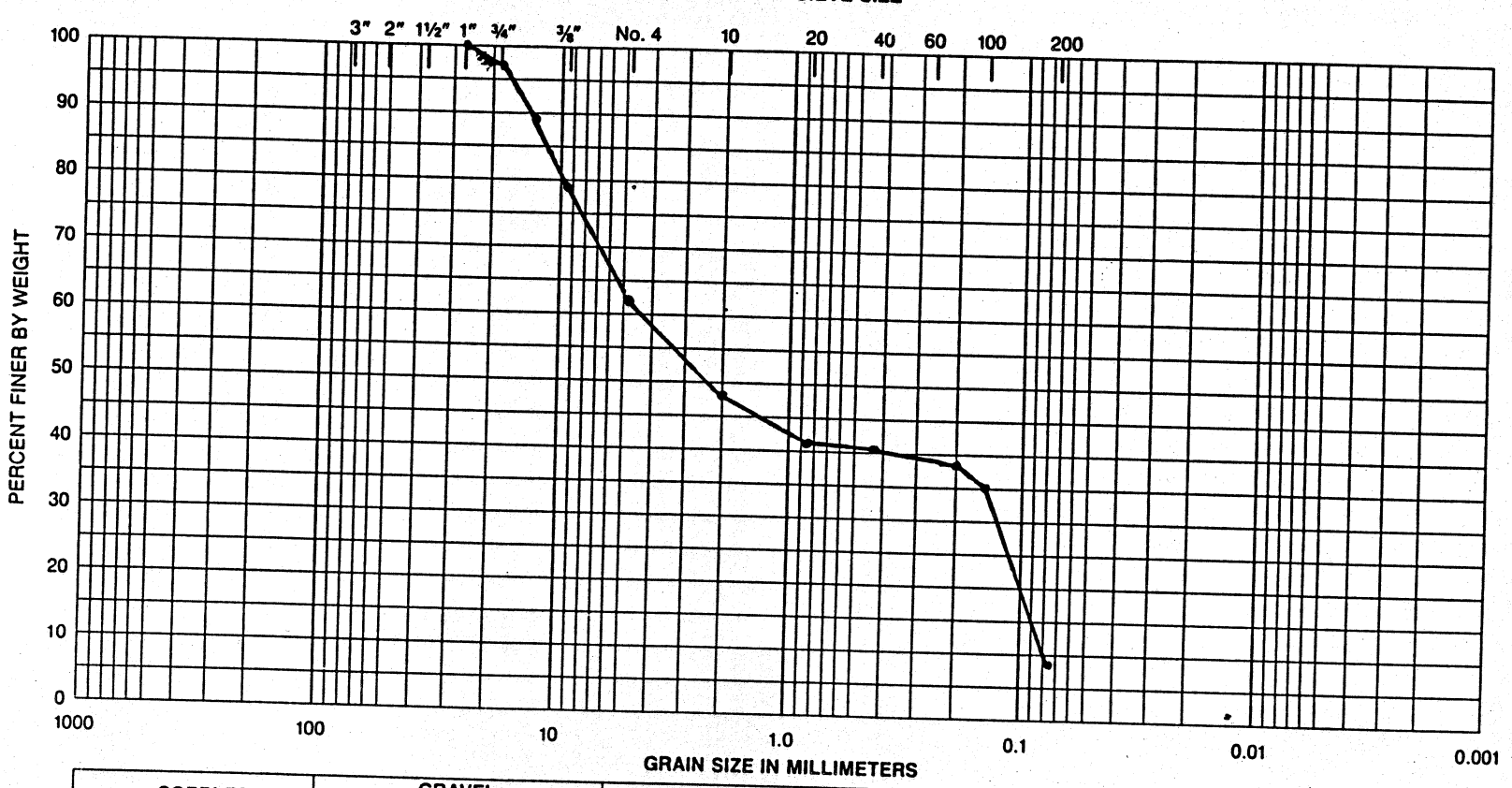
II-6 9'-14

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #17, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			– –									
			—•—									
			—••—									

