GRANULAR RESOURCE INVENTORY
- MACKENZIE -
STANTON NTS 107D NW¼ NE¼ SW¼
(1:125,000)
Produced for Indian & Northern Affairs
by Dept. of Energy, Mines & Resources

GRANULAR RESOURCE INVENTORY - MACKENZIE

STANTON NTS 107D $NW\frac{1}{4}$ $NE\frac{1}{4}$ $SW\frac{1}{4}$

SCALE (1: 125,000)

D.E. Lawrence

F.G. Shnay

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For - Department of Indian and
Northern Affairs

SUMMARY

The Stanton map area (NE¼, NW¼, SW¼) contains vast glaciofluvial and marine deposits, the majority are fine and medium grained sands. There is a small amount of coarse granular material in the immediate vicinity of the settlement of Stanton and north of the Eskimo Lakes. Exploration for additional coarse material should be directed to locating lenses and abandoned stream channels within the glaciofluvial sand deposits.

Important considerations in evaluating the availability of construction material in this area are; the amount of ground ice, the height of material above the water table, and the amount of swamp and muskeg. These conditions are highly variable, even within a single deposit, thus exploration must be undertaken in order to evaluate each potential source of material.

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INTRODUCTION

This report attempts to assess the quantity of granular material available for construction. Both unconsolidated and bedrock sources are considered. Glaciofluvial and fluvial materials are considered first rate sources of sand and gravel. Lacustrine and marine deposits are of variable quality whereas eolian material is of limited use because of its fine texture. The shale bedrock is non-resistant, ice-free and can easily be ripped. It could be used for road fill and other construction uses.

The information which appears in this report and on the accompanying map has been compiled largely from published and unpublished manuscripts and personal communication with officers of the Geological Survey of Canada. Supplementary data, mainly on depths, thicknesses and, in some cases, on texture of deposits have been obtained from confidential reports of other government departments and industry. (See Sources of Information).

The basic document used in this compilation is a surficial geology map at a scale of 1:125,000 (Rampton, 1972a). It is indexed as GSC Open File Number 96 and may be viewed at Geological Survey of Canada offices in Ottawa, Calgary and Vancouver; ozalid copies may be obtained at nominal cost. All areal data are derived from this source; all major and most minor unconsolidated deposits of granular material are represented at this scale.

A derived map for granular material has been produced from the basic surficial geology map in close association with the field geologist. His field observations provide additional data on thickness, texture, ice content, drainage, and the variability of the map units.

To supplement thickness and textural data, additional information was gathered from seismic shot hole records and samples, and from other drill hole logs.

Areal extent of deposits were estimated by planimetric means. Average thickness for each deposit was estimated from the data mentioned above and adjusted according to several other variables such as drainage, height above water table, and amount of ground ice. From this, a volume of granular material was estimated. All estimated volumes of material appear in a tabular summary at the end of the paper.

For purposes of description, areas of granular material are outlined on the surficial geology map and are numbered to correspond to a tabular summary of materials. Areas which appear to have little material with respect to anticipated demand or areas which require more detailed work are discussed in the report.

