Reclamation for Hardrock Exploration
Mount Nansen Area, Yukon Territory

Prepared for:
DIAND - Northern Affairs Program

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March, 1994

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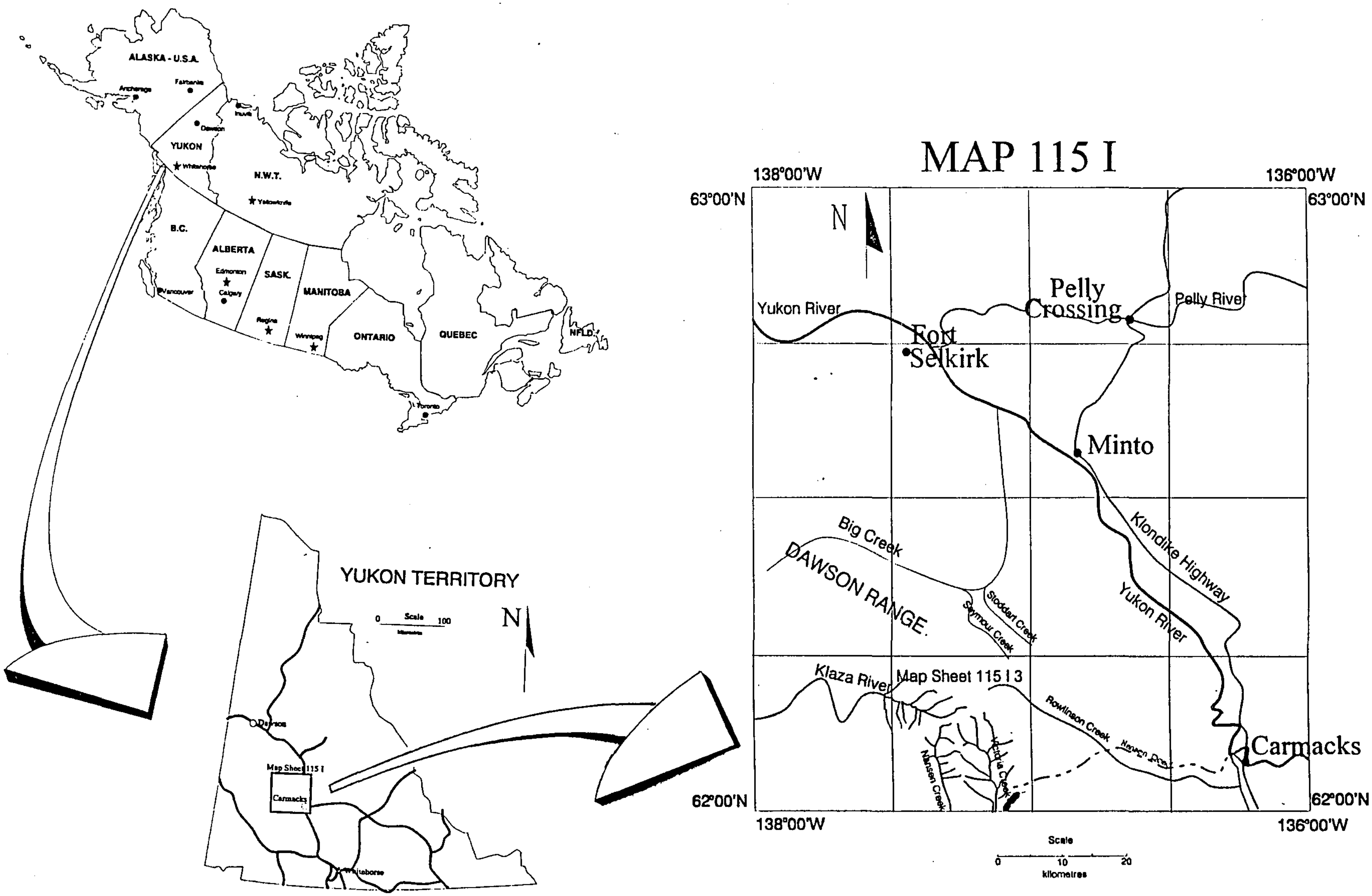
1.0 INTRODUCTION

EBA Engineering Consultants Ltd.(EBA) in association with Mougeot GeoAnalysis (Mougeot) and Steffen, Robertson and Kirsten (SRK) were retained by the Department of Indian Affairs and Northern Development, Northern Affairs Program (DIAND) to complete a study of terrain disturbance caused by exploration activity in the Mount Nansen area of the Yukon Territory (see Figure 1). The study was to involve a field exploration and mapping program, followed by the preparation of maps and reports detailing the extent of the disturbance and the natural restoration, relative to the age of the initial exploration. Authorization to proceed was received from Diane Emond, Scientific Authority, on September 23, 1993, under Consulting and Professional Services Contract No. Y3 MI 03.

The Mount Nansen study area is located 60 km west of Carmacks, Yukon between Victoria Creek and Nansen Creek directly south of Mount Victoria. The Mount Nansen Property, owned by B.Y.G. Resources contains promising gold and silver deposits which have been explored over the last 100 years, and intensively trenched and drilled over the last 30 years. The long and intense exploration history coupled with the range of natural conditions, such as elevation, exposure and slope characteristics has made this site an ideal candidate for this first study on reclamation techniques for hard rock exploration activities in Yukon Territory.

This report summarizes observations and conclusions with respect to the effects of exploration activity in the area, and includes a description of the regional geology and mining history of the area, complete with two maps at 1:25,000 scale (see back pocket), which show the surficial geology and anthropogenic features.



EBA Engineering Consultants Ltd.	PROJECT **Exploration Reclamation Study Mt. Nansen, YT**
CLIENT **DIAND - Northern Affairs Program**	TITLE **Location Map of Mt. Nansen Area**
DATE **February, 1994** DWN CHKD	DWG NO. **Figure 1** **0201-11333**

In addition the report describes the status of regulations related to reclamation of areas in nearby jurisdictions which have been affected by mining exploration and provides a summary of information that should be collected so a reclamation plan can be developed, and outlines reasonable practices for reclamation of surface disturbances after exploration activities are completed.

2.0 BACKGROUND INFORMATION

2.1 Climate

The climate of the Mt. Nansen area in south-central Yukon is characterized by long, cold winters and short, warm summers. Lack of precipitation can be a major barrier to successful revegetation and thus reclamation. Carmacks has an annual precipitation ranging from 225 to 285 mm. This general lack of precipitation is compounded by the lack of rainfall during the growing season, specifically in spring (May and June). July and August are the wettest months and April is considered the driest. In general, 60% of the total precipitation falls as rain and drizzle and the remainder as snow. The snow-pack typically melts in early May in the south and late May in the north.

Temperature is not a barrier to successful revegetation. Mean annual temperatures vary from -1 to -5 °C, depending upon location, but mean temperatures during the growing season are +9 to +11 °C. Snow accumulation and snow mold damage to vegetation may be a problem during some years.

Topography has a strong influence on temperature in the Yukon. Winter temperatures are relatively constant, but are occasionally influenced by coastal storms from the coast of Alaska. Inversions frequently develop in valley bottoms during the winter and milder temperatures tend to be found at the higher elevations. During the summer, warmer temperatures tend to develop in valley bottoms.

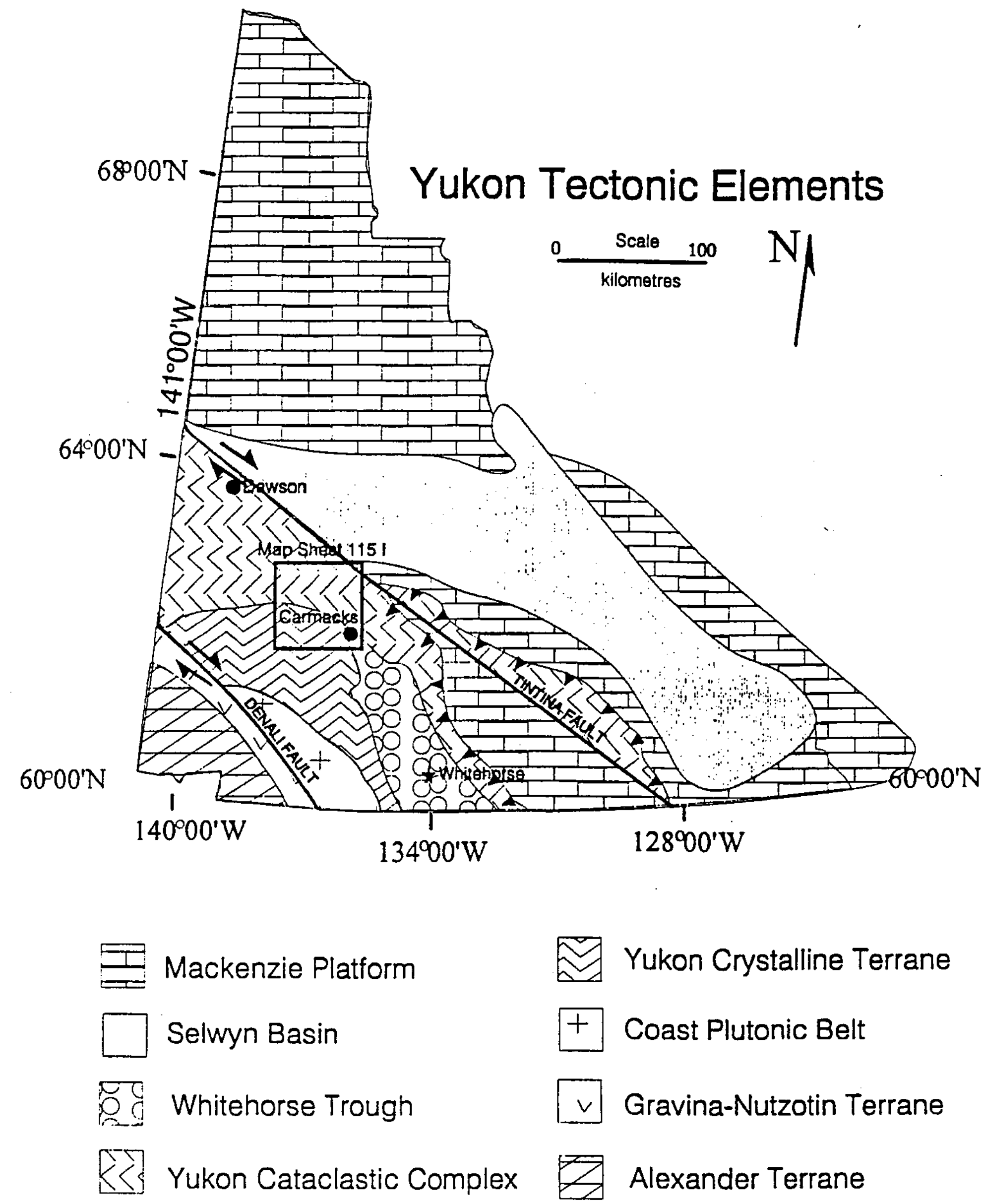
2.2 Permafrost

Mount Nansen is within the discontinuous permafrost area of the Yukon. In general the presence of permafrost in this area is controlled by vegetation cover (moss and organics provide insulation) slope aspect (north facing slopes) and elevation (tops of mountains).

Most of Mount Nansen is considered to contain permafrost below a thick (up to 1.5 m) active layer, however, the residual nature of the overburden (weathered bedrock), and the well-drained conditions infers that ground ice contents will be negligible on the mountain tops and valley sides. The accumulation of fine-grained sediments in valley bottoms, covered with organics, suggests that the potential for excess ground ice is high. Ground temperatures will also likely be warmer than 1.0 °C, therefore any minor changes to ground surface heat flux (traffic, excavation, etc) will initiate permafrost thaw.

2.3 Regional Geology

The northern Canadian Cordilleran is divided into three major terrains composed of a variety of sedimentary, volcanic and igneous rocks which are separated by two major northwest-southeast trending strike-slip fault systems termed the Tintina Fault and the Denali Fault (Figure 2). The northeast portion of Yukon Territory, which occupies the area north of the Tintina Fault, is part of the original, ancient North American continent. The area south of the Tintina Trench and north of the Denali Fault is known as the Omineca Crystalline Belt. These rocks are highly deformed metamorphic rocks which were separated from their original position and accreted to the North America craton. The Mount Nansen area is part of this accreted rock assemblage and is located within the Dawson Range of the Yukon Crystalline Terrane which is also called Yukon-Tananna Terrane (Figure 2). The general geology of the Mount Nansen area consists of Late Proterozoic-Early Paleozoic quartz-feldspar-mica schist, Upper Paleozoic metamorphosed mafic and felsic volcanics, gneisses, amphibolites, quartzite and marbles (Templeman-Kluit, 1984, Coney et al., 1989). These basement rocks were intruded by Upper Triassic to Jurassic hornblende-biotite granodiorite rocks of the Klotassin Batholith and



Yukon Tectonic Elements (after Tempelman-Kluit 1981)

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subsequently by porphyritic syenite and quartz monzonite of the Jurassic Big Creek Plutonic suite (Gabrielse et al. 1991). Other rock types in the Mount Nansen area include Cretaceous granodiorite and granite of the Dawson Range Batholith, felsic porphyry dykes, andesite to latite massive flows and lapilli tuff and feldspar porphyry of the late Cretaceous Mount Nansen volcanic suite (Grond et al. 1984; Carlson, 1987).) Of more direct relevance to this study is the supergene and hypogene alteration of rocks in the Mount Nansen area. These types of alteration make country rock friable, unstable and generally more susceptible to weathering and erosion. In addition, the replacement of primary minerals in the country rock by a variety of clays enhances the unstable nature of slopes and Quaternary deposits in the Mount Nansen area.

Additional information and a more complete description of the bedrock geology in the Mount Nansen area is included in Walls and Eaton (1987) and LeBarge (1993), and will not be repeated herein. Regional geology maps by Carlson, 1987 and descriptions of mineral occurrences in the Dawson Range are found in Yukon Minfile. The Quaternary geology is discussed in greater detail in LeBarge (1993), and a regional surficial geology map at the 1:125,000 scale is being prepared by Jackson of the Geological Survey of Canada (in press). Appendix A of this report includes a bedrock geology map of the Mount Nansen Area.

2.4 Quaternary Geology

During the Quaternary time period, at least four major Cordilleran glaciations have affected southern and central Yukon Territory (Table 1). These include the Nansen (oldest) and Klaza Glaciations which are collectively referred to as pre-Reid glaciations, the Reid (Illinoian) Glaciation and most recent McConnell (Wisconsinan) Glaciation (Bostock, 1966, Hughes et al. 1968).

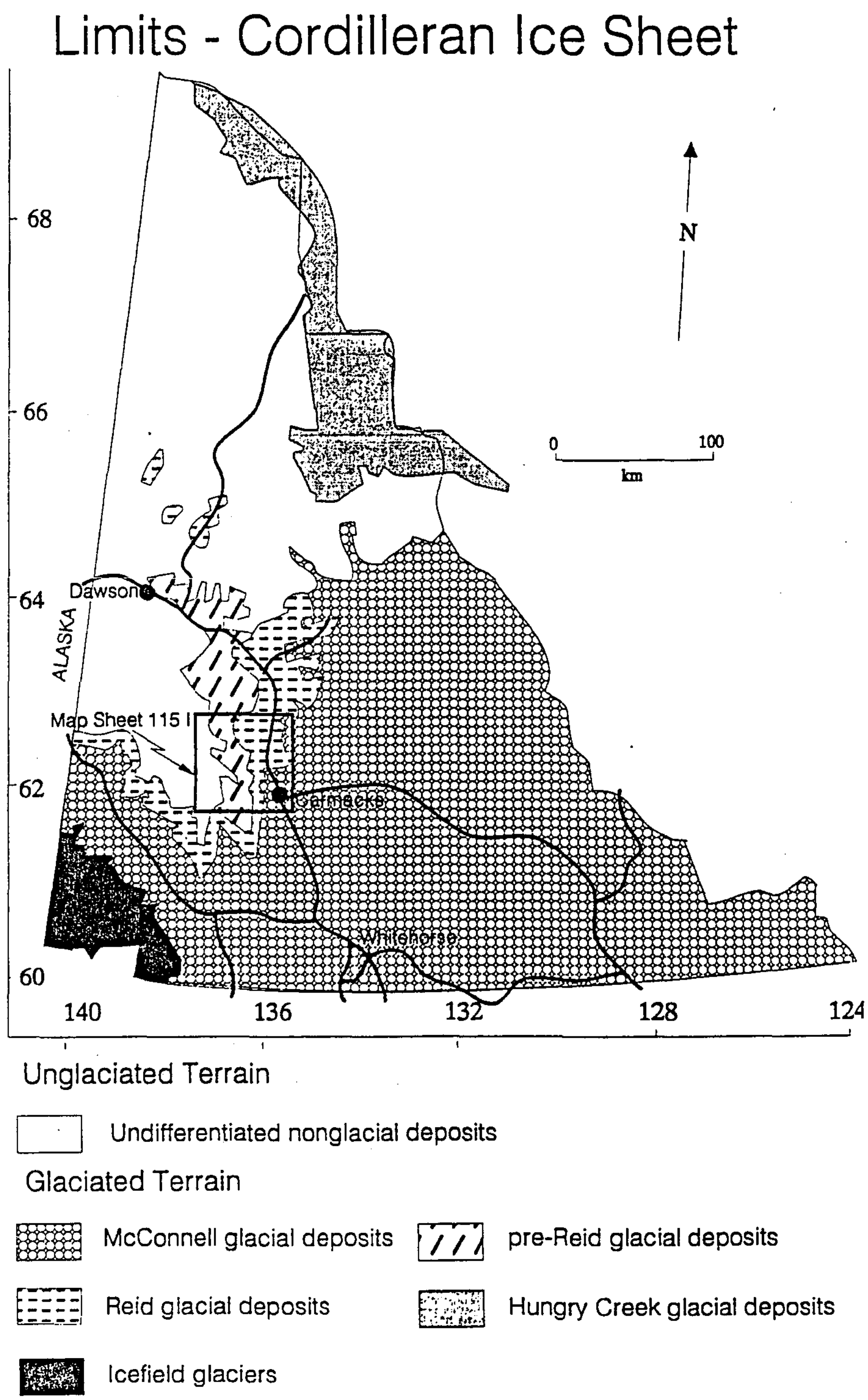
The Mount Nansen study area is located within the area covered by Pre-Reid glaciation (Figure 3) and it is believed that the only areas which escaped the advancing Pre-Reid glacial ice were the high peaks of Mount Nansen and Victoria Mountain (e.g. elevations

Table 1

Quaternary Chrono-Stratigraphy of Central Yukon

GENERAL CHRONO – STRATIGRAPHY			OXYGEN ISOTOPE STAGES	AGE (ka)	SOILS	1) CORDILLERAN ICE SHEET	2) ST. ELIAS PIEDMONT GLACIER: 2a) Snag-Klutlan area		2) ST. ELIAS PIEDMONT GLACIER: 2b) Silver Creek area
HOLO-CENE			1		Stewart Neosol	xxxxx ■ 1.2 ka White River Ash Bed Nonglacial interval	xxxxx ■ White River Ash Bed xxxxx ■ 1.2 ka Neoglaciation 1.9 ka Nonglacial interval ■ 13.66 ka	Antifreeze Pond	xxxxx ■ White River Ash Bed 1.2 ka Neoglaciation Slims nonglacial interval ■ 12.5 ka
PLEISTOCENE	LATE	WISCONSIN	2			McConnell glaciation	McCauley glaciation	Antifreeze Pond	Kluane glaciation
PLEISTOCENE	LATE	WISCONSIN	3-5 d	115	Diversion Creek Paleosol	■ 29.6 ka xxxxx Reid-McConnell nonglacial interval Sheep Creek tephra ■ >42.6 ka	McCauley-Mirror Creek nonglacial interval Old Crow tephra xxxxx ■ >48 ka		■ 29.6 ka Boutellier nonglacial interval ■ 37.7 ka
PLEISTOCENE	LATE	SANGA-MON	5e	128	Diversion Creek Paleosol				
PLEISTOCENE	MIDDLE					Reid glaciation	Mirror Creek glaciation		Icefields glaciation
PLEISTOCENE	MIDDLE			730	Wounded Moose Paleosol	Klaza-Reid nonglacial interval			Silver nonglacial interval
PLEISTOCENE	EARLY					Klaza glaciation			(Shakwak glaciation?)
PLEISTOCENE	EARLY				Wounded Moose Paleosol ?	Nansen-Klaza nonglacial interval Fort Selkirk tephra xxxxx ▼ 0.86 Ma SELKIRK GROUP ▲ 1.08 Ma			
PLEISTOCENE	EARLY					Nansen glaciation SELKIRK GROUP			(Shakwak glaciation?)
PLIO-CENE						SELKIRK GROUP	PLIOCENE		

Correlation chart for Yukon and western District of Mackenzie. Modified from Heginbottom and Vincent (19 correlation chart, p. 58; and Hughes, 1986, table 6–1, p. 16). Squares, radiocarbon ages; diamond, uranium-series age; angle, fission-track age; inverted triangle, K-Ar age.