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

FORM 407

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT
#13 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Silty Sand
Coefficient of Uniformity - ASTM 2487 - 7.1
Coefficient of Curvature - ASTM 2487 - .346

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	66
3/4"	100	#40	58
1/2"	98	#80	55
3/8"	94	#100	52
#4	87	#200	12.9
#10	80		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bunch

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

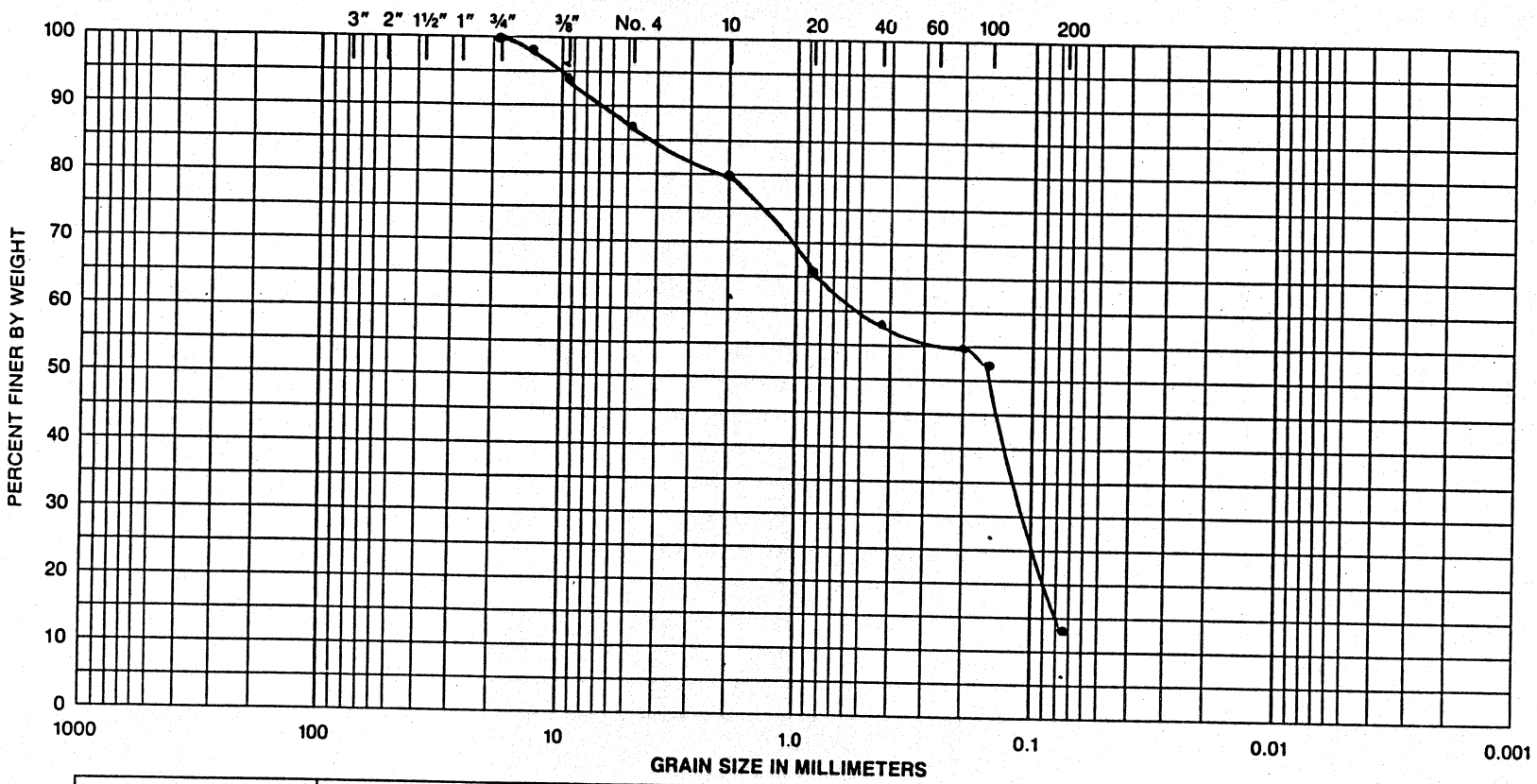
II-6 14'-16'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #13, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
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FORM 407

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

LABORATORY No. 247

CLIENT'S No.

