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Report on the Detailed Mineral Assessment of the Proposed Pickhandle Lakes Special Management Area, Yukon

R. Stroshein and R. Hulstein

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Preface

This report summarizes the results of geological field work and a detailed mineral assessment of a region of southwest Yukon that includes the proposed Pickhandle Lakes Special Management Area. This mineral assessment was done in 2002 by the Department of Energy, Mines and Resources of the Government of Yukon (YTG).

The purpose of this mineral resource assessment was to determine the mineral potential of the region and thereby assist with land planning in the area. The Yukon Geological Survey is pleased to release the results in this report.

The information is being released as originally prepared and may not conform to current Yukon Geological Survey publication standards. Please note that the report does not include information from any studies that may have been carried out in the areas since the mineral assessment was conducted. Special Management Area boundaries may have changed since the study was completed. This report was not previously released to the public due to the confidential nature of the Land Claim negotiation processes.

Report on the

Detailed Mineral Assessment

of the

Proposed Pickhandle Lakes Special Management Area

Confidential

March 25, 2003

Internal Report
Robert W. Stroshein
Roger W. Hulstein
YTG, Energy Mines and Resources
Mineral Planning and Development

Executive Summary

The proposed Pickhandle Lakes Special Management Area (SMA) consists of 50.2 square kilometers in southwest Yukon on NTS map sheet 115F/16.

The Yukon and Canadian Governments and Kluane and White River First Nations agreed to create a SMA, to be designated as a Habitat Protection Area, which covers Pickhandle Lake and the surrounding wetlands. The Habit Protection Area designation does not require the withdrawal of the area from mineral staking and withdrawal has not been requested in the Memorandum of Understanding signed between the Governments of Canada, Yukon and the First Nations.

The purpose of this report is to present the results of the detailed mineral assessment of an approximately 281.7 km^2 area that encompassed the proposed Special Management Area. This enlarged area was included to provide some relative context for the assessment.

The proposed SMA area has no known mineral occurrences and fieldwork conducted during 2002 did not identify any mineral resources. As the proposed SMA is a wetland in the overburden covered Shakwak Trench no rock exposures were found within the SMA in 2002 and conventional soil and stream sediment sampling were determined to be ineffective.

The detailed mineral assessment is based on the mineral potential of the geology as identified by a panel of industry experts. The resulting detailed mineral potential map indicates that the belt of Wrangellia Terrane rocks, on the southwest side of proposed SMA, have the highest relative mineral potential. Due to insufficient information the detailed assessment panel did not establish any applicable potential mineral deposit models for the proposed SMA area. This resulted in the tract containing the proposed SMA having the lowest relative mineral potential.

The assessment panel determined that the Wrangellia Terrane has potential for hosting gabbroic nickel – copper, volcanic massive sulfide volcanogenic type, gold-quartz vein and copper skarn deposits. The Nasina Assemblage rocks on the north east side of the SMA were considered to have potential for hosting gabbroic nickel – copper, volcanic massive sulfide Besshi/Cyprus and gold-quartz vein deposits.

Field work in 2002 located outcrops with anomalous gold, arsenic and antimony values in quartz veins in the tract bounding the northeast side of the proposed SMA.

No further evaluation work is recommended for the proposed SMA area at this time. It is recommended that land use planners take into account the relatively high mineral potential of the area surrounding the proposed SMA.

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Introduction

Land Status

The proposed Pickhandle Lakes Special Management Area (SMA) is identified as a Habitat Protection Area (HPA) in the White River First Nation Land Claim Agreement (WRFN) and the Kluane First Nation Memorandum of Understanding (MOU's). The MOU's were signed on March 31, 2002 and the proposed SMA is included as part of Chapter 10 of the proposed Final Agreements The HPA designation in the MOU's do not require interim protection or mineral withdrawal and therefore the future land use planning will be the purview of the SMA steering committee. Habitat Protection Area is a designation under the Wildlife Act and the term "mineral withdrawal" refers to a prohibition of entry order under the Yukon Quartz and Placer Mining Acts. This proposed SMA boundary & designation has been negotiated to date without the benefit of any mineral assessment studies.

The proposed SMA is located within the Ruby Range ecoregion and borders the Klondike and Saint Elias Mountains ecoregions.

The most current outline provided (September 2002) by YTG's Land Claims Secretariat of the proposed SMA covers approximately 50.2 square kilometers. As of January 2003, the area is not covered by any prohibition of entry orders; however the proposed SMA is within the Kluane Wildlife Sanctuary (a map notation that does not inhibit mineral exploration or development).

Within the boundaries of the proposed SMA as of February 27, 2003 (DIAND claim map), there are no placer claims but the northern end of the proposed SMA does cover portions of quartz claims. It should be noted that claim locations as shown on claim maps are advisory and until surveyed can only be considered as approximate. The actual size and location of the claim is dictated by the location of the claim posts on the ground. Also shown as of February 27, 2003 on the DIAND claim map are a number of small interim protected land blocks selected by the White River First Nation. The southwest side of the proposed SMA abuts a larger block of interim protected land selected by the White River First Nation. An interpretive sign, wetlands viewing platform and garbage collection site are found on the east side of the proposed SMA.

Fieldwork carried out by EMR, YTG.

During the summer of 2002, the mineral assessment team composed of geologists: Roger Hulstein, Jo-Anne vanRanden and Robert Stroshein spent three partial days (June 10, Sept. 10, 11) and Farrel Anderson one day (June 10) working in the proposed Pickhandle Lakes SMA. Access was by road and work was restricted to the Alaska Highway road cuts. Work included 1:50,000 scale geological mapping, prospecting and collection of rock, soil and silt sediment samples for geochemical analysis. All samples were analyzed for gold plus a suite of 34 elements. The details of the laboratory procedures are included in Appendix A and geochemical results are shown in Appendix B.

Preliminary evaluation of regional geological and geochemical data indicated the Wrangellia Terrane on the southwest side of the proposed SMA had the highest response in multi-elements (Regional Geochemical Survey) for potential economic metals. The Nasina Assemblage on the northeast side of the proposed SMA has modest potential for hosting gold-quartz veins.

Traverses were carried out to examine bedrock exposures in road cuts just outside the northeastern side the proposed SMA. An attempt to carry out soil and stream sediment silt sampling within the proposed SMA was abandoned due to the extensive overburden. .

Location, access and physiography

The proposed Pickhandle Lakes SMA is located in SW Yukon around Pickhandle Lake, on NTS map sheet 115 F/16, approximately 45 kilometers southeast of the settlement of Beaver Creek (Figure 1). The proposed SMA encompasses an area of 50.2 square kilometers centered over Pickhandle Lake.

Access to the area can be is by vehicle via the all weather Alaska Highway which forms part of the northeast boundary of the proposed SMA.

The proposed SMA covers the extensive wetlands around and enclosing Pickhandle Lake that abound with wildlife. Pickhandle Lake and the proposed SMA area is a wetland valley bottom within the Shakwak Trench a physiographic feature of the Denali Fault System. The detailed mineral assessment study area encompasses the higher ridges northeast and southwest of the lake and proposed SMA. The region is well vegetated with spruce, alder and dwarf birch.

The area was glaciated during the last glacial period, the McConnell (ca. 12,000 BP), with the margin of the glacial event being located close to the northern boundary of the 2002 study area. The Pickhandle Lake valley is filled with unconsolidated glacial, glaciofluvial and likely glaciolacustrine deposits of fluviatile silt, sand, gravel and local volcanic ash.

Exploration History

There are no records of exploration and no reported Yukon Minfile (2001) occurrences within the area of the proposed SMA. Eight occurrences are located in the EMR detailed mineral assessment study area surrounding the proposed SMA. As bedrock exposures are limited to the extreme eastern border of the SMA the larger study area was selected to provide context for the assessment. Yukon Minfile (2001) occurrence summary reports are provided in Appendix D.

The Pick claims (occurrence 115F 093) were staked by Noranda Exploration immediately northeast of the highway and explored in 1985-87 to follow up on gold mineralization in a shear zone, the Webster anomaly (Yukon Minfile, 2001). A rock sample yielded an analysis of 3,100 ppb gold. Follow up exploration consisted of detail stream and soil sampling, prospecting and geological mapping. The Swenson occurrence (115F 046), also located on the northeast side of the proposed SMA, is categorized as an unknown in Yukon Minfile (2001).

Two significant occurrences Cats & Dogs and Pickhandle, occurrences 115F 041 and 115F 043 respectively on the southwest side of the proposed SMA, are copper-nickel targets hosted by Permo-Pennsylvanian volcanic and sedimentary rocks (Yukon Minfile, 2001). Both occurrences may be possible extensions of the peridotite horizon that hosts the nearby Canalask copper-nickel deposit. Since the early 1950's considerable exploration on these prospects and in the belt has been carried for ultramafic hosted sulfides including airborne geophysics, diamond drilling, trenching, gridding, soil geochemistry surveys and geological mapping.

The Mexico showing (occurrence 115F 042) is a skarn cut by narrow magnetite stringers with chalcopyrite (Yukon Minfile, 2001). The remaining three occurrences (105F 039, 040 and 103) on the southwest side of Pickhandle Lake are classified as unknown in Yukon Minfile (2001).

Geology

Regional Setting

Regional geological mapping was carried out by Bostock (1952), Muller (1967) and Dodds and Campbell (1992). Mapping was at a scale of approximately 1:250,000 by all parties. Gordey and Makepeace (2001) produced a digital compilation of the geology of the Yukon from which Figures 3 and 4 were created.

The area of the proposed Pickhandle Lakes SMA is a low-lying, overburden-covered wetland located within the dextral transcurrent Denali Fault System (Figure 3). Fault displacement is estimated to be up to 400 km (Dodds, 1991). The Denali Fault System occupies the Shakwak Trench and extends for over two thousand miles from south-central Alaska to southeastern Alaska (Alaskan panhandle). The fault system consists of anastomosing strands of linear to curvilinear faults. Rocks within zones of major displacement are vertical to steeply dipping and intensely foliated to highly broken. Most displacement along the fault was post-Early Cretaceous and there is no evidence of post-latest Pleistocene to present strike–slip movement in Canada (Dodds, 1991).

The Denali Fault System juxtaposes rocks of the Yukon-Tanana Nasina sub-Terrane and Windy McKinley Terrane on the northeast side with rocks of Wrangellia Terrane to the southwest of the fault (Gordey and Makepeace, 2001). Post accretion plutonic rocks are found on both sides of the fault system. The pericratonic Yukon-Tanana Nasina sub-Terrane consists of metamorphosed early(?) to mid-Paleozoic continental margin with superimposed Late Devonian and Early Mississippian arc volcanic and plutonic rocks (Gordey and Makepeace, 2001). The Windy McKinley Terrrane, amalgamated by latest Triassic and accreted to Ancestral North America in the Jurassic consists of a mixed assemblage of Devonian to lower Mesozoic oceanic rocks and undated clastics. Wrangellia Terrane, accreted to the continental margin in Late Jurassic and Cretaceous time, consists of a basement of Devonian to Permian arc volcanics, clastics and platform carbonate overlain by Triassic oceanic rift tholeiitic basalt, carbonate and Jurassic arc volcanics intruded by comagmatic plutons (Gordey and Makepeace, 2001).

Geology of the proposed Pickhandle Lakes SMA

The geology of the proposed Pickhandle Lakes SMA and detailed mineral assessment study area are similar to the description of the regional setting above. The proposed SMA is a low-lying, overburden-covered wetland area located within the dextral transcurrent Denali Fault System (Figure 4). Rock exposures have not been located within the proposed SMA. The material underlying the area consists of unconsolidated Quaternary glaciofluvial, fluvial, lacustrine and glacial till deposits of silt, sand, gravel and cobbles, and minor amounts of volcanic ash. This is covered in part with soil and organic ('black muck') deposits. Outcrop is present in road cuts on the Alaska Highway that forms the northeast boundary of the proposed SMA.

Rock exposures in road cuts just outside the northeast side of the proposed SMA, in detailed mineral assessment tract number 1 (Figure 5), consist of Devonian, Mississippian and(?) older Nasina Assemblage siliclastics. Individual units consist of quartzite, graphitic quartzite, micaceous quartzite, quartz muscovite +/-biotite, +/-chlorite schist.

East of Wolverine Lake, at the north end of the road cut exposures, a body of biotite-hornblende 'diorite' is exposed for a minimum of 150 m. This is part of the Cretaceous – Tertiary granitoid body mapped by Bostock (1952) but left off subsequent geology maps of the area. The diorite is cut by quartz-feldspar and quartz carbonate veins and veinlets, and porphyritic felsic dykes.

At the south end of the road cut, located southeast of Pickhandle Lake, a small 25m wide zone of carbonate altered and carbonate veined feldspar megacrystic, biotite-hornblende 'granite' (or quartz monzonite?) is exposed in a shear zone cutting sheared dark green ultramafic rock. The ultramafic rock, and possibly the felsic dykes and granitoids, may be related to igneous activity associated with the Denali Fault System. Alternatively, the ultramafic rock is a slice of Kluane Ultramafic suite caught up in the fault system.

Outcrops of the Windy Assemblage are exposed to the southeast of the proposed SMA in a large rock quarry used during road construction. Rocks consist of quartz-chlorite-sericite schist, epidote-actinolite greenschist, quartzite, slate, quartz mica schist and limestone.

Geological units on the south side of the proposed SMA were not examined in 2002. Gordey and Makepeace (2001) have the area being underlain by Pennsylvanian to (?) lower Permian Skolai Assemblage and Late Triassic and (?) older – Kluane Ultramafic Suite. The Skolai Assemblage is described as a volcanic package succeeded upward by clastic strata. The assemblage is comprised of the Station Creek Formation; tuff, breccia, argillite, agglomerate, augite-phyric basaltic to andesitic flows succeeded by the Hansen Creek Formation of thin bedded argillite, siltstone, minor greywacke and conglomerate and local thin basaltic flows, breccia and tuff.

The Late Triassic and (?) older – Kluane Ultramafic Suite is described by Gordey and Makepeace (2001) as medium grey-green, massive, medium grained, pyroxene gabbro and greenstone sills, sheeny black peridotite and rare dunite.

Structural Geology

The structure of the proposed SMA is dominated by the Denali Fault System described above. As there is no rock exposed within the proposed SMA the structure(s) is unknown.

Adjacent to the proposed SMA, exposed in road cuts, bedding and foliation trend predominantly NW to NNW and dip steeply. A small parasitic fold with an axial plane of $135^0/65^0$NE and plunging 38^0SE was consistent with the observed bedding attitudes. Veins and shear zones +/- vein material have variable trends but usually are steeply dipping. The one well mineralized vein trends $067^0/68^0$S. The road cut exposure of 'granite' in a sheared ultramafic rook is cut by a stockwork of carbonate veins (up to 10-15% carbonate veinlets) and the rock appears crushed with the rare feldspar megacrysts being rounded.

Just to the southeast of the proposed SMA in a rock quarry used during road construction the contact between the Nasina Assemblage and the Windy assemblage rocks is exposed. A sheared fault zone trending $113^0/75^0$S separates Nasina assemblage graphitic quartzite and banded limestone – marble.

Mineralization and Metallogeny

No mineralized occurrences are known in the proposed SMA area. Quartz claims, in good standing on the north end of the proposed SMA, are covered by the perimeter of the proposed boundary.

The geological setting of the proposed SMA is unknown, other than it is underlain by the Denali Fault System, but is suspected to be permissive for various types of deposits.

Yukon Minfile (2001) occurrences are recorded on both the northeast and southwest sides of the proposed SMA and their summary descriptions are included as Appendix D. Two occurrences (115F 046 and 115F 093) are described as an unknown and a vein type occurrence respectively.

The vein type occurrence was explored in the 1980's and is described as a silicified shear zone with anomalous gold, silver, zinc and arsenic values.

Of the six occurrences found on the southwest side of the proposed SMA three are described in Yukon Minfile (2001) as unknown. One occurrence (115F 103) described as a skarn was explored intermittently in the 1950's to 1970's. Mineralization apparently consists of chalcopyrite in narrow stringers of massive magnetite in local skarn zones hosted by volcanic and sedimentary rocks near a thrust fault. The two most significant occurrences, 115F 041 and 115F 043, are both magmatic ultramafic hosted copper-nickel showings and drilled prospects respectively. Both have been explored on a regular basis since the early 1950's and are currently covered by active quartz claims (as of February 27, 2003). Both occurrences are hosted by Permo-Pennsylvanian volcanic and sedimentary rocks.

Mineralization at the 115F 043, Pickhandle occurrence, is hosted by an extension of the peridotite sill that hosts the nearby Canalask deposit. Float samples are reported as containing up to 6.55% Cu and 0.56% Ni and soil sample surveys outlined Au, Pt and Pd anomalies. Mineralization at the 115F 041, Cats & Dogs occurrence, consists of copper-nickel bearing float associated with a 30 m think serpentinized peridotite sill. Two other styles of mineralization, stratiform and mineralized veins, are found 1.6 km northwest of the float occurrence. Samples of peridotite with 2% pyrrhotite assayed 0.31% Ni and a sample of pyroclastic rocks yielded 1.2% Cu.

Mineralization located in 2002 consisted of mineralized quartz veins exposed in road cuts located immediately northeast of the proposed SMA. The narrow (<8 cm) quartz veins trend E to NE cut schistose quartzites and dip steeply south and contain variable percentages of disseminated pyrite, arsenopyrite, galena and sphalerite and have narrow centimeter scale rusty weathering selveges. Results from two geochemical samples in 2002 yielded up to 2154 ppb Au, 7.9 ppm Ag, 4033 ppm Zn, 2505 ppm Pb, 14758 ppm As and 2061 ppm Sb. Rob Carne (pers. comm.. 2002) reported finding a narrow, centimeters thick, band of oxidized sulfides in an ultramafic near where the sheared ultramafic hosting the carbonate altered 'granite' is exposed. It apparently yielded anomalous copper-nickel values but low to background PGE values.

Geochemistry

Regional Reconnaissance Stream Geochemical Survey (RGS)

The proposed SMA contains the Pickhandle Lake and a major portion of the surrounding wetlands. The area was covered by the most recent glacial episode. The low-lying areas are prime wetland habitat and the stream sediment quality for sampling is very poor. Streambeds are composed of organic muck or reworked glacial till or glaciofluvial material with no representative silt sediment accumulations. Locally, adjacent to the proposed SMA the stream sediments are of good quality.

A total of 29 Regional Reconnaissance Stream Geochemical survey (RGS) stream sediment samples, were collected by the Geological Survey of Canada (GSC) (Geological Survey of Canada, 1986) in and around the Pickhandle Lakes detailed mineral assessment study area. Due to the low lying wetland nature of the proposed SMA no RGS samples were collected in the area as stream sediment geochemistry is not effective in such terrains. The 29 RGS samples are from drainages on the hills bounding the northeast and southwest sides of the SMA. Due to the contrasting terranes in the detailed mineral assessment study area and the small number of samples, thresholds for anomalous values were determined visually. The following discussion on the RGS results is restricted to the 29 sample group (RGS geochemistry results listed in Appendix B).

Three areas, the north and south ends of Mineral Assessment tract #3 (draining the Pickhandle, 115F 043 and Cats & Dogs, 115F 041 occurrences) and the south end of Tract 1 returned anomalous values. A single RGS sample draining the Pickhandle occurrence returned 348 ppm Ni, 36 ppm Co and 100 ppm zinc. A number of drainages below the Cats & Dogs occurrence, taken collectively, returned up to 38 ppb Au, 49 ppm Ni and 85 ppm Cu. The single sample draining the south end of tract 1, underlain by Windy assemblage rocks, yielded 47 ppm Cu, 63 ppm Ni, 140 ppm Zn, 2.8 ppm Sb and 20 ppm As.

2002 Energy Mines and Resources Geochemistry

A total of 19 rock, 1 soil and 3 stream sediment silt samples were collected by EMR Mineral Assessments in the course of 2002 fieldwork. The samples were submitted to Northern Analytical Laboratories Ltd. of Whitehorse where they were prepared and the pulp samples were shipped to Acme Analytical Laboratories in Vancouver for analysis. The samples were analyzed by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) following an Aqua Regia digestion. Laboratory procedures are described in Appendix A. Sample descriptions and analytical results for rock, soil and stream sediment silt samples collected in 2002 are presented in Appendix B.

Quality control to ensure the integrity of the 2002 geochemical data was done all for all samples, from all projects, submitted by mineral assessments in 2002 as one data set for all the 215 rock samples and one set for the 667 stream sediment and soil samples. Data pertaining to the proposed Pickhandle Lakes SMA is included within these sample sets. Quality control analysis of the data showed that the 2002 analytical results are reliable. Analytical procedures and geochemical statistics for quality control are described by Hulstein, et.al, (2002).

