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INDIAN AND NORTHERN AFFAIRS CANADA
NORTHERN AFFAIRS: YUKON REGION

Open File 1994-11 (G)

FINE SEDIMENT GEOCHEMISTRY FOR GOLD

ORIENTATION SURVEY

written by

Gordon MacKay

MacKay Falkiner and Associates
1994
Whitehorse, Yukon

Canada

Yukon
Government

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ACKNOWLEDGMENTS

This project and the final report have greatly benefited from critical review by K. Fletcher of the University of British Columbia and R. DiLabio of the Geological Survey of Canada.

Funding for this project was provided by the Yukon Mineral Development Agreement, Pacific Sentinel Gold Corp., and Noranda Exploration.

Assistance in sample collection and processing was provided by the very able and amiable P. Rouble.

A special thank you to K. Fletcher, R. DiLabio, L. Walton, J. Kowalchuk, D. Forster, and G. Pierce.

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SUMMARY

This orientation survey is a direct outgrowth of Yukon Open File 1993-9 (G), *Very Fine Stream Sediment Sampling For Gold* (MacKay, 1993). That paper summarized existing information on this topic. Many geoscientists have made considerable contributions in this area of study and this project attempts to build on that body of knowledge.

This project compares fine sediment geochemistry (-53 microns) with traditional -180 microns (-80 mesh) sediment geochemistry (-180 micron sediment geochemistry is the standard used by the exploration industry and the government sponsored Regional Geochemical Surveys). The goal of this project is to confirm or deny the key theoretical advantages of fine fraction sediment sampling as outlined in O.F. 1993-9 (G), and to develop practical and efficient techniques for collecting and processing the samples. Those key theoretical advantages are less local sample site variation, improved reproducibility, and the potential to preferentially define anomalies associated with significant bedrock mineralization.

Five study areas were selected in the Yukon. Four of these areas contained known gold mineralization that has been mined in the past or contain significant drill indicated reserves. The Mt. Skukum deposit is a low sulfide quartz carbonate vein system that was mined in the mid 1980's. Ketza River is a sulfide rich manto-style deposit with significant oxide reserve that was mined in the late 1980's. Dublin Gulch is a gold-bearing stockwork hosted within intrusive, similar to the Fort Knox gold deposit at Fairbanks, Alaska. Brewery Creek is a disseminated gold deposit hosted primarily within structurally disrupted intrusives.

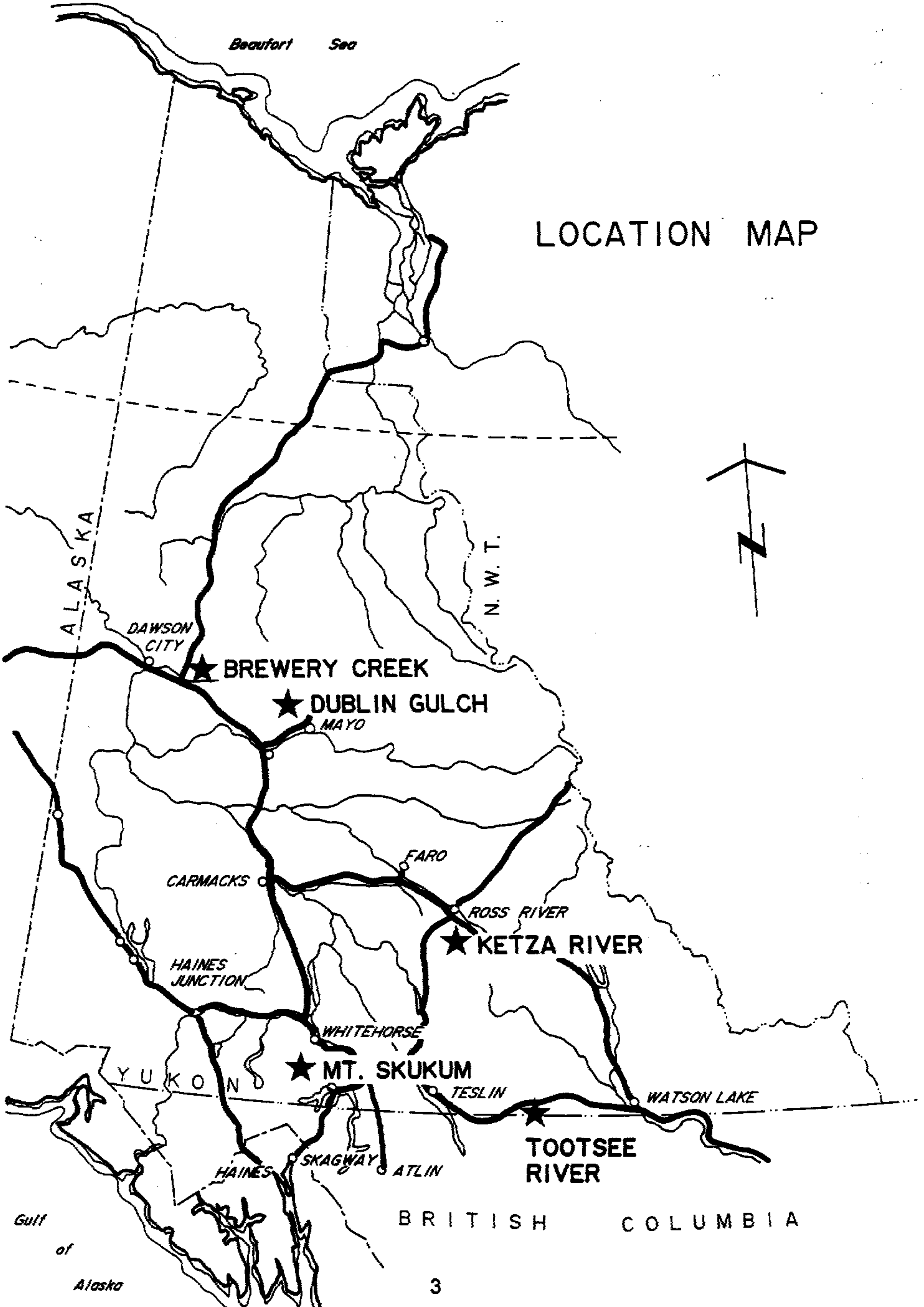
Samples of -2000 micron sediment were collected from streams draining these areas of known mineralization, as well as from streams draining areas with no known significant mineralization but with erratic gold values from government sponsored regional geochemical surveys (RGS), and from streams that have only background gold values from RGS. The samples were wet sieved into a -180+53 micron coarse fraction and a -53 micron fine fraction. Gold concentrations for each sample were determined by duplicate 30g fire assay and one 10g aqua-regia analysis. Values for 32 other elements were determined by ICP analysis.