July 31, 1984

ORDER No. ANC 244

REPORT
#14 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Silty Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 300
Coefficient of Curvature - ASTM 2487 - .0675

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	41
3/4"	100	#40	40
1/2"	91	#80	39
3/8"	81	#100	38
#4	57	#200	26.5
#10	45		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

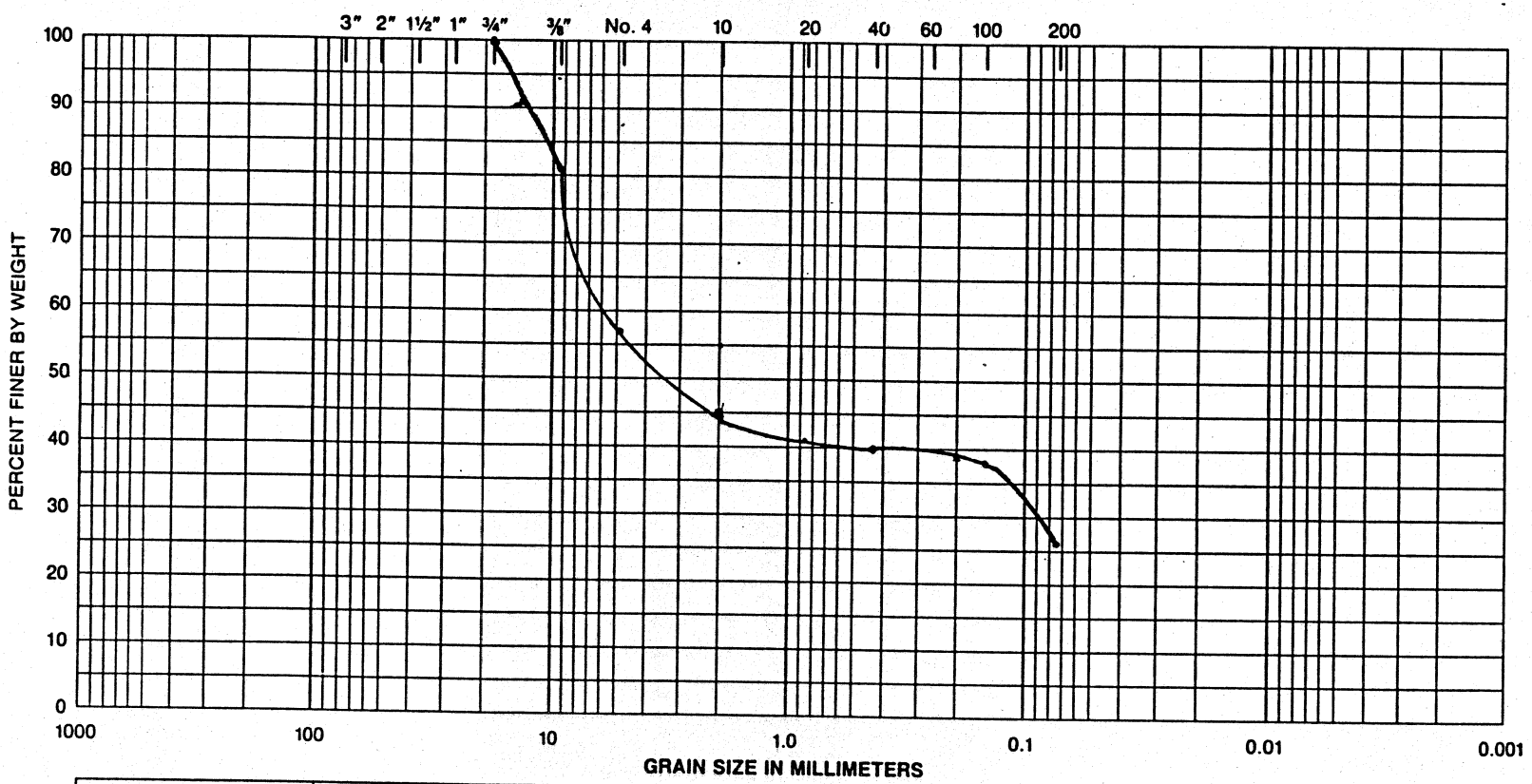
II-6 17'-19.5'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #14, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
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FORM 407