Limits - Cordilleran Ice Sheet (after Hughes 1987)

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above 1370 m or 4500 feet a.s.l). It is possible that Pre-Reid morainal blankets are present at high elevations in the study area. Morainic deposits most often consist of diamicton which is a mixture of clay, silt, sand, and gravel to boulder size clasts. In this study, no attempt was made to differentiate between slope generated diamicton deposits or glacially derived diamicton deposits such as till. On the surface geology map accompanying this report (Figure 4 in back pocket), colluvial blankets or veneers (map units Cv, Cb and C) can be interpreted as including till of pre-Reid age and residual bedrock.

The Reid and McConnell glaciers did not cover the Mount Nansen area (Figure 3) although the area was obviously subjected to the same climatic conditions as the glaciated portions of Yukon Territory. The limit for the Reid glacial advance however is located a few kilometres east from Victoria Creek (Figure 1) and proglacial deposits related to advancing and retreating glacial advance are found at lower elevations in the major valley floors of the study area. Some gravel deposits at higher elevation could also be linked to the Reid glaciations (Jackson, in prep.), as well as some of the main terraces along the major valleys in the area (map units Atr on Figure 4). The Mount Nansen area was also subject to changes in stream base level during glaciation where rising base levels caused considerable aggradation of gravelly deposits in Victoria Creek valley and Nansen Creeks valley (LeBarge 1993). In contrast, during deglaciation base levels were lowered which resulted in the degradation, downcutting and dissection of pre-existing alluvial landforms such as fans and terraces. These base level cycles may have occurred several times during either or both of the Reid and McConnell glaciations, impacting both valley bottom alluvial fill deposits and higher level colluvial slope deposits (Figure 4, in back pocket).

Colluvial or slope processes are quite active within the study area and permafrost is widespread in both valley bottoms, on north facing slopes and at higher elevations in sub-alpine to alpine areas. At lower elevations, permafrost with high ice content (large ice lenses or pods) can be expected in fine-grained sediments with a thick organic cover. Disruption of the organic cover will reduce the insulation that preserves the frozen soil and will initiate or enhance soil creep, solifluction and slope failure. In fine-grained sediments containing large ice lenses, such disruption may trigger thermokarst collapse activity as well as very poor drainage conditions for several years.

2.5 Mining History

The study area has been an exploration target since the 1890's when placer gold was discovered, and since 1912 when gold-silver veins, copper-gold skarns and porphyry copper mineralization were discovered.

Placer mining in creek bottoms has been active since 1898, when H. S. Back found gold at the mouth of Discovery Creek on Mount Nansen Creek (LeBarge 1993). Several claims were staked in 1910 and most creeks in the areas have been mined at one time or another since. Placer mining (map units PM on Figure 5) is still ongoing in several creeks, including Nansen Creek and Victoria Creek and several of their tributaries such as Back Creek, Discovery Creek and East Fork Creek (LeBarge 1993). LeBarge (1990) believes that the glaciofluvial and glacial sediments associated with the oldest glaciations (e.g. pre-Reid) have the best potential for placer gold.

In the early 1900's, the area was also prospected for gold veins. The first important discovery of veins was made in 1943 by the prospectors Browne and McDade. Samples from their claims showed gold and silver values high enough to cause a spurt of exploration in the Mount Nansen area, and the first drilling and trenching activity took place in the Webber Creek and Huestis Zones (Figure 5 in back pocket).

A second period of exploration work occurred in the late 1950's and early 1960's with drilling and trenching activities. In 1962, the Webber Zone and Huestis Zone were investigated by geochemical surveys and bulldozer trenching by the Mount Nansen Exploration Syndicate. In 1963, Mount Nansen Mines Ltd. was formed and further trenching of Webber Zone followed. From 1964 to 1967, underground development and diamond drilling of the Brown-McDade Zone, the Huestis Zone and Webber Zone showed grades and reserves sufficient to justify a production decision and a mill was constructed. The mill operated from September 1968 to April 1969 with ore from the Huestis Zone producing approximately 2,500 oz of Au, 76,500 oz of Ag, and 108,621 lb of Pb. The mine was then abandoned until December 1975, when it reopened and processed ore from the Huestis Zone and Webber Zone until May 1976.

The property was inactive until 1985 when B.Y.G. Natural Resources Inc. began consolidation of the property and optioned it to Chevron Canada Resources Limited. The 1985 exploration program included geological mapping, multi-element soil geochemistry sampling, VLF-EM surveys, line cutting and baseline surveys, aerial photography (not available for this study), environmental and geotechnical studies, drilling, and 7582 lineal metres of bulldozer and excavator trenching. Most of the trenching done in 1985 was concentrated in the Brown-McDade Zone and Webber Zone (Figure 5 in back pocket).

In 1986, an exploration program included trenching in the Flex Zone, located southeast of the Webber Zone, and north of the Brown-McDade Zone (Figure 5 in back pocket).

In 1987, several areas were trenched using an excavator or bulldozer and several exploration roads were developed. The Dickson Zone, Orloff King Zone, Spud Zone, Huestis Zone, Flex Zone and Webber Zone, as indicated on the map (Figure 5 in back pocket), were trenched at various depths and lengths and crossed a variety of slopes of different aspects and parent material types.

Most of the information on the Mount Nansen property is available from 1987 assessment reports (Walls and Eaton, 1987). The precise age of trenches in the variety of zones, which have been densely trenched over several exploration years, could not be determined from air photo interpretation.

3.0 OBSERVATIONS FROM THE FIELD PROGRAM

3.1 Site Inspection Descriptions

Field work started late in the 1993 season and was cut very short due to poor weather conditions. The camp and mill sites were inspected and one trench located north east of the mill in the Huestis Zone was sampled and described. As mentioned above, the field work was carried out in the fall, and as a result seasonal frost had already set in and the frozen state of surface sediments made field observations and sampling difficult. Vegetation was already wilted and partially covered by falling snow and therefore comments pertaining to revegetation of the site are limited. Field observations include comments on active geological processes, and limited sampling of trench material for nutrient analyses and geotechnical properties. Other aspects of exploration activity, such as portals, were not observed.

3.1.1 Camp Site

3.1.1.1 Undisturbed Conditions

A cursory observation of the natural vegetation adjacent to the camp site showed ground completely covered by shrubs (willows, Labrador Tea), mosses and lichens, and by spruces (Plate 1). The surface shows no evidence of instability or erosion. Permafrost is probably present and the overburden consists of a thin and discontinuous veneer of colluvium (gravel, sand silt and clay) overlying the parent bedrock.

3.1.1.2 Disturbed Conditions

The camp site (Point #1, Figure 5) has been abandoned presumably since 1987. Roads leading directly to the camp and mill sites are blocked by large soil barricades and this has reduced access and limited vandalism. Buildings seem structurally sound but slightly damaged, with some doors and windows missing or broken. These buildings rest on a pad of granular fill up to 4 m thick, depending upon the slope of the original ground surface. There were no visible signs of damage due to ground instability or erosion by surface water. Litter was minimal and restricted to specific waste sites and consisted of old lumber and equipment pieces. Oil stains were present around a building probably used for equipment maintenance. In general three types of terrain conditions were observed around the camp area:

1. The area directly surrounding the camp and adjoining roads is characterized by a nearly flat surface, which has been compacted during the construction of the gravel pads and as a result of intense use. Revegetation is minimal (Plate 2) with less than 5% of the surface covered by a low density of pioneer species such as foxtail barley (*Hordeum jubatum*) and fireweed (*Epilobium angustifolium*). Intense traffic paths and roads are still unvegetated (Plate 2) probably due to higher ground compaction. This area shows no sign of instability due to permafrost, erosion or slope processes, and no fractures, depressions, or gullying were observed.

2. This terrain type is in areas of lower traffic with gentle slopes and/or rugged micro-topography, such as the slopes around the camp and between buildings. These areas show a higher rate of revegetation with an average of 20% surface cover with pioneer grass species (foxtail barley, possibly Arctic Bluegrass -*Poa arctica* and/or Alpine Bluegrass -*Poa alpina*) and fireweed (Plate 3) and in a few cases by dwarf, shrubby willows and white spruce. Vegetation is generally less dense in areas with steep slopes.

3. Other areas include older surfaces that could have belonged to earlier developments of the mill and exploration camp, older stripped surfaces, areas at the foot of slopes (Plate 1) and in areas at the margin of the camp site and pad. In such areas, dwarf willows, spruces, and Labrador Tea (*Ledum groendlandicum*) are growing on both near horizontal and gently sloping surfaces. Similar vegetation is also present on irregular areas of microtopography or less compacted surfaces (Plate 1). On slopes steeper than about 17°, localized gullying and slope

wash is common. At the foot of such slopes, the run-off and fine-grained slope-washed sediment accumulates and forms a moisture trap with higher revegetation cover. No noticeable processes related to permafrost were observed.

3.1.2 Mill Site

3.1.2.1 Undisturbed Conditions

Undisturbed areas around the mill are similar to the undisturbed areas around the camp site.

3.1.2.2 Disturbed Conditions

The mill (Point # 2, Figure 5) has also been inactive since 1987 and is constructed on a thick gravel pad similar to the camp (Plate 5). Several steep slopes in the hillside behind the mill are cut in bedrock and appeared stable (Plate 6). The area surrounding the mill itself can be divided in four types of terrain conditions, which include the types outlined above for the camp, plus a fourth terrain type associated with the drainage pond and surrounding stream and creeks.

The higher traffic, flat surfaces around the mill and access roads are well compacted and revegetation is generally lacking. No signs of active geological processes were observed.

Areas of lower traffic, around old buildings have less compaction and/or irregular topography, with a range of slopes from 1° to 11° (Plate 5). These areas are being slowly re-colonized by grasses (bluegrasses, foxtail barley and possibly one grass type belonging to the fescue family) and fireweed with vegetation cover of approximately 5-10 %. Terrain conditions on secondary roads were noted to be similar to that of areas where compaction is minimal (Plate 7).

Around the settling ponds and in areas where the terrain was disturbed, but where no material was imported or compacted, there is a greater variety and quantity of plants, including dwarf willows, spruce, lichens (*Clandina rangiferina ?, Cladonia Pyxidata*), mosses, grasses (foxtails, and fescue grasses) Northern Gentian (*Gentianella amarella*) and fireweed, covering up to 40% of the ground (Plate 8). The surface appeared friable with a very irregular microtopography including numerous small depressions, which act as moisture and seed traps. No noticeable soil development nor geological processes were observed.

Areas directly associated with the settling ponds (Plate 8) and with small creeks or drainage ditches showed a profusion of willows, spruces, horsetails, mosses, grasses (fescue family and foxtail barley), and lichens with nearly 100% ground coverage by vegetation (Plate 9). Willows attain a height of 2 to 3 metres. No noticeable soil development or visible sign of active slope related processes were seen. However, it is apparent that the present stream is overflowing from the drainage ditch, which is causing minor erosion around it. The "drunken" trees seen in Plate 8 indicate either undercutting by stream erosion, or ground subsidence caused by thaw of ice-rich permafrost.

3.1.3 Stripped Area-Brown-McDade Zone

Terrain in this area (Point # 3, Figure 5) is characterized by a gently sloping south-facing surface which has been recently stripped (1987?). Rapid visual inspection of the large stripped surface showed a non-existent to very low rate of revegetation. No noticeable geological processes were observed.

3.1.4 Trenches-Huestis Zone

In general, the trenches located directly northwest of mill in the Huestis zone (Point #4, Figure 5) are oriented perpendicular to the slope contours and face in a northerly direction. This group of trenches was probably part of the 1987 exploration program. The excavations start at the top of a gently sloping crest, continue down slopes that range from 30° to 40°, and terminate at the bottom on slopes less than 5°. Areas between these trenches are covered by a continuous mat of mosses, lichens and shrubs. No signs of active processes were noted in the undisturbed portions of the slope, although extensive shallow permafrost with low ground ice content is likely present. The poor visibility and snow cover made it difficult to observe the irregularity of the surface.

Several trenches were observed during a brief reconnaissance. In summary, each trench had four sections which vary in length and width but have the same pattern:

1. The upper crest section was cut in the gently sloping bedrock surface, and was characterized by minor erosion and minimal re-growth.
2. A steep upper slope portion, cut into bedrock or into a thin veneer of colluvium or residual bedrock over sound bedrock, showed noticeable gullying at the bottom, and no re-growth.
3. An intermediate, moderately steep to steep midslope section, cut into colluvium or residual bedrock, showed noticeable to severe side wall collapse due to permafrost melting, gullying at the bottom, and minimal re-growth.
4. A toe slope section on a colluvium surface is characterized by gullying, deposition of sediment, and considerable re-growth where the surface was stripped.

3.1.4.1 Detailed Trench Description

The trench selected (Point #5, Figure 5) is approximately 4 metres wide at the base and 1.5 metres wide at the top, facing in a northeastern direction. Approximately 150 metres long, the trench runs down the slope of the hill with the upper third of trench excavated directly in bedrock and its lower portion cutting through at least 1.5 m of colluvium (Plate 10). The toe of the slope was partially stripped by the trenching process and by a primitive access road linking the trenches to the mill site. Soil samples were collected from disturbed and undisturbed surfaces adjacent to the trench.

3.1.4.1.1 Undisturbed Conditions

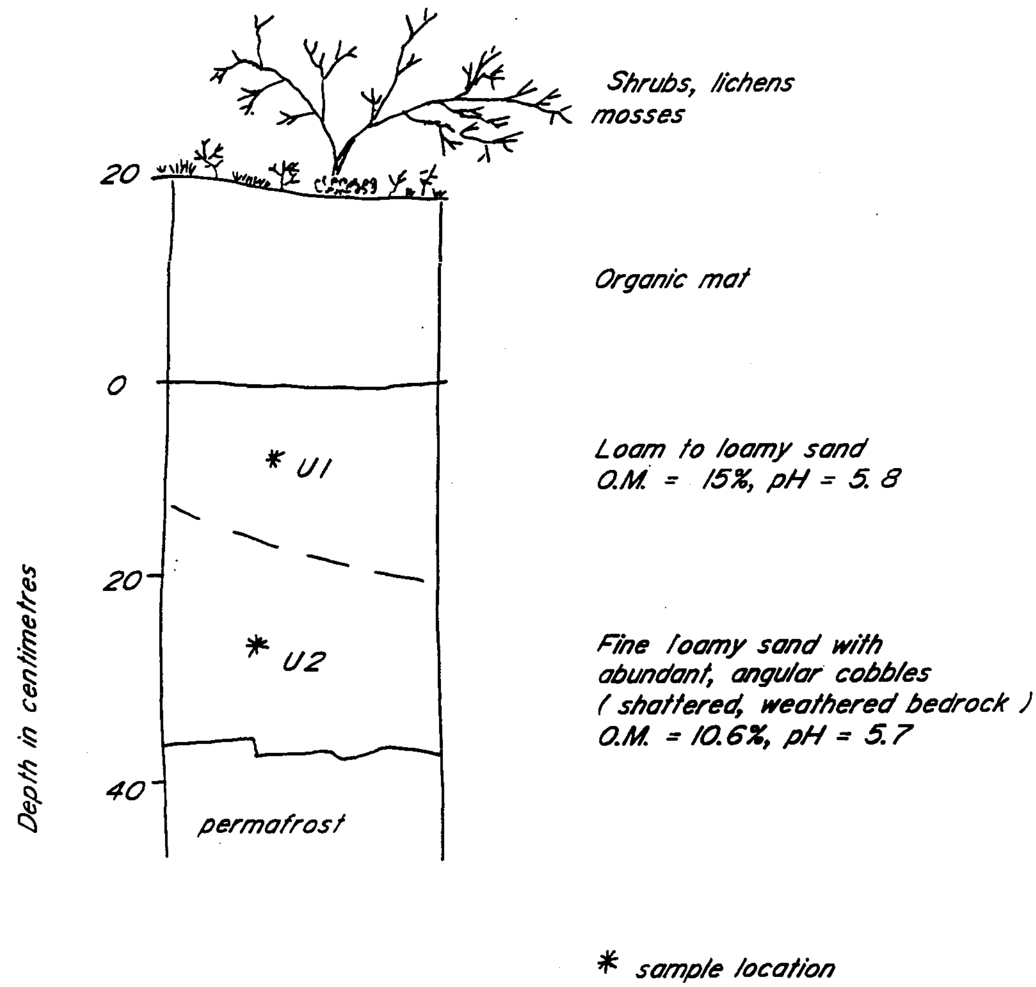
The undisturbed vegetation directly adjacent to the trench consists of mosses, lichens and shrubs. The undisturbed soil is composed of a 200 mm thick organic layer and root mat, over a veneer of fine-grained sand with traces of silt, overlying a stony diamicton (Figure 6). This soil profile is generally consistent along the trench, with the soil horizons slightly increasing in thickness in a downslope direction.

Soil pH averaged at 5.7 (acid) and nutrient analyses shows very low nitrate, phosphate, sulphate and potassium content and marginal contents of calcium, sodium and magnesium (see Appendix B). Organic matter contents averaged 13% by weight within 300 mm of the surface. The diamicton has a matrix composed of unsorted silt and fine sand with a minor component of low plasticity clay, and contains a high percentage of angular clasts, ranging from 20 mm to 150 mm diameter. Most of the overburden observed in the Huestis zone consists of this diamicton which originates from colluviated, weathered and altered bedrock, or reworked till of pre-Reid age. This soil has satisfactory moisture holding capacity and is well drained in most cases. Two undisturbed samples, U1 and U2, were taken from this area at about 0.4 m depth (see laboratory test results in Appendix B).

3.1.4.1.2 Disturbed Conditions

The first segment of the trench excavated at the crest of the slope into the bedrock had stable, steep sidewalls formed of hard rock or altered friable bedrock. Slopes along the trench floor range from 2° to 8°. There is no vegetation on the trench walls, and very little growth (less than 5%) at the bottom of the trench, primarily because the bottom surface is undergoing minor erosion and consists of hard rock. Sample SA4 was taken from this area.

The section below also cuts into bedrock with a discontinuous, thin veneer of colluvium or till. Slopes are much steeper, ranging from 25° to 40°. The trench is narrow (less



EBA Engineering Consultants Ltd.	PROJECT **Exploration Reclamation Study Mt. Nansen, YT**
CLIENT **DIAND - Northern Affairs Program**	TITLE **Undisturbed Soil Profile in Trench A**
DATE **February, 1994** DWN CHKD	DWG NO. **Figure 6** **0201-11333**

than 2 metres), steep sided and basically unvegetated. Side walls seem stable, and at isolated locations where the trench bottom is covered by overburden, it is rilled. Soil sample SA3 was taken from here.

The third portion of the trench (Figure 6) exposes 1.5 to 2 metres of colluvium over bedrock. The trench in this area is at least 4 metres wide at the surface, with sloping walls indicating evidence of instability. For example, lobate tension cracks up to 4 metres in length were seen both on the side walls and back from the side walls as well as slumped and displaced blocks of sediment (Plates 11 and 12). This regressive slumping will continue until the thermal regime in the ground has stabilized. The bottom of the trench is severely eroded into both colluvium and shattered bedrock. Re-vegetation is very limited and seems to favour the disturbed, slumping walls rather than the trenched material. Sample SA2 was taken from within this portion.