2002 Rock Geochemistry

Nineteen rock samples were collected in 2002 from road cut exposures adjacent to the proposed Pickhandle Lakes SMA. Most samples consisted of quartz and/or carbonate veining, rusty or sulfide bearing horizons. Gold is the most significant precious metal with two anomalous rock chip samples yielding 393.8 ppb and 2154.5 ppb from an 8 cm and a 2 cm quartz vein respectively. Both samples also contained anomalous lead, zinc, antimony and arsenic values (Table 1). These anomalous results have a metal signature similar to that reported form the nearby Yukon Minfile (2001) Webster vein type occurrence (115F 093)

Table 1 Significant Rock Geochemistry Results

Sample Number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Sb ppm	As ppm	Description	Width	Attitude
176465	393.8	7.9	58.7	2505.4	4033	2061	2119.5	quartz vein bearing with granular arsenopyrite blebs concentrated along selvages, milky white and grey quartz, local open space filling, much thinner 1-2mm white pasty carbonate veinlets coat fracture.	8 cm	092/85S
176535	2154.5	7.5	48.8	1579.5	1475	1215.5	14758.3	Quartz-arsenopyrite-pyrite +/- sphalerite with 5-10 cm rusty selvages. Arsenopyrite needle crystals. Disseminated pyrite in vein selvages.	2 cm	067/68SE

2002 Soil and Stream Sediment Geochemistry

Soils are generally poorly developed in the proposed SMA. With the vegetative cover relatively thick humus deposits cover the soils in the low-lying wetland areas. Outside the proposed SMA loess and frozen soils likely inhibit sampling at higher elevations especially early in the summer season. Soil sampling is possible and would likely represent underlying bedrock on the Northeast side to the proposed SMA above the road cuts where the glacial till cover is thin to nonexistent.

One soil sample from a fluvial (glaciofluvial?) deposit was collected which yielded low to background values.

As in the case of soil sampling, stream sediment silt sampling is hampered in the area of the proposed SMA by the abundance of fluvial and glaciofluvial material in the area. Three stream sediment samples were collected in 2002 and all contained low to background values. The significance of any anomalous values would be very difficult to determine due to the nature of the sample environment.

Geophysics

The Geological Survey of Canada's regional aero-magnetic survey was plotted and the results were processed to calculate and plot the residual magnetic anomaly (Figure 6) and the first vertical derivative (Figure 7) of the total magnetic field.

The aeromagnetic anomalies for both the residual total field and first vertical derivative aero-magnetics consist of a series of highs and lows that trend approximately parallel to the Denali Fault System. The first vertical derivative plot accentuates the intensity of the magnetic trends. The Shakwak Trench, underlain by the Denali Fault System, is reflected by an aeromagnetic low that underlies the proposed SMA. Prominent linear highs parallel the fault system. On the southwest side of the proposed SMA the aeromagnetic high is interpreted as being underlain by ultramafic rocks that host the Cats & Dogs (115F 041) and Pickhandle (115F 043) occurrences.

The linear aeromagnetic high on the northeast side of the proposed SMA is shown by Gordey and Makepeace (2001) as being underlain by metamorphic siliclastics of the Nasina Assemblage. The cause of this positive anomaly is unknown. A positive aeromagnetic anomaly is also found over the sheared ultramafic body exposed in the road cut on the southeast side of the proposed SMA. The magnetic intensity on the first vertical derivative aeromagnetic map is variable, low to moderately high, in areas mapped as underlain by rock units of the Windy – McKinley Terrane.

Mineral Assessment

Regional Mineral Potential

Most of the study area of the proposed Pickhandle Lakes SMA was included the regional mineral potential assessment of Southwest Yukon in 2001 (Figure 2). This was the fourth phase of Regional Mineral Potential mapping of the Yukon Territory carried out by YTG. The proposed SMA lies within one tract, number 76, ranked as the highest relative regional mineral potential category. The surrounding detailed mineral potential study area covers parts of tracts 76 and a minor part of tract 82, also ranked in the highest relative regional mineral potential category. Tract 76 was ranked for gold-quartz veins, gabbroic nickel-copper, plutonic related gold, polymetallic veins and Kuroko VMS deposits. Tract 82 was ranked for, gabbroic nickel-copper, plutonic related gold and tungsten skarn deposits. The southwest side of the Pickhandle Lake study area, mapped as being underlain by Wrangellia Terrane, was not assessed for regional mineral potential in 2001. An internal Energy Mines and Resources - YTG desktop study (Héon, 1996) concluded that the area had highest relative mineral potential based on its prospective geology, geochemistry and abundance of mineral occurrences.

Detailed Mineral Potential Map

A detailed mineral assessment of the proposed Pickhandle Lakes SMA took place in Whitehorse, on December 14th, 2002. The detailed mineral assessment study area was separated into three tracts of approximately equal size totaling 281.7 km^2. Tract number one, on the northeast side of the proposed SMA, is underlain by Nasina assemblage and Windy – McKinley Terrrane rocks. Tract number two, including the proposed SMA area and wetlands in the Shakwak Trench, is underlain by the Denali Fault System. Tract number three, on the southwest side of the proposed SMA, is underlain by Wrangellia Terrane. Figure 8 displays the resulting mineral potential map of the proposed Pickhandle Lakes SMA and surrounding study area.

Methodology

The study area was divided into three tracts, each representing a package of rocks that constitute a domain with unique lithological, geophysical or physiographic characteristics.

Five panelists were chosen for their expertise in the geology and mineral deposits of the Yukon and the study area: Rob Carne (consultant), Gerald Bidwell (consultant), Al Doherty (consultant), Mark Baknes (consultant) and Anna Fonseca (consultant). The Pickhandle Lakes assessment lasted one half day. After examining and discussing all the geoscientific information available for each tract the panelists decided upon a list of deposit models pertinent to the tract and filled in evaluation forms for the likelihood of new discoveries of the median tonnage for each deposit type in the tract. The forms were utilized to maintain the focus on mineral deposit models and explorability of the tract and to reduce personal biases. The forms are not used for a statistical analysis. At the of the assessment, the panelists ranked the tracts relative to each other unanimously, from highest to lowest mineral potential.

Limitations

Mineral potential maps portray the best estimation at the time of the assessment. Since the expert panelists are assessing a hidden resource, it is important to realize that the geological knowledge base is in a constant state of growth, and mineral deposits may one day be found in rocks that we once thought to have lower relative potential.

Results and Conclusions

The detailed relative mineral potential map displays the relative mineral potential within the SMA and study area. The final ranking of tracts from highest to lowest relative mineral potential is as follows: tract # 3 (highest), 1, and 2 (lowest). Details of relative mineral potential tract ranking and deposit models used are presented in Appendix C.

The areas of highest mineral potential (tract 3) reflect the underlying potential of the Wrangellia Terrane rocks to host gabbroic nickel-copper, VMS type, gold-quartz veins and copper skarn deposits. Tract number 2 includes the proposed SMA and ranked lowest in terms of relative mineral potential. The detailed mineral assessment panel decided not to apply any mineral deposit models to the area as the information on the overburden covered wetland was insufficient (i.e., no rock exposures, meaningful geochemistry and no aeromagnetic relief).

The anomalous RGS stream sediment silt geochemistry for Ni, Cu, Co, and Au along with the positive aeromagnetic anomalies over the Cats & Dogs and Pickhandle, magmatic type, mineral occurrences indicate at the significant mineral potential of tract number three. Anomalous Au, As and Sb results in rock sample geochemistry samples collected in 2002 indicate the potential for gold-quartz veins and possibly intrusive related gold deposits in tract number one, along the boundary between tracts 1 and 2.

The ultramafic rocks of the Kluane Untramafic Suite are mappable using the aero-magnetic survey plot to extrapolate rock formations in outcrop through the vegetated hills. The RGS results indicate that the wedge of Windy Assemblage rocks south of Pickhandle Lakes is prospective and warrants field examination.

Recommendations and Future Work

It is recommended that land use planners take into account the results of the mineral assessments of the proposed Pickhandle Lakes SMA and use the mineral potential maps in their planning. Ideally land use planners would avoid alienating exploration and development in the surrounding area, tracts one and three, identified as having higher relative detailed mineral potential.

No additional research is recommended at this time to better constrain the mineral deposit types applicable to the proposed Pickhandle SMA. However, should new information or exploration techniques become available that would be applicable for evaluating the mineral potential of the proposed SMA, they should be considered.

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Amy Stuart, Panya Lipovsky, and Gary Stonghill provided technical support preparing the data for the fieldwork and assessment panel as well as base data for the study area. Rod Hill and Monique Shoniker performed the diplomatic and administrative services that allowed fieldwork to proceed.

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Appendix A

2002 Analytical Procedures and Quality Control

Energy Mines and Resources, Yukon Geology Program
2002 Mineral Assessment

Geochemical Analysis

Laboratory Procedures

Northern Analytical Laboratories Ltd., of Whitehorse, secured the 2002 contract to supply geochemical analysis to the Mineral Assessment branch of the Yukon Geology Program. Northern Analytical Laboratories Ltd. in turn subcontracted Analytical Laboratories Limited, of Vancouver, B.C. to carry out the geochemical determinations. All samples; rock, soil and steam sediment were submitted to Northern Analytical Laboratories Ltd. for sample preparation and then shipped to Acme Analytical Laboratories Limited for analysis by ICP-MS.

The attached sheets supplied by Acme Analytical Laboratories Limited and Northern Analytical Laboratories Ltd. summarizes the analytical methodology and sample preparation procedures respectively. Also shown are the elements analyzed for and their detection limits. Gold analysis was ideally done on 30gm pulps but where there was insufficient material Au analysis was done on a 15gm, 7.5gm or 5gm sample (as applicable). Analytical results were sent to the Yukon Geology Program in both digital and paper form. The digital results were merged with the digital sample location data and converted from MS Excel file to an MS Access database.

Quality Control

In addition to Acme Analytical Laboratories Limited's internal sample standards and duplicates Yukon Geology Program - Mineral Assessments inserted standards prepared by CANMET (Natural Resources Canada) and locally collected material as sample checks. The local material consisted of marble rock (used a blank) and mineralized copper-magnetite skarn used with rock sample submissions. Local material consisting of unlithified silt ('clay cliff') and tailings from the Whitehorse copper mine (milled copper-magnetite skarn rock) were inserted with the soil and stream sediment samples. Duplicates of the soil samples and occasionally the stream sediment samples were collected in the field or a sample was split later and inserted with the same number with a 'B' appended to the sample number denoting a duplicate. The result is that analysis were carried out on duplicate samples approximately every 20-25 samples. Check samples and standards inserted into the sample stream can be determined by the letters appended to the sample number as, where xxx is the sample number:

XXXa = Whitehorse 'clay cliff' check
XXXb = duplicate sample split
XXXc = Whitehorse copper mine tailings check
XXXd = marble rock, blank (collected at the Grafter occurrence)
XXXe = magnetite copper skarn rock (collected from Best Chance occurrence)
XXXf = Canmet standard STSD-3 (derived from stream sediment samples)

In addition Acme Analytical Laboratories Limited carried out their in house internal duplicate checks as; reXXX (re-assay of sample XXX) and inserted their own standard, standard DS4.

Rock Sample Quality Control Results

Marble Blanks

Results from 14 marble blanks show that values are mostly uniform and the variation could be due to the marble rock which had visible impurities (trace sulfides?) once it was crushed and homogenized (using cone on cone method). Variations are restricted to only a few (or one) element per sample. The highest gold value coincides with a high As and Pb value (sample 176535D). For almost all the samples and all elements the samples returned low ('blank') values. The variation in analytical results could be due to contamination or lack of analytical precision.

Magnetite Copper Skarn

Results from the 15 magnetite copper skarn samples show highly variable results for most elements. Following crushing, the sample was homogenized (cone on cone method) but homogeneity was not achieved. The samples do show that anomalous values were determined but precision and accuracy are very questionable due to the variably mineralized material. This results in a very high percent relative standard deviation and shown graphically by univariante scatterplots for 6 selected elements.

Acme Analytical Laboratories Limited – Duplicate Analysis

Most elements for all the splits correlated very closely (visually <10% difference).

Acme Analytical Laboratories Limited – In-house Standard DS4)

The 12 standards analyzed with the rock samples returned very consistent values, so consistent that descriptive statistics were not calculated.

Soil and Stream Sediment Quality Control Results

Over all the analytical results are acceptable although questions about the accuracy and precision of the data are raised by variations in the Canmet standards. The check samples of Whitehorse copper tailings and Whitehorse clay cliff material served their purpose and returned anomalous and low values respectively.

Canmet Standard STSD-4

Results for the Cannmet standards show an acceptable range of values. The univariate scattergrams for Au, Cu, Zn, Pb, Ni and As illustrate that it is the occasional and random (not restricted to one sample or sample batch) 'flyer' that results in the higher percent relative standard deviation values (values >10%). Results for Au analysis are disturbing as two samples returned values that could be considered anomalous at 18ppb and 29ppb. Analysis of the standard only tests the analytical techniques for accuracy and precision as the standard is received in a pulped form (<-200 mesh, -74um) it is not prepared (dried, sieved or split). The percent relative standard deviation was calculated for Au, Cu, As, Zn, Pb, Ni, and As. Values were below <10% for Z, Pb, Ni (acceptable) and <16% As and Cu (marginally acceptable) and a high 128% for Au due to the two high values mentioned above.

Whitehorse Copper Mine Tailings

A total of 20 copper mine tailing samples were inserted into the sample stream with two purposes in mind; one was to confirm that obviously anomalous samples (for Cu, Au, Ag, Bi) were being detected and secondly, to test for analytical precision and accuracy. As the samples were prepared at Northern Analytical they also test the preparation procedures. All the samples returned anomalous values for the above elements although the variation for Au exceeded the preferred 10% maximum (at 32%) for the percent relative standard deviation. Other elements where the percent relative standard deviation was calculated (Cu, Ag, As, Pb, Zn, Mo, Bi) returned a close to or less than a 10% percent relative standard deviation.

Whitehorse Clay Cliff Silt

A total of 25 clay cliff silt samples were inserted into the sample stream for two purposes; one was to ensure that material considered to have background values did indeed return background values and to test for analytical precision and accuracy. As the samples were prepared at Northern Analytical they also test the preparation procedures. All the samples exceeded the preferred 10% maximum for the percent relative standard deviation for Au (31%), Cu 11%, Pb (38%), Zn (13%), As (26%) and Ni (12%). The variations in the gold values are quite acceptable as the highest value was 4.7ppb. Most of the variation in the other samples is due to two samples that yielded inconsistent values. Variation in the 'clay cliff' material is expected and is likely responsible for the variation. Laboratory error is not suspected as other check samples and standards from the same batches did not produce similar errors.

EMR Duplicate Check Samples

A total of 29 duplicate pairs were submitted to check for reproducibility – accuracy. A visual scan reveals a close approximation. All of the seven elements (Au, Cu, As, Ni, Pb, Zn and U) display a linear trend on scatterplots. The only errant value was for gold in one stream sediment (silt) sample pair. This is not unexpected given gold's nugget effect.

Acme Analytical Laboratories Limited – In-house duplicate pairs

Acme Analytical analyzed 20 duplicate pairs. The scatter plot results are as close for Cu and Pb as for the duplicate pairs submitted by EMR. Gold values were less than 7.4ppb so significant variation for anomalous samples can't be determined. Interestingly, the Acme duplicates included 5 duplicate pairs of clay cliff material, presumably because there was abundant sample to split, but no Whitehorse copper tailing samples.

Acme Analytical Laboratories Limited – In-house Standard DS4)

The 27 standards analyzed with the stream sediment and soil samples returned very consistent values, so consistent that descriptive statistics were not calculated.

Statistical Analysis Procedures used in 2002

Following computer listing of the data, statistical parameters such as arithmetic mean, median and mode, standard deviation and sample variance were calculated using MS Excel. Histograms of selected elements from data subsets were generated by MS Excel for specific projects to aid in establishing five ranges for the results, ideally; background, slightly above background, weakly anomalous, moderately anomalous and anomalous.

The stream sediment data procured from the Geological Survey of Canada's, 'Regional Stream Sediment and Water Geochemical Data', open files were also statistically analyzed in a similar manner using MS Excel. Histograms and calculated thresholds for project areas, where applicable, are attached.

Where Histograms and statistical were not used in generating geochemical plots, ESRI Arview 3.2a was used utilizing natural breaks in the data. Occasionally where there was a large number of values below, at or near the detection limit, or obviously anomalous samples were observed, threshold were adjusted visually, either in Arcview 3.2a or from a MS Excel histogram that was not printed.

2002 Fieldwork, Mineral Assessments
GPS Waypoint and Geochemical Sample Data Handling Protocol

June 18, 2002 RWH

GPS data

1 Create folder with project name in L:\fieldwork\2002fieldwork\GPS coord . Dump GPS waypoints in new file, named with GPS owners' initials and date (XX_June18), and place in project folder.

2 Open new file in excel, make columns and clean up data; delete extraneous points and place columns in following order: Ident Easting Northing Date. Save as excel file.

3 On L:\fieldwork\2002fieldwork\GPS coord\ open: All_dnload_gps_pts.xls, copy from new GPS file data to be added and add appropriate data to complete columns.

Sample data

4 Open sample_data.xls in L:\fieldwork\2002fieldwork and copy GPS data with sample numbers over to GPS_all_samples sheet. Fix any problems or add any missing samples to this table.

5 Copy GPS data to appropriate sample description sheet (ie. rock_descriptions).

6 Add sample descriptions, notes etc. in sample description file after sample number and GPS data is appended.

7 Other waypoint stations (geology etc.) are copied from All_dnload_gps_pts.xls to Other_Stations sheet and notes etc. added if required.

8 Geochemical data from the lab is added to the geochemical sheet and is merged with the sample descriptions in the merged sample sheet appropriate to each sample type. Sample location data with descriptions are merged with the geochemical data in MS Access.

9 The merged samples are used in GIS program of choice

10 Problems or questions? See your friendly data guy.

B - IV. ROCKS & DRILL CORE

Review the information under the headings of "Notice" and "Safety" at the beginning of this "Sample Preparation" section of the manual!!

Ensure that the equipment is properly adjusted and lubricated as per the equipment maintenance instructions at the end of this sub-section.

1. Set out the samples on a mobile workbench, making sure they are all present in their proper order and the matching pulp bags are in the exact same order. Locate the workbench near the jaw crusher where the samples can be reached conveniently. However, if there are samples in open containers, make sure they are not located where they could be susceptible to contamination by stray rock chips that may be ejected from the crushers.

2. Ensure that you are wearing the required safety equipment. Ensure that the jaw crusher, cone crusher and riffle splitter and its 3 pans are thoroughly clean.

Start the dust extractor. Start the jaw crusher and run the first sample through it. The best procedure for feeding the sample into the crusher depends on the nature of the sample and you will develop a feel for this with experience. Generally, large samples consisting of relatively small fragments can be poured directly from the sample bag into the crusher, maintaining enough material on top of the jaws to prevent pieces from spitting out. Individual, hard rocks will require quickly covering the opening with a block of wood or a pan to prevent material from ejecting. Some rocks may not crush until they are forced down into the jaws with the block of wood. Large rocks will have to be broken with a sledgehammer before they will go into the jaws.

Try to avoid spilling any sample as you feed it into the crusher. With large samples, be careful that the pan collecting the crushed material does not overflow; frequently shaking the pan to level the contents will help.

3. Brush any loose chips from the crusher (particularly the pan channel) into the pan. Remove the pan and pour the sample into the hopper of the empty, clean cone crusher. Move the empty sample bag along the crushing line, next to the cone crusher to track the sample.

Thoroughly blow the jaw crusher and its pan clean with compressed air. Make sure no sample material remains in hidden nooks and crannies. If sample remains stuck to the jaws it must be brushed away or cleaned by crushing some barren rock and then cleaning with compressed air again. Replace the pan in its slot under the crusher.

4. After the sample has passed through the cone crusher, blow the head of this crusher clean with compressed air. Open the side flap and blow clean the inside of the crusher, paying particular attention to the peak of the slides at the centre of the machine, where material tends to accumulate.

Remove the receiving pan, shake to level the crushed rock in the pan and pour it into the splitter (with empty pans in place on each side). Be careful to hold the pan laterally level so that the sample pours out evenly along the entire width of the slot and through all the vanes of the splitter. Move the sample bag along the line to the splitting hood.

Blow the cone crusher pan clean with compressed air and, after ensuring that the cone crusher is thoroughly blown clean, replace the pan in it. If barren rock was needed to clean the jaw crusher, run it through the cone crusher to clean it too and again blow the unit clean. Be sure to dispose of the cleaning rock so it does not end up in a pulp bag in place of the next sample.

5. Remove one pan from under the splitter and replace it with the third pan. Level the sample in the removed pan and pour it out the wide side into the splitter, again making sure it is distributed evenly into all the vanes. This even distribution of sample through the riffles is critical to obtaining a sample split that is compositionally near identical to the original whole sample. Do not bang the pan against the top of the vanes or they will gradually become burred and splitting efficiency will be lost.

Repeat the splitting process as many times as necessary, resplitting the same side pan until it contains just enough sample to fill the pulp bag about _ full (about 250 grams). Make sure no sample material is stuck in the riffles; sharply rocking and banging the unit will help clear it.

Pour the sample split into the pulp bag without spilling any of it, making sure you have the right pulp bag labelled to match the original sample bag. If there is a sample tag, place it in the pulp bag. Fold over the top of the bag to prevent contaminants from getting into it and place on a cardboard tray. The bags are arranged in order on the tray in 4 rows of 5 samples (20 per full tray), beginning at the front left.