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

LABORATORY No. 247

CLIENT'S No.

July 31, 1984

ORDER No. ANC 244

REPORT
#15 - Final

REPORT OF:	Sieve Analysis
PROJECT:	Drill Hole Data
CLIENT:	G.E.O.D.E. Exploration 1343 G Street, Suite 3 Anchorage, AK 99501
SAMPLED BY:	Client
SAMPLE DATE:	Unknown
DATE TESTED:	7/26/84
REPORTED TO:	2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 22.86
Coefficient of Curvature - ASTM 2487 - .80

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	28
3/4"	93	#40	22
1/2"	76	#80	9
3/8"	63	#100	7
#4	61	#200	5.4
#10	46		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Sandy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

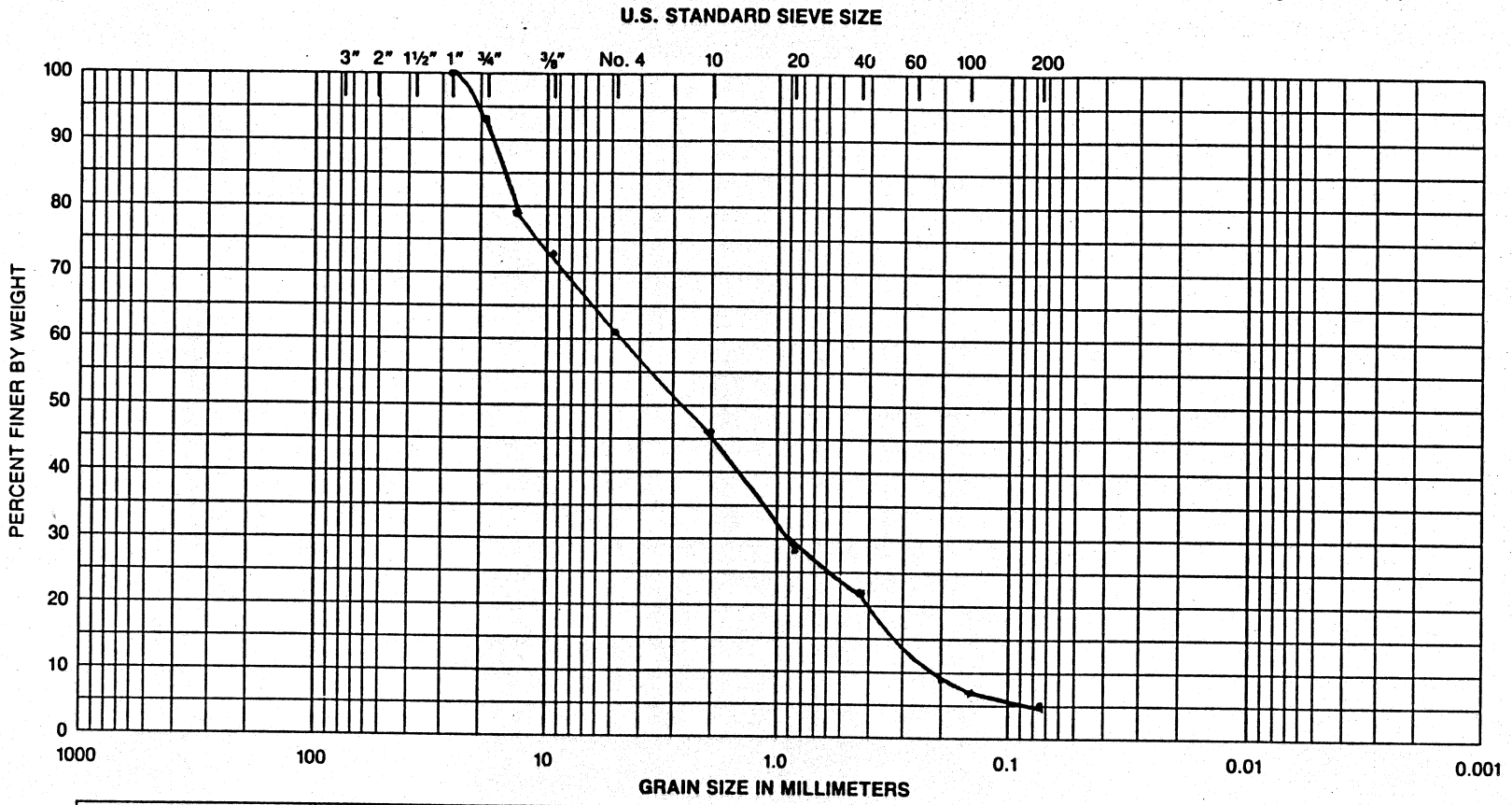
II-7 9-12'