GENERAL GEOLOGY AND PHYSIOGRAPHY

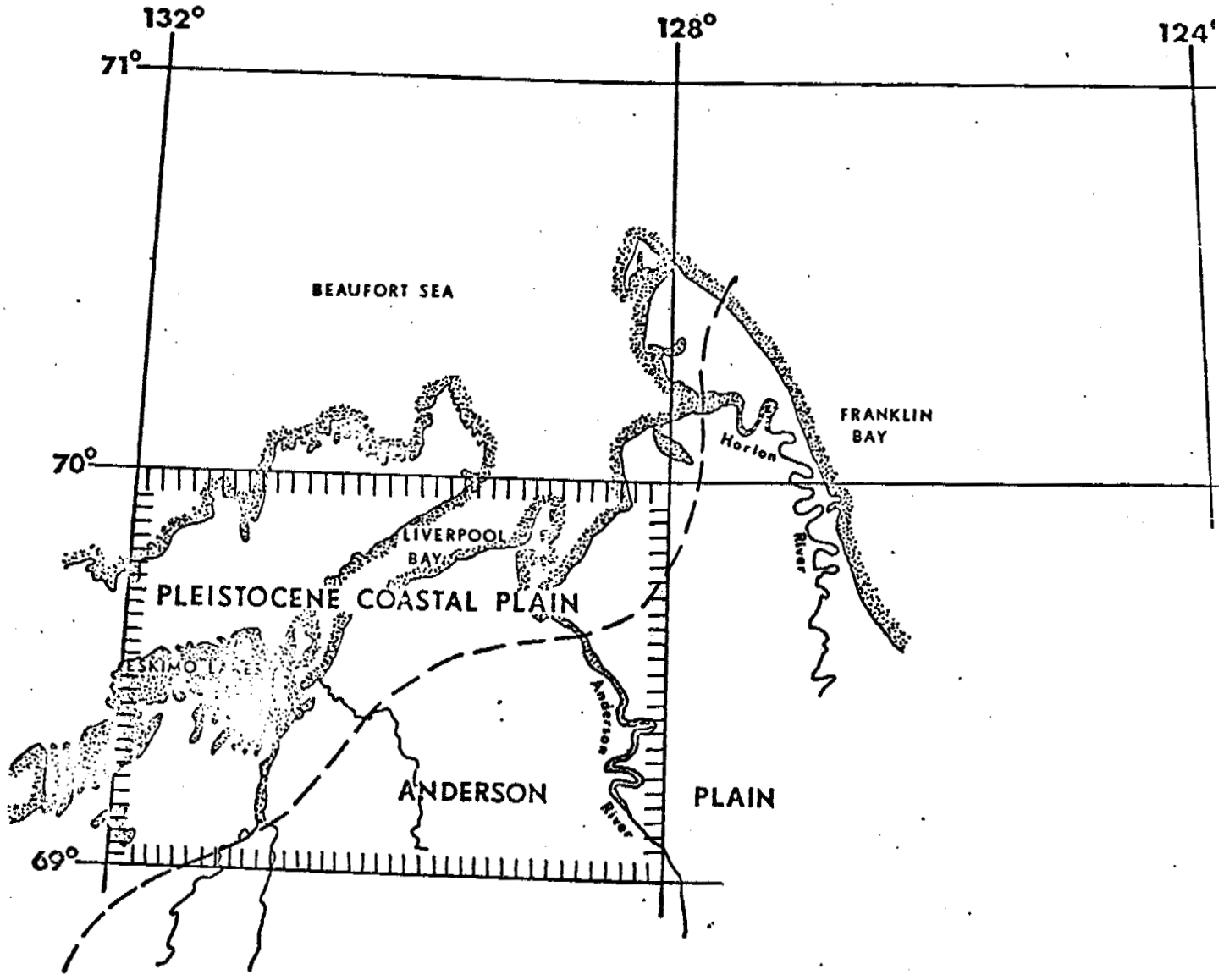
Two physiographic regions are represented on the Stanton map (fig.1): the Pleistocene Coastal Plain in the northwest and the Anderson Plain in the southeast (Rampton, 1971c). Bedrock is only exposed along the southwestern shore of Liverpool Bay and along the Anderson River. Except for the northern part of the Tuktoyaktuk Peninsula, unconsolidated marine sands were subjected to two periods of continental glaciation.

Thick deposits of deltaic marine sands underlie all surficial deposits. Ground and end morainal till cover the marine sands south of Liverpool Bay and south of the Eskimo Lakes. North of the limit of glaciation on the Tuktoyaktuk Peninsula a glaciofluvial outwash plain of sand and gravel covers the marine deposits. Coarse material covering the southern portion of the Peninsula grades to fine material towards the north. Wind action has produced a fine sand eolian veneer which covers the sandy glaciofluvial deposits in the northern part of the Tuktoyaktuk Peninsula. Pingos, ice slumps, thermokarst lakes, patterned ground, oriented lakes and hummocky relief are the result of post-glacial permafrost and thermokarst processes.

Unconsolidated Deposits

Glaciofluvial Deposits, F^G

Glaciofluvial deposits of sand and gravel in the Stanton map area were formed as glacial outwash plains. Sandy deposits occur at the mouth of the Kugatuk River and between the Eskimo Lakes and the Beaufort Sea. Mixed sand and gravel deposits occur south of the Eskimo Lakes and in the vicinity of the settlement of Stanton. Isolated deposits of gravel are found along the Anderson River near Wood Bay and immediately north of the Eskimo Lakes. Thermokarst activity has created hummocky terrain and the many small lakes which are distributed throughout the map area.



STANTON

PHYSIOGRAPHIC REGIONS

0 Km 80
0 Mi 50

after RAMPTON 1971

The sand and gravel deposits average 20 feet in thickness; sixty percent of the gravel deposits are available for construction purposes. Sandy deposits are less desirable as construction material because they tend to have a finer texture, high ground ice and poor drainage.