Pour the sample from the other pan (the reject) into the original sample bag; the splitting hood contains a chute to the floor to facilitate this for larger samples. Fold and staple the top of this bag, making sure the sample label remains visible, and place it in a rice sack that has been marked with the work order number and client name.

Blow the splitter and all three pans clean with compressed air and leave set up for the next sample.

NEVER add or remove sample by hand to adjust the size of a split. If it is too large, resplit the split until one pan contains the right amount. If you have riffled it down too small, resplit the reject to make up the requisite amount.

Note that if a sample is small enough that it will be all used for the pulp, it can be dumped directly from the crusher pan into a splitter pan and then transferred to the pulp bag. Place the empty sample bag in the rejects sack so no one searching through the rejects will think the sample is missing.

5. Continue crushing and splitting the remaining samples.

In practice, for efficient production, you will have consecutive samples in different stages of the process simultaneously and one person may be crushing while another splits and bags the samples. This makes it vital to be well organised and methodically consistent to prevent sample mix-ups. Always remember to double check that each piece of equipment is empty and clean just before you dump in a sample and always move each sample bag along the line with its corresponding sample. If there are sample tags, these also must accompany the samples throughout the process (but don't let them go through the crushers) and end up in the pulp bags as a further check.

When a tray of crushed sample splits is full or completes a work order, place it in a drying oven to ensure that the samples will be completely dry for pulverizing.

6. Turn on the dust extractor for the pulverizing station hood. Ensure that you are wearing the required safety equipment, including safety glasses and a dust mask.

Before starting to pulverize a work order, place a handful of cleaning gravel in each of two pulverizing pots containing their rings and puck. Position the lid on one pot and clamp it in place in the pulverizer, ensuring that it clamps securely with the lid centred so that it seals properly. Close the lid of the pulverizer box and press the start button to begin the pulverizing cycle.

When the machine stops at the end of the timed cycle, unclamp the pot and replace it with the other pot. While the pulverizer is cycling with the second pot, carefully dump the contents of the first pot (including rings and puck) onto a sheet of Kraft paper in the dust hood. Blow the bowl, rings, puck and lid clean with compressed air. Discard the pulverized cleaning gravel in the garbage and blow the sheet of paper clean.

Reassemble the rings and puck in the bowl and dump in the first crushed sample split to be pulverized, distributing it fairly evenly. Continue as above, always having one pot pulverizing while you clean out the other.

With the samples, be careful to minimize sample loss as light components will blow away more readily, changing sample composition. Pour the pulverized sample from the sheet of paper back into the correct pulp bag, replace the sample tag if there is one, fold the top and place it back on the cardboard tray. Blow the sheet of paper clean with compressed air.

Always pulverize the samples in order to facilitate keeping track so you do not put any pulps in the wrong bags.

It is important that the samples be pulverized to the consistency of flour. You should feel no grittiness when you rub some pulp between your thumb and a finger. For average samples, the standard pulverizing time of 80 seconds should be satisfactory. Very hard minerals require longer. If a pulverized sample remains gritty, pulverize it for part of another cycle until it is fine enough; this is a process of trial and error. The timer can be reset for a series of similar samples that require a non-standard pulverizing time.

Soft samples require reduced pulverizing time or they will cake and stick inside the pot. Sticking may still occur even with appropriately less pulverizing. Note that samples will stick if they are not perfectly dry so make sure this is not the problem. Adding a few drops of acetone or ethanol to the crushed sample in the pot just before pulverizing may reduce sticking of hygroscopic samples which always retain some moisture.

Brushing may help remove slightly stuck material. Otherwise, if the bowl, rings and puck do not blow clean they must be cleaned by pulverizing a load of cleaning gravel, the same as at the start of a work order.

Also use cleaning gravel after any sample that has been noted as "high grade" or any sample that has obvious mineralization, especially if the next sample to be pulverized in the same pot is not mineralized.

The friction of pulverizing will heat up the pots until eventually they are too hot to handle comfortably. Switch to another set of cleaned pots when that happens. Samples requiring critical analysis for mercury, arsenic or tellurium may be flagged to be pulverized only in cool pots because there could be significant losses of these elements in hot pots.

Samples that are very high in sulphide minerals also require cool pots and minimum pulverizing time or they may ignite. **DANGER!** Do not let such samples start a fire. Avoid breathing the toxic fumes, which smell like rotten eggs. Burning may not be apparent immediately, as oxidation begins slowly and accelerates, so after pulverizing sulphide-rich samples monitor the bags of pulp for increasing temperature and the smell. Sealing an oxidizing sample in a pulverizer pot may stop the process. However, the composition of the sample will have changed so a new split must be riffled from the crushed reject. Be very careful pulverizing the new split to avoid igniting it too; a series of very brief pulverizing cycles may be necessary. If there is no reject for a new split, notify the senior chemist. He may authorize analysis of an oxidized sample if it is quenched before the pulp shows any lightening of colour, but this must be noted to the client.

7. Occasionally, you may be instructed to "roll" pulps. This is done to ensure that the pulps are homogeneous, without stratification of light and heavy components.

Roll a sample when it is on the Kraft paper after emptying it from the pulverizer pot. Grasp one corner of the paper and pull it gently towards the opposite corner, keeping it low over the surface so that the pulp rolls rather than slides. Before sample spills off the sides of the sheet, return the lifted corner to flat, then roll the sample from the opposite corner but stop when the pulp is centred on the paper. Next, grasp an adjacent corner and repeat the rolling process along the other diagonal. Repeat at least five times in each direction before pouring the pulp into its bag.

8. When preparation of a tray of samples has been completed, take it into the lab. Place the trays in order on the "in" shelves or at a work station where you have been instructed to take them.

When the last tray of a work order is brought into the lab, write the date in the log book by the "X" under "Sample Prep" on the line for that work order. Make sure the work order copy and the Sample Sorting and Preparation form are brought in with the last tray.

9. Equipment Maintenance:

Jaw Crusher: The adjustment of the crusher should be checked before each use. The drive belts should be snug with minimal free play but should not be strung tight. Also check that they are in good condition, free of cracks. The jaws should have a maximum ½ inch gap at the widest opening and the moveable jaw should just contact the stationary plate at maximum closure. If adjustment is needed, it should be done by someone who is familiar with the procedure. Whenever adjustments are made, it should be ensured that the tension spring is adjusted for a gap of _ inch between the coils at maximum compression; if it is too tight the crusher may be damaged by the excessive force, but too little tension will result in inadequate crushing of hard rocks. The crusher must be greased using a grease gun at the three nipples about every two hours of use or whenever there is an apparent increase in noise or heat in the bearing area. Inject grease until it starts to ooze out between the parts, then wipe off the excess so it will not fall into any samples. Failure to inject grease when necessary will result in the bearing being destroyed.

Cone Crusher: Before each use, check the condition and tension of the drive belts. Verify that the machine runs smoothly and quietly when it is not crushing and that the head is not spinning violently and moves freely. If this does not appear to be in order, notify the general manager immediately and do not use the machine as a seized head bearing can lead to much more extensive damage. Ejection of rock chips from the head is another sign of a seized bearing. The crusher should produce a crush of at least 60% minus 10 mesh and a supervisory employee should verify this regularly, at least daily during full production, using cleaning rock for consistency. Run about a kilogram of the rock through the jaw crusher and the cone crusher, sieve it through a 10 mesh screen and weigh the plus and minus fractions. When the crusher needs to be adjusted, this is done by loosening the bolts securing the top plate and rotating the plate, which is threaded. Retighten the bolts and recheck the fineness of crush, repeating the procedure until 60% minus 10 mesh is achieved. Do not tighten the gap more than necessary or the crusher will be more susceptible to failure.

Pulverizer: The only routine maintenance required for the pulverizer is oiling of the joints in the clamping mechanism, daily during full production. Wear eventually will necessitate shimming to keep the mechanism clamping the pots tightly. The O-rings of the pot lids should be monitored closely and replaced if there is visible damage or evidence that any powdered sample is leaking during pulverizing. The components of the pots gradually will wear to the point that they no longer pulverize efficiently and have to be retired. Wear will be obvious as reduced size of the rings and puck and slight concave curvature of the bottom of the bowl and the lid. Pulverizing efficiency for each pot should be checked periodically by pulverizing 250 grams of cleaning gravel for the standard 80 seconds and sieving it thoroughly through a 100 mesh screen. The product should be at least 98% minus 100 mesh. A supervisor also should routinely spot check each employee's pulverizing by screening random pulps to verify they meet the specification of 98% minus 100 mesh, and should check pulps in every tray using the feel test for grittiness. Senior employees performing sample prep without direct supervision must do these tests on their own work.

Dust Collector System:

B - V. REVERSE DRILL CUTTINGS

Generally, these samples are treated the same as rocks and drill core, except they usually do not require jaw crushing. Cone crushing must be done unless they contain no fragments larger than 10 mesh. Drill cutting samples usually are large and most are received wet. You may be given special instructions regarding the recording of wet samples and overweight.

Review the section titled "Rocks & Drill Core".

B - VI. SOILS & SEDIMENTS

1. Set out the dried samples in order by the work location, which preferably should be in a dust hood. Have the corresponding pulp bags at hand in the same order.

Obtain a sheet of Kraft paper and a sieve of the required mesh size, which normally is 80 mesh unless otherwise specified. Inspect the screen to make sure it is in good condition with no tears, distortion or separation at the edge.

Ensure that you are wearing safety glasses and a dust mask.

2. Starting with the first sample, if it has dried into a hardened mass, pound it with a rubber mallet to break up the material, being careful to try to avoid rupturing the sample bag.

Empty the sample into the sieve, which should be sitting on the sheet of paper. Agitate the sieve in a side to side motion to shake the fine material through the screen. An occasional sharp rap may help clear the holes so the material passes through more efficiently. Agglomerated material should be broken up between the fingers or in a separate container such as a mortar and pestle, but do not break down stones or vegetation. Do not rub sample material against a fine screen as these screens are easily damaged; you can stack a 10 mesh screen on top and rub material through it to help break it up.

Do not let any of the sample escape out the top of the sieve onto the paper. If this happens and you cannot separate and remove 100 percent of the coarser material from the pulp, then the pulp has to be returned into the sieve and rescreened.

Fold the paper and pour the screened sample into its pulp bag.

3. Usually at least 30 grams of pulp is required unless you are told differently. A balance is available to check how much you have obtained. Tare the balance with an empty pulp bag before weighing the pulp.

If you cannot obtain enough pulp, first make sure all agglomerated material has been liberated including particles stuck to stones. If you still need more, then transfer the sample oversize from the 80 mesh sieve into a 40 mesh sieve and screen what will pass through that. Transfer this "-40 mesh" fraction into a separate pulp bag that you have marked with the sample number and "-40". Fold this bag tightly and place it inside the bag of -80 mesh pulp after first inspecting it to make sure it will not leak into the finer pulp.

4. Fold over the top of the pulp bag to prevent contaminants from getting into it and place on a cardboard tray. The bags are arranged in order on the tray in 4 rows of 5 samples (20 per full tray), beginning at the front left.

Dump the oversize material from the screen onto the paper and pour it back into the original sample bag. (If the bag is torn, patch or replace it.) Place the bags of oversize in a plastic sample bag and when this is full or the end of a work order is reached, seal the plastic bag with tape and place it in a rice sack that has been marked with the work order number and client name.

5. After each sample, clean the sieve(s) and the sheet of paper with compressed air. Be careful not to damage fine screens when blowing them clean; never contact the screen with the nozzle.

6. When preparation of a tray of samples has been completed, take it into the lab. Place the trays in order on the "in" shelves or at a work station where you have been instructed to take them.

When the last tray of a work order is brought into the lab, write the date in the log book by the "X" under "Sample Prep" on the line for that work order. Make sure the work order copy and the Sample Sorting and Preparation form are brought in with the last tray.

B - VII. CONCENTRATES

Various types of concentrates may be received and their preparation will vary somewhat depending on type. Generally, they require riffle splitting if they are much larger than 300 grams and most require pulverizing. Review these parts of the section titled "Rocks & Drill Core".

Pan concentrates usually are small. Extra care must be taken to avoid loss of sample, not only because there may be no surplus material to waste but also because light or heavy components of the sample may tend to be lost preferentially and this will alter the analysis. Recover all particles of the sample from the bag or other container in which it was received. For this purpose, a wet sample in a non-porous container can be washed into a beaker using a wash bottle and the sample can be dried in the beaker in a drying oven where it is safe from contamination or on a warm hotplate (being very careful not to overheat it). Pulverize cleaning gravel before and after each sample, even if no visible material sticks in the pots. Be sure the lid seal on the pot will not leak and take care to minimize loss of sample when cleaning out the pot.

Placer concentrates also must be thoroughly recovered from their sample containers or small, heavy gold particles may easily be left behind, especially in bag seams. Again, it is important to clean the pulverizing pots with cleaning gravel after every sample. The pulps should be rolled to ensure that the gold grains are distributed as homogeneously as possible.

Mine mill concentrates usually are extremely high grade so the greatest concern with these samples is to not contaminate other samples. They should be prepared away from any other samples and care should be taken to avoid raising dust from them. All equipment must be cleaned meticulously afterwards. These samples also require careful adherence to proper preparation procedures because the utmost accuracy of analytical results is demanded. Pulps should be rolled, especially in the case of gold concentrates.

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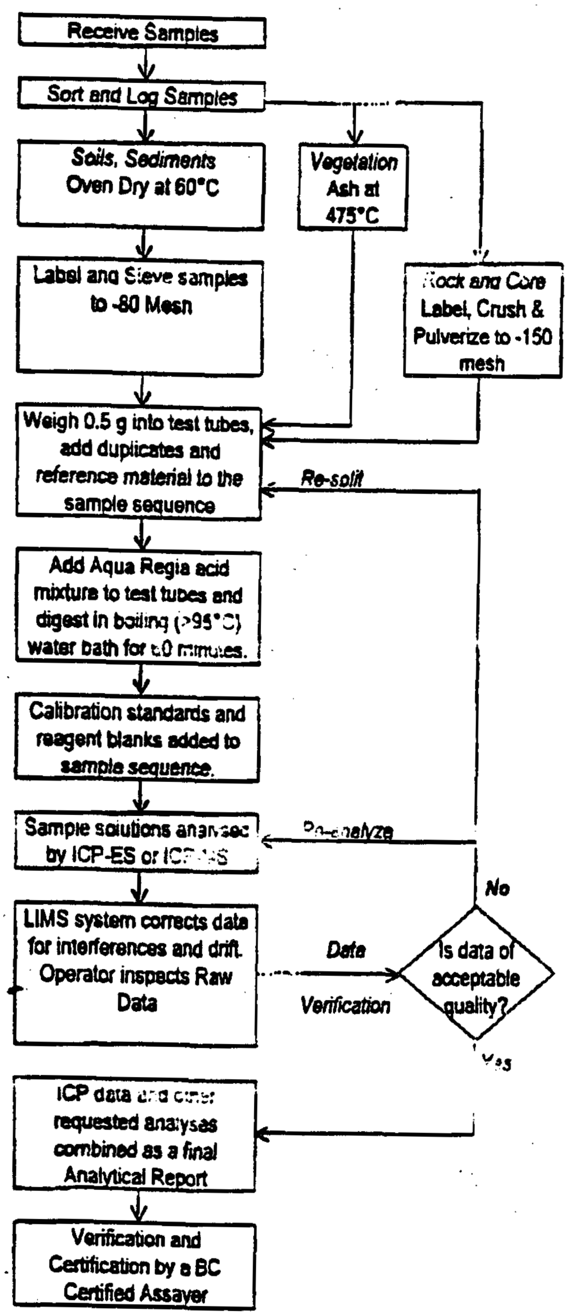
METHODS AND SPECIFICATIONS FOR ANALYTICAL PACKAGE
GROUP 1D & 1DX • ICP ANALYSIS – AQUA REGIA

Analytical Process



Comments

Sample Preparation

Soil or sediment is dried (60°C) and sieved to -80 mesh (-177 µm). Vegetation is dried (60°C) and pulverized or ashed (475°C). Moss-mats are dried (60°C), pounded and sieved to yield -80 mesh sediment. Rock and drill core is jaw crushed to 70% passing 10 mesh (2 mm), a 250 g aliquot is riffle split and pulverized to 95% passing 150 mesh (100 µm) in a mild-steel ring-and-puck mill. Aliquots of 0.5 g are weighed into test tubes. QA/QC protocol includes inserting a duplicate of pulp to measure analytical precision, a coarse (10 mesh) rejects duplicate to measure method precision (drill core samples only), two analytical blanks to measure background and an aliquot of in-house reference material STD DS3 to measure accuracy in each analytical batch of 34 samples.

Sample Digestion

Aqua Regia, a 2:2:2 mixture of ACS grade concentrated HCl, concentrated HNO_3 and de-mineralised H_2O, is added to each sample. Samples are digested for one hour in a hot water bath (>95°C). QA/QC protocol requires simultaneous digestion of two regent blanks randomly inserted in each batch.

Sample Analysis

Group 1D: sample solutions are aspirated into a Jarrel Ash AtomComp 800 or 975 ICP emission spectrograph to determine the following 30 elements: Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Sr, Th, Ti, U, V, W, Zn.

Group 1DX: sample solutions are aspirated into a Perkin Elmer Elan 6000 ICP mass spectrometer to determine the following 35 elements: Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, *Ga*, *Hg*, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, *S*, Sb, *Sc*, *Tl*, Sr, Th, Ti, U, V, W, Zn.

Data Evaluation

Raw and final data undergoes a final verification by a British Columbia Certified Assayer who then signs the Analytical Report before it is released to the client. Chief Assayer is Clarence Leong, other certified assayers are Dean Toye and Jacky Wang.

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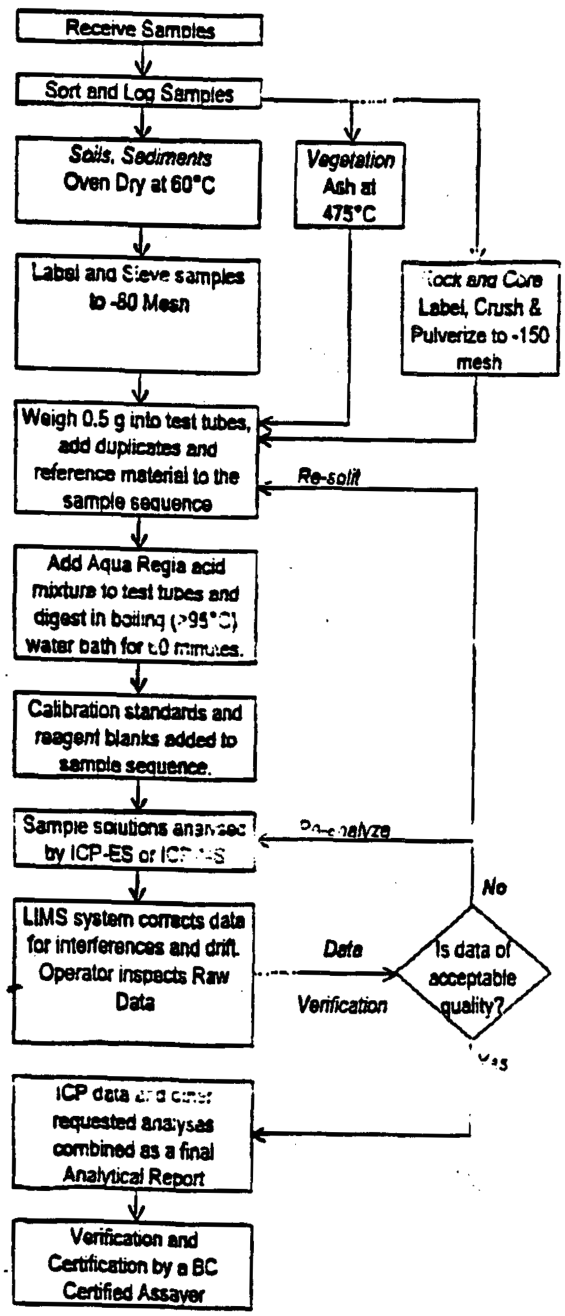
METHODS AND SPECIFICATIONS FOR ANALYTICAL PACKAGE
GROUP 1D & 1DX • ICP ANALYSIS – AQUA REGIA

Analytical Process



Comments

Sample Preparation

Soil or sediment is dried (60°C) and sieved to -80 mesh (-177 µm). Vegetation is dried (60°C) and pulverized or ashed (475°C). Moss-mats are dried (60°C), pounded and sieved to yield -80 mesh sediment. Rock and drill core is jaw crushed to 70% passing 10 mesh (2 mm), a 250 g aliquot is riffle split and pulverized to 95% passing 150 mesh (100 µm) in a mild-steel ring-and-puck mill. Aliquots of 0.5 g are weighed into test tubes. QA/QC protocol includes inserting a duplicate of pulp to measure analytical precision, a coarse (10 mesh) rejects duplicate to measure method precision (drill core samples only), two analytical blanks to measure background and an aliquot of in-house reference material STD DS3 to measure accuracy in each analytical batch of 34 samples.