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #15, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
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FORM 407

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A; Anchorage, AK 99502

CLIENT'S No.

LABORATORY No. 247

ORDER No. ANC 244

July 31, 1984

REPORT
#16 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 13.57
Coefficient of Curvature - ASTM 2487 - .46

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	38
3/4"	100	#40	31
1/2"	99	#80	21
3/8"	95	#100	12
#4	79	#200	5.6
#10	61		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

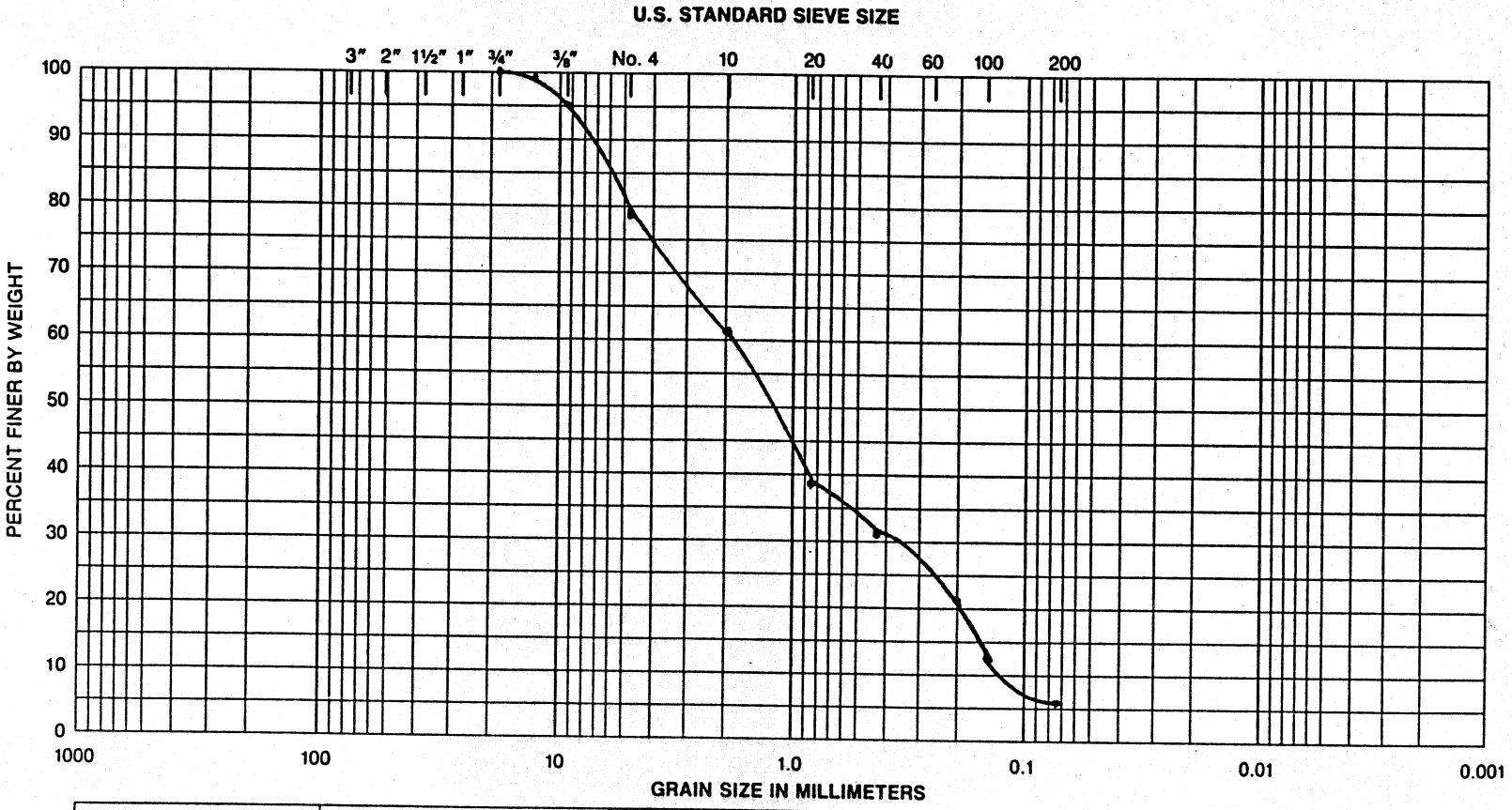
II-7 12'-14

Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E. Exploration
Report #16, Lab #247



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
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FORM 407

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

700 West 58th, Unit A, Anchorage, AK 99502

LABORATORY No. 247

CLIENT'S No.

July 31, 1984

ORDER No. ANC 244

REPORT
#18 - Final

REPORT OF: Sieve Analysis

PROJECT: Drill Hole Data

CLIENT: G.E.O.D.E. Exploration
1343 G Street, Suite 3
Anchorage, AK 99501

SAMPLED BY: Client

SAMPLE DATE: Unknown

DATE TESTED: 7/26/84

REPORTED TO: 2 - Client

SAMPLE DESCRIPTION

Gravelly Sand
Coefficient of Uniformity - ASTM 2487 - 5
Coefficient of Curvature - ASTM 2487 - .092

TEST RESULTS

Sieve Size	% Passing	Sieve Size	% Passing
1"	100	#20	12
3/4"	97	#40	8
1/2"	96	#80	2
3/8"	93	#100	1
#4	73	#200	.7
#10	43		

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

Timothy K. Bundy

For Brian H. Barron, Acting Manager
Anchorage Branch

klk

II-11 10'-12'