The -2000 micron bulk samples were found to contain an average of 5.5% -53 micron sediment with a 2.8% standard deviation. Collection of the -2000 micron primary sample, using a flexible screen, takes 5 to 90 minutes. The most significant factor affecting sampling time is the wetness of the sample. Wet sieving of the -2000 micron bulk sample into the two size fractions selected for this study takes approximately 15 to 20 minutes using mechanical sieving equipment designed for this project.

The -53 micron fraction effectively identified all the drainages with known mineralization, providing good anomaly definition and long dispersion trains. Sub-sampling variation and local sample site variation are significantly reduced in the fine fraction.

The coarse fraction failed to return significant anomalies from Laura Creek, which drains the Brewery Creek gold deposit, and was unable to distinguish between mineralized, erratic, and background drainages around Dublin Gulch.

Evidence from this orientation survey demonstrates the potential to improve the success rate of reconnaissance exploration for gold by collecting fine fraction sediment samples as a first step in exploration. Increased project cost at this stage could be greatly offset by more efficient and successful follow-up programs.



Beaufort Sea
LOCATION MAP
ALASKA
N.W.T.
DAWSON CITY
BREWERY CREEK
DUBLIN GULCH
MAYO
FARO
CARMACKS
ROSS RIVER
KETZA RIVER
HAINES JUNCTION
WHITEHORSE
MT. SKUKUM
YUKON
TESLIN
WATSON LAKE
TOOTSEE RIVER
HAINES
SKAGWAY
ATLIN
BRITISH COLUMBIA
Gulf of Alaska

INTRODUCTION

Stream sediment geochemistry is one of the most powerful tools for mineral exploration. This study investigates the potential for improving the usefulness of stream sediment geochemistry by sampling a fine fraction containing particles smaller than 53 microns. The need to develop better techniques for stream sediment sampling is most notable in gold geochemistry where traditional techniques have failed to reliably lead explorationists to the discovery of economically viable deposits.

Traditional sediment geochemistry, which consists of -180 micron sediment typically collected from low energy environments, has been shown to produce gold data which is often unreliable and non-reproducible. While many ore deposits have been found with the aid of traditional sediment geochemistry, there is a growing understanding that many more have been missed and valuable exploration dollars have been wasted on the follow-up of spurious anomalies.

Traditional techniques tend to produce data that shows highly anomalous values associated with insignificant mineralization, highly anomalous values associated with distant mineralization that cannot be traced to its source, and the lack of anomalous values associated with ore deposits where the gold occurs exclusively in sub-micron sizes. These problems result in unsuccessful exploration programs.

The need to analyze for gold in parts per billion is further complicated by the tendency for gold to occur as discrete particles. This creates both a nugget effect problem and a particle sparsity problem which results in unreliable data. Nugget effect is the term used to describe situations where data is made erratic and unreliable by rare large grains that produce large anomalies that are not reproducible. Particle sparsity relates to the number of grains in the sample. Assuming the grains of interest are all the same size, a sample must contain a minimum of 20 grains to have a sampling error better that +-50% (Clifton et al 1969).

To overcome the particle sparsity problem it is necessary to increase the number of gold particles in the sample to be analyzed. The easiest way to do that is to increase the size of the sample to be analyzed. The standard sub-sample size for gold analysis was 5 or 10 grams; that has increased now to 30 grams which approaches the practical limit for commercial fire assay analysis.