The toe of the trench itself extends into a stripped surface that connects to an access road or dozed trail leading to the mill. Both the surface of this road and the toe of the trench show distinct signs of gullying and localized accumulations of fine sediment, with intermittent ponding. These pools of silt act as moisture and seed traps and are hosts to several species of wild flowers (fireweed, Northern gentian, others) and grasses(mostly foxtail barley). Sample SA1 was obtained from the sidewalls of the trench in this area.

The results of all index and classification tests on samples are presented in Appendix B. Soil chemical analyses for two undisturbed samples are also included.

4.0 RECLAMATION GUIDELINES FOR HARDROCK EXPLORATION

4.1 Introduction

The objective of this section of the report is to provide preliminary guidelines concerning geotechnical and geological characteristics relevant to the reclamation of surficial deposits in subalpine areas impacted by hardrock exploration activities. It is hoped that this will, in turn, facilitate land use decisions related to environmental screening and reclamation practices.

Reclamation of hardrock exploration, like mine reclamation, has the objectives in order of priority of:

- protecting public health and safety;
- reducing or preventing environmental degradation; and,
- allowing a productive land use, either its original use or an acceptable alternative.

In developing reclamation measures to meet the above objectives, exploration activities must address three broad categories:

- physical stability;
- chemical stability; and,
- land use and aesthetics.

In general, reclamation of a mine site is often driven to a large extent by chemical issues primarily, followed by physical stability and land use. Conversely, reclamation of an exploration site, which typically impacts a much smaller area than a mine site, is driven more by physical stability and land use. Therefore, within the framework of this study, DIAND has indicated that chemical aspects of surface disturbances should be disregarded. Only those aspects of disturbances which relate to physical stability, land use and aesthetics are considered in this report.

With respect to land use, the criterion normally applied is that disturbed areas must be reclaimed to a physically stable condition that will prevent significant impacts to the environment and the use of surrounding lands/waters. In more restrictive environments, disturbed areas are required to be reclaimed to a condition that either meets or exceeds the original, undisturbed condition. Based on "The Regulation of Mine Site Reclamation for Quartz Mining in Yukon, A Proposal for Discussion," prepared by Indian and Northern Affairs Canada in 1993, the reclamation objectives DIAND favours are based on the former requirement, i.e. the achievement of stability and insignificant impact on the environment and the use of surrounding lands/waters.

4.2 Review of Existing Regulations

4.2.1 Reclamation Regulations for Mining Exploration

The extent and strength of regulations governing reclamation within the mining industry have grown significantly in recent years. The initial thrust of such guidelines has typically been concerned with operating and closed mines. This is because the potential impacts normally associated with mining operations are generally more significant, and areas affected are much larger than the impacts associated with exploration activity. The most important of these impacts typically include impacts from major mine facilities such as open pits, waste dumps and tailings impoundments. Regulations directed to the reclamation of these facilities are present in some form in many jurisdictions, although the level of detail and specific requirements vary markedly.

Within those jurisdictions where reclamation guidelines have been developed to address impacts of mining operations (as either a law or a document for public review and discussion), the emphasis of regulators is shifting to the development of reclamation guidelines for mining exploration activities.

Examples of the typical range in regulatory status that exists where mining represents a major component of the local industry are found in two adjoining jurisdictions, namely British Columbia and Alaska. Alaska has very general reclamation guidelines which apply to development, extraction and processing, but not exploration (State of Alaska, 1990). In contrast, British Columbia has a set of reclamation guidelines for mining operations and a second set specifically for mineral exploration. The reclamation guidelines from British Columbia (British Columbia Ministry of Energy, Mines and

Petroleum Resources, 1992) are reasonably detailed and constitute a major component of the reclamation practices discussed later in this report.

4.2.2 Reclamation Regulations for the Forestry Industry

Another set of regulations of relevance to mineral exploration has been established for the forestry industry of British Columbia. The feature common to both industries is the development of access roads through natural, undeveloped terrain.

Forest harvesting practices in British Columbia have, in recent past, come under intense public scrutiny. As a result, the government has published a document dealing with proposed rule changes to forest practices in British Columbia (B.C. Ministry of Environment, Lands and Parks, 1993). The document has been made available to both industry and the public for their review and comment. This document contains proposed guidelines for the deactivation of access roads, many details of which have direct relevance to mineral exploration. The Ministry of Energy, Mines and Petroleum Resources (Hart, pers. comm.) has indicated that regulators will be reviewing the rule changes recommended for forestry practices and will likely revise the documents so that the two are in agreement.

4.3 Significance of the Mount Nansen Study

4.3.1 Relevance of the Geotechnical Conditions at Mount Nansen

For purposes of this study, it has been assumed that the conditions at Mount Nansen are typical of an unglaciated subalpine environment. Conditions related to factors such as climate and vegetation will not be discussed here as they can be obtained from documents describing the regional environment. The site specific subsurface profile, also assumed to be typical of the area, can be summarized as organic soils (peat) underlain by residual soils underlain by relatively weak bedrock.

The characteristics of the peat and organics will vary depending on the local climate and drainage conditions, but is likely to be relatively thin in most locations where exploration activities are undertaken.

Residual soils tend to be well graded and, at times, quite variable with respect to geotechnical characteristics such as moisture content, relative density and permeability. For instance, they may be either relatively impermeable (i.e., lots of fines) or very permeable (i.e., no fines).

Bedrock is generally exposed on the unglaciated peaks, and tends to be weak and prone to weathering, but there are areas where stronger, more erosion-resistant rock exists. This variability can be inferred from the bedrock information included in Appendix A.

Permafrost, a key factor in ground behaviour, may be present depending on factors such as climate, drainage, slope aspect, and local soil conditions.

4.3.2 Natural Factors Relevant to Reclamation Plans

The B.C. guidelines related to reclamation do not specify what data must be collected as part of the development of a detailed reclamation plan. Nor has a preliminary assessment of the literature revealed a list of data that must be collected before a reclamation plan for a mineral exploration property can be developed. However, it is clear from the recommended reclamation procedures contained in Section 4.4 that most procedures are intended to minimize the vulnerability of the reclaimed areas to erosion and improve the aesthetics of the area. Most of these procedures depend on "common sense" approaches to managing water and establishing vegetation. There is, therefore, no need to collect extensive quantities of geotechnical and geological data to develop reclamation plans for most hardrock exploration sites.

The principal factors which affect reclamation plans and their likelihood of success include climate, aspect, hydrology, hydrogeology and soil parameters (soils, soil stratigraphy, soil properties, permafrost presence, etc.).

4.4 Reclamation Procedures of Relevance to Hardrock Exploration

4.4.1 General

Reclamation activities which deal with physical stability consist, in their most basic form, of the following three activities:

- Recontouring the ground to a stable configuration;
- Revegetating to enhance the erosion resistance of the recontoured ground; and,
- Re-establishing drainage.

Exploration activities generally consist of road construction, camp construction, geological, geophysical and geochemical assessments performed from the ground surface, trenches or stripped areas excavated by dozer, test pits excavated by backhoe, boreholes, and underground exploration. Most of these activities are inherently shallow and/or localized with respect to their disturbance, although the presence of permafrost can, over time, significantly increase the depth and extent of disturbance. As a consequence, excavated trenches associated with exploration activities tend to be generally not more than a few metres deep. The risk of slope "failure" under these conditions, is relatively inconsequential. Of greater concern, typically, are the consequences of erosion that results from surface runoff, particularly during spring thaw, and the need to stabilize slopes so that revegetation processes, either natural or assisted, can be effective. In areas where the surficial soil has been compacted, it is beneficial to scarify the soil so that vegetative species can establish themselves, naturally or otherwise. Further details related to reclamation of specific exploration facilities have been extracted from regulatory documents related to mineral exploration and forestry practice in British Columbia are provided below.

4.4.2 Description of Procedures

The following guidelines are minimum requirements. These guidelines are intended to ensure that the environmental impacts of mineral exploration are minimized, and that surface disturbances are reclaimed after exploration activities are completed. Depending on the nature of the exploration activity and the environmental sensitivity of the area, increased standards may be required as a condition of the reclamation permit.

a) Roads

It is important to identify those roads that can be abandoned and those roads that are necessary for future exploration. Roads that will not be used the following field season should be treated as abandoned. Some portions of the road system may be required for permanent fire access, therefore it is in the operator's interest to contact the necessary Government Agencies in this regard.

i) Permanent Roads

Roads that are to be retained for permanent access shall be maintained annually. Roadsides and embankment slopes shall be revegetated. All drainage structures should be inspected and cleaned on a regular basis, especially after the spring run-off period and periods of heavy rainfall.

ii) Abandoned Roads

All abandoned roads must have a system of permanent erosion control, with erosion barriers placed at frequent intervals to ensure stability. All culverts and bridges must be removed and stream banks must be restored as nearly as possible to their original condition. Abandonment activities must be undertaken in a manner that minimizes sedimentation of watercourses.

The requirement to recontour roads will vary according to their location and environmental sensitivity as summarized below:

- Roads on environmentally sensitive areas will require complete recontouring.
- Roads in alpine areas will require the pulling back of berms containing topsoil material. Sidecast fill will need to be pulled back on steep sidehill road cuts.
- Other roads will only require recontouring where necessary for erosion control, although drier sites would also benefit from a dressing with topsoil.

All abandoned roads should be ripped, if necessary to break surface compaction, and revegetated. Abandoned roads should be ditched at their junction with permanent roads so as to prevent vehicle access.

b) Geophysical Exploration

In general, most types of geophysical exploration are conducted remotely (airborne) and have little or no impact. Seismic exploration requires drilling with tracked vehicles, and has the greatest effect on the exploration site. Some re-establishment of vegetation may be required.

c) Trenches, Drill Sites and Major Excavations

All trenches, drill sites and major excavations should be backfilled and recontoured as nearly as possible to the previously existing slope. Boreholes should be backfilled or plugged. Stockpiled topsoil and overburden should be spread over the site and the entire site revegetated. Surface drainage should be diverted around disturbed areas. Where this is not possible erodible material must be protected by riprapping or some other acceptable means.

In addition, where exploration at a designated site results in any exposed surfaces or excavated materials including drill core, cuttings or rock samples that emit radiation above the baseline level, the exposed surfaces or materials should be covered with a suitable buffer material.

d) Underground Portals and Waste Dumps

Portal areas and waste rock dumps from detailed exploration areas should be recontoured, dressed with available stockpiled topsoil and revegetated. Any drainage from the portal should be directed away from unstable slopes and onto the valley floor. Portals should be backfilled or otherwise sealed to the satisfaction of the local environmental authorities.

If acid generation tests indicate a potential for acid mine drainage, special waste rock disposal and reclamation treatments may be prescribed.

e) Drill Core Storage

Drill core should be removed from the property or otherwise disposed of upon abandonment, unless specifically exempted by the local authorities. Any drill core left on the site must be stored in a secure location and the costs of removal provided for under a reclamation permit.

f) Fuel Drums

All empty fuel or oil drums should be removed from the property at the end of operations.

Fuel or oil left on site for future work programs requires the specific approval of the local authorities, and the removal costs should be provided for in the reclamation security. Fuel drums left on site must be stored in a central, secure location, away from watercourses.

g) Camp Sites

Exploration camps which are to be abandoned should be dismantled and removed at the end of operations. All refuse should be burned and buried or removed, and all pits should be backfilled. The site should be ripped, if necessary to break surface compaction, and revegetated.

Camps which are to be maintained for future use should be left in a clean and tidy condition at the end of operations. All refuse should be burned, buried or removed and all pits shall be backfilled. Any camps that remain inactive for three years will be considered to be abandoned, and must be removed and the site fully reclaimed as described above.

h) Revegetation Methods

This section outlines revegetation treatments for the **normal** situation. Recommended seed mixtures will need to be based on site specific conditions.

All disturbed areas must be stabilized and revegetated before the reclamation security can be returned. In all instances, revegetation treatments require applications of both seed and fertilizer. Where necessary the operator should be required to reseed or refertilize poorly vegetated sites.

The introduction of non-native plant species to reclaimed areas may be a concern to DIAND. Specific revegetation proposal for these areas may therefore be subject to restrictions on the use of certain species.

Methods of seed and fertilizer application consist of the following:

- Broadcasting is the usual method for applying seed and fertilizer. Seed may be broadcast by hand, by hand-held cyclone seeders, by spreaders mounted on all-terrain vehicles or by spreaders mounted on helicopters or aircraft.

- Revegetation success is increased if, following broadcasting, the seed is buried by a thin layer of soil. This may be accomplished by running a tracked vehicle over the seeded area or by harrowing the area.

- Hydroseeding is a technique whereby a slurry composed of seed, fertilizer mulch (or other soil stabilizer) and water is pumped through a nozzle and sprayed over the ground.

- Agricultural seed drills can also be used for seed and fertilizer applications. They are limited to well prepared, level areas.

i) Revegetating with Shrubs

Revegetation with native shrubs can be a valuable reclamation tool, particularly in highly sensitive areas such as recreation areas, alpine tundra and grasslands. The following characteristics of shrubs make them useful for reclamation work, especially when used with a grass/legume seed mix:

- Erosion Control. Shrubs have deep woody roots which give mechanical support to slopes. When planted with grass, they can help to avoid sloughing of the shallow sod layer. The woody top growth of shrubs can also help to stabilize reclaimed areas by reducing the surface wind velocity and its associated erosion.

- Wildlife Habitat. Shrubs provide a good source of food and protective cover for wildlife. Ungulates make use of many species of shrubs as browse, especially during winter when other food sources are buried beneath snow.

- Aesthetics. Shrubs are very useful for screening areas of activity from public view and for softening the harsh lines of disturbed sites.

4.5 Likelihood of Reclamation Success

Review of existing regulations and discussions with individuals within various jurisdictions have suggested that the guidelines have evolved over several years and were based primarily on common sense and practical experience. At the time, there were few, if any, scientific studies available to support the technology. Furthermore, annual reports are not required to document reclamation of hardrock mining exploration or the successes or failures of same. Conferences, such as the annual B.C. Mine Reclamation Conference, which concentrates mainly on mine reclamation, have sometimes had case histories of exploration site reclamation. Hall (pers. comm., 1993) suggested that some technical papers may have been used to develop the guidelines for revegetation.

Scientific studies and/or case histories on the geotechnical aspects of physical disturbances associated with exploration work and the success of reclamation methods used to mitigate exploration activities are very limited. Since the guidelines of the type provided above are intended to be "stand alone" documents, they are not intended to refer to additional documents or to provide references.

5.0 SUGGESTIONS FOR FUTURE STUDIES OF A SIMILAR NATURE

The collection of background and field data on a hardrock exploration property must be completed in an orderly fashion, to ensure that all available information is obtained. The results of the study presented herein were gathered over the course of several months, and it would be beneficial to future work of a similar nature if the data collection procedure was well defined. The following outline presents, in alphabetical order, suggestions for data collection in future studies. The data is subdivided into two main components -- Natural Factors and Anthropogenic Factors (related to man's activities). All of these factors should be considered but, depending on the type and extent of exploration activities, not all factors will require definition before an efficient, productive reclamation plan can be developed.

5.1 Natural Factors

Bedrock Geology:

- Parent bedrock material and relevant structural features in the area.

Climate:

- Primarily temperature, precipitation and prevailing wind, as they relate to vegetation and permafrost.

Hydrology and Hydrogeology:

- Surface and subsurface drainage conditions.

Permafrost:

- Ground temperature and ice content, ice classification, thaw or frost heave features.

Soil Chemistry and Lithology:

- Chemical composition of the natural overburden in the area, as well as the basic index properties relating to moisture content, grain size distribution, plasticity, moisture retention capability, organic content, etc.

Surficial Geology:

- Surficial geology map, including glacial features and effects, slopes, soil origins, geological processes, terrain hazards, etc.

Topography and Slope Aspect:

- Geographic orientation of slopes, including elevation, measurement of slope angles and observations of existing stability.

Vegetation:

- Undisturbed vegetation, pioneer species and ground cover, natural seed sources.

Wildlife:

- Local species, particularly those that may be unique.

5.2 Anthropogenic Factors

Anthropogenic Activities:

- Existing exploration features, with dates, etc., use map format (1:25,000 scale), map entire drainage basin downslope of explored area.

Boreholes:

- Terrain disturbance, debris, lubricating and drilling fluids, borehole backfill.

Buildings and Roads:

- Effects of construction on the natural terrain, with particular emphasis on soil compaction, drainage, permafrost thaw, erosion, vegetation, microtopography, etc.

Drainage:

- Extent of drainage alterations and the effect on vegetation, permafrost, etc.

Exploration Trenches and Pits:

- Relationship of the trench to the natural slope (i.e. parallel or perpendicular to contours), trench aspect (north or south facing, etc.), evidence of erosion, side and end wall stability, permafrost thaw features, lithology of trench sides and base, minimum depth which does not naturally cave in, ponded water areas, stability of excavated material piles.

Fuel Storage Areas:

- Evidence of past leakage in both bulk storage tanks and drums, proximity to natural drainage courses, and effects on natural terrain.

Lagoons and Ponds:

- Retention dyke stability for camp sewage lagoons, drilling mud pits, potable or other water retention structures.

Land Use:

- Existing land use parameters (i.e. recreation, etc).

Portals or other Underground Exploration Activities:

- Drainage, backfill, waste rock piles, etc.

Soil Chemistry and Lithology:

- Effects on the natural chemical composition of the soil through leaching, thawing, re-working, etc., what is the moisture retention capability, degree of compaction, changes to soil index properties.

Vegetation:

- Comparison of vegetation in re-vegetated areas versus undisturbed areas.

6.0 CLOSURE

The information presented herein has been based on a limited field program, and deals primarily with physical parameters of exploration reclamation. Chemical parameters are also important in assessing reclamation measures, as chemical influences can be carried further from the site in water courses. Generally, however, chemical usage is not expected in most hardrock exploration activities, except when on site milling or other testing of samples may have taken place.

Respectfully submitted,

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PLATE 1: Camp Site: Natural vegetation in the background consists predominantly of spruce and willows. Lower slopes in foreground are acting as a fine sediment and moisture trap, fostering denser re-vegetation.

PLATE 2: Camp Site: Roads around camp and mill are well compacted and show negligible re-vegetation. Less disturbed areas along edges of roads are better vegetated.

PLATE 3 Camp Site - Area around building shows slow re-vegetation, dominantly by grasses. Surface is similar to road, but less compacted. No Active geological processes

PLATE 4: Camp Site: Area behind (north of) camp building

PLATE 5: Mill Site: General view.

PLATE 6: Mill Site: Steep slope in the hillside behind the mill cut in bedrock.

PLATE 7: Mill Site: Secondary road leading to the Huestis Zone.

PLATE 8: Mill Site: Settling Pond.

PLATE 9 Mill Site: Dense vegetation around creek.

PLATE 10: Trench A: Natural vegetation consists mainly of dwarf shrubs, mosses and lichens. Gullying noticeable in the lower third of slope.