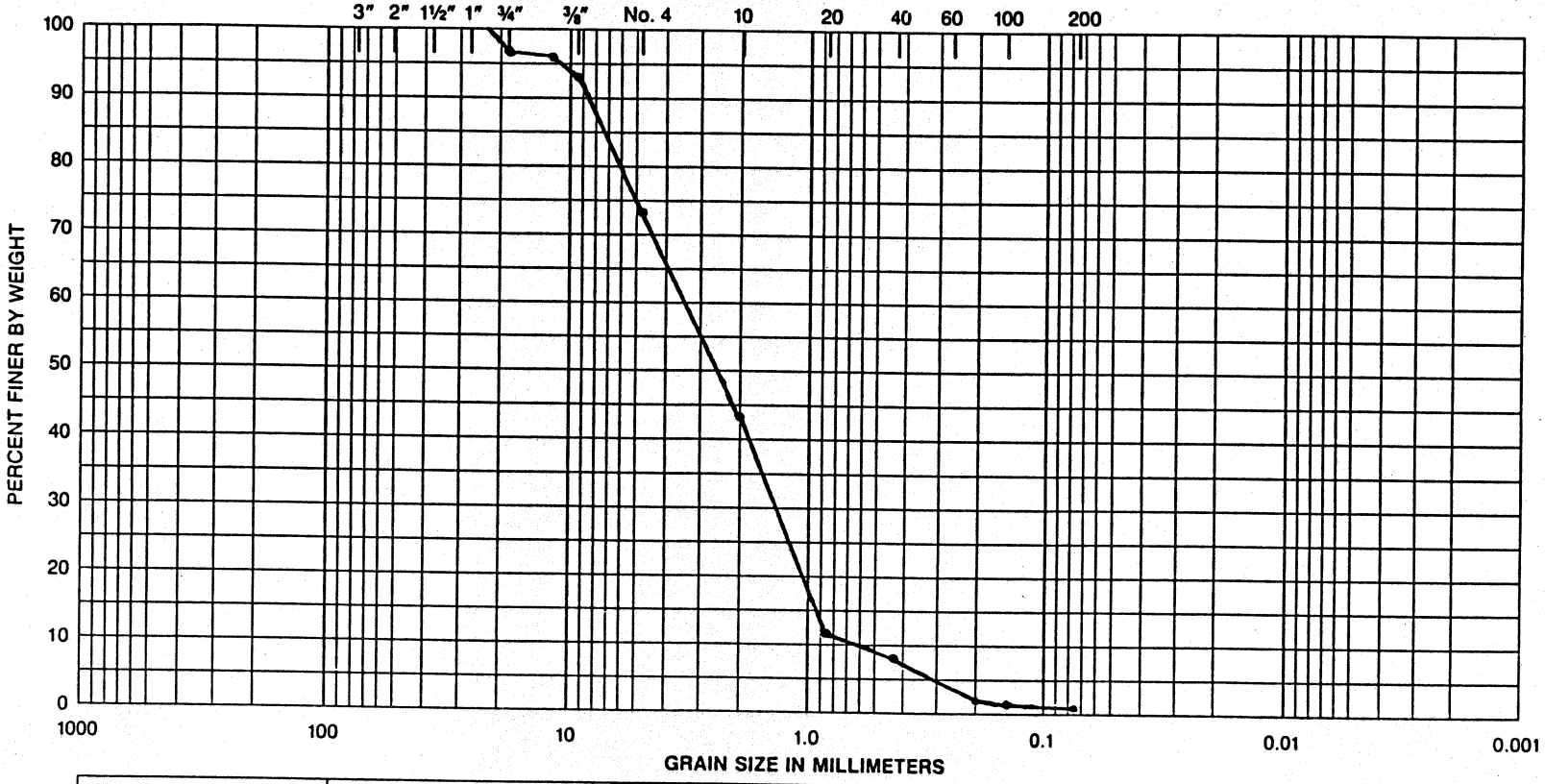
Pittsburgh Testing Laboratory

GRAIN SIZE DISTRIBUTION CURVE

ORDER NO. ANC 244

CLIENT: G.E.O.D.E Exploration
Report #18, Lab #247

U.S. STANDARD SIEVE SIZE



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

TEST BORING NO.	SAMPLE NO.	DEPTH FT.	LINE	GROUP SYM.	CLASSIFICATION	IN-SITU WC	LL	PL	PI	Gs	REMARKS	PLOTTED BY:
			——									
			— —									
			—•—									
			—••—									