Two other approaches to solving the reproducibility problem caused by particle sparsity are heavy mineral concentrate sampling and bulk cyanide leach technique. In both cases an original sample size is selected which is expected to contain enough gold particles to provide reliable data.

With heavy mineral concentrate sampling a concentrate of heavy minerals is made from the bulk sample; that concentrate is then analyzed for gold and the recoverable gold content of the original sample can be calculated. The concept is to use the unique characteristics of gold, in this case its high specific gravity, to separate the gold particles from the bulk sample, leaving a sample that is small enough to be analyzed but still contains the gold present in the bulk sample.

Unfortunately the majority of the gold contained in the bulk sample is often too fine to collect by gravity separation. At best heavy mineral concentrate sampling identifies the presence or absence of coarse gold (>50 microns). Many of the economic ore deposits in the Cordillera do not contain a significant amount of coarse gold. Therefore the presence or absence of coarse gold in stream sediments in the Cordillera may be irrelevant to the presence or absence of economic ore deposits. Another danger with this technique is the tendency to want to split the concentrate before analysis so that other elements can be analyzed. While the original concentrate is representative of the coarse fraction gold in the bulk sample, the split of that concentrate is not. Heavy mineral concentrate sampling is also very sensitive to sample site selection and is greatly complicated in streams that have erratic hydraulic regimes.

Bulk cyanide leach technique also requires the collection of a bulk sample which is expected to contain enough gold particles to provide reliable data. A cyanide solution is added to the bulk sample to make a slurry which is agitated to allow the cyanide to take the gold in the sample into solution. The solution is then removed and analyzed for its gold content. This technique provides only a partial dissolution of gold. Gold that is encapsulated or somehow not exposed to the cyanide will not be dissolved.

By collecting and treating large bulk samples, very low detection limits can be calculated using this technique. This presents the potential problem of mistaking natural variations in gold backgrounds for anomalies that may be associated with economic ore deposits. Another major problem with bulk cyanide leach technique is how the varying chemistry of exploration samples affects gold extraction by cyanide. For example, carbon present in the sample can remove the gold from the solution before the solution can be removed from the sample. Another problem is the expensive and awkward requirement of transporting the entire bulk sample to a lab where cyanide extraction can be done.

Advantages can be gained by separating out the fine fraction (-53 microns for this study). A 30g fine fraction sample will contain many more particles than a 30g traditional sample. The average size of the gold particles will be reduced, resulting in reported gold values representing more particles of gold, reducing particle sparsity problems. Maximum size of a gold grain that can cause nugget effect will be reduced. These advantages should result in data that is less erratic and more reproducible.

Studies by Delaney (1993) and DiLabio (1985) in the Cordillera and in the Canadian Shield demonstrate that the highest percentage of gold associated with known ore bodies in till, soil and sediment is contained in the very fine fraction. This suggests that by removing coarser fraction material, better anomaly definition should be possible using the fine fraction. The fine fraction is also expected to be less influenced by variations in hydraulic regime, reducing local sample site variations. Dilution of fine fraction anomalies will be expected to create relatively uniform dispersion trains that get stronger as the mineralization is approached.

Theory supporting the application of very fine fraction sediment sampling is outlined in O.F. 1993-9 (G), *Very Fine Stream Sediment Sampling For Gold* (MacKay, 1993).

RESEARCH OBJECTIVES

The main objectives of this project were to test the theoretical advantages of using fine fraction sediment geochemistry for gold exploration and to develop a practical technique for the collection and processing of very fine fraction sediment samples. Multi-element ICP analysis was also used to test the concentrations of a wide range of other elements.

PROJECT OUTLINE

This project compares -53 micron (-270 mesh) sediment geochemistry with -180 +53 micron (-80 +270 mesh) sediment geochemistry in 64 samples collected from 45 sites. A total of 24 heavy mineral concentrate samples were also collected from 18 of the 45 sites.

Sample Site Selection

Sample sites were selected on the basis of known significant gold mineralization, erratic RGS (Regional Geochemical Survey) gold data, and background RGS gold data. Target areas in glaciated and unglaciated regions were selected.

Site selections were based on the assumption that the drainages with known significant mineralization were target streams. Streams with erratic RGS results have gold occurrences that may or may not be significant. Streams with background gold values have no significant mineralization. An effective geochemical technique must be able to distinguish between these targets, clearly identifying anomalies worthy of follow-up.

Sample Site Considerations

The key factors that affect geochemical surveys are: exotic surfical deposits (till, glacial fluvial, glacial lacustrine, loess, volcanic ash), depth of weathering (glaciated, unglaciated), occurrence characteristics of gold in the bedrock source, source of sediment, and amount of mineralization that has been eroded into the stream.

Exotic Surficial Deposits

Exotic surficial deposits will dilute anomalies from bedrock sources or displace anomalies from their bedrock sources. This causes dispersion patterns to be shorter, and requires careful interpretation, especially in the case of displaced anomalies.