Sample Digestion

Aqua Regia, a 2:2:2 mixture of ACS grade concentrated HCl, concentrated HNO_3 and de-mineralised H_2O, is added to each sample. Samples are digested for one hour in a hot water bath (>95°C). QA/QC protocol requires simultaneous digestion of two regent blanks randomly inserted in each batch.

Sample Analysis

Group 1D: sample solutions are aspirated into a Jarrel Ash AtomComp 800 or 975 ICP emission spectrograph to determine the following 30 elements: Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Sr, Th, Tl, U, V, W, Zn.

Group 1DX: sample solutions are aspirated into a Perkin Elmer Elan 6000 ICP mass spectrometer to determine the following 35 elements: Ag, Al, As, Au, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, *Ga*, *Hg*, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, *S*, Sb, *Sc*, *Tl*, Sr, Th, Ti, U, V, W, Zn.

Data Evaluation

Raw and final data undergoes a final verification by a British Columbia Certified Assayer who then signs the Analytical Report before it is released to the client. Chief Assayer is Clarence Leong, other certified assayers are Dean Toye and Jacky Wang.

Document: Method and Specifications for Group 1D&1DX.doc	Date: April 4, 2002	Prepared By: J. Gravel

GEOCHEMICAL – ICP by Aqua Regia Digestion

GROUP 1C MERCURY BY COLD VAPOUR AA OR ICP-MS

Accurate, low level determination of Hg by Aqua Regia digestion followed by either cold vapour AA or ICP-MS analysis.

Element	Method	Detection	Cdn	U.S.
Hg	Cold Vapour AA or ICP-MS	10 ppb	$4.40	$3.30
Hg	Cetac Cold Vapour AA	1 ppb	$7.70	$5.80

Analysis is not suitable for high-grade Au, Pt or elevated Se samples (cold vapour method only). Acme retains the right to select the method of determination.

NEW!

GROUP 1D, 1DX & 1DA: ICP & ICP-MS ANALYSIS – AQUA REGIA

Now you can choose ICP-ES or **ICP-MS** analysis at very economical prices to complement your geochemical survey. You can also select a larger split size to ***get better Au values without a second, costly analysis***. A 0.5 g split is leached in hot (95°C) Aqua Regia then analysed by ICP-ES **(Group 1D)** or ICP-MS **(Group 1DX)**. **Group 1DA** offers a choice of 10 g, 20 g or 30 g splits.

Group 1D		Cdn	U.S.
Any 1 element		$3.85	$2.[illegible]0
Any 5 elements		$5.20	$3.90
All 30 elements		$6.[illegible]5	$4.75
‡Include Hg and Tl	add	$0.[illegible]	$0.40

Group 1DX	Cdn	U.S.
Any 1 element	$6.00	$4.50
Any 5 elements	$7.50	$5.60
All 35 elements	$9.00	$6.75

Group 1DA		Cdn	U.S.
10 gm split	add	$2.50	$1.90
20 gm split	add	$3.75	$2.[illegible]
30 gm split	add	$5.00	$3.75

See Page 6 for Group 1F-MS Aqua Regia / ICP Mass Spec analysis for ultratrace elements

	Group 1D Detection	Group 1DX & 1DA Detection	Upper Limit
Ag	0.3 ppm	0.1 ppm	100 ppm
Al*	0.01 %	0.01 %	10 %
As	2 ppm	0.5 ppm	10000 ppm
Au	2 ppm	0.5 ppb	100 ppm
B*	3 ppm	1 ppm	2000 ppm
Ba*	1 ppm	1 ppm	1000 ppm
Bi	3 ppm	0.1 ppm	2000 ppm
Ca*	0.01 %	0.01 %	40 %
Cd	0.5 ppm	0.1 ppm	[illegible]000 ppm
Co	1 ppm	0.1 ppm	2000 ppm
Cr*	1 ppm	1 ppm	10000 ppm
Cu	1 ppm	0.1 ppm	10000 ppm
Fe*	0.01 %	0.01 %	40 %
Ga*	-	1 ppm	1000 ppm
Hg‡	1 ppm	0.01 ppm	100 ppm
K*	0.01 %	0.01 %	10 %
La*	1 ppm	1 ppm	10000 ppm
Mg*	0.01 %	0.01 %	30 %
Mn*	2 ppm	1 ppm	10000 ppm
Mo	1 ppm	0.1 ppm	2000 ppm
Na*	0.01 %	0.001 %	10 %
Ni	1 ppm	0.1 ppm	10000 ppm
P*	0.001 %	0.001 %	5 %
Pb	3 ppm	0.1 ppm	10000 ppm
S	-	0.05 %	10 %
Sb	3 ppm	0.1 ppm	2000 ppm
Sc	-	0.1 ppm	100 ppm
Sr*	1 ppm	1 ppm	10000 ppm
Th*	2 ppm	0.1 ppm	2000 ppm
Ti*	0.01 %	0.001 %	10 %
Tl‡	5 ppm	0.1 ppm	1000 ppm
U*	8 ppm	0.1 ppm	2000 ppm
V*	1 ppm	1 ppm	10000 ppm
W*	2 ppm	0.1 ppm	100 ppm
Zn	1 ppm	1 ppm	10000 ppm

*Some elements are partially leached

Appendix B

Geochemistry Results

Proposed Pickhandle Lakes Special Management Area
Geological Survey of Canada - Regional Stream Sediment Geochemistry

Uniq_id	Lat_27	Long_27	Stm_wdth	Stm_dpth	Bnk_type	Stm_flow	Stm_phys	Stm_dran	Stm_typ	Stm_class
115F861031	61.92823	-140.09006	1.4	0.5	Colluvial	Moderate	Mountainous	mature	Discont shield type	Permanent
115F861032	61.91243	-140.09883	0.7	0.1	Colluvial	Moderate	Mountainous	mature	Dendritic	Permanent
115F861033	61.88147	-140.07142	0.5	0.3	Organics	Moderate	Mountainous	mature	Dendritic	Permanent
115F861035	61.85284	-140.13146	1	0.1	Colluvial	Moderate	Mountainous	mature	Dendritic	Permanent
115F861036	61.88301	-140.1688	0.5	0.1	Colluvial	Moderate	Mountainous	mature	Dendritic	Permanent
115F861050	61.9464	-140.49162	1	0.3	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F861083	61.91748	-140.21461	2.8	0.5	Colluvial	Moderate	Mountainous	youthful	Dendritic	Permanent
115F861084	61.92045	-140.15165	0.5	0.2	Colluvial	Moderate	Mountainous	youthful	Dendritic	Permanent
115F861117	61.92313	-140.39902	0.4	0.1	Organics	Slow	Mountainous	youthful	Dendritic	Intermit
115F861118	61.8966	-140.33597	0.5	0.2	Organics	Moderate	Mountainous	youthful	Dendritic	Intermit
115F861119	61.88228	-140.25973	1.5	0.6	Organics	Moderate	Mountainous	youthful	Dendritic	Permanent
115F861120	61.86559	-140.25498	1	0.2	Organics	Moderate	Mountainous	youthful	Dendritic	Permanent
115F861122	61.84232	-140.24494	1.2	0.2	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F861123	61.8484	-140.21284	0.5	0.2	Colluvial	Moderate	Mountainous	youthful	Dendritic	Intermit
115F861124	61.83901	-140.18797	0.6	0.2	Organics	Slow	Mountainous	youthful	Dendritic	Intermit
115F861140	61.79525	-140.27333	2	0.2	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F861146	61.81029	-140.32277	0.8	0.1	Colluvial	Moderate	Mountainous	youthful	Dendritic	Permanent
115F861147	61.82762	-140.33562	1	0.2	Undefined	Fast	Mountainous	youthful	Dendritic	Permanent
115F861148	61.85316	-140.37749	3	0.2	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F861149	61.85043	-140.36356	1	0.1	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F861152	61.86744	-140.41268	3	0.4	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F861155	61.89756	-140.4688	5	0.6	Colluvial	Fast	Mountainous	youthful	Dendritic	Permanent
115F863002	61.96357	-140.30978	2	0.4	Colluvial	Fast	Hilly	undulating	Dendritic	Permanent
115F863003	61.9702	-140.318	2.5	0.3	Colluvial	Fast	Hilly	undulating	Dendritic	Permanent
115F863004	61.95642	-140.24947	2	0.4	Colluvial	Fast	Hilly	undulating	Dendritic	Permanent
115F863006	61.94756	-140.24061	1	0.3	Colluvial	Moderate	Hilly	undulating	Dendritic	Permanent
115F863007	61.95361	-140.21745	2	0	Colluvial	Fast	Hilly	undulating	Dendritic	Permanent
115F863008	61.95	-140.20615	4	0.4	Colluvial	Fast	Hilly	undulating	Dendritic	Permanent
115F863009	61.94608	-140.13661	1.5	0.3	Colluvial	Fast	Hilly	undulating	Dendritic	Permanent

Uniq_id	Wat_sorc	Collectors	Ag	As	As_ina	Au	Au_r	Au_ina	Ba	Ba_ina	Bi	Br_ina	Cd	Ce_ina	Co	Co_ina
115F861031	Tertiary	Groundwater	0	0.1	4	-10	0.5	-10	-10	815	-9999	-10	-9.99	0.2	-10	9
115F861032	Primary	Groundwater	0	0.1	4	-10	0.5	-10	-10	808	-9999	-10	-9.99	0.3	-10	12
115F861033	Primary	Groundwater	0	0.1	6	-10	2	-10	-10	1180	-9999	-10	-9.99	0.4	-10	13
115F861035	Secondary	Groundwater	0	0.4	6	-10	0.5	-10	-10	650	-9999	-10	-9.99	0.1	-10	12
115F861036	Primary	Groundwater	0	0.4	20	-10	0.5	-10	-10	1820	-9999	-10	-9.99	0.7	-10	16
115F861050	Secondary	Groundwater	0	0.2	12	-10	5	-10	-10	479	-9999	-10	-9.99	0.3	-10	36
115F861083	Tertiary	Groundwater	0	0.1	3	-10	0.5	-10	-10	706	-9999	-10	-9.99	0.1	-10	12
115F861084	Primary	Recent precipitation	0	0.1	5	-10	1	-10	-10	1105	-9999	-10	-9.99	0.3	-10	13
115F861117	Primary	Recent precipitation	0	0.1	20	-10	4	-10	-10	409	-9999	-10	-9.99	0.1	-10	14
115F861118	Primary	Recent precipitation	0	0.1	4	-10	8	-10	-10	517	-9999	-10	-9.99	0.1	-10	17
115F861119	Secondary	Recent precipitation	0	0.1	6	-10	15	3	-10	517	-9999	-10	-9.99	0.1	-10	21
115F861120	Primary	Groundwater	0	0.1	6	-10	58	18	-10	530	-9999	-10	-9.99	0.1	-10	20
115F861122	Primary	Recent precipitation	0	0.1	7	-10	5	-10	-10	530	-9999	-10	-9.99	0.1	-10	25
115F861123	Primary	Recent precipitation	0	0.1	8	-10	2	-10	-10	576	-9999	-10	-9.99	0.1	-10	18
115F861124	Primary	Recent precipitation	0	0.1	15	-10	0.5	-10	-10	245	-9999	-10	-9.99	0.2	-10	19
115F861140	Secondary	Recent precipitation	0	0.1	8	-10	59	4	-10	461	-9999	-10	-9.99	0.1	-10	20
115F861146	Tertiary	Groundwater	0	0.1	5	-10	2	-10	-10	553	-9999	-10	-9.99	0.1	-10	16
115F861147	Primary	Recent precipitation	0	0.1	5	-10	2	-10	-10	600	-9999	-10	-9.99	0.1	-10	18
115F861148	Tertiary	Recent precipitation	0	0.1	3	-10	4	-10	-10	473	-9999	-10	-9.99	0.1	-10	17
115F861149	Primary	Recent precipitation	0	0.1	8	-10	2	-10	-10	564	-9999	-10	-9.99	0.1	-10	31
115F861152	Secondary	Recent precipitation	0	0.1	2	-10	0.5	-10	-10	230	-9999	-10	-9.99	0.1	-10	14
115F861155	Tertiary	Recent precipitation	0	0.1	2	-10	0.5	-10	-10	306	-9999	-10	-9.99	0.1	-10	16
115F863002	Primary	Groundwater	0	0.1	5	-10	3	-10	-10	915	-9999	-10	-9.99	0.1	-10	12
115F863003	Primary	Groundwater	0	0.1	6	-10	0.5	-10	-10	680	-9999	-10	-9.99	0.1	-10	10
115F863004	Secondary	Groundwater	0	0.1	4	-10	0.5	-10	-10	658	-9999	-10	-9.99	0.1	-10	10
115F863006	Primary	Groundwater	0	0.1	3	-10	3	-10	-10	720	-9999	-10	-9.99	0.1	-10	12
115F863007	Primary	Groundwater	0	0.1	3	-10	0.5	-10	-10	640	-9999	-10	-9.99	0.1	-10	8
115F863008	Secondary	Groundwater	0	0.1	3	-10	0.5	-10	-10	684	-9999	-10	-9.99	0.1	-10	9
115F863009	Secondary	Groundwater	0	0.1	3	-10	8	-10	-10	687	-9999	-10	-9.99	0.1	-10	10

Uniq_id	Cr_ina	Cs_ina	Cu	Eu_ina	F	Fe	Fe_ina	Hf_ina	Hg	La_ina	Loi	Lu_ina	Mn	Mo	Mo_ina	Na_ina	Ni	Ni_ina
115F861031	-10	-10	-9.99	20	-10	345	1.97	-9.99	-10	20	-10	7.4	-9.99	320	1	-10	-9.99	26
115F861032	-10	-10	-9.99	26	-10	280	2.22	-9.99	-10	25	-10	12	-9.99	350	1	-10	-9.99	27
115F861033	-10	-10	-9.99	36	-10	410	3.04	-9.99	-10	25	-10	8.4	-9.99	260	1	-10	-9.99	34
115F861035	-10	-10	-9.99	27	-10	305	2.17	-9.99	-10	20	-10	6.8	-9.99	290	1	-10	-9.99	27
115F861036	-10	-10	-9.99	47	-10	440	4.93	-9.99	-10	20	-10	14.6	-9.99	1200	2	-10	-9.99	63
115F861050	-10	-10	-9.99	68	-10	280	3.9	-9.99	-10	40	-10	14	-9.99	2700	1	-10	-9.99	348
115F861083	-10	-10	-9.99	22	-10	260	2.3	-9.99	-10	15	-10	3.6	-9.99	340	1	-10	-9.99	27
115F861084	-10	-10	-9.99	31	-10	340	2.7	-9.99	-10	20	-10	7.8	-9.99	300	1	-10	-9.99	34
115F861117	-10	-10	-9.99	76	-10	190	8	-9.99	-10	80	-10	38	-9.99	1300	1	-10	-9.99	31
115F861118	-10	-10	-9.99	51	-10	260	2.8	-9.99	-10	40	-10	8.6	-9.99	570	1	-10	-9.99	32
115F861119	-10	-10	-9.99	56	-10	20	4	-9.99	-10	20	-10	7.8	-9.99	530	1	-10	-9.99	42
115F861120	-10	-10	-9.99	60	-10	290	4.1	-9.99	-10	20	-10	7.2	-9.99	520	1	-10	-9.99	49
115F861122	-10	-10	-9.99	85	-10	290	4.8	-9.99	-10	35	-10	14.2	-9.99	1900	1	-10	-9.99	45
115F861123	-10	-10	-9.99	59	-10	315	3.8	-9.99	-10	40	-10	15	-9.99	510	1	-10	-9.99	37
115F861124	-10	-10	-9.99	35	-10	210	6.8	-9.99	-10	70	-10	41.4	-9.99	2100	1	-10	-9.99	20
115F861140	-10	-10	-9.99	75	-10	320	4	-9.99	-10	45	-10	7	-9.99	600	2	-10	-9.99	27
115F861146	-10	-10	-9.99	42	-10	290	3.5	-9.99	-10	45	-10	7.8	-9.99	820	2	-10	-9.99	26
115F861147	-10	-10	-9.99	89	-10	320	3.4	-9.99	-10	40	-10	15.8	-9.99	650	2	-10	-9.99	30
115F861148	-10	-10	-9.99	70	-10	340	3.3	-9.99	-10	30	-10	5.2	-9.99	500	1	-10	-9.99	27
115F861149	-10	-10	-9.99	107	-10	400	5	-9.99	-10	25	-10	6	-9.99	880	1	-10	-9.99	47
115F861152	-10	-10	-9.99	68	-10	290	2.4	-9.99	-10	50	-10	1.4	-9.99	220	1	-10	-9.99	38
115F861155	-10	-10	-9.99	58	-10	240	3.2	-9.99	-10	25	-10	1.8	-9.99	270	1	-10	-9.99	33
115F863002	-10	-10	-9.99	31	-10	330	3	-9.99	-10	20	-10	6	-9.99	370	1	-10	-9.99	36
115F863003	-10	-10	-9.99	34	-10	280	2.8	-9.99	-10	50	-10	27.8	-9.99	500	1	-10	-9.99	40
115F863004	-10	-10	-9.99	25	-10	330	2.5	-9.99	-10	25	-10	8	-9.99	280	1	-10	-9.99	24
115F863006	-10	-10	-9.99	39	-10	345	3.1	-9.99	-10	40	-10	16.6	-9.99	310	1	-10	-9.99	32
115F863007	-10	-10	-9.99	18	-10	270	2.6	-9.99	-10	15	-10	3.2	-9.99	280	1	-10	-9.99	24
115F863008	-10	-10	-9.99	15	-10	360	2.6	-9.99	-10	15	-10	3.2	-9.99	280	1	-10	-9.99	22
115F863009	-10	-10	-9.99	20	-10	280	2.8	-9.99	-10	20	-10	4.4	-9.99	310	1	-10	-9.99	26

Uniq_id	P2o5	Pb	Rb_ina	Sb	Sb_ina	Sc_ina	Se	Sm_ina	Sn	Ta_ina	Tb_ina	Th_ina	U	U_ina	V	W	W_ina	Wt_ina	Yb_ina
115F861031	-10	-9.99	5	-10	0.2	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.3	-10	37	2	-10	-9.99
115F861032	-10	-9.99	4	-10	0.4	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.8	-10	40	1	-10	-9.99
115F861033	-10	-9.99	5	-10	0.4	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	3.4	-10	44	2	-10	-9.99
115F861035	-10	-9.99	4	-10	0.6	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.5	-10	42	1	-10	-9.99
115F861036	-10	-9.99	7	-10	2.8	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	3.3	-10	51	2	-10	-9.99
115F861050	-10	-9.99	9	-10	0.5	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	1.4	-10	52	2	-10	-9.99
115F861083	-10	-9.99	4	-10	0.5	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	2.3	-10	38	1	-10	-9.99
115F861084	-10	-9.99	6	-10	0.8	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.6	-10	51	2	-10	-9.99
115F861117	-10	-9.99	9	-10	0.6	-9.99	-10	-10	-9.99	2	-9.99	-9.99	-10	1.5	-10	36	1	-10	-9.99
115F861118	-10	-9.99	5	-10	0.5	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	1.9	-10	36	1	-10	-9.99
115F861119	-10	-9.99	9	-10	0.6	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	1.4	-10	44	1	-10	-9.99
115F861120	-10	-9.99	8	-10	0.2	-9.99	-10	-10	-9.99	2	-9.99	-9.99	-10	1.5	-10	49	1	-10	-9.99
115F861122	-10	-9.99	9	-10	1	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	1.5	-10	57	1	-10	-9.99
115F861123	-10	-9.99	9	-10	0.8	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	2	-10	46	1	-10	-9.99
115F861124	-10	-9.99	5	-10	0.6	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	1.1	-10	47	1	-10	-9.99
115F861140	-10	-9.99	7	-10	0.5	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	3.3	-10	40	1	-10	-9.99
115F861146	-10	-9.99	6	-10	0.1	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	3.7	-10	60	1	-10	-9.99
115F861147	-10	-9.99	7	-10	0.1	-9.99	-10	-10	-9.99	2	-9.99	-9.99	-10	2	-10	52	1	-10	-9.99
115F861148	-10	-9.99	3	-10	0.1	-9.99	-10	-10	-9.99	2	-9.99	-9.99	-10	3.1	-10	61	2	-10	-9.99
115F861149	-10	-9.99	7	-10	0.3	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	2.2	-10	63	2	-10	-9.99
115F861152	-10	-9.99	2	-10	0.1	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.1	-10	67	1	-10	-9.99
115F861155	-10	-9.99	2	-10	0.3	-9.99	-10	-10	-9.99	3	-9.99	-9.99	-10	1.8	-10	70	1	-10	-9.99
115F863002	-10	-9.99	1	-10	0.9	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	1.9	-10	46	1	-10	-9.99
115F863003	-10	-9.99	1	-10	0.9	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.2	-10	45	1	-10	-9.99
115F863004	-10	-9.99	1	-10	0.8	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	2.7	-10	42	1	-10	-9.99
115F863006	-10	-9.99	1	-10	0.7	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.5	-10	43	1	-10	-9.99
115F863007	-10	-9.99	1	-10	0.2	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	3.4	-10	46	1	-10	-9.99
115F863008	-10	-9.99	1	-10	0.1	-9.99	-10	-10	-9.99	1	-9.99	-9.99	-10	3.1	-10	49	1	-10	-9.99
115F863009	-10	-9.99	1	-10	0.1	-9.99	-10	-10	-9.99	0.5	-9.99	-9.99	-10	2.6	-10	45	1	-10	-9.99