Deltaic Marine Deposits, Sand $s(\eta)Gk$

Layered deltaic marine sands are exposed primarily on the south shore of Liverpool Bay. Glaciers have modified the deposit, thermokarst activity has produced small lakes and wind erosion has formed dunes and blow outs. The elevation of this area is less than 100 feet.

The marine deposits of this map area average 20 feet in thickness. Approximately 50 percent is available as construction material. Coarser material may be found in abandoned stream channels.

Active Marine Deposits, sand and gravel $(\eta)^A$

Sands and gravels are constantly being deposited and eroded by coastal wave and current action, forming spits, bay head bars, beaches and some near shore islands. Their average height above sea level is 8 feet and approximately 20 percent of the material is available as a granular resource.

Bedrock

Bedrock exposures of flat lying Upper Cretaceous shale, occur in the area southeast of Liverpool Bay and along the river cuts of the Anderson River. North of Liverpool Bay, and in some areas, south of the Bay, the cover of unconsolidated deposits is continuous. Thicknesses of more than 200 feet surficial material are common.

MATERIALS

There are large areas of glaciofluvial materials distributed unevenly throughout the map area, most of this material however is fine and medium grained sand. The deposits range in thickness from 10 to 50 feet or more. Additional coarse material may be found as lenses or channels within the glaciofluvial sand units. In most areas ground ice and muskeg will hamper exploitation of these deposits.

Glaciated marine sands which underlie most of the glaciofluvial units are exposed extensively along the southern coast of Liverpool Bay. These sands are mainly fine grained and are up to 50 feet thick. Some clay and gravel lenses exist in the sand.

Recent marine deposits are composed of sand and gravel, medium and fine sand being the most abundant material. These units are actively forming at present and average 8 feet above sea level.

The depth to bedrock is variable throughout the map area. South of Liverpool Bay Upper Cretaceous shale is exposed but on the coast it is estimated that depth to bedrock is 200'. The Upper Cretaceous shale, where exposed, tends to be non-coherent.

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
Stanton North East				
Area I MASSON RIVER				
a) $s\overset{M}{\underset{r}{A}}$				
marine deposits actively forming ridges and beaches; sand.	0.59	8	4.87	.97
Area II STANTON				
a) sgF^{G}_{p}				
glaciofluvial plain; sand and gravel.	3.51	20	73.13	43.87
Area III ANDERSON RIVER				
a) gF^{a}_{p}				
glaciofluvial plain; gravel.	0.2	20	4.06	2.43
Area IV RUFUS LAKE				
a) $\underset{g^{F}}{Lv}$				
lacustrine veneer over fluvial; gravel	0.2	10	2.03	0.4
Area V LIVERPOOL BAY				
a) $s\overset{M}{\underset{,k}{C}}$				
marine glacial thermokarst, sand.	10.70	20	222.58	16.69

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
Area VI NORTH LIVERPOOL BAY				
a) $\underline{Ev,r}$ sF^Gp description:- area, 4.4 sq. mi.: veneer ridged over glaciofluvial plain; sand. - this area is largely inaccessable. - at least 60-70% is marshy.				
Area VII NORTH SHORE LIVERPOOL BAY				
a) $\underline{sF^Gp}$ glaciofluvial plain; sand.	4.10	20	85.32	25.59
$\underline{gs\eta^Ar}$ marine deposits actively forming beaches and ridges; gravel and sand.	.23	8	1.94	.38

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
Stanton South West				
Area IX ESKIMO LAKES				
a) $\underline{sF^G_p}$				
glaciofluvial plain; sand.	.31	20	6.53	1.95
Area X				
a) $\underline{gF^G_k}$				
glaciofluvial thermokarst; sand.	1.37	20	28.44	8.53
Area XI				
a) $\underline{sF^G}$				
glaciofluvial; sand.	.03	20	.65	.19
Area XII				
a) $\underline{sF^G}$				
glaciofluvial sand.	.40	20	8.12	2.42
b) $\underline{sgF^G_k}$				
glaciofluvial sand and gravel.	11.33	20	235.63	141.36

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
Area XIII				
a) $sg^{G}_{F}p$				
glaciofluvial sand and gravel.	0.39	20	8.13	4.87
Area XIV				
a) $sF^{G}p$				
glaciofluvial plain;	2.73	20	56.88	17.06
b) $sgF^{G}k$				
glaciofluvial thermokarst; sand and gravel.	9.37	20	207.23	124.33
Area XV				
a) $gF^{G}p$				
glaciofluvial plain; sand.	.39	20	8.13	2.43
b) $sgF^{G}k$				
glaciofluvial thermokarst; sand and gravel.	.98	20	20.31	12.18
c) $sgF^{G}p$				
glaciofluvial plain; sand and gravel.	3.90	20	89.39	50.37
Area XVI				
a) $sgF^{G}p$				
glaciofluvial plain; sand and gravel.	1.37	20	28.44	17.06