Loess and volcanic ash deposits can be assumed to have background gold content. Therefore, their presence in a drainage should act to dilute bedrock anomalies and shorten dispersion trains downstream from bedrock sources.

Glacial till can displace gold anomalies down-ice from their source. Sampling tills has been used in areas of extensive overburden as an effective tool for locating mineralization where ice movements have been established. A stream geochemical anomaly from an area draining till can be traced to mineralization if the anomaly is sourced from the till and the direction to the source of the till is known.

Glacial fluvial deposits can also cause anomaly displacement. Coarse fraction sediments may contain heavy minerals that are concentrated by hydraulic effects and can create large anomalies relating to glacial fluvial deposits that have been reworked a number of times and are completely removed from their source. The large volume of sediment involved in creating glacial fluvial deposits will dilute fine fraction sediment enough to make it unlikely that the fine fraction would return anything but background gold values.

Depth of Weathering and Occurrence Characteristics of Gold

Depth of weathering affects the breakdown of primary minerals containing gold, determining whether the fine fraction gold will be present in the fine fraction of the sediment. This directly relates to how the gold occurs in the bedrock source. If the gold occurs in solid solution or in very fine grains associated with sulfides, an unglaciated area with deep oxidation will have released that gold from the sulfides. However in an area with recent or active glaciation and little or no surface oxidation, much of that gold may still be expected to be contained in the sulfides in a coarser fraction of the stream sediment.

The size and chemical stability of the primary sulfides will affect the speed of their oxidation. If the gold occurs within resistant minerals such as quartz, a much longer process of weathering is required to release the gold. This could create an anomaly that reaches its highest value at a point downstream from where the resistant minerals break down, rather than having the anomaly show peak values nearest the deposit as might be expected.

Source of Sediment

In areas of active glaciation most of the sediment in the stream will be sourced from directly under the glacier, causing that part of the drainage to be over-represented. Mineralization that occurs elsewhere in the drainage will be correspondingly under-represented. In areas of discontinuous permafrost the areas that freeze and thaw will be over-represented in the drainage relative to areas that remain frozen. Colluvial deposits can similarly cause areas of high erosion to be over-represented in stream sediments.

Another consideration is that a large deposit that has only a small area of exposure may be expected to source a geochemical anomaly that would be similar to a small deposit that has a large area of exposure.

STUDY AREAS

Mt. Skukum District

Mt. Skukum is located 60km southwest of Whitehorse, Yukon on the northeast edge of the Coast Mountains. Elevations range from 1030m to 2200m. The area has undergone significant recent glaciation and small glaciers are still present at the headwaters of many drainages. Glacial deposits are generally locally derived except along the edges of the larger valleys where significant lateral moraines contain material that may have been transported several kilometers.

Regional geology is dominated by felsic volcanics and intrusives with minor metamorphics.

Ten sample sites were located in the Mt. Skukum area. Four sites were located on Butte Creek (Sites 3, 4, 7, 8), downstream of the formerly producing Mt. Skukum gold mine. Two sites were located on a tributary of Becker Creek which had returned erratic RGS gold results (Sites 1, 2). Four sites were located on two drainages that returned background gold values in RGS sampling (Site 5, 6, 9, 10).

Butte Creek

The Skukum vein gold deposit occurs at the headwaters of Butte Creek. Mineralization at Skukum is associated with quartz and calcite veins. Gold occurs as free grains up to 15-20 microns in size within quartz.

The Butte Creek drainage contains a complex mix of locally derived alluvial, colluvial and glacial deposits.

RGS sampling in 1985 returned a first analysis of 277 ppb with a repeat analysis of 130 ppb.

Four sample sites are located on Butte Creek. Site 4 is located approximately 500m downstream from the old gold mine, Site 3 is located 500m further downstream with Sites 7 and 8 one kilometer and two kilometers further downstream.

A flood event occurred in Butte Creek in 1991 when water contained behind ice in the workings of the old mine was released. This event likely had a large impact on the geochemistry of the drainage, causing the mine workings to be greatly over-represented.

Ketza River District

The Ketza River gold mine is located 180 km northeast of Whitehorse, Yukon within the Pelly Mountains. Elevations range from 2010m to 1100m. The area has undergone local glaciation, but there is no active glaciation at this time.

Regional geology is dominated by weakly metamorphosed carbonates and pelitic sediments with minor volcanics.

Eight sample sites were located in the Ketza River area. Four sites were located on Cache Creek downstream from the formerly producing Ketza River gold mine (Sites 11, 12, 13, 14). Another four sites were located on streams that returned background gold values in the RGS survey (Sites 15, 16, 18, 19).

Cache Creek

Gold at the Ketza River deposit is reported to be between 0.5 and 20 microns in size and associated with sulfides. However, coarser gold reportedly has been panned from oxide ore, suggesting coarsening of the gold during low pH oxidation.

The Cache Creek drainage contains locally derived till and glacial fluvial deposits.