Uniq_id	Zn	Ph	F_w	U_w
115F861031	-10	68	7.6	66
115F861032	-10	82	7.7	66
115F861033	-10	92	7.4	58
115F861035	-10	72	7.7	82
115F861036	-10	140	8	280
115F861050	-10	100	7.5	76
115F861083	-10	56	7.2	56
115F861084	-10	108	6.7	44
115F861117	-10	86	7.5	86
115F861118	-10	72	7	62
115F861119	-10	88	7.3	82
115F861120	-10	104	7.7	88
115F861122	-10	104	7.8	76
115F861123	-10	96	7.6	82
115F861124	-10	74	6.7	64
115F861140	-10	88	7.8	110
115F861146	-10	84	7.1	60
115F861147	-10	100	7.5	60
115F861148	-10	76	7.4	64
115F861149	-10	108	8.1	130
115F861152	-10	32	7	28
115F861155	-10	34	7.3	48
115F863002	-10	64	6.5	50
115F863003	-10	113	6.6	40
115F863004	-10	62	7.2	54
115F863006	-10	77	6.4	62
115F863007	-10	56	6.9	70
115F863008	-10	55	7.3	70
115F863009	-10	56	7.2	66

2002 Mineral Assessments - Proposed Pickhandle Lakes SMA
EMR Rock Sample Geochemistry

Sample Number	Albers X	Albers Y	Sample Type	Project	Ba ppm	Cr ppm	Ga ppm	La ppm	Mn ppm	Sr ppm	V ppm	Zn ppm	Al %	Ag ppm	As ppm	Au ppb	B ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cu ppm
140305	89760.80467	851919.8336	rock	Pickhandle	41	85	2	7	103	11	9	15	0.37	0.1	0.8	2.2	2	0.05	0.3	0.05	1.9	29.9
140306	92129.88336	849667.7024	rock	Pickhandle	19	55	9	6	318	25	43	34	2.69	0.1	0.3	0.5	4	0.1	3.63	0.05	10.1	57.8
140307	92225.98835	849592.95	rock	Pickhandle	60	107	4	2	246	14	55	28	1.28	0.1	0.5	0.6	1	0.3	1.01	0.05	18.5	185.6
140308	92418.30539	849388.4093	rock	Pickhandle	7	47	10	3	936	94	69	75	3.64	0.05	29.7	2.2	4	0.1	14.13	0.2	10.9	11.8
140309	92776.49079	848996.1058	rock	Pickhandle	240	127	7	10	312	20	62	71	2.24	0.2	0.3	0.25	0.5	0.2	0.99	0.05	13	119.6
140310	92980.09623	848740.8011	rock	Pickhandle	46	112	3	9	126	6	12	18	0.35	0.05	1	1.7	1	0.1	0.52	0.1	3.8	22.9
140311	93038.29447	848693.2064	rock	Pickhandle	38	160	3	3	348	17	37	28	0.46	0.6	1.9	5.2	0.5	0.1	0.84	0.1	4.6	64.8
140312	93296.15778	848375.096	rock	Pickhandle	20	44	7	17	340	218	24	33	2	0.05	0.3	0.25	0.5	0.05	7.65	0.1	3	6.1
176462	89917.08874	851836.4021	rock	Pickhandle	78	71	11	13	609	126	110	71	2.66	0.1	1.8	1.7	2	0.1	3.49	0.2	16.5	34
176463	89868.22358	851839.0992	rock	Pickhandle	43	107	3	7	256	22	13	18	0.6	0.1	2.3	9.7	1	0.4	0.71	0.05	2.2	35.4
176464	92076.99151	849702.3078	rock	Pickhandle	14	58	3	7	157	6	1	16	0.86	0.05	1.6	1.5	0.5	0.1	0.74	0.05	0.6	8.8
176465	92297.02316	849512.3079	rock	Pickhandle	26	127	3	1	757	64	45	4033	0.82	7.9	2119.5	393.8	2	0.1	7.85	12.6	6	58.7

Sample Number	Fe %	Hg ppm	K %	Mg %	Mo ppm	Na %	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Th ppm	Ti %	Tl ppm	U ppm	W ppm	Utmzone	X	Y	Datum	Date
140305	0.65	0.5	0.1	0.16	0.4	0.025	2	0.007	6.2	0.025	0.1	1.5	10.6	0.048	0.1	5.5	0.2	07V	534951	6867054	NAD83	20020910
140306	2.26	0.01	0.06	0.39	1.3	0.041	8.3	0.05	1.4	0.34	0.2	5.7	1.3	0.099	0.1	2.7	0.8	07V	537599	6865139	NAD83	20020911
140307	2.5	0.5	0.1	0.99	0.5	0.106	22.5	0.028	1.4	0.73	0.1	6.9	0.9	0.102	0.1	0.4	1.2	07V	537704	6865078	NAD83	20020911
140308	2.34	0.03	0.01	0.69	0.2	0.002	5.8	0.134	9.9	0.07	0.2	15.3	0.2	0.106	0.1	0.1	1.4	07V	537922	6864901	NAD83	20020911
140309	3.33	0.5	0.74	1.58	1.3	0.03	30.9	0.036	5.8	0.84	0.1	4	4.6	0.18	0.2	1.2	0.1	07V	538329	6864560	NAD83	20020911
140310	0.91	0.5	0.04	0.29	1.8	0.083	23.7	0.014	8.4	0.07	0.1	2.2	10.2	0.075	0.1	2.1	0.1	07V	538565	6864334	NAD83	20020911
140311	2.87	0.01	0.06	0.26	2.3	0.005	23.5	0.019	2.6	1.1	3.6	2.7	1	0.044	0.4	0.4	0.1	07V	538629	6864295	NAD83	20020911
140312	1.13	0.5	0.04	0.37	0.4	0.013	2.7	0.038	6.9	0.025	0.05	2	5.9	0.091	0.1	1	0.3	07V	538927	6864014	NAD83	20020911
176462	3.68	0.01	0.09	1.58	2.8	0.03	13.5	0.111	8.2	0.025	0.2	8.3	3.9	0.206	0.1	3.2	0.1	07V	535117	6866992	NAD83	20020910
176463	0.67	0.5	0.12	0.18	3.7	0.086	2.6	0.01	14.2	0.025	0.1	4.4	17.6	0.044	0.1	6.8	0.2	07V	535068	6866988	NAD83	20020910
176464	0.47	0.5	0.06	0.05	0.4	0.025	0.7	0.004	11	0.025	0.5	1.6	5.8	0.016	0.1	1.9	0.1	07V	537542	6865166	NAD83	20020911
176465	2.03	0.68	0.07	0.54	0.8	0.006	3.9	0.009	2505.4	0.51	2061	6.7	0.1	0.004	0.1	0.1	0.1	07V	537785	6865007	NAD83	20020911

Sample Number	Person	Quality	Description	Width	Attitude
140305	RH		Road cut: almost white granodiorite, cutting diorite (not included in sample), bounded by discontinuous quartz veinlets and qtz-feld veinlets. Tr belbs of pyrrhotite in granodio and qtz veins. Mag sus, 0.03-0.21 granodio.		
140306	RH		Sample of weakly rusty wea grey graphitic quartzite 1-2 m in FW of <1 m wide of qtz-feld dyke. Qtzite cut by weak carb veinlets. Tr diss pyrrohotite.	1.5	308/85E
140307	RH		20-25cm thick rusty wea metaseds with occasional 1-3mm pyrrhotite lamin in graphitic quartzite. Weak sil green 'skarny?' bands.	0.25	
140308	RH		thin. 5cm quartz carb vnlet wth tr dis pyrrhotite cutting graphitic quartzite. Weak shear on vein contacts. Carb-cal-shl-lim on joints. Veinlet strike and dip		070/75s
140309	RH		Rusty wea bio schist. Tr dis pyrite, andalusite crystals, 5-10% qtz sweats.		
140310	RH		6in white felsic dyke with 1-2% fine gr dis pyrite and minor qtz segregations. Fractured.	0.15m	
140311	RH		Fractured qtz vein, locally rusty wea, cutting bio graph (grey) quartzite. White-grey vein qtz	0.3m	
140312	RH		sample from 25m exposure in road cut of carb alt and veined granite. 10-15% white carb - calcite. Granite has white rounded feldspar crystals, <5% bio-hbl and occassional megacrystic feld x-tal.	1.0m	
176462	JvR		chip across o/c of diorite in road cut, 0.75m shear zone with sheeted qtz/carbonate veinlets with abundant biotite/muscovite in sheared core, 9 3mm to 2cm wide carbonate veinlets bearing 197/60NW	0.75	197/60NW
176463	JvR		diorite o/c on road cut with pink potassic altered quartz veins plus chlorite blebs at vein selvages, 3/meter		
176464	JvR		sample of 0.4m wide quartz vein parallel gneissic bed bearing 121/80East, four brown garnet porphoroblasts observed with green skarn selvages [MS on rusty weathering gneissic band of 30.5, 25.8, 15.8, 20.1 - rusty blebs coul,,0.4,121/80E,		
176465	JvR		quartz vein bearing 092/85S up to 8 cm wide with granular arsenopyrite blebs concentrated along selvages, milky white and grey quartz, local open space filling, much thiner 1-2mm white pasty carbonate veinlets coat fracture,,,092/85S,		

Sample Number	Albers X	Albers Y	Sample Type	Project	Ba ppm	Cr ppm	Ga ppm	La ppm	Mn ppm	Sr ppm	V ppm	Zn ppm	Al %	Ag ppm	As ppm	Au ppb	B ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cu ppm
176466	92840.29977	848925.3538	rock	Pickhandle	505	195	6	8	170	14	61	53	1.48	0.1	8	5	1	0.05	1.51	0.05	17.6	127.4
176467	93001.11199	848717.9986	rock	Pickhandle	45	219	1	1	55	4	6	10	0.19	0.05	1	0.25	1	0.05	0.09	0.05	1.2	8
176535	92174.04982	849635.2978	rock	Pickhandle	5	153	2	1	1074	102	7	1475	0.41	7.5	14758.3	2154.5	2	0.1	4.75	4.1	4.4	48.8
176539	92853.0451	848942.8767	rock	Pickhandle	102	263	10	13	363	21	130	120	2.16	0.2	13.2	2	1	0.3	0.61	0.3	30.3	200.4
JVR001	96582.77142	845984.9642	rock	Pickhandle	218	136	3	14	304	75	33	65	0.69	0.1	2.3	2.5	7	0.1	3.09	0.2	9.7	37.4
JVR002	96686.17038	846020.6447	rock	Pickhandle	118	9	4	13	379	126	99	45	1.05	0.3	3.3	1.5	3	0.4	7.92	0.2	20.8	108.2
JVR003	96537.88594	845990.4366	rock	Pickhandle	259	124	2	9	192	141	165	465	0.31	0.5	68.3	0.9	2	0.2	2.53	5.8	6.4	75.3

Sample Number	Fe %	Hg ppm	K %	Mg %	Mo ppm	Na %	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Th ppm	Ti %	Tl ppm	U ppm	W ppm	Utmzone	X	Y	Datum	Date
176466	2.01	0.5	0.27	1.51	0.6	0.128	114	0.112	17.2	0.025	12.4	5.5	1.4	0.153	0.1	0.3	0.1	07V	538402	6864498	NAD83	20020911
176467	0.42	0.5	0.06	0.12	0.5	0.005	9.3	0.022	2.2	0.025	1.6	1.7	0.3	0.014	0.1	0.1	0.05	07V	538589	6864314	NAD83	20020911
176535	3.02	0.26	0.02	0.48	0.5	0.002	4.1	0.012	1579.5	1.19	1215.5	2.5	0.1	0.001	0.1	0.1	0.5	07V	537647	6865113	NAD83	20020911
176539	5.27	0.02	1.07	1.92	2	0.089	130.1	0.132	6.2	1.88	1.9	9.1	4.9	0.252	0.3	2	0.1	07V	538412	6864517	NAD83	20020911
JVR001	1.67	0.01	0.19	0.39	2.7	0.049	32.7	0.041	3.4	0.28	0.4	5.6	5.7	0.071	0.1	2	0.3	07V	542502	6862085	NAD83	20020611
JVR002	4.06	0.41	0.15	0.68	1.1	0.026	10	0.119	5	1.38	0.3	8.1	4.4	0.068	0.1	4.8	0.3	07V	542600	6862134	NAD83	20020611
JVR003	1.48	0.06	0.11	0.54	25.8	0.005	110.4	0.385	8.6	0.84	13	2.2	3.8	0.004	0.1	6.5	0.7	07V	542457	6862084	NAD83	20020611

Sample Number	Person	Quality	Description	Width	Attitude
176466	JvR		dark grey locally rusty weathering foliated biotite schist o/c in road cut; zone of sub parallel qtz stringers up to 1 cm wide trending 120/80SW with hairlike and boudinaged sweats (15 per 10cm); trace pyrite		120/80SW
176467	JvR		rusty weathering quartz sweat? In rusty weathering biotite schist road cut, pyrite veinlets in quarts and also in host		
176535	RS		Qz-aspy-py+/- sphal with 5 - 10 cm rusty selvages. Aspy needle crystals. Diss py in selvages.	2 cm	067/68se
176539	RS		Foliated, rusty weathering, qz-biot meta-seds +/- chlorite. Mag sus up to 13.0 reading.	1.0 m	118/77n
JVR001	JvR		sample of sheared fault zone; local quartz and rusty veinlets in Nasina rocks (see RH notes for fault attitude)		
JVR002	RH				
JVR003	JvR		graphitic shear with brecciated quartz and minor limonite; in the HW of fault sampled in JvR02001		

2002 Mineral Assessments - Proposed Pickhandle Lakes SMA
EMR Stream Sediment Silt Sample Geochemistry

Sample Number	Albers X	Albers Y	Sample Type	Project	Ba ppm	Cr ppm	Ga ppm	La ppm	Mn ppm	Sr ppm	V ppm	Zn ppm	Al %	Ag ppm	As ppm	Au ppb	B ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cu ppm	Fe %	Hg ppm	K %
176461	85949.53	855991.56	silt	Pickhandle	74	58	5	7	435	34	99	53	1.26	0.05	4.9	0.25	5	0.05	0.74	0.1	13.8	29.6	3.23	0.09	0.06
176532	85993.20	855964.74	silt	Pickhandle	119	59	5	9	667	46	78	75	1.55	0.1	7.4	2.1	6	0.1	0.97	0.2	16	50.6	3.04	0.02	0.09
176536	98079.27	842040.33	silt	Pickhandle	53	88	6	7	391	28	251	56	0.85	0.05	4.9	0.9	5	0.1	0.64	0.1	14.6	23.6	6.02	0.5	0.04

2002 Mineral Assessments - Proposed Pickhandle Lakes SMA
EMR Soil Sample Geochemistry

Sample Number	Albers X	Albers Y	Sample Type	Project	Ba ppm	Cr ppm	Ga ppm	La ppm	Mn ppm	Sr ppm	V ppm	Zn ppm	Al %	Ag ppm	As ppm	Au ppb	B ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cu ppm	Fe %	Hg ppm	K %
176534	85874.39	855974.03	soil	Pickhandle	117	29	5	10	688	94	101	65	1.15	0.1	7.3	1.1	5	0.1	4.52	0.1	15.1	36.2	3.47	0.01	0.07

Sample Number	Mg %	Mo ppm	Na %	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Th ppm	Ti %	Tl ppm	U ppm	W ppm	Utmzone	X	Y	Datum	Date	Person	Quality
176461	0.95	0.4	0.027	28	0.092	2.3	0.025	0.3	3.3	1.6	0.095	0.1	0.4	0.1	07V	530631	6870578	NAD83	20020910	JvR	poor
176532	1.11	0.5	0.04	35.2	0.105	4.2	0.07	0.4	4.7	1.8	0.101	0.1	0.7	0.1	07V	530678	6870558	NAD83	20020910	RS	poor
176536	0.69	0.4	0.015	22.3	0.099	2.2	0.025	0.3	2.3	2.1	0.12	0.1	0.3	0.2	07V	544511	6858377	NAD83	20020911	RS	fair

Sample Number	Mg %	Mo ppm	Na %	Ni ppm	P %	Pb ppm	S %	Sb ppm	Sc ppm	Th ppm	Ti %	Tl ppm	U ppm	W ppm	Utmzone	X	Y	Datum	Date	Person	Quality
176534	1.36	0.7	0.088	29.3	0.089	4.2	0.025	0.4	6.3	1.7	0.12	0.1	0.5	0.1	07V	530559	6870551	NAD83	20020910	RS	fair

Sample Number	Description
176461	silt on North side of river but suspect disturbed gravels for bridge construction; marble and schist rounded cobbles near sample site and contains a high ash content
176532	fine black clay and organics on an organic stream bed. Upstream from Koidern No. 2 bridge.
176536	Koidern River. Lake Campground. Silt with grey-white ash. Granodiorite, grey quartzite, greenston, tan quartzite, maroon chert, phyllite, gneiss and quartz pebbles

Sample Number	Description
176534	Till sample. Fine silt and clay matrix with abundant cobble to boulder clasts. Including grey qtzitew/diss py,light grey qtzite, light grey limestone, f.g. green mafic volcanic, hbld diorite, corase grained granite, black,,,,

Appendix C

Detailed Mineral Assessment
Relative Mineral Potential Tract Ranking

Appendix C

Pickhandle Lake Proposed SMA
Detailed Mineral Assessment
Mineral Deposit Models applied to each tract

Tract 1
VMS Besshi/Cyprus Type
Au-Qz veins
Gabbroic Ni-Cu

Tract 2
No deposit models were assessed for this tract

Tract 3
VMS – Kuroko Type
Au-Qz Veins
Gabbroic Ni-Cu
Cu - Skarn

Pickhandle Lake Proposed SMA
Detailed Mineral Assessment
Relative Mineral Potential Ranking of Tracts

Tract	Rank
1	2
2	3
3	1

Appendix D

Yukon Minfile Occurrence Descriptions

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 037
NAME: KOIDERN
DEPOSIT TYPE: UNKNOWN
STATUS: UNKNOWN
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 45' 52" N
LONGITUDE: 140° 13' 25" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES:
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

GALENA

WORK HISTORY

Staked as Robert, etc cl (65555) in Apr/53 by W. Pulsifer, June cl (65727) in Sep/53 by E. Hammer, Don & Harry cl (68280) in Mar/54 by D. MacPhail & H. Enger and Connie, etc cl (68923) in Jun/54 by K. Ericson.

Restaked as AL-CU cl(Y12396) in Mar/67 by G. Harris; as Enger cl(Y25723) in Jul/68 by J. Brown; and as Doll and Brooks cl (Y36445) in Aug/69 by T.W. Sturgeon.

Restaked as Galena cl (YB20058) in Jun/88 by A.J. Papineau. Luck cl (YB21215) were tied on to the north in Aug/88 by H. Eckervogt. All cl (YB25615) were staked 2 km to the west in Apr/89 by R. Smarch.

R. Stack staked the Wreck claims (YB27634) 3 km to the southeast in July, 1990. The Wreck claims were restaked as Lindsey 1-2 (YB36960) by M.J. Stack in Aug/92, who conducted trenching in Aug/93.

GEOLOGY

Claims cover Permo-Pennsylvanian metavolcanic and sedimentary rocks in contact with a Cretaceous intrusion of the Kluane Range Plutonic Suite.

REFERENCES

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 038
NAME: LIBERTY
DEPOSIT TYPE: VEIN
STATUS: SHOWING
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 47' 23" N
LONGITUDE: 140° 10' 59" W

OTHER NAME(S):
MAJOR COMMODITIES: GOLD, COPPER
MINOR COMMODITIES: LEAD, COPPER
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

CWL

WORK HISTORY

Staked as Elsa, Liberty, etc cl (65078) in May/53 by G. Black, P. Versluce and R. Hide. Restaked as Maya cl (73047) in Jun/57 by C. Eminger and C. Gibbons, and as GG cl (Y26277) in Sep/68 by R.G. Hilker and P. Versluce, who conducted bulldozer trenching early in 1969.

Restaked as CWL cl (YA97373) in May/87 by Harjay EL, which performed hand trenching in 1988 and trenching and prospecting in 1989. G. Davidson restaked the CWL cl (YB27630) in Jul/90.

GEOLOGY

Gold-bearing quartz and quartz-carbonate veins up to 20 cm wide occur in silicified green tuff of Permian age. Specimens containing 2% chalcopyrite, 2% galena and 1% pyrite assayed up to 13.7 g/t Au. Prospecting in 1988 located another area of narrow veins containing galena and chalcopyrite 250 m upslope which may represent the faulted offset of the main showing.