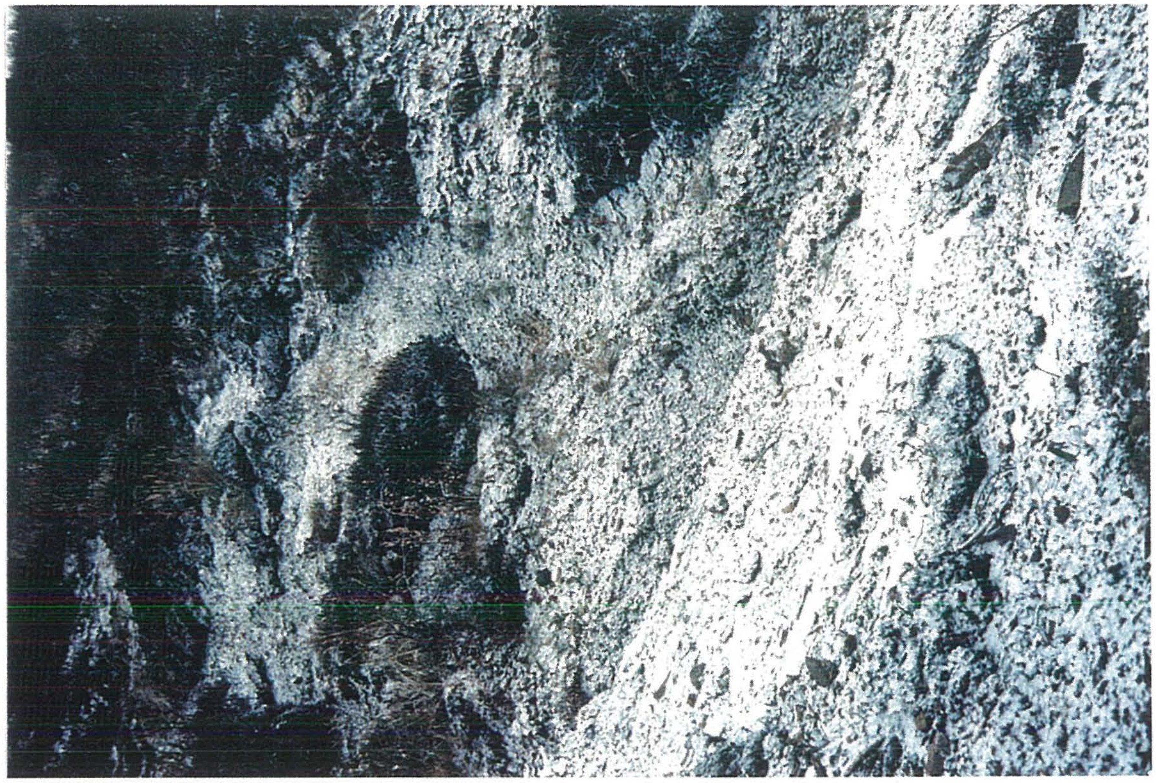
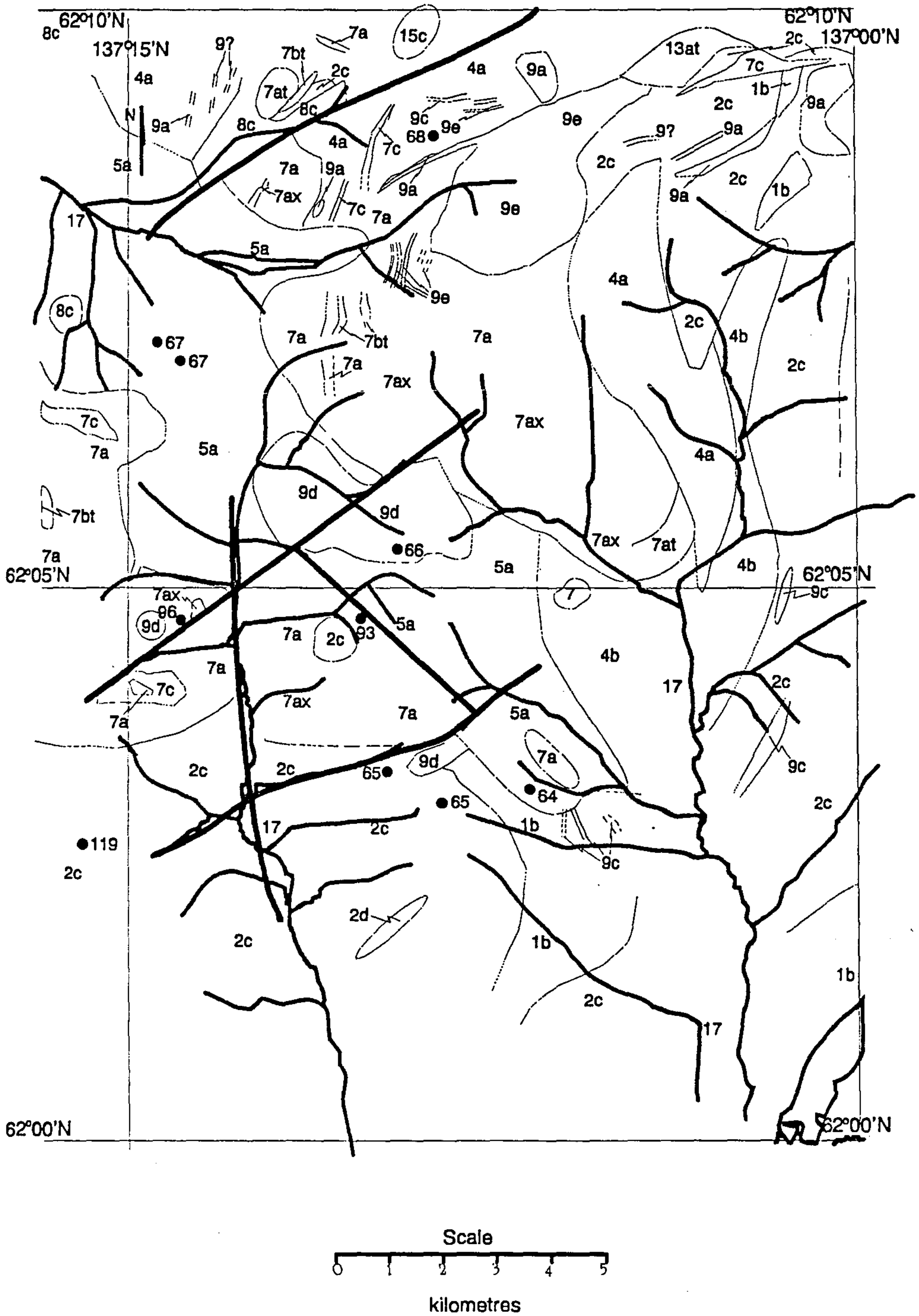


PLATE 11: Trench A: Slumped blocks along the side of the trench.

PLATE 12: Trench A: Widening of the trench is being caused by active gullying and slumping of the lower portion of the trench.

Bedrock Geology



Bedrock Geology (after Carlson 1987)

LEGEND - BEDROCK GEOLOGY

Quaternary

17	Unconsolidated sediments

Late Cretaceous to Paleocene

15	Late intrusions (15c - medium to coarse-grained potassic gabbro)
13	Lower andesite member - Carmacks suite(13at - andesite tuff and agglomerate)

Cretaceous to Paleocene

9	Porphyry dykes (9a - plagioclase hornblende porphyry, 9c- quartz-feldspar porphyry 9e - gabbro to syenite, plagioclase +/- hornblende porphyry)
8	Bow Creek Granite (8c - pink aphanitic dykes)
7	Mount Nansen Volcanics (7a - andesite to latite flows, 7ax,at - tuff, 7bt - welded vitric tuff, 7c - flow-banded quartz-feldspar porphyry)

Early Cretaceous

5	Dawson Range Batholith (5a - Casino granodiorite)

Early Jurassic

4	Mount Freegold meta-plutonic suite (4a - orthoclase-hornblende porphyritic syenite 4b - plagioclase-hornbleende monzonite)
3	Klotassin meta-plutonic suite

Paleozoic and older

2	Schist and gneiss units (2c - biotite-quartz-feldspar schist, 2d - amphibolite)
1	Metasedimentary unit (1b - quartz-feldspar mica schist)

Other Features

	Faults
	Contacts
•65	Mineral Deposit - Minfile number
	Roads

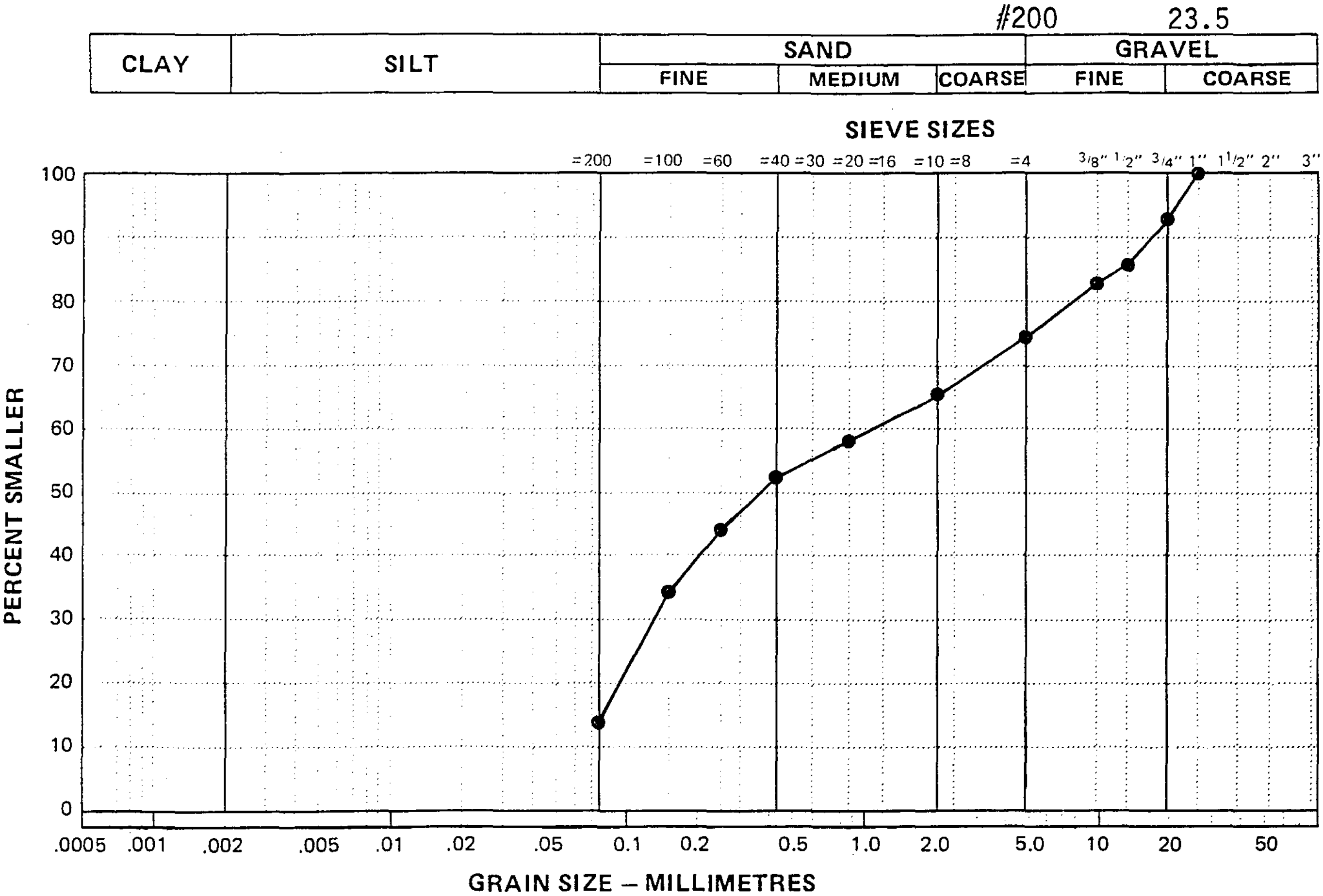
for detailed lithological descriptions refer to Carlson (1987)

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Exploration Reclamation
Mt. Nansen
Project Number: 0201-11333
Date Tested: 1993 10 14
Borehole Number: SA-1
Depth:
Soil Description: SAND (SM) - gravelly, silty
Cu:
Cc:
Natural Moisture Content: 23.3 %
Remarks:
Sampled from bottom third of trench

SIEVE	PERCENTAGE PASSING
3"	
2"	
1 1/2"	
1"	100.0
3/4"	93.4
1/2"	86.1
3/8"	82.1
#4	74.1
#10	66.0
#20	58.5
#40	52.4
#60	44.0
#100	34.5
#200	23.5



Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Exploration Reclamation
Mt. Nansen

Project Number: 0201-11333

Date Tested: 1993 10 14

Borehole Number: SA-2

Depth:

Soil Description: SAND(SM) - gravelly, silty

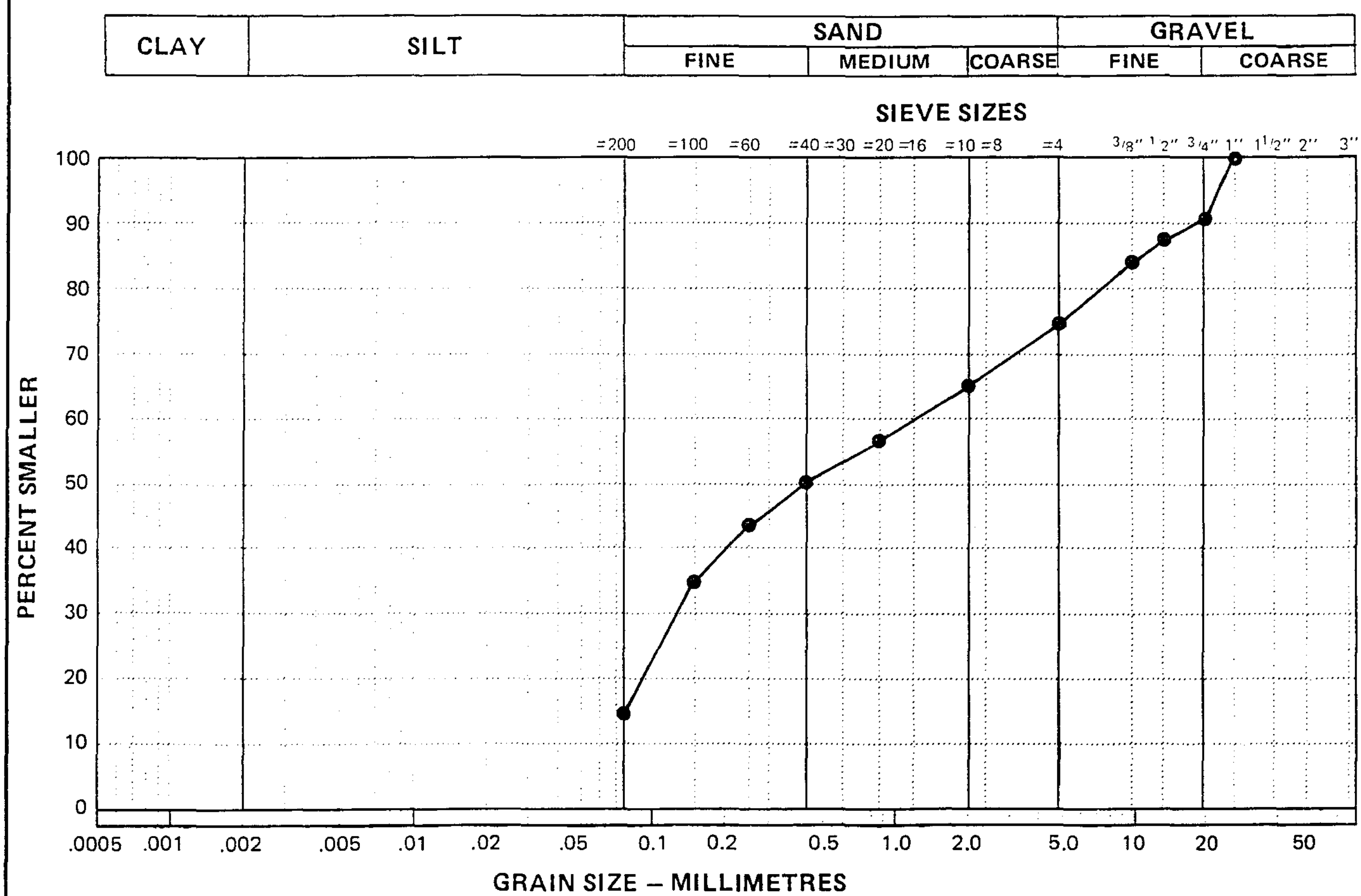
Cu:

Cc:

Natural Moisture Content: 23.8 %

Remarks:
Sampled from middle third of trench

SIEVE	PERCENTAGE PASSING
3"	
2"	
$1^1/2$"	
1"	100.0
3/4"	90.1
3/8"	84.0
No. 4	75.2
No. 10	65.7
No. 20	57.0
No. 40	50.2
No. 60	43.0
No. 100	35.1
No. 200	24.6



EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Exploration Reclamation
Mt. Nansen

Project Number: 0201-11333

Date Tested: 1993 10 14

Borehole Number: SA-3

Depth:

Soil Description: SAND (SM) and GRAVEL, some silt

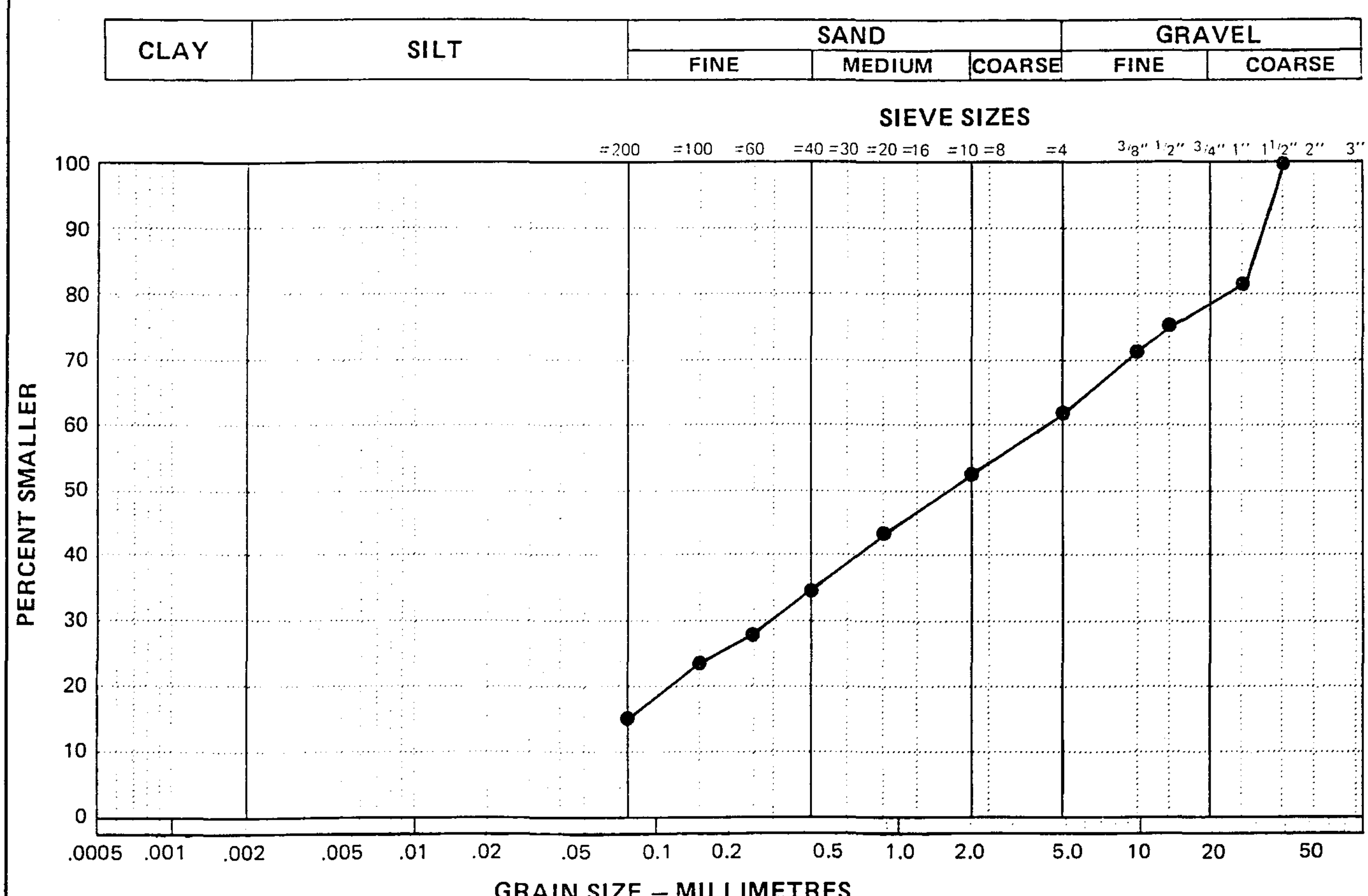
Cu:

Cc:

Natural Moisture Content: 15.6 %

Remarks:
Sampled from middle third of trench

SIEVE	PERCENTAGE PASSING
3"	
2"	
1 1/2"	100.0
1"	81.5
3/4"	--
3/8"	70.9
No. 4	61.2
No. 10	52.2
No. 20	43.1
No. 40	35.1
No. 60	28.5
No. 100	23.1
No. 200	16.3



EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Exploration Reclamation
Mt. Nansen

Project Number: 0201-11333

Date Tested: 1993 10 14

Borehole Number: SA-4

Depth:

Soil Description: GRAVEL (GM) & SAND - some silt

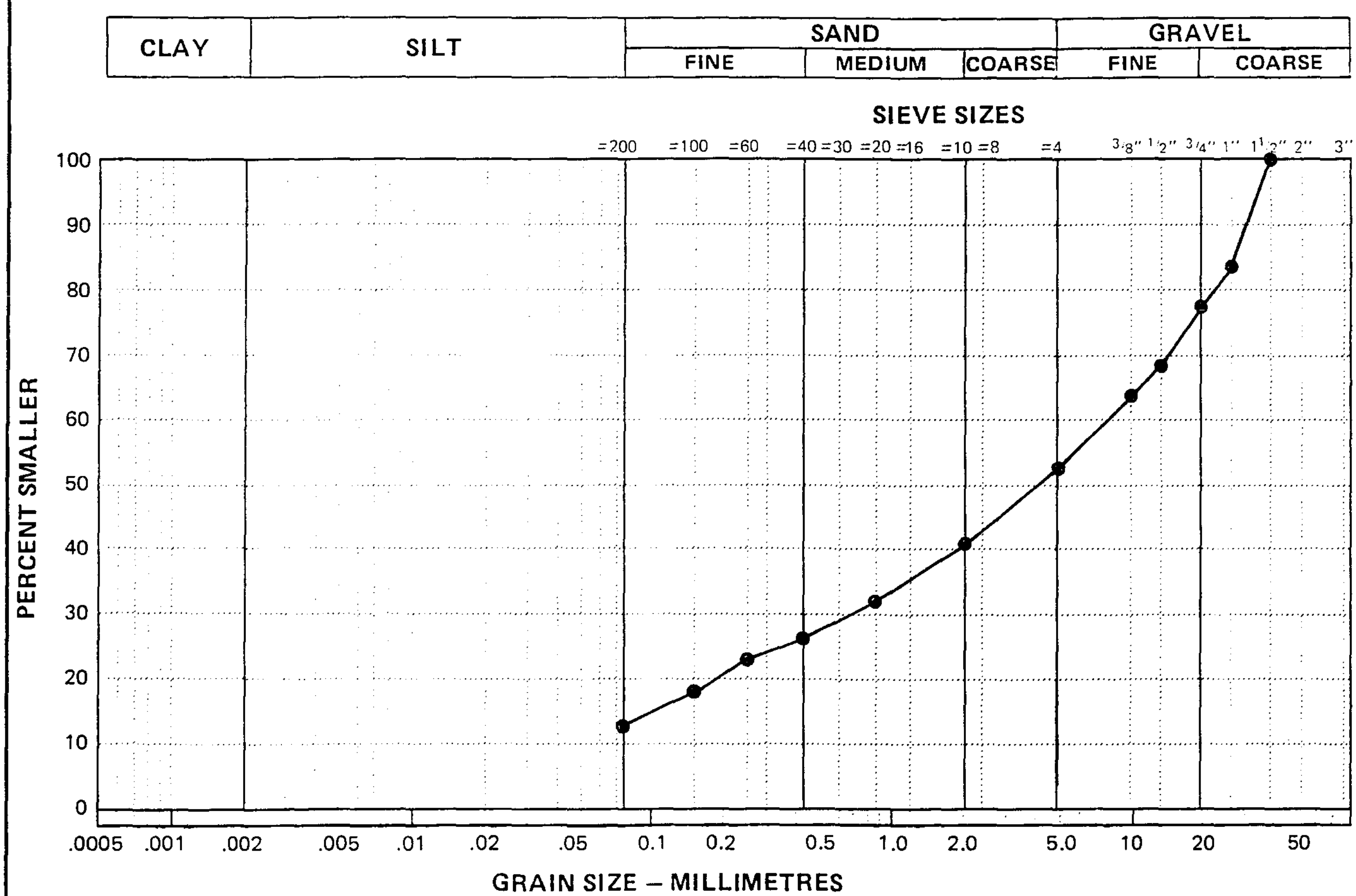
Cu:

Cc:

Natural Moisture Content: 12.1 %

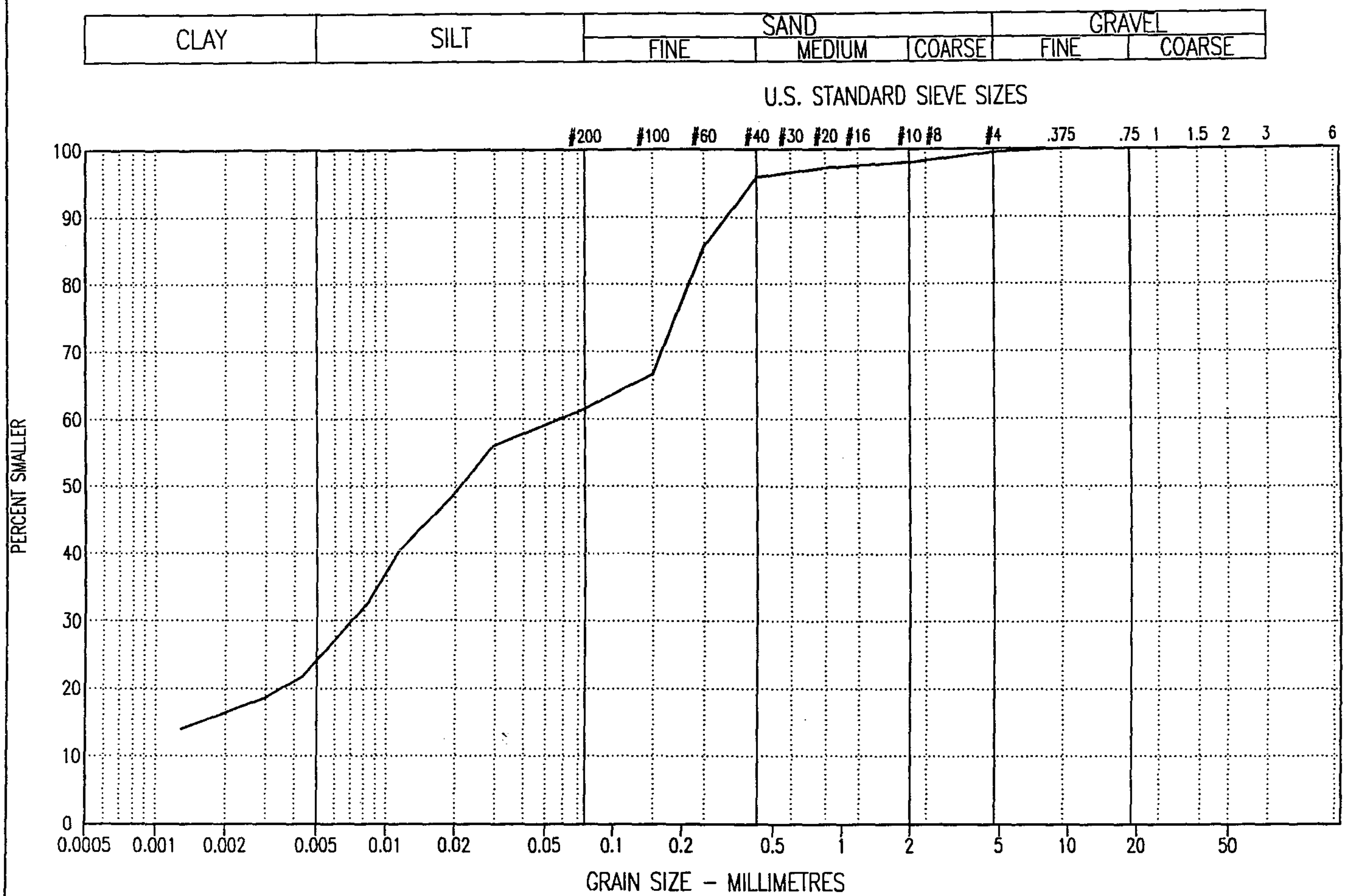
Remarks:
Sampled from top third of trench

SIEVE	PERCENTAGE PASSING
3"	
2"	
1 1/2"	100.0
1" 83.7	83.7
3/4"	77.2
3/8"	63.8
No. 4	52.4
No. 10	40.5
No. 20	32.0
No. 40	27.0
No. 60	22.8
No. 100	18.4
No. 200	12.3



EBA Engineering

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
———	U-1	0.4	23.7	37.8	38.0	0.5	–	–	

SAMPLE FROM UNDISTURBED AREA
SILT AND SAND - clayey, some organics
Natural Moisture Content: 89%
LL=72%, PL=68%, PI=4%

Project: 201-11333

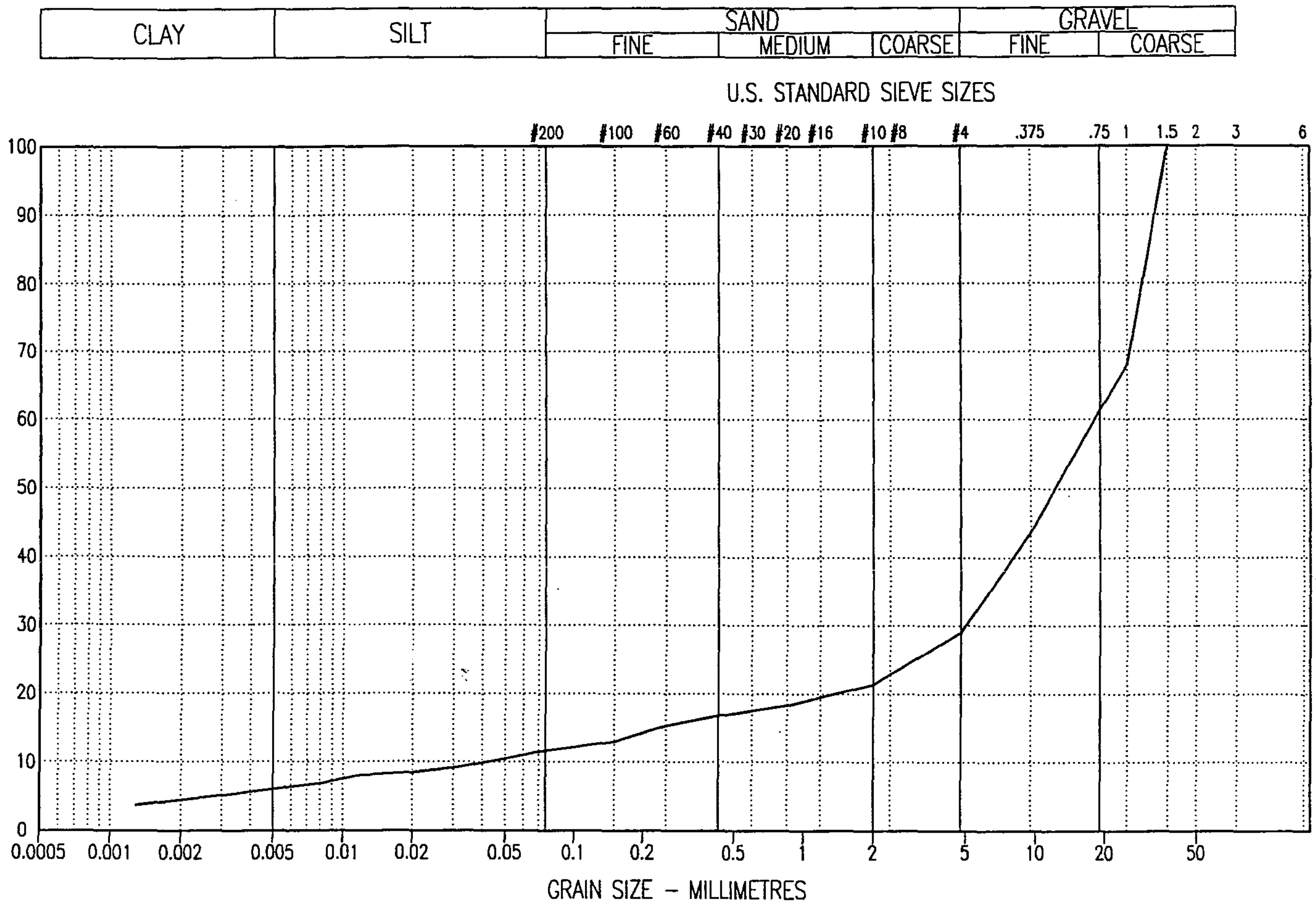
Date Tested: 93/11/03

BY: IS

Tested in accordance with ASTM D422 unless otherwise noted.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION CLAY %	SILT %	SAND %	GRAVEL %	Cu	Cc	U.S.C
———	U-2	0.4	6.0	5.6	17.5	70.9	–	–	

SAMPLE FROM UNDISTURBED AREA
GRAVEL-some sand and fines, some organics
Natural Moisture Content: 18%
LL=60%, PL=32%, PI=28%

Project: 201-11333 Date Tested: 93/11/03 BY: IS

Tested in accordance with ASTM D422 unless otherwise noted.

9§ 3-67 Avenue
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NORWEST LABS
(403)438-5522
(403)438-0396fax

W.O. NUMBER: 4 71379
PAGE: 1 of 2
LAB NUMBER: 150935

EBA ENGINEERING CONSULT
14535-118 AVENUE
EDMONTON, AB
T5L 2M7

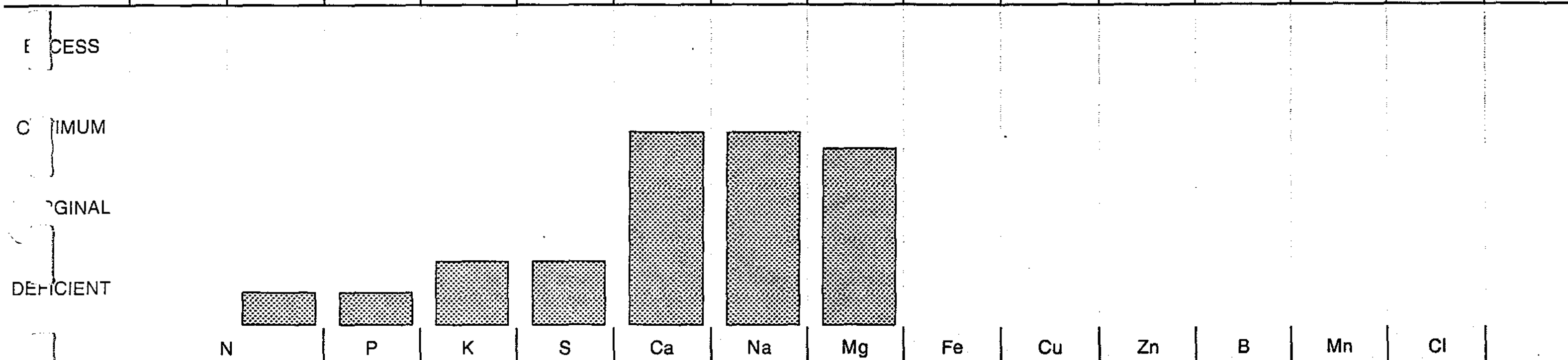
EBA
SAMPLE: 11333-01

SAMPLE RECEIVED: 25 OCT 93
ANALYSIS COMPLETED: 27 OCT 93 14:37
SAMPLE RETAINED UNTIL: 27 NOV 93
FOR INFORMATION CALL: Doug Keyes
AT: 1-800-661-7645
or 403-438-5522

client number: 32506 fax:FAX4034545688 phone:

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
6"		1	1	45	2	880	11	84						
TOTAL LBS/ACRE		2	2	90	3									
ESTIMATED AVAILABLE LBS./ACRE		**4**	**2**	**90**	**6**									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)	E.C.(SALINITY)	ORGANIC MATTER %	Sand % Silt % Clay % TEXTURE
6"	5.8 (Acid)	0.0 (O.K.)	15.1	

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

BARLEY-FEED

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
Excellent	87	70	50	86	16
Average	65	60	44	78	13
Your goal	None given				
Goal is	% of average cond.				

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 60	70	80	90
Excel.	83	87	89	91
Avg.	65	67	69	71

(Yield response to N for a typical field)

CANOLA

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
Excellent	44	108	52	88	24
Average	34	92	45	79	22
Your goal	None given				
Goal is	% of average cond.				

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 80	90	100	110
Excel.	42	43	44	44
Avg.	33	34	34	34

(Yield response to N for a typical field)

COMMENTS

This recommendation is made for soil: Black
The previous crop was UNKNOWN
Total Extractable Cations: 5 meq/100g
Low pH could reduce yields of Alfalfa & Sweet Clover
Have a LIME REQUIREMENT test done if considering liming to correct acidity.
Recommended application rates are based on seed placed or banded fertilizer efficiencies unless otherwise indicated.
The method of application, however, is left to your discretion. The total amount can not necessarily be placed with the seed!

These recommendations are given as a management tool based on general research consensus. They should not replace prudent and responsible judgment.

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NORWEST LABS

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(403)438-0396fax

W.O. NUMBER: 4 71379

LAB NUMBER: 150936

EBA ENGINEERING CONSULT
14535-118 AVENUE
EDMONTON, AB
T5L 2M7

EBA
SAMPLE: 11333-02

SAMPLE RECEIVED: 25 OCT 93
ANALYSIS COMPLETED: 27 OCT 93 14:37
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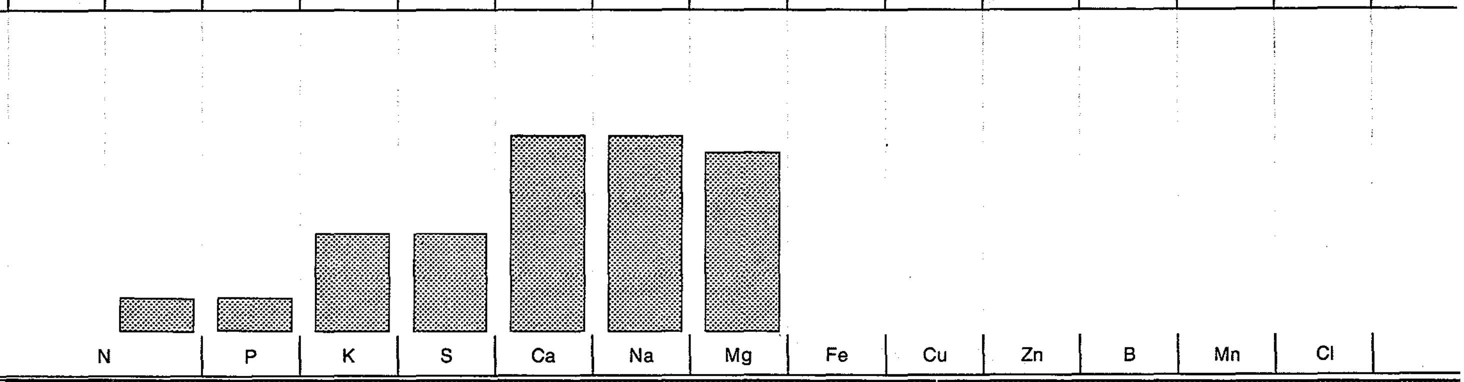
FOR INFORMATION CALL: Doug Keyes
AT: 1-800-661-7645
or 403-438-5522

client number: 32506 fax:FAX4034545688 phone:

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
[illegible]- 6"		2	<1	84	2	1570	16	176						
TOTAL LBS./ACRE		4	<2	167	4									
ESTIMATED AVAILABLE LBS./ACRE		**8**	**2**	**167**	**8**									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)	E.C.(SALINITY)	ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
6"	5.7 (Acid)	0.1 (O.K.)	10.6				

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

BARLEY-FEED

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
Excellent	87	70	51	57	15
Average	65	58	44	48	12
Your goal	None given				
Goal is	% of average cond.				