Three samples were collected on Cache Creek during the RGS survey. A sample taken just below the deposit returned a first value of 3130 ppb and a second value of 158 ppb. A sample collected between there and the mouth of the stream returned 562 ppb with a second value of 25 ppb. A third sample taken at the mouth of Cache Creek returned values of 20 ppb and 16 ppb. This offers a good opportunity to demonstrate whether fine fraction sediment sampling can return more consistent results and demonstrate a longer dispersion train.

Site 11 is located on Cache Creek approximately 300m downstream from the known mineralization. Sites 12, 13 and 14 are located 1 km, 2.5 km, and 4.5 km further downstream respectively.

Sites 15 and 16 are located on the Ketza River upstream from its junction with Cache Creek. Sites 17 and 18 are located on the first drainage from the east into Ketza River below the junction with Cache Creek.

Dublin Gulch District

Dublin Gulch is located 370 km north of Whitehorse, Yukon within the Ogilvie Mountains. Elevation ranges from 730m to 1500m. This area has not undergone recent glaciation, therefore overburden is locally derived fluvial and colluvial deposits.

Regional geology contains quartz mica chlorite schist and quartz feldspar biotite intrusives.

Ten sample sites were located in the Dublin Gulch area. Four sites were located on Dublin Gulch downstream from the Dublin Gulch gold exploration project (Site 20, 21, 22, 23). Two sites were located on Lynx Creek which returned erratic gold values from the RGS survey (Site 24, 25). Four sites were located on streams with background RGS values (Site 26, 27, 28, 29).

Dublin Gulch

Mineralization at Dublin Gulch is reportedly similar to the Fort Knox deposit in Alaska and therefore a significant portion of the gold should be contained in the coarse fraction (+100 microns), although gold is also expected to occur in the very fine fraction. Coarse gold eroded from this deposit and concentrated by the hydraulic effect of the stream is likely the source of much of the placer gold that has been mined in Dublin Gulch and further downstream in Haggart Creek. Discontinuous permafrost is present at Dublin Gulch.

A single gold analysis from RGS sampling returned 120 ppb from Dublin Gulch.

Site 20 is located approximately 500m up Dublin Gulch from its junction with Haggart Creek at the approximate location of the RGS sample. Sites 21, 23, and 22 are located 600m, 1200m, and 2100m further upstream respectively.

Lynx Creek

Lynx Creek is located 10 km south of Dublin Gulch. This creek has a history of placer mining though no large scale mining has recently occurred.

RGS results from this stream returned 16 ppb on the first analysis and 170 ppb on the second analysis.

Site 24 is approximately at the location of the RGS sample and Site 25 is 500m further upstream. This should establish whether the anomaly on Lynx Creek is only associated with coarse gold or if there is a fine gold component that may point to potential bedrock mineralization.

Secret Creek

This drainage is located 10 km south of Dublin Gulch and has some history of placer mining. RGS results from two samples collected on this drainage returned values of -1 ppb.

Site 26 is at the approximate location of RGS sample 1024. The stream bed in this location has been disrupted by placer mining approximately two years previously. Site 27 is located 500m further upstream, above the area of extensive placer mining.

Sites 28 and 29 were collected 500m apart on a unnamed drainage that returned background RGS values along the west side of the Dublin Gulch road just as the road comes out of the Haggart Creek valley into the McQuesten River valley.

Brewery Creek District

The Brewery Creek area is located 400 km northwest of Whitehorse, Yukon, 60 km east of Dawson City. Elevations range from 600m to 1190m. This area has not undergone recent glaciation; however the lower valleys are covered by glacial fluvial deposits derived from valley glaciation in the higher Ogilvie Mountains to the north.

Regional geology consists of Paleozoic pelitic sediments with rare carbonates and volcanics that have been intruded by Cretaceous quartz feldspar biotite monzonite.

Mineralization at the Brewery Creek deposit is characterized by gold less than 0.5 microns in size, contained within fine-grained sulfides. Much of the upper 50m of the deposit has been oxidized, breaking down the sulfides and releasing the gold. The lower part of Laura Creek is bounded on the west by glaciofluvial deposits while the east side and the headwaters have not been recently glaciated. The entire drainage contains a significant blanket of McConnell glaciation loess (windblown silt). The loess should dilute geochemical response and shorten the dispersion train.

Laura Creek

Four sample sites are located on Laura Creek, which drains the area of mineralization at the Brewery Creek gold exploration project. Site 31 is located directly adjacent to the Canadian Zone mineralization. Sites 33, 32, and 30 are located 1.5 km, 3 km, and 8 km further downstream respectively.

The drainage also contains discontinuous permafrost which restricts erosion where present and causes stream sediments to be over-represented by areas that do not contain permafrost. The majority of mineralization outlined to date occurs in areas where no permafrost is present.

RGS sampling on Laura Creek reported a single analysis of 38 ppb. More detailed silt sampling by Noranda Exploration returned only one anomalous value of 20 ppb in 12 samples. All other samples returned the detection limit value of 10 ppb for the analytical technique used.