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
b) $\underline{sF^Gp}$				
glaciofluvial plain; sand.	15.53	20	321.82	96.53
Area XVII				
a) glaciofluvial plain; sand.	0.39	20	8.13	2.42
b) $\underline{Ev,r}$ sF^Gp				
ridged eolian veneer over glaciofluvial plain; sand.	0.16	20	3.26	.97
Stanton North West				
Area XVIII BEAUFORT SEA				
a) $\underline{sM^A}$				
marine actively forming ridges and beaches; sand.	1.04	8	8.43	1.67
Area XIX ATKINSON POINT				
a) $\underline{sM^A}$				
marine actively forming ridges and beaches; sand.	1.57	8	.98	1.58
Area XX MCKINLEY BAY				
$\underline{sM^A}$				
a) marine actively forming ridges and beaches; sand.	.35	8	2.92	0.58

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
Area XXI				
a) $\underline{Ev,}$ sF^Gp				
eolian veneer over glaciofluvial plains; sand. - marshy in most areas and inaccessable.	74.37	20	1,324.85	464.34
Area XXII LIVERPOOL BAY NORTH SHORE				
a) $\underline{gF^Gk}$				
glaciofluvial thermokarst;	.78	60	48.8	24.4
b) $\underline{gF^Gp}$				
glaciofluvial plain gravel.	.20	20	4.06	3.23
c) $\underline{gF^G}$				
glaciofluvial gravel.	.08	60	4.8	1.92
d) $\underline{gsF^Gk}$				
glaciofluvial thermokarst; sand and gravel.	8.32	60	369.74	300.84
e) $\underline{sF^Gp, sF^Gk}$				
glaciofluvial plains and thermokarst; sand.	208.61	20	5,297.98	1,595.32
Area XXIII LIVERPOOL BAY				
a) $\underline{Ev,}$ sF^Gp				
eolian veneer actively forming ridges and beaches over glaciofluvial plains; sand	8.02	20	166.60	49.93

TABULAR SUMMARY

Description and Material	Area (sq. mi.)	Estimated Average Thickness (ft.)	Estimated Volume of Granular Material ($yds^3 \times 10^6$) total	available
Area XXIV LIVERPOOL BAY-SOUTH SHORE				
a) $s\text{M}^{G}_{k}$				
glaciomarine thermokarst; sand.	22.64	20	471.26	35.34
b) sgF^{G}_{p}				
glaciofluvial plain;	.63	50	32.49	25.98
c) sF^{G}_{k}				
glaciofluvial thermokarst; sand.	.08	20	1.6	.48

SOURCES OF INFORMATION

Mackay, J.R.
1963: The Mackenzie Delta Area; N.W.T.; Dept. Mines Tech. Survey Geog. Br., Mem. 8.

Prest, V.K., Grant, D.R. and Rampton, V.N.
1967: Glacial Map of Canada; Geol. Surv. Can., map 1253A.

Rampton, V.N.
1971a: Manuscript Surficial Geology Map of Stanton, Geol. Surv. Can. Open File number 96.

1971b: Surficial deposits of portion of Mackenzie Delta, Stanton, Cape Dalhousie and Malloch Hill map sheets, Geol. Surv. Can. (in preparation)

1971c: An outline of the Quaternary Geology of the geomorphology, Mackenzie and Keewatin districts, N.W.T., Edited by J.G. Fyles et al. 24th Inter. Geol. Cong., Guidebook A30.

APPENDIX I, Part I

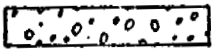
Unconsolidated Granular Materials

Each map sheet has a surficial geology legend (see appendix). This legend, differentiated by means of patterns, only indicates granular material classified by genetic characteristics. In some cases only part of a map unit has been patterned, indicating that only that portion is considered a suitable source for ganular material.