REFERENCES

DODDS, C.J., AND CAMPBELL, R.B., 1992. Overview, legend and mineral deposit tabulations for Geological Survey of Canada Open Files 2188, 2189, 2190 and 2191.

YUKON EXPLORATION 1988, p. 167, 169.

YUKON MINING AND EXPLORATION OVERVIEW, 1988, p. 29.

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 039
NAME: QUEBEC
DEPOSIT TYPE: UNKNOWN
STATUS: ANOMALY
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 49' 11" N
LONGITUDE: 140° 14' 13" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES:
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

WORK HISTORY

Staked as Tanya, etc cl (64297) in Apr/53 by Canalask Nickel ML, a new company formed by Ontario Nickel ML and Frobisher L. Frobisher's interest was later transferred to Quebec Metallurgical Ind L.

Restaked in Nov/86 by Kluane JV (All-North Res L and Chevron Mls L) as Liberty cl (YA96624), which were optioned to Silverquest Res L and explored with mapping and geochem sampling in 1987.

GEOLOGY

Claims are underlain by Permo-Pennsylvanian sedimentary and volcanic rocks and cover a southeast-trending aeromagnetic anomaly that is believed to be caused by a Lower Triassic ultramafic sill that is not exposed. The 1987 sampling failed to locate any mineralization or anomalies.

REFERENCES

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 040
NAME: DUENSING
DEPOSIT TYPE: UNKNOWN
STATUS: UNKNOWN
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 49' 52" N
LONGITUDE: 140° 17' 56" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES:
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

WORK HISTORY

Staked as Top cl (Y9975) in Aug/66 by F. Hoey, and as Ni-Cu, Vic and Dic cl (Y18118) in Apr-Sep/67 by H. Gloslee, H. Babb and D. Duensing, who trenched in 1968.

Restaked as Vic & Dic cl (Y98817) in Jun/75 by D. Dickson and as Fifty-Two cl (YA74639) in May/82 by G. Harris.

GEOLOGY

Claims cover Permo-Pennsylvanian volcanic and sedimentary rocks at the contact of a Kluane Range intrusion.

REFERENCES

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 041
NAME: CATS & DOGS
DEPOSIT TYPE: ULTRAMAFIC
STATUS: SHOWING
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 51' 37" N
LONGITUDE: 140° 18' 57" W

OTHER NAME(S):
MAJOR COMMODITIES: COPPER
MINOR COMMODITIES: NICKEL
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

KLU, DOGS, CATS, LIBERTY

WORK HISTORY

Staked as Cat, Dog, etc cl (65425) in Apr/53 by Canalask Nickel ML, a new company formed by Ontario Nickel ML and Frobisher L, following an aeromagnetic survey by Lundberg EL. Frobisher's interest was later transferred to Quebec Metallurgical Ind L. Canalask built a winter road to the property and attempted to drill but was unable to penetrate the overburden.

Restaked as Bean & Late cl (Y5585) in Apr/66 by R. Granger and as Ni-Cu cl (Y18122) in Apr/67 by General Ent L, which built a new road and bulldozer trenched later in the year. Restaked as JJ cl (Y24922) and GG cl (Y26293) in May-Sep/68 by P. Versluce and R. Hilker, who did more bulldozer trenching in 1969, partially restaked the M cl (Y77302) to the northwest in Oct/73, hand trenched in 1973-74 and optioned the property in 1975 to Western ML (Brascan), which conducted mapping, a mag survey, geochem sampling and hand trenching in 1975 and more mapping in 1976 before terminating the option.

Restaked in Oct/86 as Cats, etc cl (YA96439) by Kluane JV (All-North Res L and Chevron Mls L) and optioned to Silverquest Res L, which explored with mapping and geochem sampling in 1987. Harjay ECL tied on Pillow cl (YA97385) to the west in May/87 and performed prospecting and sampling in 1988.

In July/94 Archer, Cathro & Associates (1981) restaked the showing as the Klu cl 1-24 (YB47016).

Small showings outside the mineralized horizon include chalcopyrite and pyrite in quartz veins in tuff and argillite; chalcopyrite in shears in argillite; and, disseminated chalcopyrite, pyrite and magnetite in brecciated coarse-grained tuff. Specimens assayed in 1987 returned 0.31% Ni from peridotite with 2% pyrrhotite, and 1.2% Cu from pyroclastic rocks. PGE values were low.

REFERENCES

CAMPBELL, S.W., 1976. Nickel-copper sulphide deposits in the Kluane Ranges, Yukon. Exploration and Geological Services Division, DIAND; Open File 1976-10.

CAMPBELL, S.W., 1981. Geology and genesis of copper deposits and associated host rocks in and near the Quill Creek area, Southwestern Yukon. Unpublished Ph.D. thesis, University of British Columbia, 1981.

DODDS, C.J., AND CAMPBELL, R.B., 1992. Overview, legend and mineral deposit tabulations for Geological Survey of Canada Open Files 2188, 2189, 2190 and 2191.

MINERAL INDUSTRY REPORT 1975, p. 130-131; 1976, p. 165-166.

YUKON EXPLORATION 1987, p. 241-242.

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 042
NAME: MEXICO
DEPOSIT TYPE: SKARN
STATUS: SHOWING
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 51' 0" N
LONGITUDE: 140° 21' 16" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES: COPPER
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

WORK HISTORY

Staked as Mexico etc cl (65248) in Apr/53 by G. Scott during the staking rush around the Canalask deposit. Transferred in Jul/54 to Callinan Flin Flon ML. Adjoining claims consisted of Otter and Lucky cl (64939) to the northwest, staked in Apr/53 by Waddington Mg Corp L, and Antler cl (66013), staked in Jun/53 by Selco EL.

Restaked as Mag cl (Y20589) in Jul/67 by R. Hoey and later as KK cl(Y53468) in Jun/70 by Imperial OL, Bow Valley Ind. L and Can. Ind. G & OL.

GEOLOGY

Claims are underlain by Permo-Pennsylvanian volcanic and sedimentary rocks near a major thrust fault. Chalcopyrite occurs in narrow stringers of massive magnetite in local skarn zones.

REFERENCES

CANADIAN MINING JOURNAL, Oct/54, p. 101.

DODDS, C.J., AND CAMPBELL, R.B., 1992. Overview, legend and mineral deposit tabulations for Geological Survey of Canada Open Files 2188, 2189, 2190 and 2191.

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 043
NAME: PICKHANDLE
DEPOSIT TYPE: ULTRAMAFIC
STATUS: DRILLED PROSPECT
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 55' 29" N
LONGITUDE: 140° 27' 20" W

OTHER NAME(S):
MAJOR COMMODITIES: COPPER
MINOR COMMODITIES: NICKEL
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

WORK HISTORY

Staked as GE cl (64407) & Ann cl (65031) in Mar/53 by General Enterprises L, which performed grid mag and self potential surveys in 1953. In 1954, Canalask Nickel ML drilled 5 holes (598.0 m) under an option. The SE cl (Y59212) were staked in Oct/70 by R. Voisine immediately to the southeast. Restaked as MAG cl (75747) in Jun/73 by the Nickel Synd (Can Superior EL, Aquitaine, Home OL and Getty ML).

Restaked in Aug/86 as V cl (YA95733) by Polestar E Inc, which performed mapping and geochem sampling in 1987. Walhalla EL tied on Pick cl (YA97846) to the south in Jun/87 and Harjay ECL and Kluane JV (All-North Res L & Chevron Mls L) tied on KF cl (YA97554) to the north and Pete cl (YA97949) to the southeast in Jun/87. Polestar carried out geochem sampling in 1987, followed by VLF-EM and mag surveys in 1988.

Restaked as WR cl 67-80 (YB96934) by Expatriate Resources Ltd in Oct/96.

GEOLOGY

Claims cover the extension of the peridotite sill associated with the Canalask deposit, which intrudes Permo-Pennsylvanian volcanic and sedimentary rocks. Dumbrille obtained an assay in 1953 of 6.55% Cu and 0.56% Ni from mineralized peridotite float. Polestar outlined three gold anomalies in soil with values up to 280 ppb Au, and six platinum-palladium anomalies with values up to 204 ppb Pt and 365 ppb Pd.

REFERENCES

DODDS, C.J., AND CAMPBELL, R.B., 1992. Overview, legend and mineral deposit tabulations for Geological Survey of Canada Open Files 2188, 2189, 2190 and 2191.

ONTARIO NICKEL MINES LTD, Oct/53. Assessment Report by J.C. Dumbrille.

YUKON EXPLORATION 1985-86, p. 316-317; 1987, p. 244.

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 046
NAME: SWENSON
DEPOSIT TYPE: UNKNOWN
STATUS: UNKNOWN
TECTONIC ELEMENT: NISLING TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 58' 15" N
LONGITUDE: 140° 22' 46" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES:
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

WORK HISTORY

Staked as Dewie and Aldas cl (73224) in Oct/57 by D. Swenson and A. Laine.

GEOLOGY

Claims are underlain by quartz-biotite schist of the Nisling Terrane.

REFERENCES

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 058
NAME: DOWN
DEPOSIT TYPE: UNKNOWN
STATUS: UNKNOWN
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 46' 0" N
LONGITUDE: 140° 26' 26" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES:
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

MC

WORK HISTORY

Staked as Deep cl (Y12387) in Mar/67 by D. Dickson and as Down cl (Y25719) in Jul/68 by G. Harris. Harris restaked again as MC cl (YB25653) in Apr/89.

GEOLOGY

The claims were staked near a contact between Upper Paleozoic to Triassic volcanic and sedimentary rocks and one of the Kluane intrusions.

REFERENCES

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 093
NAME: WEBSTER
DEPOSIT TYPE: VEIN
STATUS: ANOMALY
TECTONIC ELEMENT: NISLING TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 55' 30" N
LONGITUDE: 140° 17' 25" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES: COPPER, GOLD, LEAD, SILVER, ZINC
TRACE COMMODITIES: ARSENIC

CLAIMS (PREVIOUS & CURRENT)

PICK

WORK HISTORY

Staked as Pick cl (YA92096) in Jun/85 by M. Webster, who mapped and prospected in 1986, then optioned the property to Noranda ECL which mapped and prospected in 1987.

GEOLOGY

The claims are underlain by quartz-biotite schist, quartz-feldspar-biotite gneiss and amphibolite. Anomalous gold, silver, zinc and arsenic were obtained from a silicified shear zone but follow up work was disappointing.

REFERENCES

YUKON MINING AND EXPLORATION OVERVIEW 1988, p. 316-317.

YUKON MINFILE
YUKON GEOLOGY PROGRAM
WHITEHORSE

MINFILE: 115F 103
NAME: HARJAY
DEPOSIT TYPE: UNKNOWN
STATUS: ANOMALY
TECTONIC ELEMENT: WRANGELLIA TERRANE

NTS MAP SHEET: 115F\16
LATITUDE: 61° 53' 9" N
LONGITUDE: 140° 26' 22" W

OTHER NAME(S):
MAJOR COMMODITIES:
MINOR COMMODITIES:
TRACE COMMODITIES:

CLAIMS (PREVIOUS & CURRENT)

HAZEL

WORK HISTORY

Staked as Hazel cl (YB5909) in Jul/87 by Harjay EL and Kluane JV (All-North Res L & Chevron Mls L) on an aeromag anomaly outlined by a 1953 survey by Lundberg EL for Ontario Nickel ML and Frobisher L.

GEOLOGY

A highly sheared, limonitic ultramafic body is poorly exposed in landslide material near the creek.

REFERENCES

Appendix E

2002 Photographs

Pickhandle Lake roadside turnout to wildlife viewing interpretive panels and picnic area, southwest Yukon.

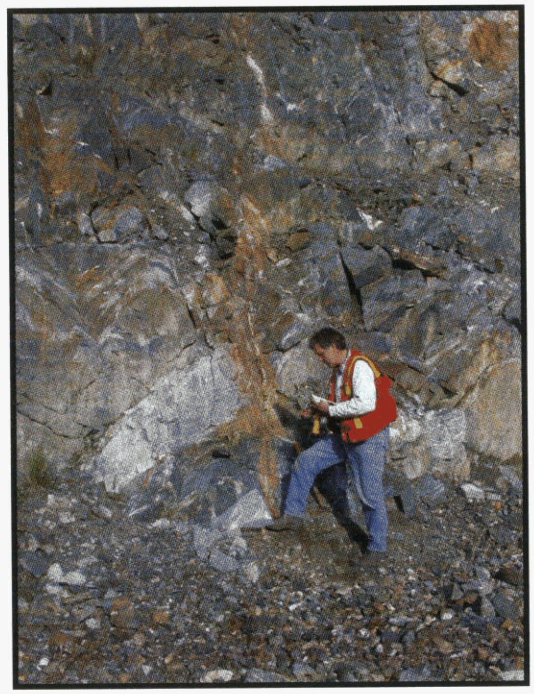
Nasina Assemblege metasedimentary rocks exposures in road cuts, looking NE.

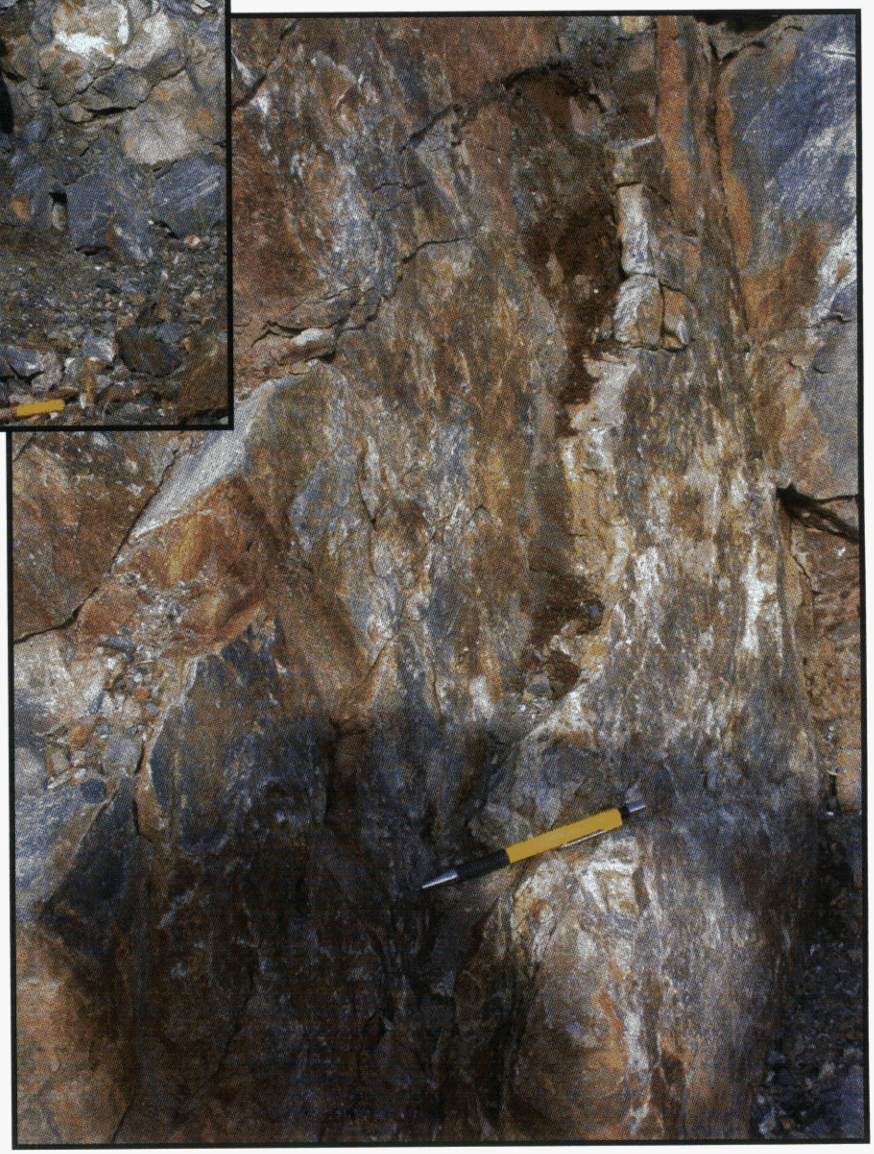
Graphitic quartzite and muscovite schist contact examined during 2002 mineral assessment work on road cuts at south end of proposed SMA.

Bleached feldspar porphyry dykes and sill crosscutting Cretaceous quartz-hornblende diorite, north edge of central portion of proposed SMA.

Left: Quartz-carbonate vein crosscutting quartz hornblende diorite.

Right: Rusty quartz-carbonate veinlets crosscutting offset feldspar porphyry dykes and quartz veins hosted in quartz hornblende diorite.





Quartz arsenopyrite vein with rusty weathering selvages hosted in Nasina Assemblage metasedimentary rocks, sampled during 2002 Mineral Assessment work from a road cut near the proposed Pickhandle Lakes SMA.

Above: Fold anticline in Nasina Assemblage metasedimentary rocks cored by resistant quartzite.

Quartz-carbonate stockwork zone in carbonate altered gabbro, ? Windy McKinley Assemblege.

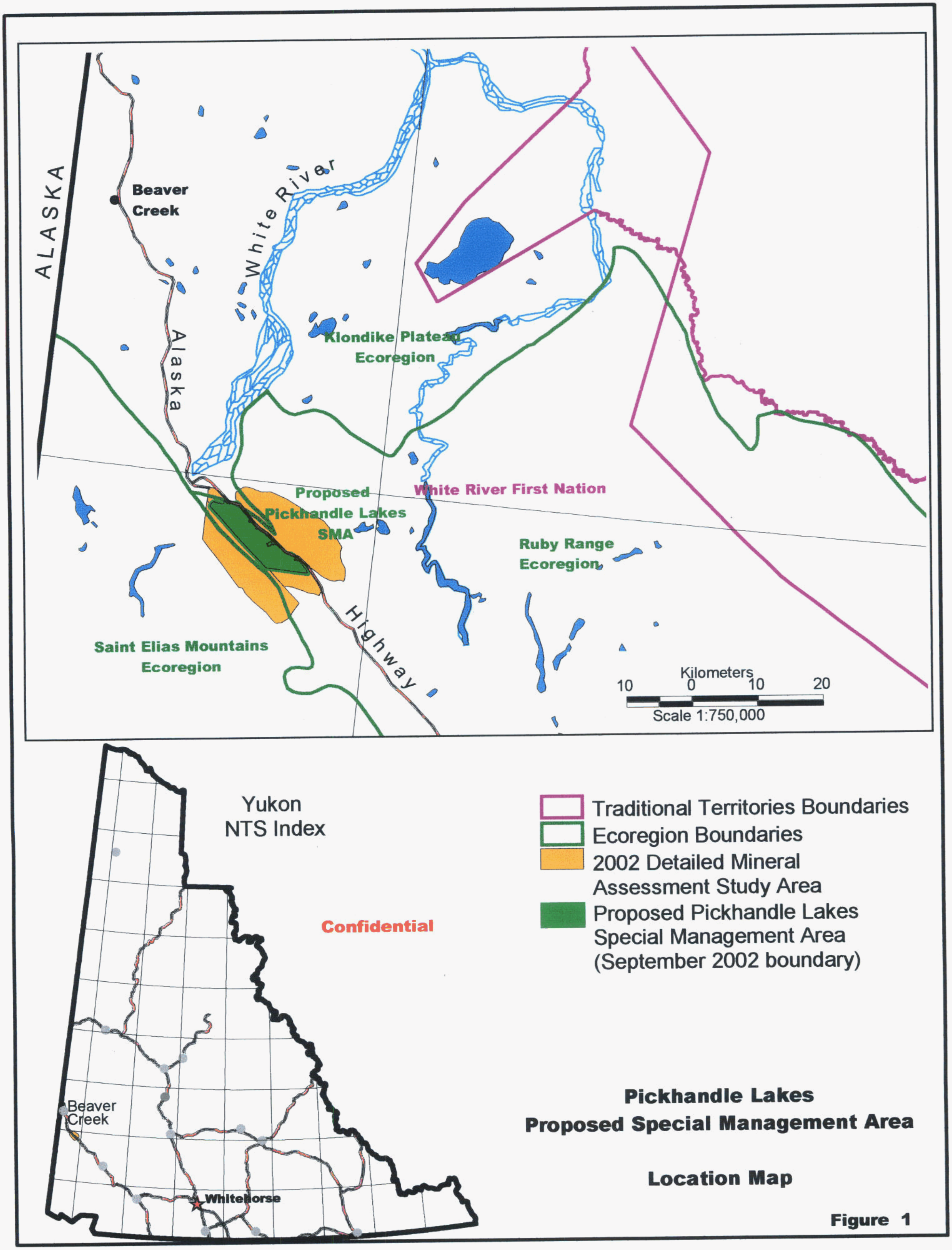
Silt sediment sampling on the Koidern River (at the YTG Lake Creek Campground), upstream of the proposed SMA. Kluane Ranges are in the background.

Collecting pan concentrates where the Koidern River crosses the Alaska Highway, West end of the proposed Pickhandle Lakes SMA.