Quartz Creek

Two sites were located on Quartz Creek where RGS results returned erratic gold values. Quartz Creek is located on the south side of the Tintina Fault within the Klondike gold fields. Geology is dominated by quartz mica chlorite schist. Quartz Creek drains the south side of King Solomon Dome, southeast of Dawson City. This area has a long history of placer mining.

RGS results returned 55 ppb on the first analysis and 4 ppb on the second analysis. Quartz Creek branches at the location marked for the RGS sample. Site 35 is located 100m up the east branch of the fork and Site 36 is located 500m up the north branch of the fork. The north fork of Quartz Creek has recently been stripped to prepare for placer mining and the creek was routed along the east edge of the drainage behind a retaining berm. The samples for Site 36 were collected from sediments deposited along the new streambed.

Site 34 is located along the Dempster Highway 100 km north of Dawson City where RGS sampling returned background gold values.

Tootsee River District

Tootsee River is located 270 km southeast of Whitehorse, Yukon. Elevations range from 890m to 2000m. This area has undergone extensive broad glaciation. Much of the overburden may have been transported many kilometers. Five sample sites are located in this area. Two sites are located on a tributary of Tootsee River which returned erratic RGS results. Three other sites are located on unnamed streams that drain into the Rancheria River from the north. These streams all returned background RGS gold values.

One site was located on Judas Creek in an extensively glaciated area 55 km southeast of Whitehorse, which returned background RGS gold values.

BULK SEDIMENT

Sample Collection

A total of 43 of the 65 primary samples were collected by sieving material through a -2000 micron screen. The -2000 micron pre-screen removes oversize material to standardize samples collected from different areas. These samples were collected in medium and high energy stream environments. The remaining 22 samples were collected with no pre-screening from mostly low energy environments. Work in southern British Columbia, Thailand and Eastern Canada indicates wide variation in grain size of sediments from regions with different glacial and weathering histories. Therefore, the actual primary sample size required was expected to vary widely in the different regions of Yukon.

Table 1						
		Percentage of sample per fraction				
		for samples pre-sieved to -2000 microns.				
	Samples	-53	-180+53	-500+180	-1000+500	-2000+1000
*Skukum	16	5.5	4.9	15.4	23.1	51.1
Ketza	8	7.1	5.7	11	11.8	64.5
Dublin	11	4.3	4.1	10.6	14.6	66.3
Brewery	8	5.1	4.9	14.9	23.9	51.2
*Skukum pre-sieved to -1700 microns.						

The average -53 micron fraction contained in pre-sieved samples is 5.5% while one standard deviation is 2.8. For a minimum final sample of 100g of -53 micron material, 3731g of -2000 micron sediment will need to be collected to ensure enough sample at one standard deviation. Samples that showed anomalously low percentages of -53 micron sediment (e.g.. EFS-25A) were generally collected from medium energy environments that appeared sorted. These sites should be avoided.

Sample Separation

The largest hurdle to overcome in order to create a practical technique is finding a fast, efficient and error-free method to separate the very fine grain size fraction from the bulk sample. In order to maintain a homogeneous sample the separation must not rely on or be affected by the specific gravity of the individual grains.

The technique applied in this study involved wet sieving the bulk sample through vibrating nested sieves. The -53 micron (-270 mesh) fraction and the water used were collected in a container at the bottom and allowed to settle for 24 to 48 hours. After settling, the excess water was decanted and the sample was left to air dry. Once dry the sample was weighed and then transferred to a plastic bag for shipping.

The -180+53 micron (-80+270 mesh) fraction was transferred from the screens, air dried, weighed and also shipped for analysis.

The -1000 micron fraction can be examined under binocular microscope to identify major and minor lithologies represented and the presence of alteration or mineralization.

Wet sieving was selected to avoid the need to dry and disaggregate the bulk sample. This allows the equipment to be used in a field camp where drying bulk samples is impractical. It also prevents contamination of the fine fraction during disaggregation.

Samples of average composition were processed in this manner into six size fractions in 15 to 25 minutes.

Between samples all screens required cleaning in a sonic cleaner for ~5 to 10 minutes each. Delays caused by cleaning sieves could be reduced by having two complete sets of sieves.

Sample Analysis

The -53 micron fraction was split into two 30g subsamples and two 10g subsamples.

The first 30g subsample was analyzed for gold by fire assay with a neutron activation or atomic absorption finish. Samples from sites 1 to 19 that recorded a value less than 10 ppb on the first analysis had the second 30g subsample analyzed by the aqua-regia column technique that provides a 0.1 ppb detection limit with a 100 ppb upper limit. Samples from sites 20 to 45 that recorded a value less than 50 ppb on the first analysis had the second 30g subsample analyzed by the aqua-regia column technique. Samples that returned greater values on the first analysis were analyzed by fire assay AA on the second analysis.

One 10g split from each sample was analyzed for gold by aqua-regia AA.

The other 10g subsample was analyzed by aqua-regia ICP to determine values for antimony, arsenic, bismuth, cadmium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, phosphorous, silver, vanadium and zinc. Values for 15 other elements are also reported with this technique but are of limited value due to high detection limits or partial dissolution.