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 60	70	80	90
Excel.	84	87	90	92
Avg.	65	68	70	71

(Yield response to N for a typical field)

CANOLA

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
Excellent	44	106	52	59	23
Average	34	92	45	50	21
Your goal	None given				
Goal is	% of average cond.				

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 80	90	100	110
Excel.	42	43	44	44
Avg.	33	34	34	35

(Yield response to N for a typical field)

COMMENTS

This recommendation is made for soil: Black
The previous crop was UNKNOWN
Total Extractable Cations: 10 meq/100g
Possibility of yield reduction due to low pH and Al toxicity.
Have a LIME REQUIREMENT test done if considering liming to correct acidity.
Recommended application rates are based on seed placed or banded fertilizer efficiencies unless otherwise indicated.
The method of application, however, is left to your discretion. The total amount can not necessarily be placed with the seed!

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NORWEST LABS

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(403)438-0396fax

W.O. NUMBER: 4 71379

LAB NUMBER: 150935

EBA ENGINEERING CONSULT
14535-118 AVENUE
EDMONTON, AB
T5L 2M7

EBA
SAMPLE: 11333-01

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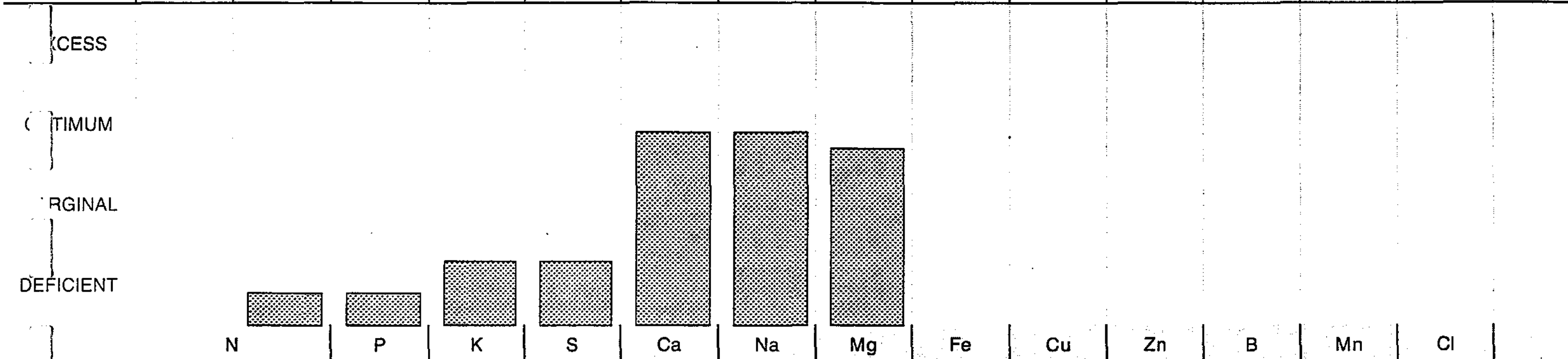
AT: 1-800-661-7645
or 403-438-5522

client number: 32506 fax:FAX4034545688 phone:

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
[illegible]6"		1	1	45	2	880	11	84						
TOTAL L[illegible]/ACRE		2	2	90	3									
E[illegible]IMATED AVAILABLE LBS./ACRE		4	2	90	6									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)		E.C.(SALINITY)		ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
6"	5.8	(Acid)	0.0	(O.K.)	15.1				

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

B[illegible]RLEY-FEED

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
E[illegible]cellent	87	70	50	86	16
Average	65	60	44	78	13
Your goal	None given				
Goal is	% of average cond.				

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 60	70	80	90
Excel.	83	87	89	91
Avg.	65	67	69	71

(Yield response to N for a typical field)

C[illegible]NOLA

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
E[illegible]cellent	44	108	52	88	24
Average	34	92	45	79	22
Y[illegible]ur goal	None given				
Goal is	% of average cond.				

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 80	90	100	110
Excel.	42	43	44	44
Avg.	33	34	34	34

(Yield response to N for a typical field)

COMMENTS

This recommendation is made for soil: Black
The previous crop was UNKNOWN
Total Extractable Cations: 5 meq/100g
Low pH could reduce yields of Alfalfa & Sweet Clover
Have a LIME REQUIREMENT test done if considering liming to correct acidity.
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NORWEST LABS

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EBA ENGINEERING CONSULT
14535-118 AVENUE
EDMONTON, AB
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EBA
SAMPLE: 11333-02

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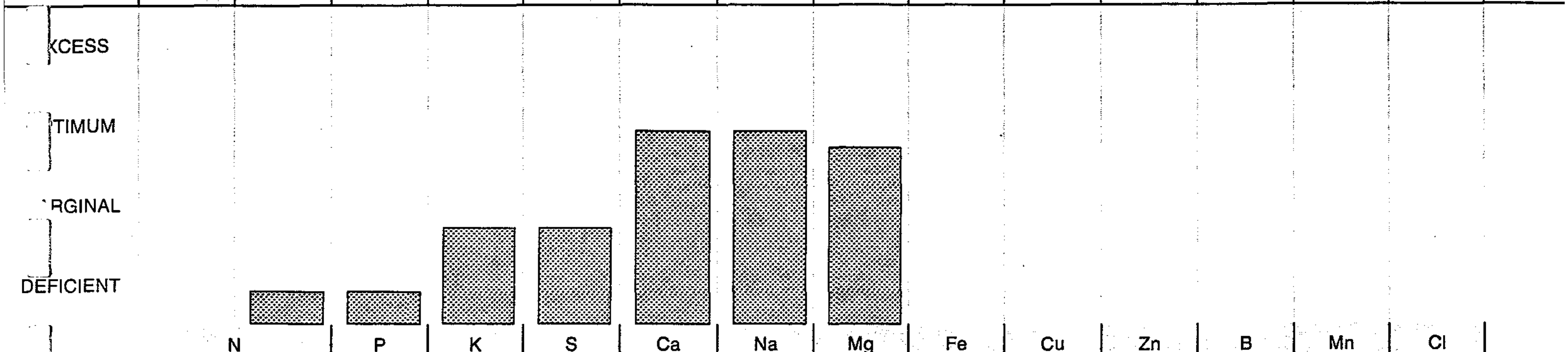
FOR INFORMATION CALL: Doug Keyes
AT: 1-800-661-7645
or 403-438-5522

client number: 32506 fax:FAX4034545688 phone:

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
0- 6"		2	<1	84	2	1570	16	176						
TOTAL LBS./ACRE		4	<2	167	4									
ESTIMATED AVAILABLE LBS./ACRE		**8**	**2**	**167**	**8**									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)		E.C.(SALINITY)		ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
0- 6"	5.7	(Acid)	0.1	(O.K.)	10.6				

MICRONUTRIENTS

No micronutrient analysis requested.

RECOMMENDATIONS

BARLEY-FEED

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
Excellent	87	70	51	57	15
Average	65	58	44	48	12
Your goal	None given				
Goal is	%	of average cond.			

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 60	70	80	90
Excel.	84	87	90	92
Avg.	65	68	70	71

(Yield response to N for a typical field)

CANOLA

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S
		----lbs/ac----			
Excellent	44	106	52	59	23
Average	34	92	45	50	21
Your goal	None given				
Goal is	%	of average cond.			

RESPONSE TO N TABLE

GROW. COND.	LBS. APPLIED N 80	90	100	110
Excel.	42	43	44	44
Avg.	33	34	34	35

(Yield response to N for a typical field)

COMMENTS

This recommendation is made for soil: Black
The previous crop was UNKNOWN
Total Extractable Cations: 10 meq/100g
Possibility of yield reduction due to low pH and Al toxicity.
Have a LIME REQUIREMENT test done if considering liming to correct acidity.
Recommended application rates are based on seed placed or banded fertilizer efficiencies unless otherwise indicated.
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These recommendations are given as a management tool based on general research consensus. They should not replace prudent and responsible judgment.

NORWEST LABS

Understand Your Soil Test Report

- The DEPTH(s) sampled are shown here. There may be several different depths sampled for each field, for example, 0-6", 6-12" and 12-24".

- The TOTAL POUNDS per acre of each major nutrient is calculated from the soil test and the sample depth. There are about two million pounds of soil per acre for each six inches of sample depth.

- The total pounds of each major nutrient is used to calculate the ESTIMATED AVAILABLE pounds to a standard depth - 24 " for N and S, 6" for P and K. The estimate is based on a typical depth distribution for each nutrient.

- MAJOR NUTRIENTS are tested to estimate fertilizer requirements. Nitrogen recommendations are based on nitrate N only (not ammonium).

- LABORATORY INSTRUMENTS give the concentration of nutrients as parts per million (ppm),which is one pound of nutrient in one million pounds of soil. The symbol ">" means greater than and "<" means less than.

- MICRONUTRIENTS are tested to determine whether they may limit potential yield. Total pounds are not shown because only the concentration is important.

- The BAR CHART provides a quick general assessment of the field's nutrient status. Watch for both low and high bars on the graph.

- SOIL QUALITY information is useful for monitoring problem soils and is needed for determining the rate of application for some herbicides.

- RECOMMENDATIONS are offered for up to three crops. For each crop, recommendations are given for two growing conditions and for your yield goal. Growing condition will mainly be determined by moisture. Soil test results, crop response to nitrogen, crop/fertilizer prices and soil zone are all considered in these recommendations. For most crops, an expected YIELD RESPONSE TO NITROGEN table is shown.

- This section shows MICRONUTRIENT RECOMMENDATIONS

- This section includes SOIL ZONE and CROPPING HISTORY, and the results of any special tests.

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(403)438-5522
(403)438-0396fax

Mike's Fuel and Fertilizer
1516 - 107 Avenue
Town, Canada
2K5

client number 12345 fax FAX4034380396 phone

RENTED QUARTER
1

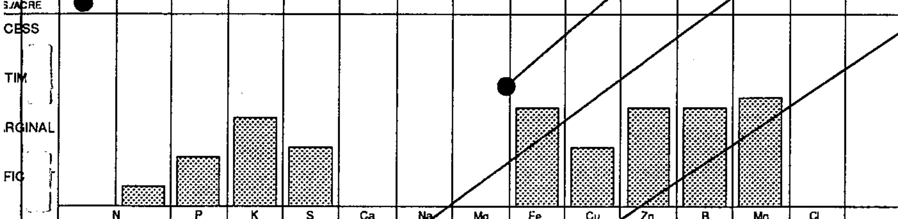
SE22 T 57 R25 W4

W.O. NUMBER: 4 51735
PAGE: 1 of 1
LAB NUMBER: 122635

SAMPLE RECEIVED: 28 SEP 92
ANALYSIS COMPLETED: 1 OCT 92 15:24
SAMPLE RETAINED UNTIL: 1 NOV 92
FOR INFORMATION CALL: Doug Keyes
AT: 1-800-661-7645
or 403-438-5522

NUTRIENT ANALYSIS (P.P.M.)

SAMPLE DEPTH	AMMONIUM	NITRATE	PHOSPHATE	POTASSIUM	SULPHATE	CALCIUM	SODIUM	MAGNESIUM	IRON	COPPER	ZINC	BORON	MANGANESE	CHLORIDE
6"		7	13	121	3				163	0.4	2.1	0.8	24.6	
TOTAL LBS/AC		13	26	242	6									
ESTIMATED AVAILABLE LBS/ACRE		26	26	242	12									



SOIL QUALITY

SAMPLE DEPTH	pH (ACIDITY)		E.C.(SALINITY)		ORGANIC MATTER %	Sand %	Silt %	Clay %	TEXTURE
- 6"	6.1	(Normal)	0.2	(O.K.)	5.0				

MICRONUTRIENTS

Iron level is adequate.
Copper level is marginal. Monitor yearly.
Zinc level is adequate.
Boron level is adequate.
Manganese level is adequate.

RECOMMENDATIONS

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S	GROW. COND.	APPLIED N 60	70	80	90
Excellent	126	80	40	35	15	Excel.	120	123	126	128
Average	96	64	33	25	11	Avg.	95	98	100	101
Your goal	100	66	34	26	12	(N response is based on a typical field)				
Goal is	104 %	of Average								

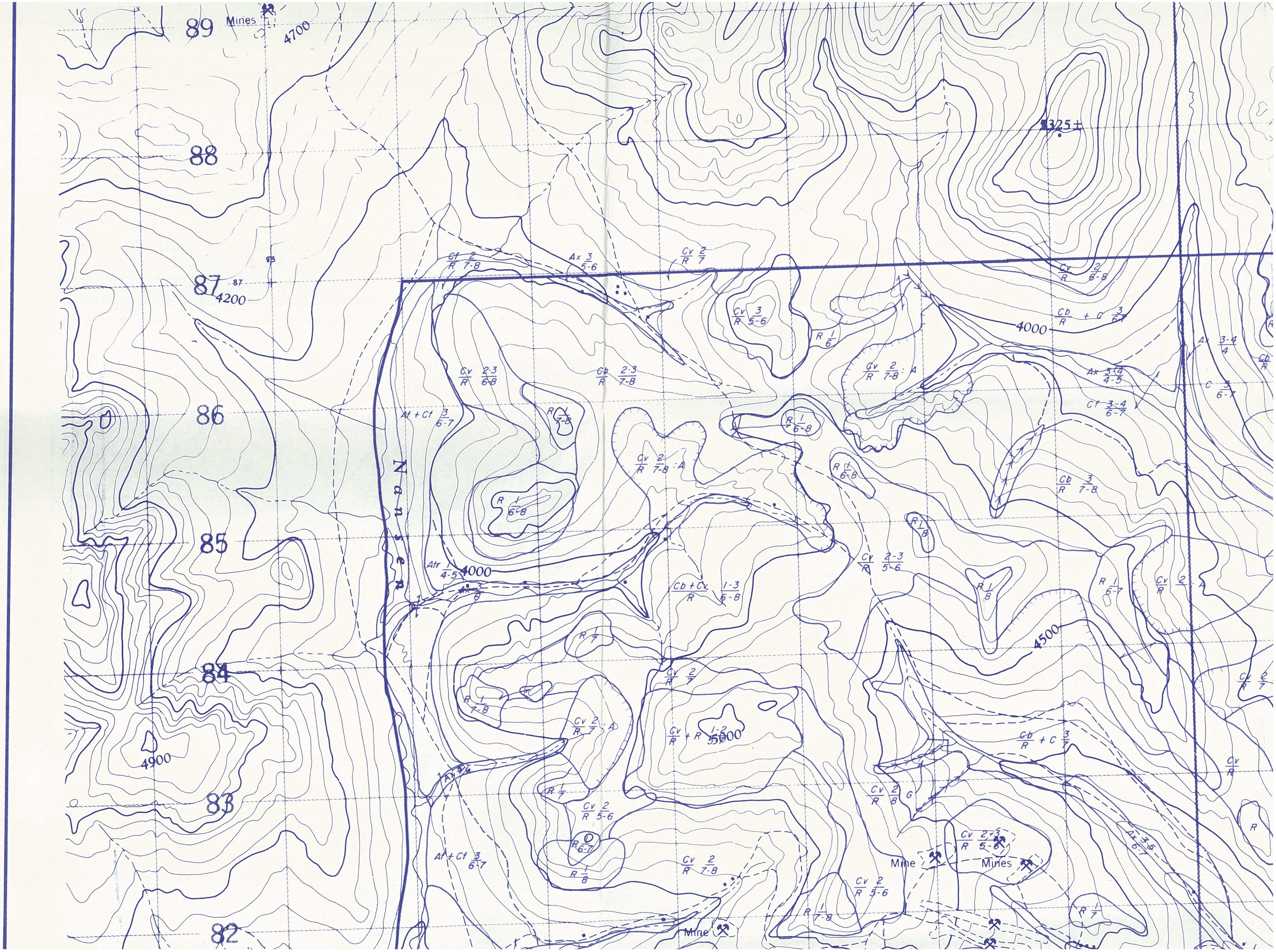
BARLEY-FEED — YIELD RESPONSE TO N

GROWING CONDITION	YIELD (Bu/Ac)	N	P_2O_5	K_2O	S	GROW. COND.	APPLIED N 60	70	80	90
Excellent	92	80	37	30	13	Excel.	86	90	92	94
Average	70	68	30	21	10	Avg.	68	70	72	73
Your goal	75	70	32	23	11	(N response is based on a typical field)				
Goal is	107 %	of Average								

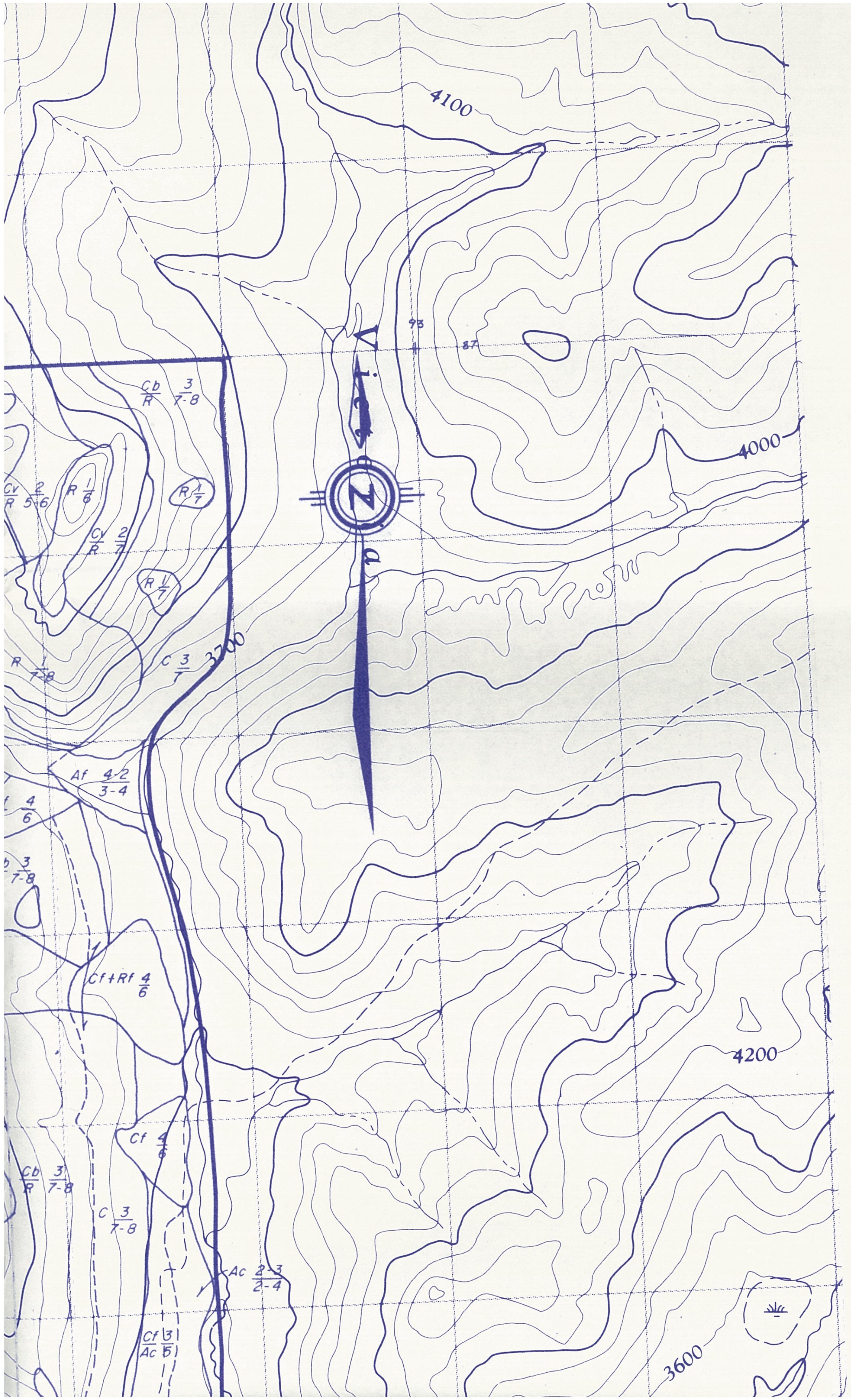
COMMENTS

This recommendation is made for soil: Black
The previous crop was ALFALFA ESTB
Low pH could reduce yields of Alfalfa & Sweet Clover
Have a LIME REQUIREMENT test done if considering liming to correct acidity.
Recommendations are based on nitrate-N only.
Lower N rates may be required due to the presence of other forms of N

These recommendations are given as a management tool based on general research consensus. They should not replace prudent and responsible judgment.