Above: Looking Southeast along Shakwak Trench, Pickhandle Lake in foreground and Kluane Range in distance.

Left: Wildlife veining platform at Pickhandle Lake road side turnout.

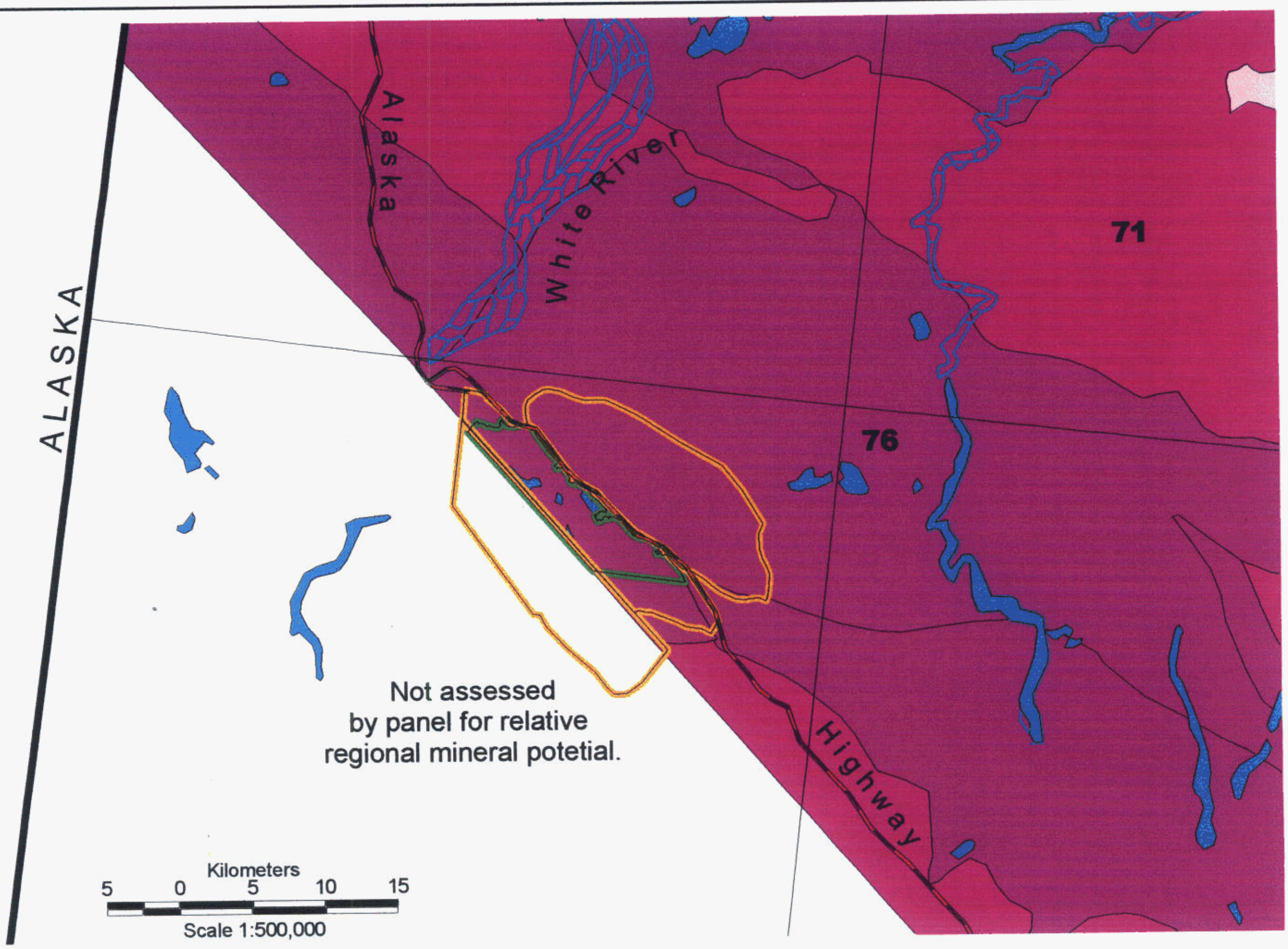
Below: Alaska Highway along Pickhadle Lake with snow capped Kluane Ranges in background.



Pickhandle Lakes
Proposed Special Management Area

Location Map

Figure 1



Confidential

2002 Detailed Mineral Assessment Study Area

Proposed Pickhandle Lakes Special Management Area (September 2002 boundary)

Relative Regional Mineral Potential

- Highest
- Lowest

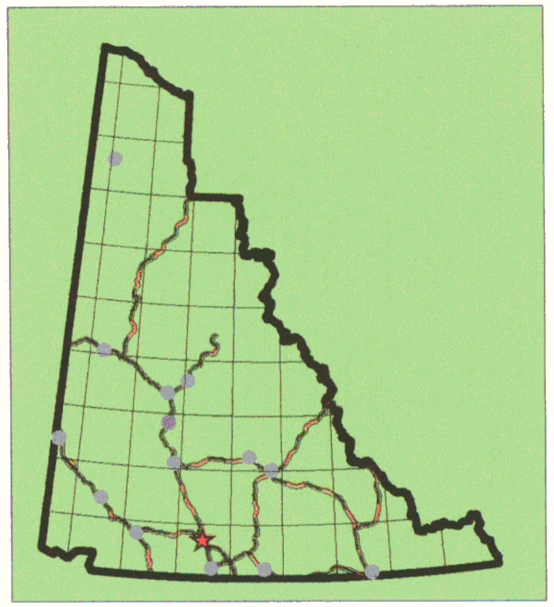
76 Tract Number

Pickhandle Lakes
Proposed Special Management Area

Relative Regional
Mineral Potential

Figure 2

Proposed Pickhandle Lakes SMA
Detailed Mineral Assessment



Legend

- Fault
- Quartz claims as of February 27, 2003

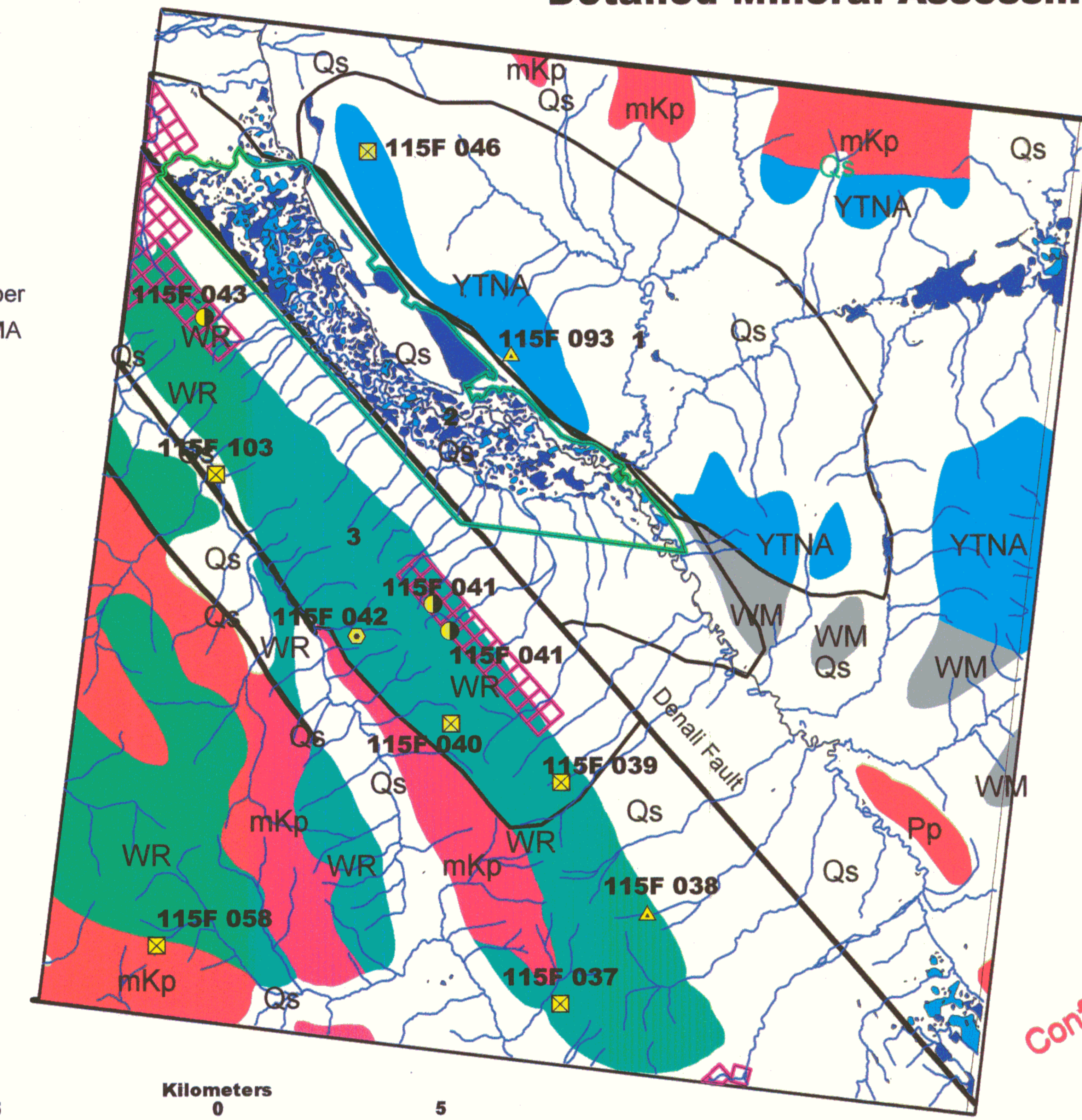
Minfile Occurrences

- SKARN
- ULTRAMAFIC
- UNKNOWN
- VEIN

115F 093 Yukon Minfile Occurence Number

Proposed Pickhandle Lakes SMA

2 Tract, Number



Legend

Qs	Quaternary unconsolidated cover
Pp	Paleogene post accretion plutonic rocks
mKp	mid-Cretaeous, post accretion plutonic rocks
YTNA	Yukon - Tanana; Nasina Sub-terrane
WM	Windy McKinley
WR	Wrangellia

Kilometers

5 0 5

Scale 1:150,000

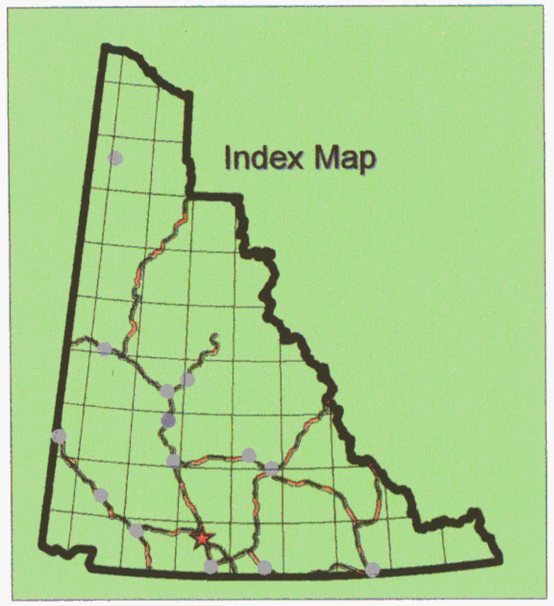
Note: Geology after Gordy and Makepeace, 2001.

TERRANE MAP

Figure 3

Arcview GIS version 3.2a - RWH - March 17, 2003

Proposed Pickhandle Lakes SMA
Detailed Mineral Assessment



Legend

Fault

Quartz claims as of February 27, 2003

Minfile Occurrences

- SKARN
- ULTRAMAFIC
- UNKNOWN
- VEIN

115F 093 Yukon Minfile Occurence Number

Proposed Pickhandle Lakes SMA

2 Tract, Number

Geological Legend

Q — Quaternary
Unconsolidated glacial, glaciofluvial and glaciolascustrine deposits

ETgN — Early Teritary - Nisling Range Suite
medium to coarse grained, equigranular to porphyritic rocks of intermediate composition

mKgW — Mid-Cretaceous - Whitehorse Suite
grey, medium to coarse grained, generally equigranular granitic rocks of felsic (q), intermediate (g), locally mafic (d), and rarely syenitic (y)

EKK — Early Cretaceous - Kluane Ranges Suite
mid-grey, medium to coarse grained, biotite hornblende granodiorite, quartz diorite, quartz monzonite, and hornblende diorite

uTrN — Upper Triassic - Nickolai Group
amygdaloidal basaltic and andesitic flows, with local tuff, breccia, shale and base; locally includes dark grey phyllite and minor thin grey limestone

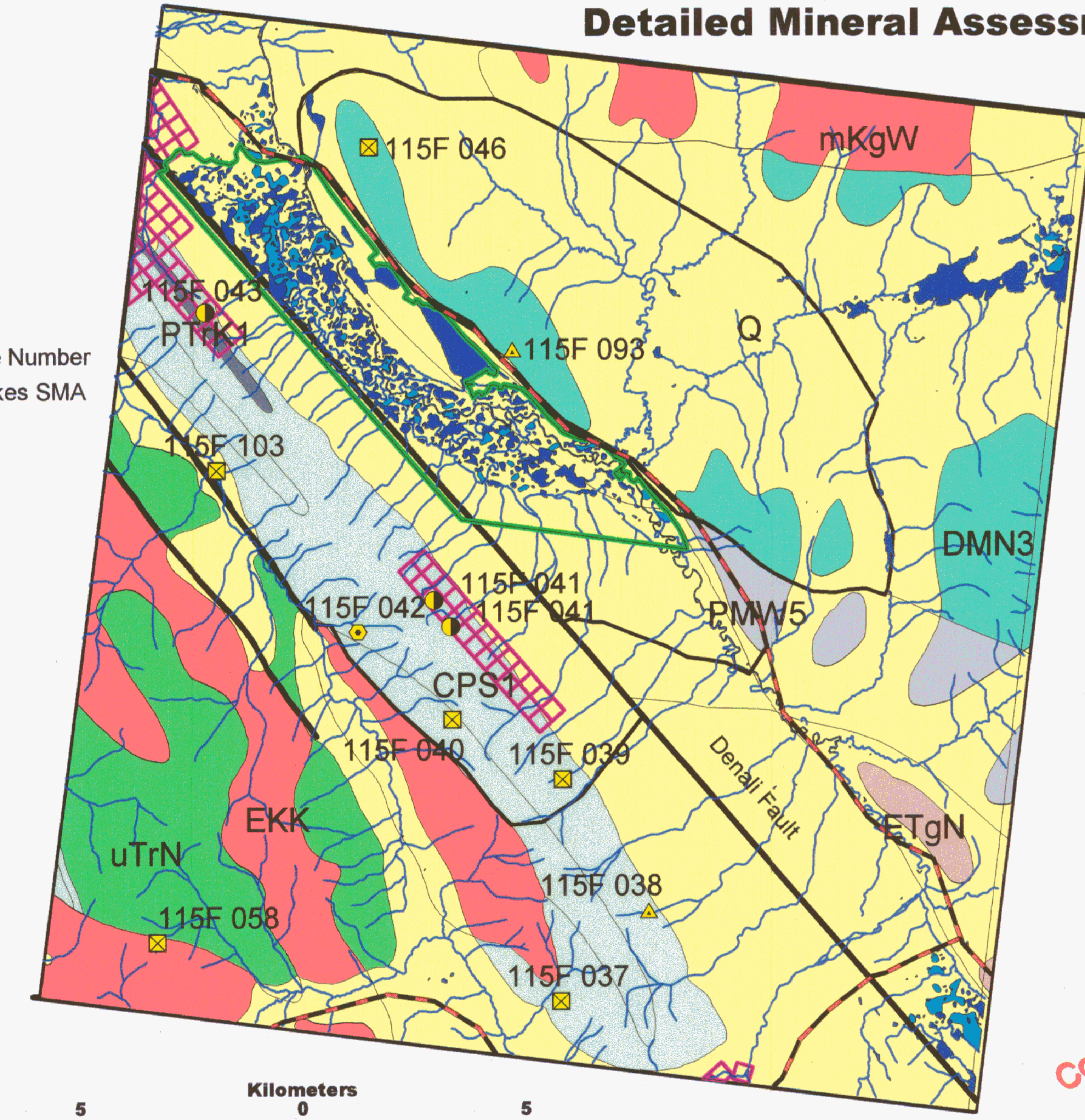
CPS1 — Pennsylvanian to (?) Lower Permian - Skolai Fm
1, tuff, breccia, argillite, agglomerate, augite-phyric basaltic to andesitic flows (Station Ck. Fm); succeeded by thin-bedded argillite, siltstone, minor greywacke and conglomerate and local thin basaltic flows, breccia and tuff (Hansen Ck. Fm)
2, buff bioclastic limestone, calcarenite

PTrK1 — Late Triassic and (?) Older - Kluane Ultramafic Suite
1, medium grey-green, massive, medium grained, pyroxene gabbro and greenstone sills; sheeny black peridotite, rare dunite

PMW5 — Devonian to Cretaceous - Windy - McKinley Terrane
5, quartz-chlorite-sericite schist, epidote-actinolite greenschist, quartzite, slate, quartz-mica schist, limestone

DMN3 — Devonian, Mississippian and (?) Older - Nasina Assemblage
3, quartzite, micaceous quartzite, quartz muscovite (+/- chlorite; +/- fledspar augen) schist, and minor metaconglomerate and metagrit, but may locally include significant Nisling Assemblage

Note: Geology after Gordy and Makepeace, 2001.



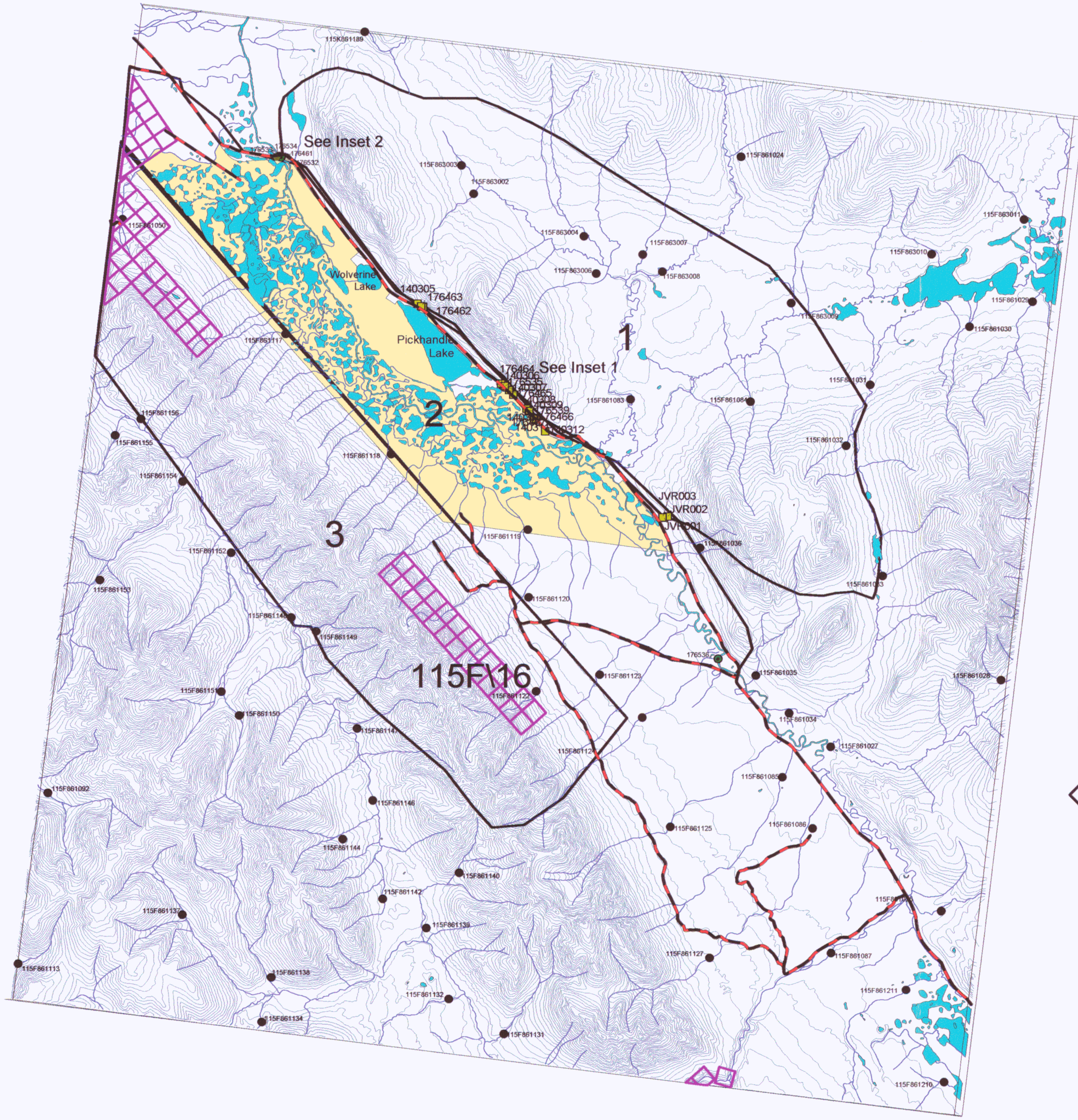
Kilometers
5 0 5
Scale 1:150,000

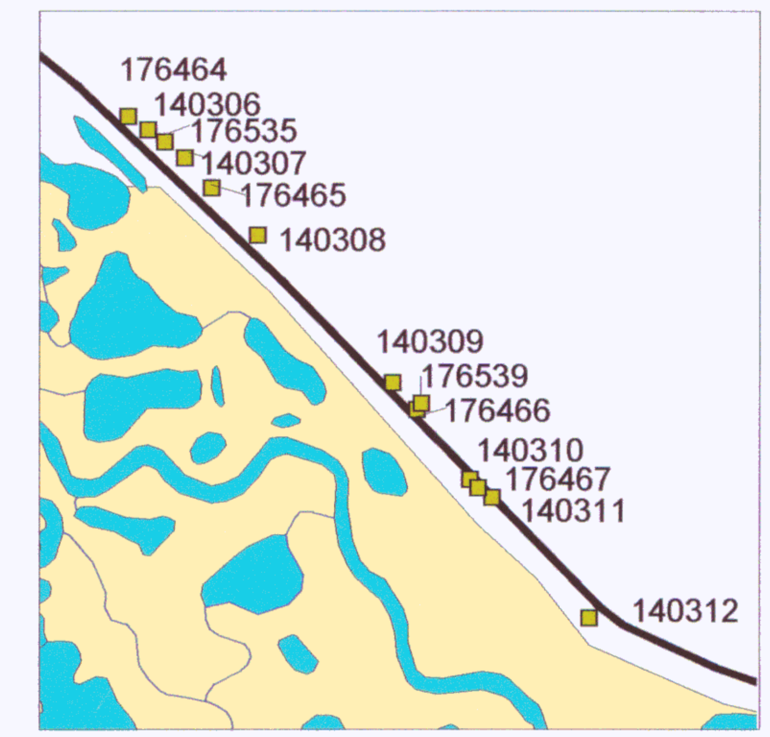
Confidential

GEOLOGY MAP

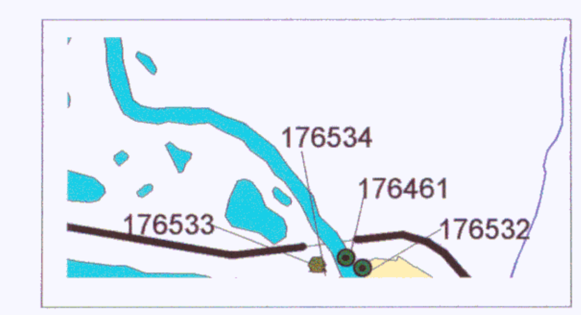
Arcview GIS version 3.2a - RWH - March 17, 2003