The -180+53 micron fraction was analyzed for gold and multi-elements using the same techniques. This provides a means for comparison between the two different grain sizes.

HEAVY MINERAL SAMPLING

Pan concentrate sampling for heavy minerals is perhaps the oldest form of geochemistry. It relies on the high specific gravity of gold and other elements and minerals of interest to separate them from bulk samples.

As part of this project a total of 24 heavy mineral samples were collected from 18 sites.

Collection and Processing

A 20kg -5000 micron bulk sample was collected from high energy sites within 10m of the primary fine sediment sites. The bulk samples were panned on site to less than 30g of heavy concentrate.

Analysis

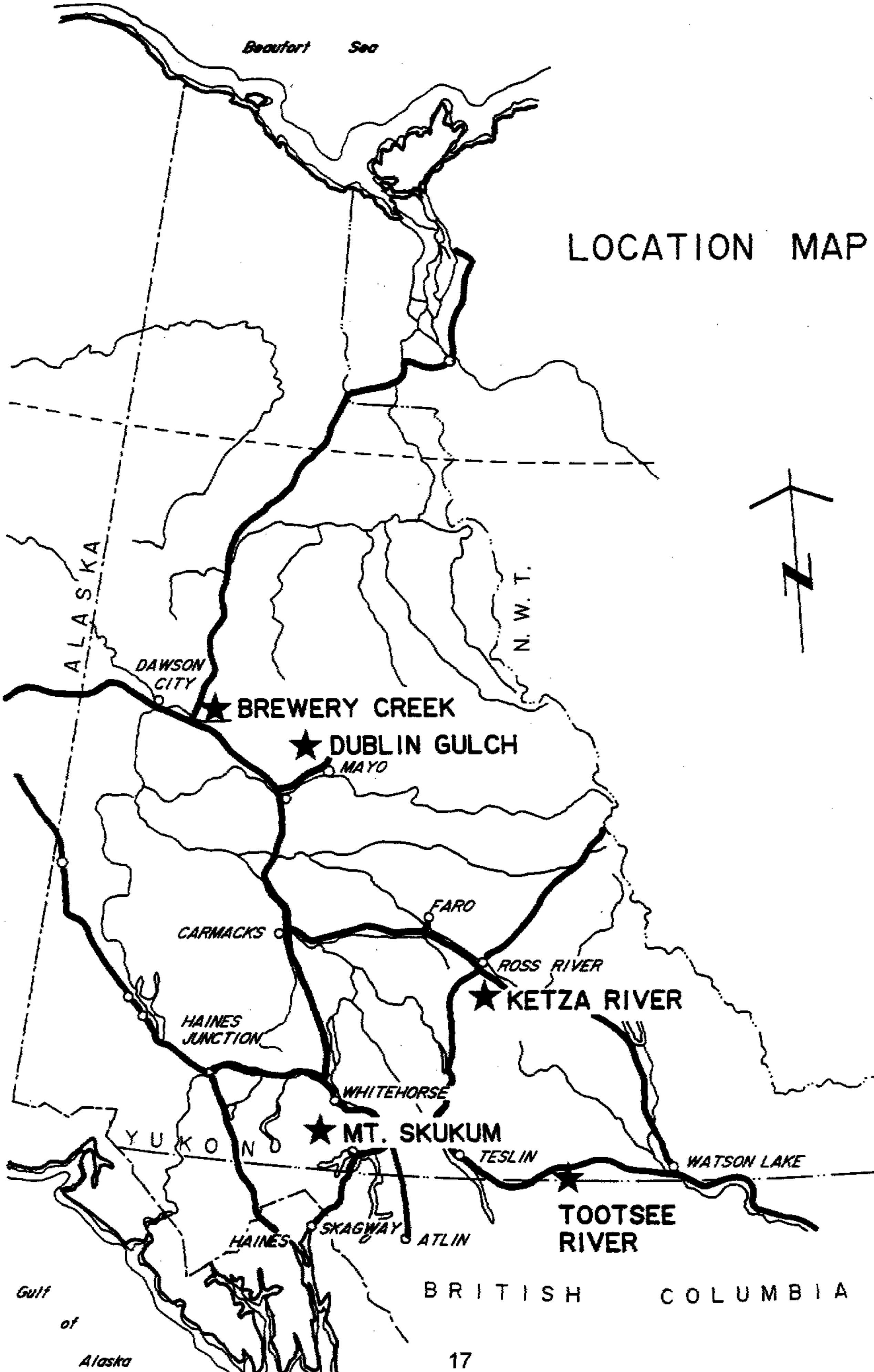
The pan concentrate samples were split and both splits were analyzed by fire assay with an AA finish, providing a total digestion of the sample.

RESULTS

Introduction

The goal of this project was to test the theoretical advantages of fine fraction sediment geochemistry. These advantages include less local sample site variation, greater sample homogeneity, and the ability to highlight drainages with potentially economic gold deposits. This project also shows dispersion trains downstream of known mineralization.