89
Mines
4700
88
87
4200
86
85
84
83
82
4900
Nansen
4000
4500
5000
5325±
Mine
Mines



MOUNT NANSEN RECLAMATION STUDY

SURFICIAL GEOLOGY MAP 1:25,000 SCALE

Air Photo Interpretation by C. Mougeot, Mougeot GeoAnalysis, 1993.
Drafting by Anne Jessup

COMMENTS

This map was constructed from air photo interpretation with limited ground truthing. Black and white photographs at the 1:40,000 scale (1988) were used.

Extensive permafrost is probably present at high elevation with a low ice content, in the form of ice crystals and small ice lenses. Permafrost is probably more extensive on north facing slope, where soil temperatures are lower and thick organic mats cover the ground.
Ice content would be higher in poorly drained, fine-grained alluvial deposits located above flood plain level. These areas are susceptible to thermokarsting.

REFERENCES

Dept. of Indian Affairs and Northern Development, Forestry Division, 1988, AIR PHOTOS A 27477-189 to 193, A27477-246 to 251.

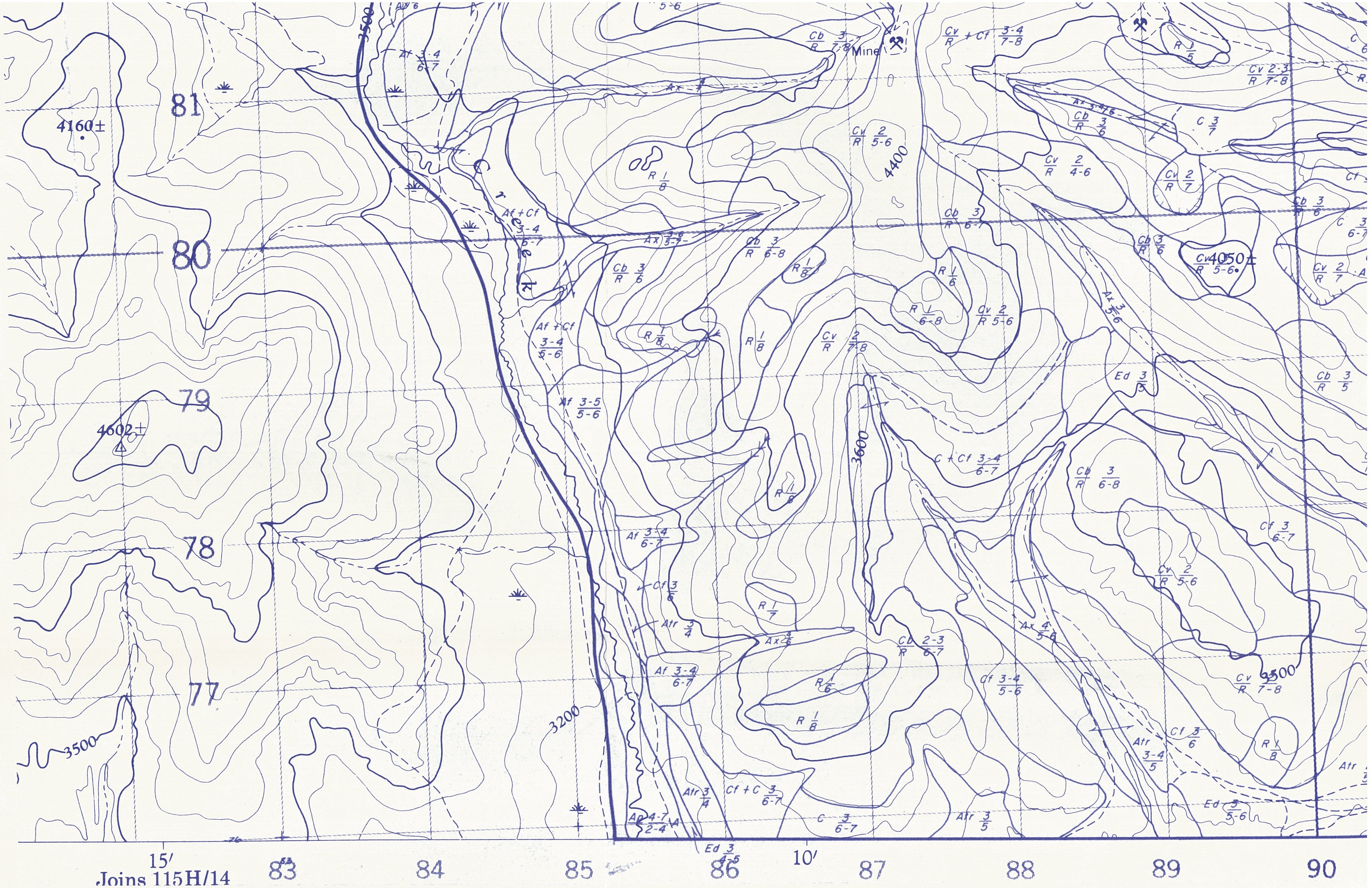
Jackson, L., in prep.: Quaternary Geology of the Carmacks Map Sheet, 115 I, Geological Survey of Canada, map at 1;125,000 scale.

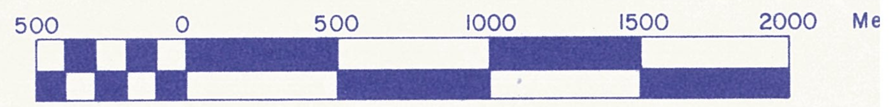
SYMBOL EXPLANATION

Geol. Unit -drainage class : Modifier
slope class

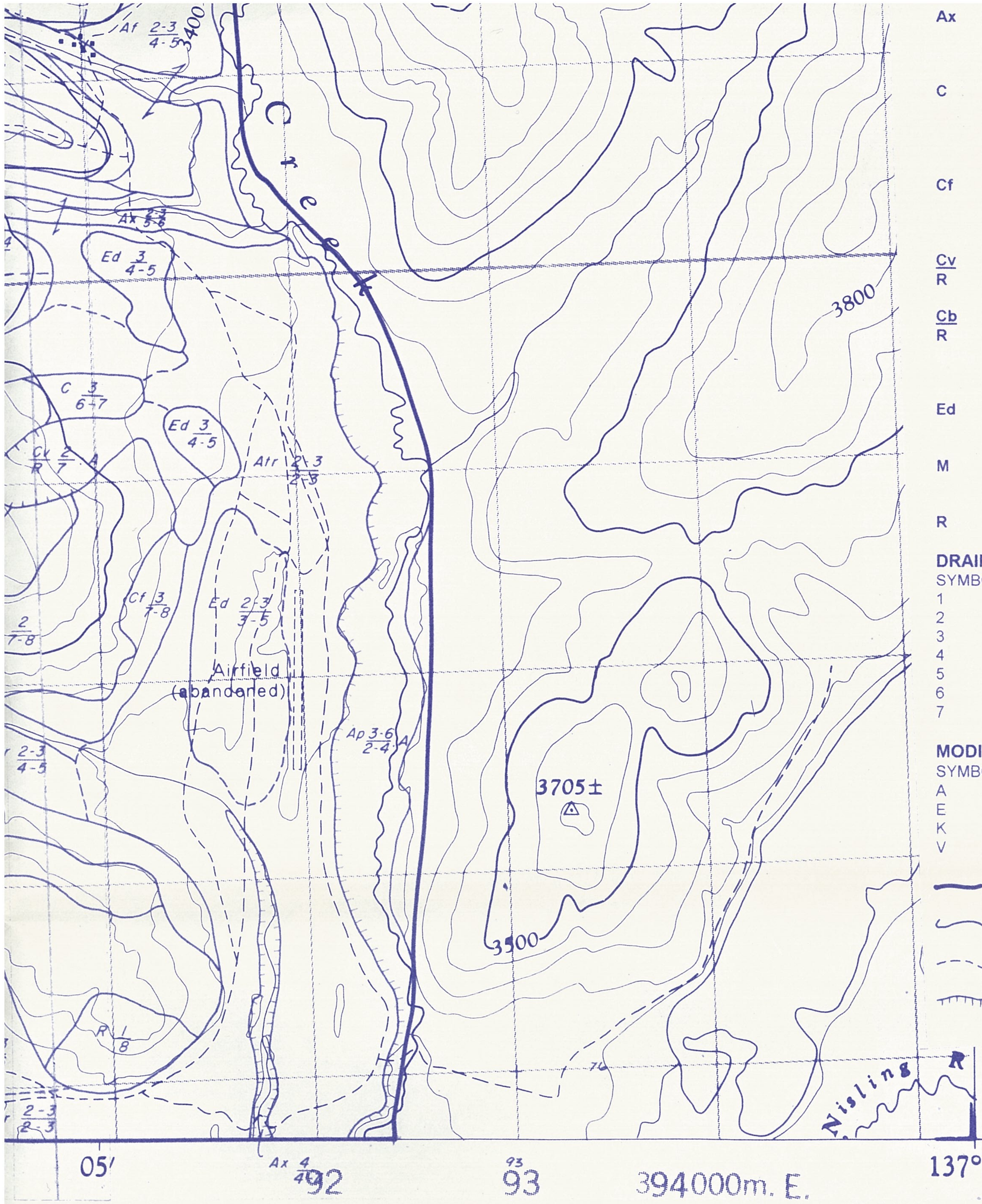
LEGEND

Geol. Unit	Description	Textural Range, Topography
Af	Alluvial fan sediments	Sediment may consist of mixed gravel, sand, silt or diamicton. Thickness of sediment increases downslope. May be subject to stream avulsion and flooding, as well as debris flows after severe storm event.
Ap	Alluvial flood plain sediments	Sediment consists of sorted silt to gravel. Topography is usually flat to undulating and may include poorly drained and organic filled depressions. May be subject to seasonal flooding.
At	Alluvial terrace sediments	Sediment consists of silt to gravel, usually flat to gently undulating. Low risk of seasonal flooding. High ice content permafrost may be present in fine-grained deposits, specially when thick organic cover is present.
Atr	Alluvial terrace sediments associated with Reid age streams	Complexes of non-glacial stream and fan sediments graded to Reid Glaciation ice margins. Textures range from partly to commonly frost-shattered and ventifacted, well-sorted angular to subangular gravel to immature sands with scattered lenses of frost shattered and wind-sculptured gravel. Sediments are commonly cut by ice wedge pseudomorphs over the





Scale 1:25,000



Ax	Alluvial complex sediments	Unit includes upper slope, poorly drained, organic, depression grading into steep sided gully with associated coarse deposits. Lower portion of unit may grade into alluvial fan.
C	Colluvial deposit (>3 meters thick)	Colluvium consists of stony diamicton with sandy loam matrix (silt with fine sand and minor clay content). Most of colluvium composed of weathered bedrock, reworked by gravitational processes. May include glacially deposited, reworked diamicton (till).
Cf	Colluvial fan	Colluvium as described above, forming a wedge-like slope-toe complex, slope decreases and deposits thickness increases downslope. Fan may be result of avalanche, debris slow, and in some cases, solifluction.
Cv/R	Colluvial veneer (less than 1 meter thick) over bedrock	Thin, often discontinuous cover of colluvium or glacial diamicton over bedrock. Topography controlled by underlying bedrock.
Cb/R	Colluvial blanket (more than 1 meter thick) over bedrock	Thin (less than 3 meters, more than 1 meter) cover of colluvium or glacial diamicton over bedrock. Thickness of colluvium varies and can be sufficiently thick to maintain permafrost layer, and therefore can be subjected to solifluction and gravity processes, such as creep and sheet flow.
Ed	Eolian sand dunes	Well sorted silt, fine sand transported and deposited by wind action, topography usually gently undulating to rolling
M	Mined, trenched, stripped or excavated surface	Surface usually consists of gravely to stony diamicton to shattered bedrock, topography similar as surrounding area, can be nearly flat to steep.
R	Bedrock	

DRAINAGE CLASS

SYMBOL	DESCRIPTION
1	Very rapidly drained.
2	Rapidly drained.
3	Well drained.
4	Moderately well drained.
5	Imperfectly drained.
6	Poorly drained.
7	Very poorly drained.

SLOPE CLASS

SYMBOL	% (o)
1	0-2.5 (0-1)
2	2.6-5 (1-3)
3	6-10 (3.5-6)
4	11-15 (6-8.5)
5	16-20 (9-12)
6	21-30 (12-17)
7	31-50 (17-33)
8	51 + (33+)

MODIFIER

SYMBOL	DESCRIPTION
A	Active
E	Eroded (steep sided, terrace scarp)
K	Thermokarsted
V	Gullied.

Study boundary

Geological unit boundary

Approximate geological unit boundary

Escarpment, steep slope

FILE COPY

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SCALE	DESIGNED	DRAWN			
		JOB No. 0201-11333			

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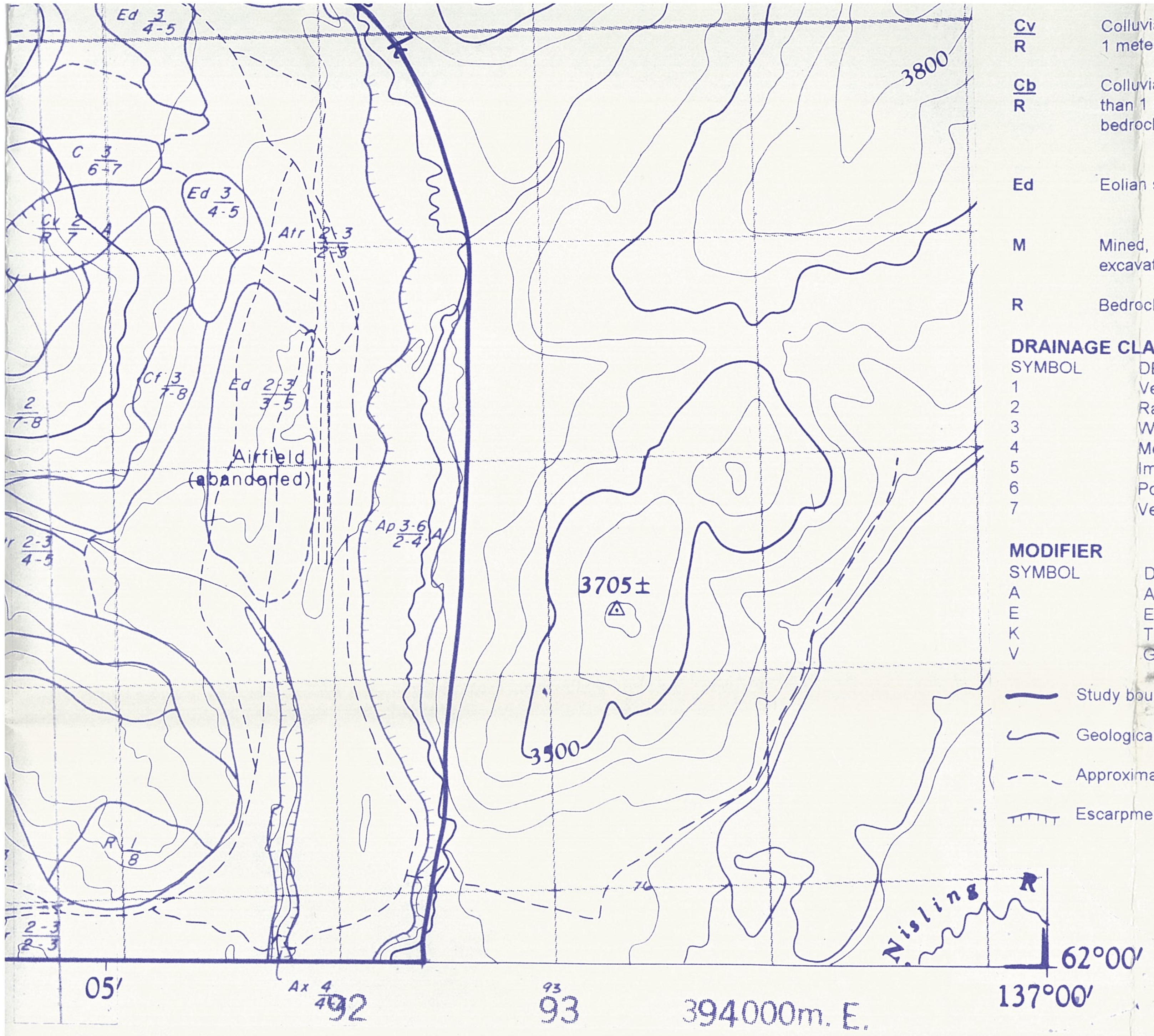

Cv R	Colluvial veneer (less than 1 meter thick) over bedrock	Thin, often discontinuous cover of colluvium or glacial diamicton over bedrock. Topography controlled by underlying bedrock.
Cb R	Colluvial blanket (more than 1 meter thick) over bedrock	Thin (less than 3 meters, more than 1 meter) cover of colluvium or glacial diamicton over bedrock. Thickness of colluvium varies and can be sufficiently thick to maintain permafrost layer, and therefore can be subjected to solifluction and gravity processes, such as creep and sheet flow.
Ed	Eolian sand dunes	Well sorted silt, fine sand transported and deposited by wind action, topography usually gently undulating to rolling
M	Mined, trenched, stripped or excavated surface	Surface usually consists of gravely to stony diamicton to shattered bedrock, topography similar as surrounding area, can be nearly flat to steep.
R	Bedrock	

DRAINAGE CLASS

SYMBOL	DESCRIPTION
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SLOPE CLASS

SYMBOL	% (o)
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5	16-20 (9-12)
6	21-30 (12-17)
7	31-50 (17-33)
8	51 + (33+)

MODIFIER

SYMBOL	DESCRIPTION
A	Active
E	Eroded (steep sided, terrace scarp)
K	Thermokarsted
V	Gullied.