Figure 4





Inset 1



Inset 2

Legend

- Quartz claims as of February 27, 2003
- Proposed Pickhandle Lakes Special Management Area (September 2002 boundary)
- 2 Detailed Mineral Assessment Tract, Number

Legend

- 2002 Regional Stream Geochemistry
- 2002 Pancrons
- 2002 Rocks
- 2002 Silts
- 2002 Soils

Confidential

Proposed Pickhandle Lakes SMA Detailed Mineral Assessment

Sample Location Map

5 0 5 10 Kilometers

1:100 000 scale

Figure 5

Arcview GIS version 3.2a - FA, RWS, RWH - March 17, 2003

Proposed Pickhandle Lakes SMA
Detailed Mineral Assessment

Legend

Fault

Quartz claims as of February 27, 2003

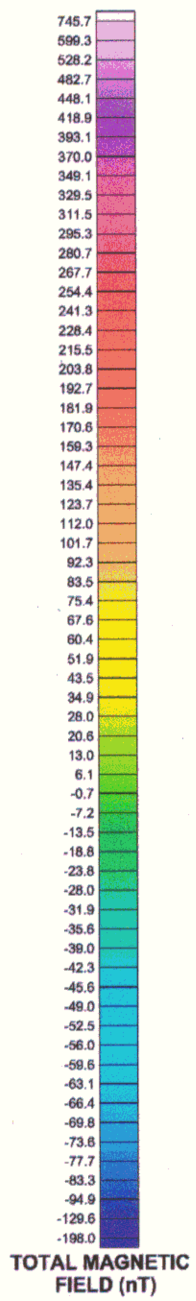
Minfile Occurrences

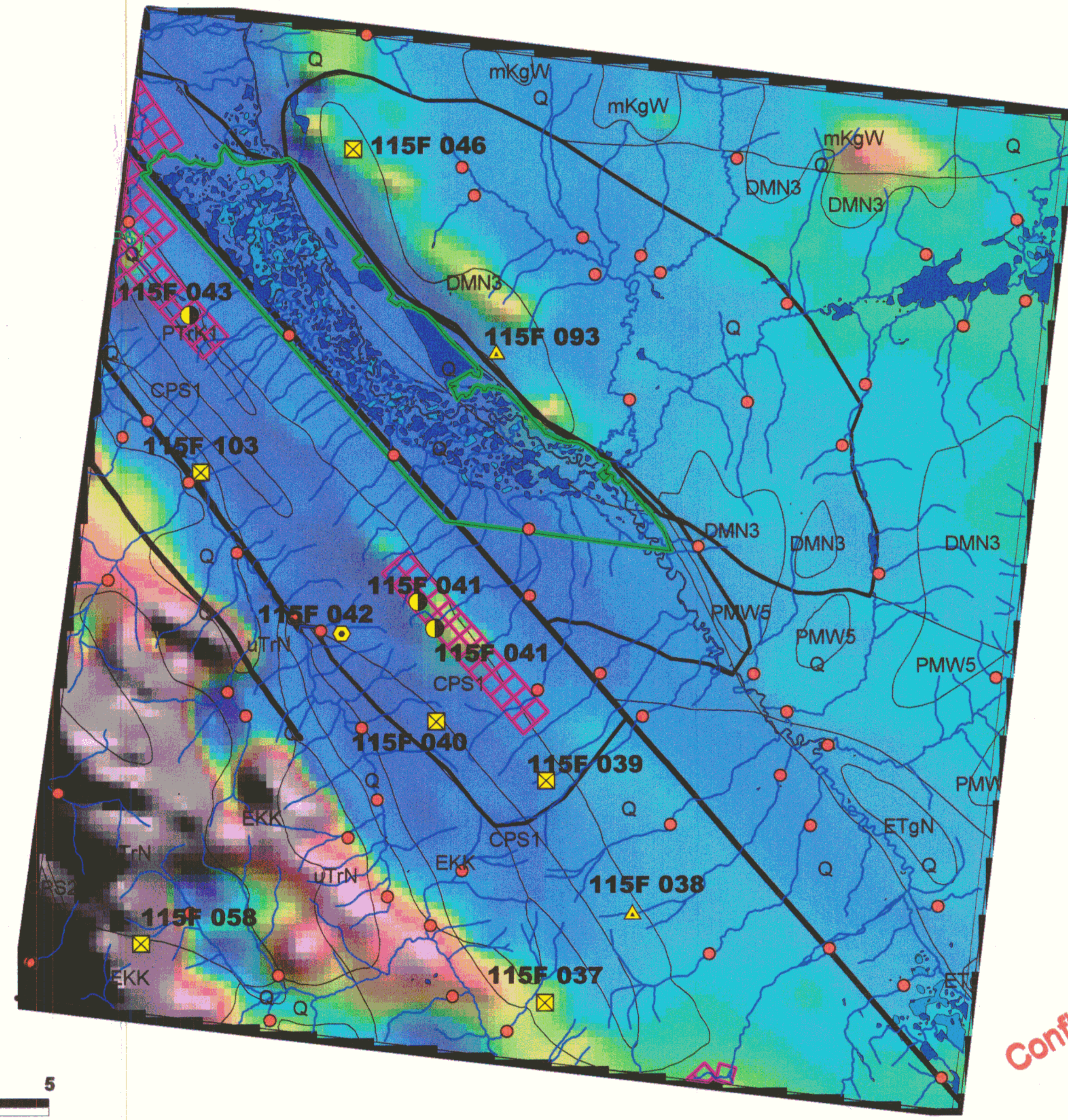
- SKARN
- ULTRAMAFIC
- UNKNOWN
- VEIN

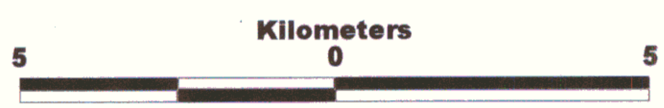
115F 093 Yukon Minfile Occurence Number

Proposed Pickhandle Lakes SMA

2 Tract, Number







Scale 1:150,000

Total Field - Residual Magnetic Anomaly

Note: Geology after Gordy and Makepeace, 2001.

Arcview GIS version 3.2a - RWH - March 17, 2003

Figure 6

Proposed Pickhandle Lakes SMA
Detailed Mineral Assessment

Legend

- Fault
- Quartz claims as of February 27, 2003

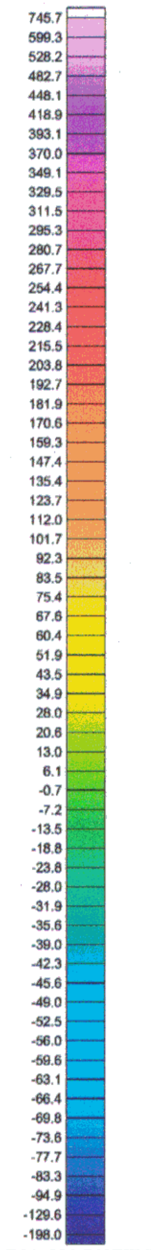
Minfile Occurrences

- SKARN
- ULTRAMAFIC
- UNKNOWN
- VEIN

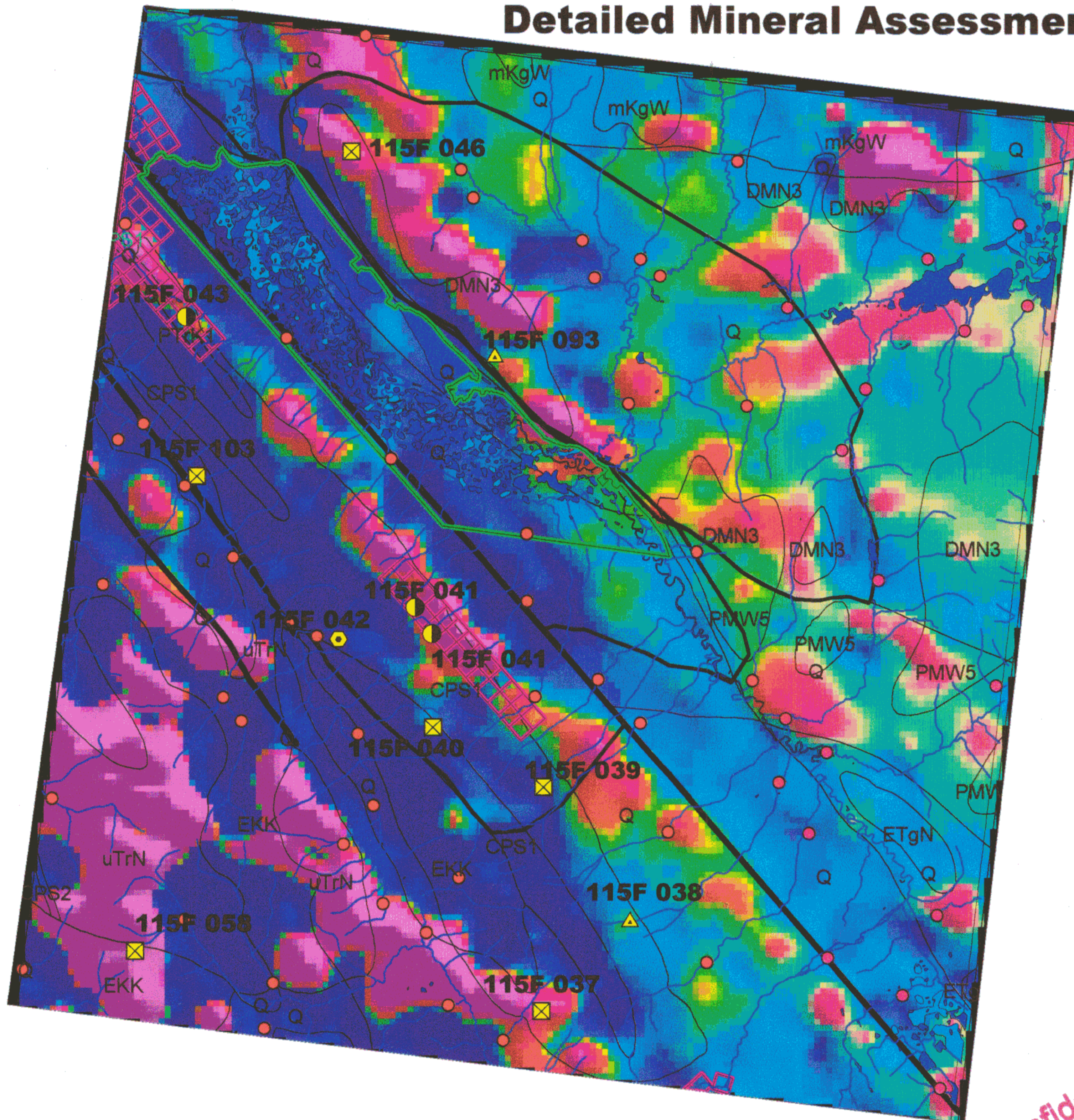
115F 093 Yukon Minfile Occurence Number

Proposed Pickhandle Lakes SMA

2 Tract, Number



TOTAL MAGNETIC FIELD (nT)



Kilometers

5 0 5

Scale 1:150,000

Note: Geology after Gordy and Makepeace, 2001.

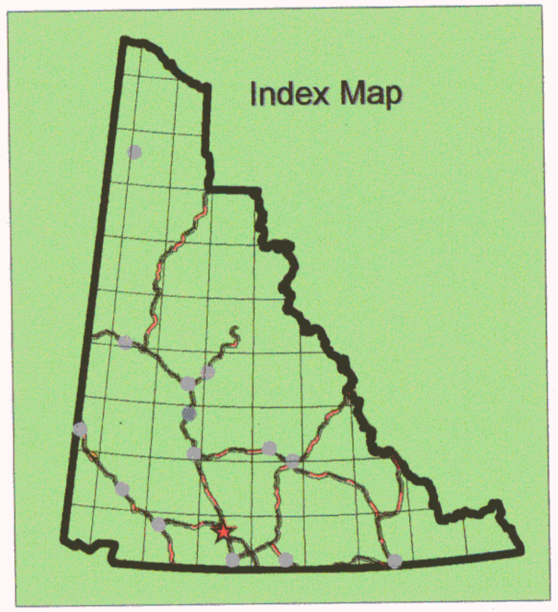
First Vertical Derivative of Aeromagnetic Total Field

Confidential

Arcview GIS version 3.2a - RWH - March 17, 2003

Figure 7

Proposed Pickhandle Lake SMA
Detailed Mineral Assessment



Legend

Relative Mineral Potential Ranking

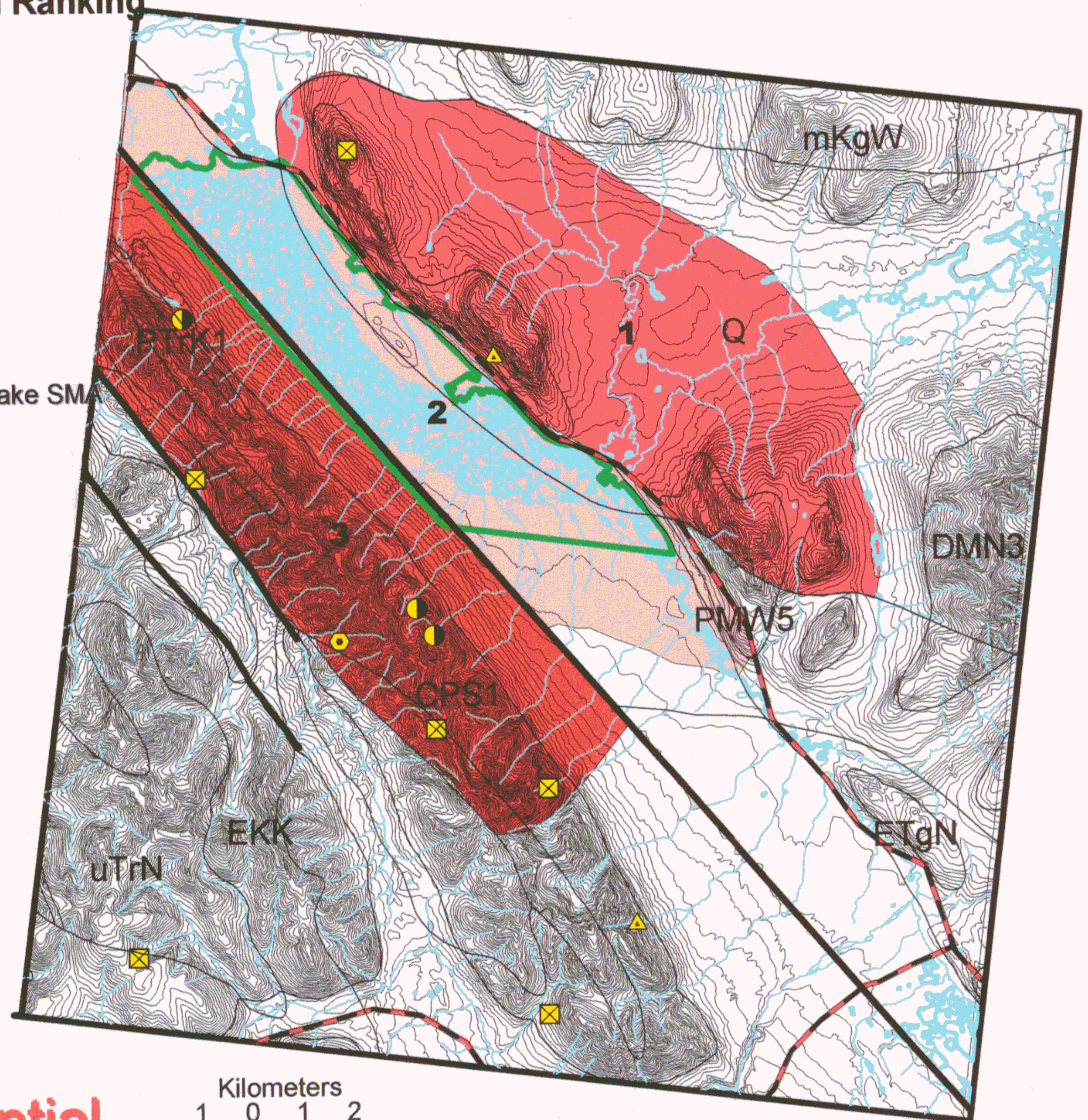
- Highest
- Moderate
- Lowest

Minfile Occurrences

- SKARN
- ULTRAMAFIC
- UNKNOWN
- VEIN

Proposed Pickhandle Lake SMA

2 Tract, Number



Geological Legend

Q — Quaternary
Unconsolidated glacial, glaciofluvial and glaciolascustrine deposits

ETgN — Early Teritary - Nisling Range Suite
medium to coarse grained, equigranular to porphyritic rocks of intermediate composition

mKgW — Mid-Cretaceous - Whitehorse Suite
grey, medium to coarse grained, generally equigranular granitic rocks of felsic (q), intermediate (g), locally mafic (d), and rarely syenitic (y)

EKK — Early Cretaceous - Kluane Ranges Suite
mid-grey, medium to coarse grained, biotite hornblende granodiorite, quartz diorite, quartz monzonite, and hornblende diorite

uTrN — Upper Triassic - Nickolai Group
amygdaloidal basaltic and andesitic flows, with local tuff, breccia, shale and base; locally includes dark grey phyllite and minor thin grey limestone

CPS1 — Pennsylvanian to (?) Lower Permian - Skolai Fm
1, tuff, breccia, argillite, agglomerate, augite-phyric basaltic to andesitic flows (Station Ck. Fm); succeeded by thin-bedded argillite, siltstone, minor greywacke and conglomerate and local thin basaltic flows, breccia and tuff (Hansen Ck. Fm)
2, buff bioclastic limestone, calcarenite

PTrK1 — Late Triassic and (?) Older - Kluane Ultramafic Suite
1, medium grey-green, massive, medium grained, pyroxene gabbro and greenstone sills; sheeny black peridotite, rare dunite

PMW5 — Devonian to Cretaceous - Windy - McKinley Terrane
5, quartz-chlorite-sericite schist, epidote-actinolite greenschist, quartzite, slate, quartz-mica schist, limestone

DMN3 — Devonian, Mississippian and (?) Older - Nasina Assemblage
3, quartzite, micaceous quartzite, quartz muscovite (+/- chlorite; +/- fledspar augen) schist, and minor metaconglomerate and metagrit, but may locally include significant Nisling Assemblage

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Kilometers
1 0 1 2

Figure 8