Legend

GLACIOFLUVIAL

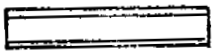
coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand



mixed or interbedded sand and gravel

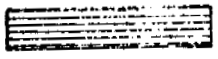
predominantly sand or sand with some fine material

GLACIOLACUSTRINE



coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand.

mixed or interbedded sand and gravel

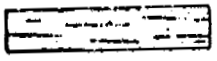


predominantly sand or sand with some fine material

FLUVIAL

only sand and gravel deposits are patterned

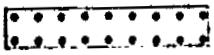
MORAINAL



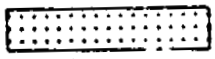
predominantly till; unsorted matrix of silt, clay, and sand imbedded with pebbles, cobbles and boulders

MARINE

coarse grained granular material: cobbles, pebbles, gravel; may be mixed with coarse sand

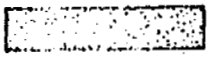


mixed or interbedded sand and gravel



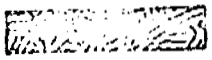
predominantly sand or sand with some fine material

EOLIAN



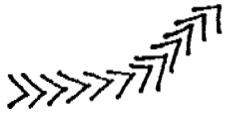
fine and medium sandy material

COLLUVIUM

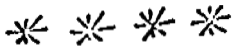


only the patterned area is coarse grained

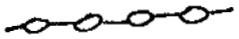
Symbols



eskers



gravel mounds

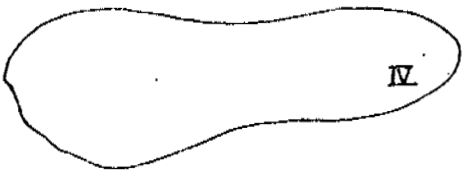


morainal ridge found within moraine

APPENDIX I, Part II

GRANULAR RESOURCE UNITS

I GRANULAR RESOURCE AREAS (black)



granular resource area (see text for corresponding description)

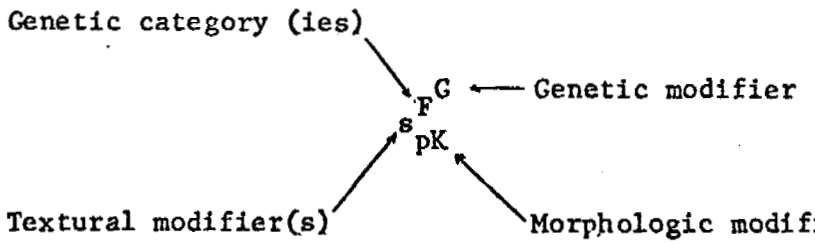
APPENDIX I, Part IV

SURFICIAL GEOLOGY AND LANDFORMS

Malloch Hill (97F), Mackenzie Delta (107C), Stanton (107D), and Cape Dalhousie (107E) map-areas

V.N. Rampton

Landform unit notation



$\frac{M}{F}$ Stratigraphic relationship (M overlies F): used when upper unit is thin and irregular and underlying unit is known.

Genetic Categories

C - colluvial
E - eolian
F - fluvial
L - lacustrine
M - morainal
(M) - marine
O - organic
R - bedrock
U - undifferentiated or unknown, commonly M or L

Genetic Modifiers[1]

G - glacial
A - responsible genetic process still actively affecting area

Textural Modifiers

c - clay, clayey
ŝ - silt or interbedded clay silt and fine sand
s - sand, sandy
g - gravel, gravelly
sh - shale

Morphologic Modifiers

e - eroded, gullied
f - fan
h - hummocky
m - rolling
p - plain
r - ridged, beach
t - terrace
v - veneer[2]
G - glaciated[3]
K - thermokarst[4]

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1. Mainly used to separate glaciofluvial deposits (F^G) from nonglacial fluvial deposits (F); to separate late Pleistocene glaciolacustrine deposits (L^G) from lacustrine deposits of thermokarst origin (L); to indicate areas where the responsible genetic process is still active (A).

2. Veneer indicates known thickness of category is less than 15 feet, commonly only 3 feet or less. Surface is flat or gently rolling.

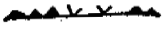
3. Glaciated indicates that map-unit has been topographically modified by glaciation even though till is not always easily identified on surface of map-unit.

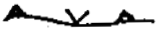
4. Thermokarst indicates that a hummocky topography has developed as a result of subsidence and erosion where frozen sediments or ground ice have melted.

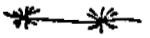
Symbols

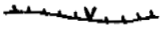

- beach ridge or spit (sand or gravel)


- former beach ridge or spit (sand or gravel; gravel)


- sea cliff or escarpment, > 25 ft., constantly or periodically undercut (V indicates escarpment partly cut in bedrock)


- former sea cliff (partly cut in bedrock)


- abandoned glaciolacustrine shoreline, marked by cliff beachs, etc.


- stream-cut escarpment, constantly or periodically undercut (V indicates escarpment partly cut in bedrock)


- standing water covering >30 percent of area


- organic deposit, 5 to 15 ft. thick


- active, or recently active, blow-out


- ground observation point


- area of aerial observation

- boundaries (defined, approximated, assumed)