Study boundary

Geological unit boundary

Approximate geological unit boundary

Escarpment, steep slope

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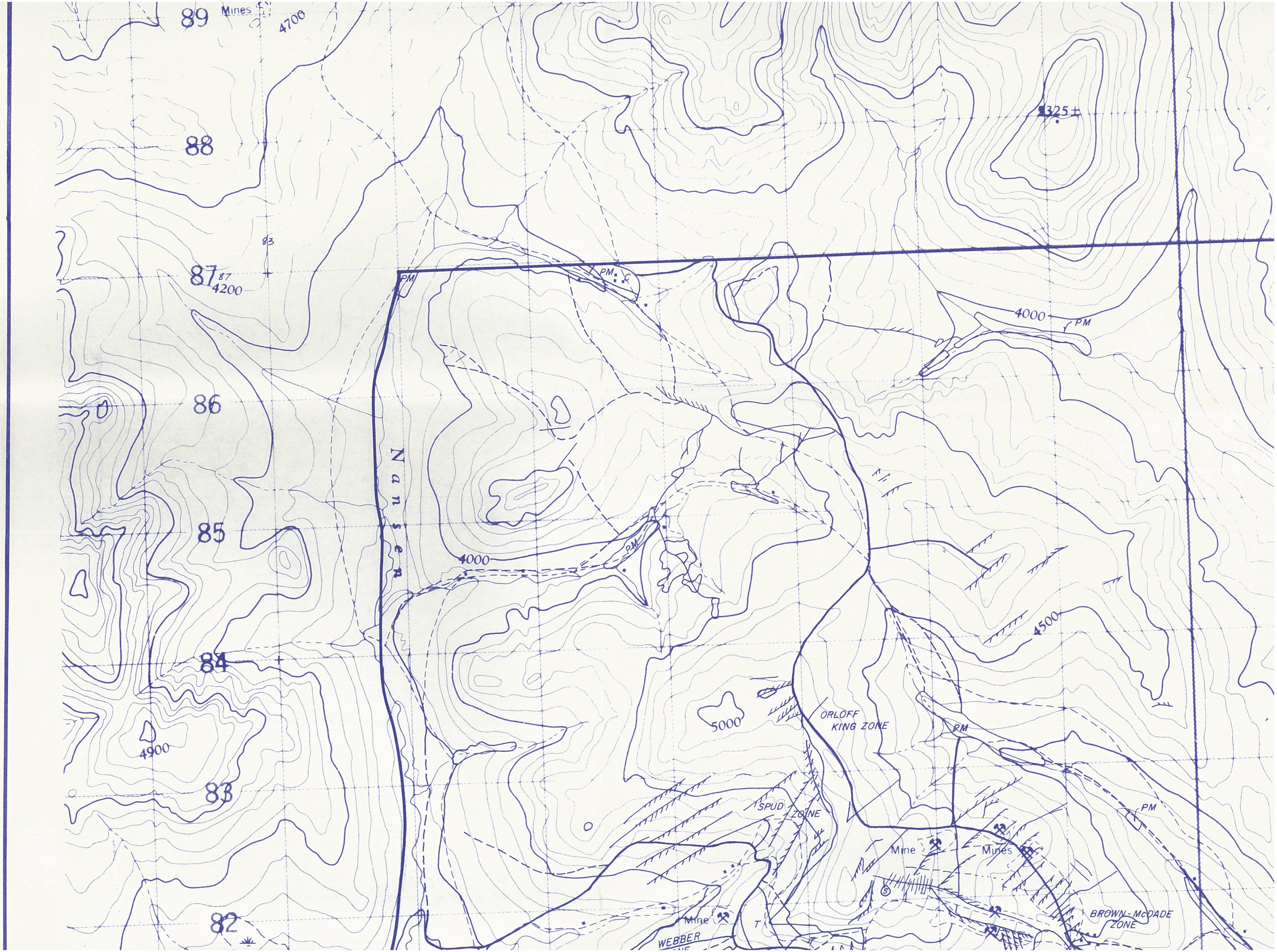
DRAWING TITLE: **SURFICIAL GEOLOGY MAP MT. NANSEN AREA, YUKON**

DRAWING No. **FIGURE 4** REV.



89
Mines
4700
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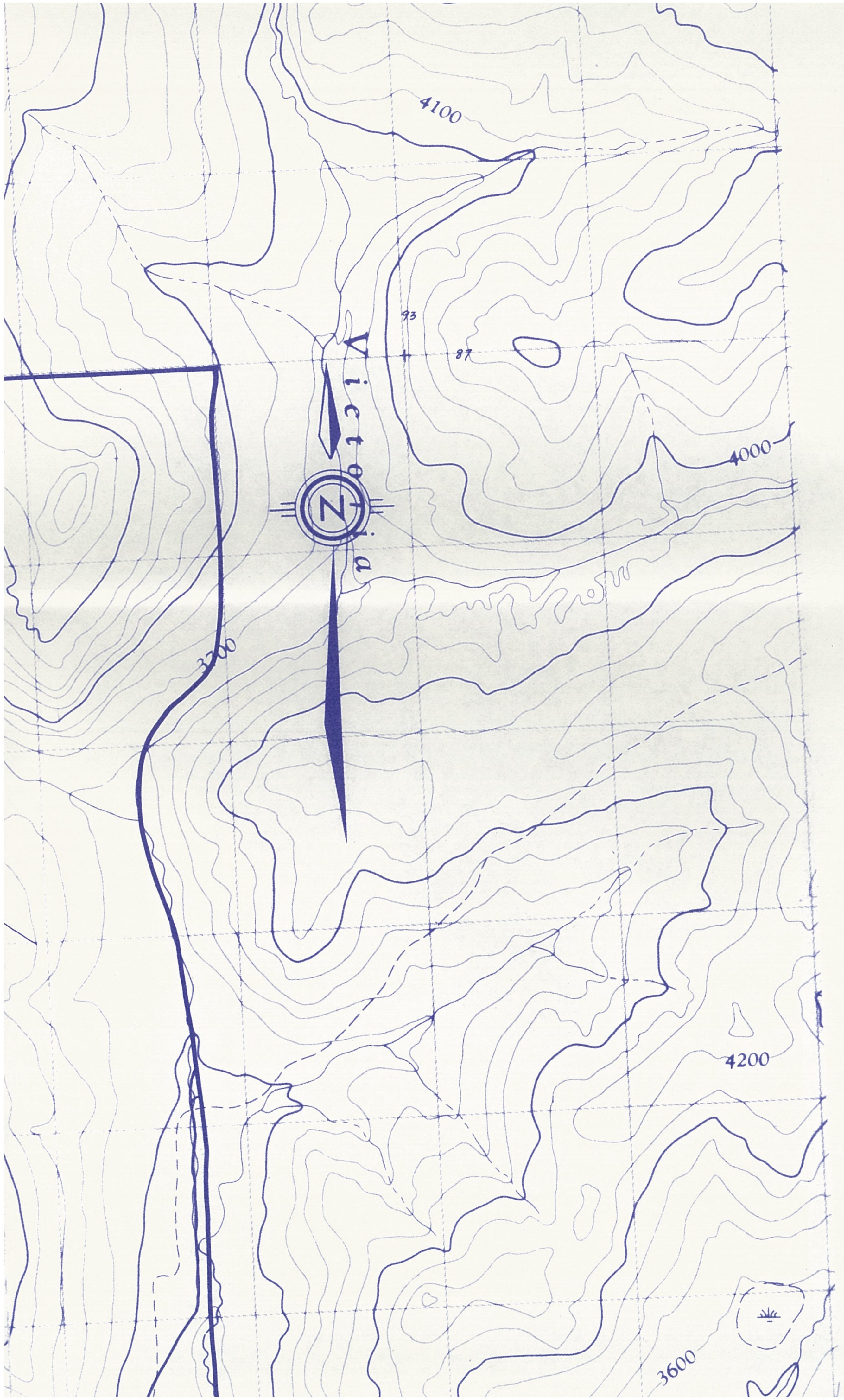
5325±
83
87
87
4200
PM
4000
PM
86
N a n s e n
85
4000
PM
4500
84
5000
ORLOFF
KING ZONE
PM
4900
83
SPUD
ZONE
PM
Mine
Mines
82
Mine
WEBBER
BROWN-McDADE
ZONE



MOUNT NANSEN RECLAMATION STUDY
ROADS AND TRENCHES MAP AT 1:25,000 SCALE

Air Photo Interpretation by C. Mougeot, Mougeot GeoAnalysis, 1994.
Drafting by .Anne Jessup.

COMMENTS

This map was constructed from air photo interpretation with limited ground truthing. Black and white photographs at the 1:40,000 scale (1988) were used. Dates mentioned in the legend are taken from Walls and Easton (1987) which was the most recent information available at the time of this study.

Easton or Eaton?

LEGEND

C	Camp
M	Mill
PM	Placer Mine
S	Stripped area
T	Trenched surface
1	Observation site, camp
2	Observation site, mill
3	Observation site, Brown-McDade zone
4	Observation site, Huestis zone
5	Observation site, detailed trench description

Road

Trail

Trenches

Stripped/trenched line/heavy equip. road

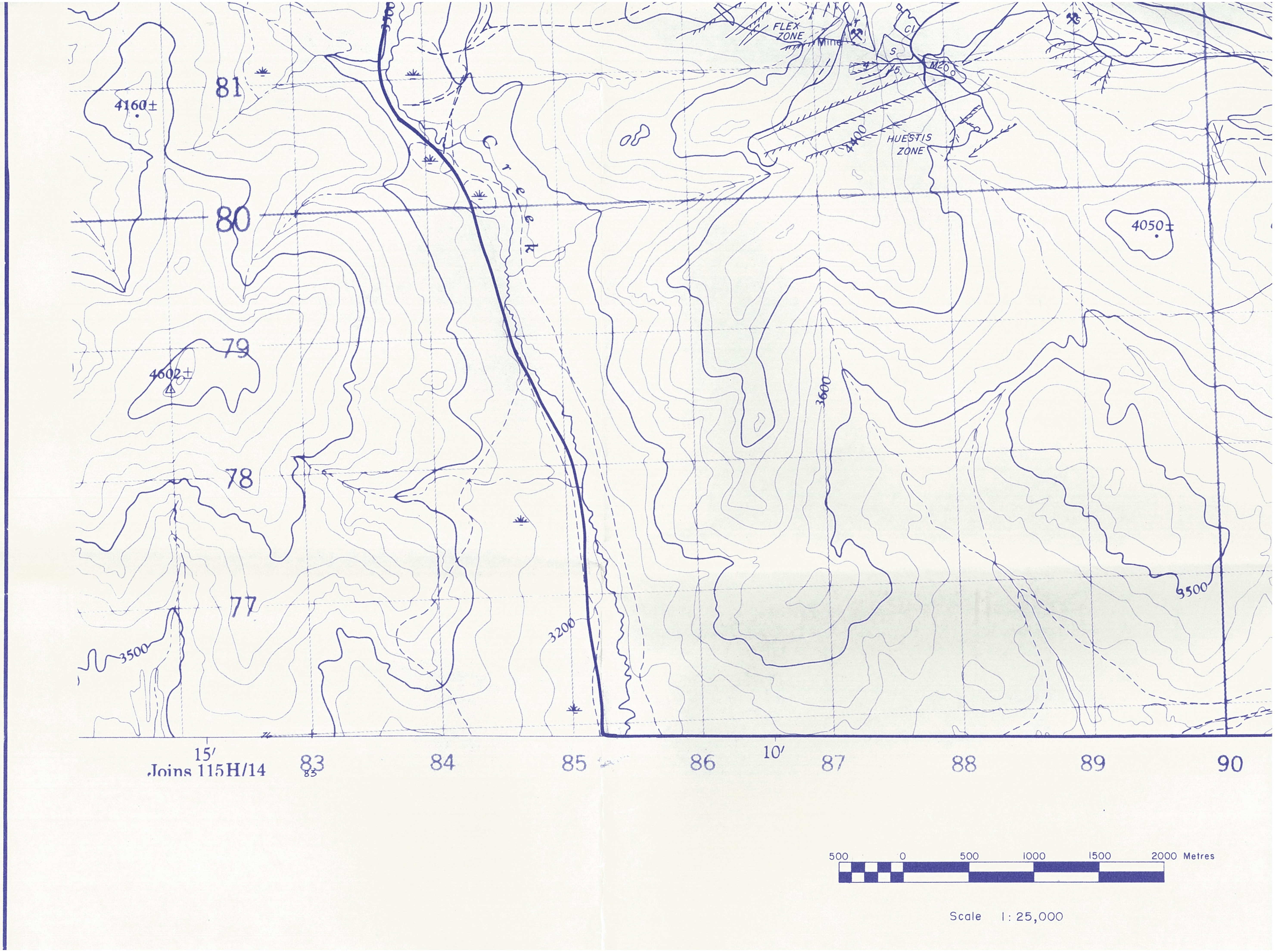
Study boundary

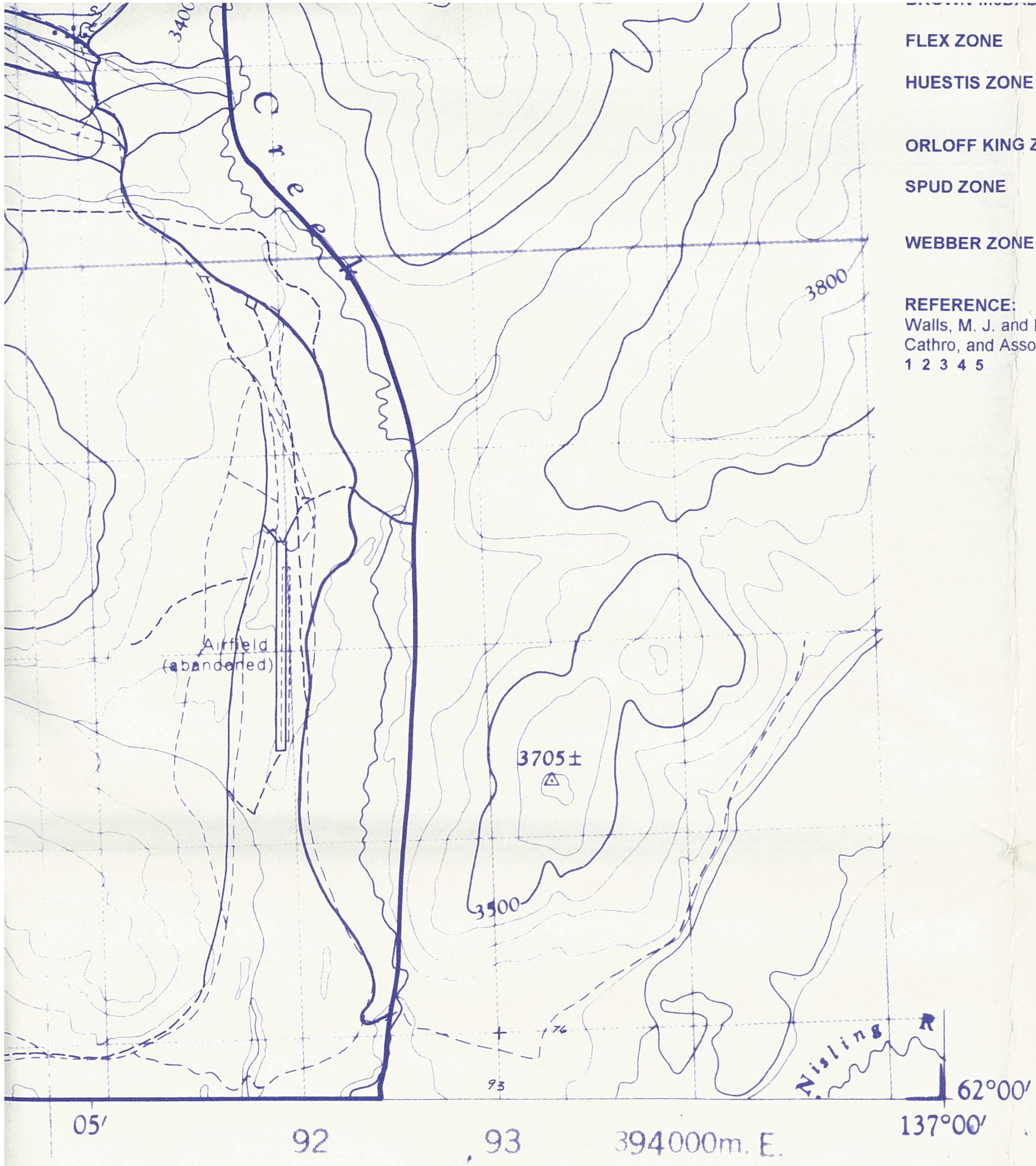
C1?

MINING HISTORY

CAMP active from 1968 to 1969, 1975 to 1976, possibly in 1985?

MILL active from 1968 to 1969, 1975 to 1976


FLEX ZONE
Mine
HUESTIS ZONE
4400
4160±
4602±
4050±
81
80
79
78
77
C r e e k
3600
3500
3200
3500
15′
Joins 115H/14
83
84
85
86
10′
87
88
89
90
500 0 500 1000 1500 2000 Metres
Scale 1: 25,000



FLEX ZONE	1986, 1987
HUESTIS ZONE	1945-47, late 50's, 1962,1963, 1969,1976 underground 1964-69,
ORLOFF KING ZONE	1987
SPUD ZONE	1987
WEBBER ZONE	1945-47, late 50's, 1962,1963, 1969, 1976, 1985 underground 1964-67,

REFERENCE:

Walls, M. J. and Eaton, W.D., 1987: Mount Nansen Final Report, Assessment Report , Archer, Cathro, and Associates LTD, Whitehorse, Yukon
1 2 3 4 5

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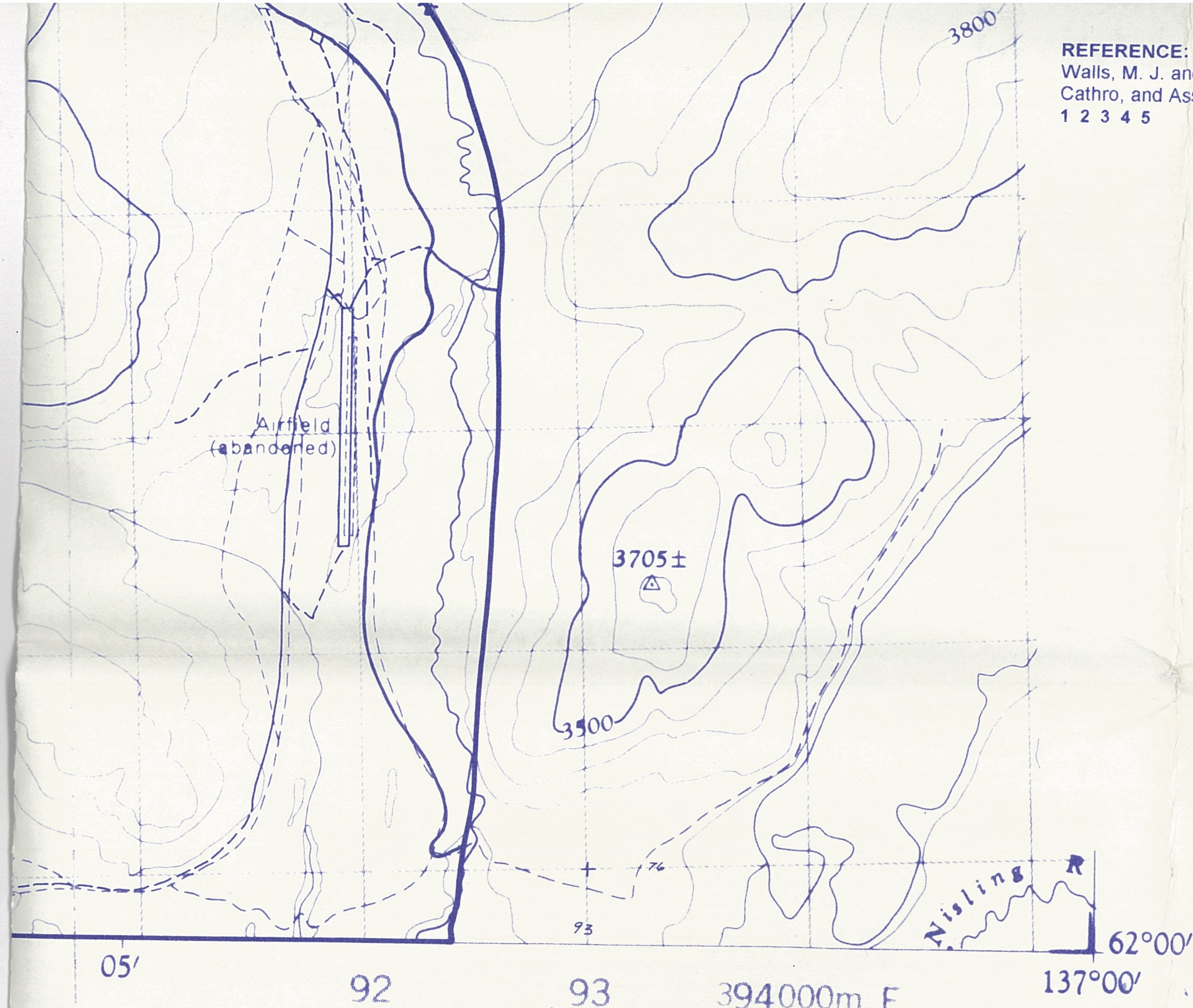
underground 1964-67,

REFERENCE:
Walls, M. J. and Eaton, W.D., 1987: Mount Nansen Final Report, Assessment Report , Archer, Cathro, and Associates LTD, Whitehorse, Yukon
1 2 3 4 5



No.	DATE	REVISIONS	BY	CHK	ENG

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JOB No. 0201-11333

DRAWING TITLE:
ANTHROPOGENIC FEATURE MAP
MT. NANSEN AREA, YUKON

DRAWING No. **FIGURE 5**
REV.