Results from the five main areas of the project are reviewed separately with data from gold and gold indicator elements.


LOCATION MAP
Beaufort Sea
ALASKA
N. W. T.
DAWSON CITY
BREWERY CREEK
DUBLIN GULCH
MAYO
FARO
CARMACKS
ROSS RIVER
KETZA RIVER
HAINES JUNCTION
WHITEHORSE
MT. SKUKUM
YUKON
TESLIN
WATSON LAKE
TOOTSEE RIVER
SKAGWAY
HAINES
ATLIN
BRITISH COLUMBIA
Gulf of Alaska

Mt. Skukum

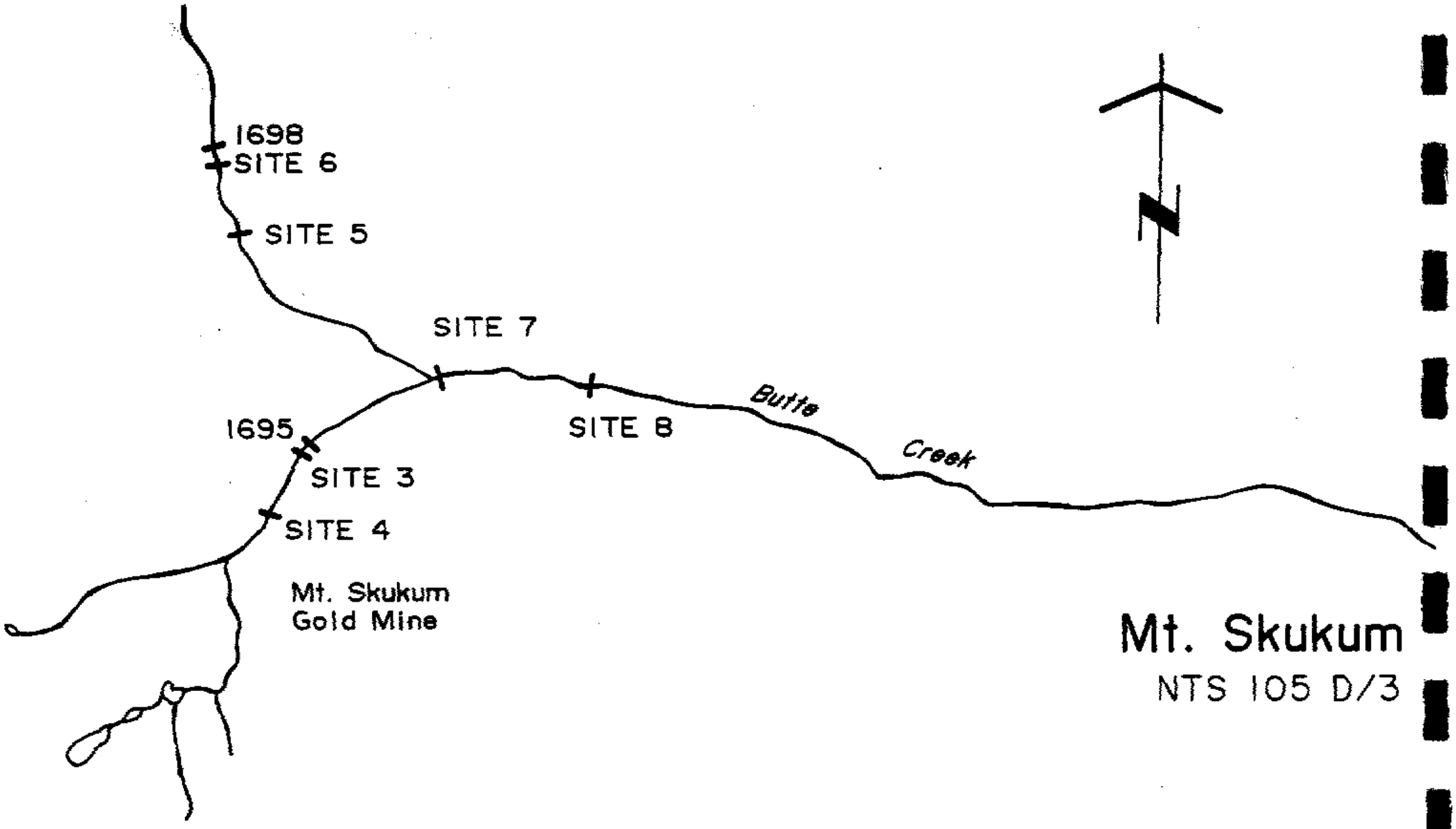
Results from Butte Creek, downstream of the Mt. Skukum gold mine, are believed to be strongly affected by sediments washed out of the mine workings during the 1991 flood event. Original RGS values, before the flood, returned a high value of 277 ppb approximately one kilometer downstream from the mine. This compares to values in this study from approximately the same location of 2532 ppb for the -53 micron fraction and 2491 ppb for the -180+53 micron fraction.

Very high gold values were returned from Butte Creek for both size fractions. The fine fraction (-53 microns) returned generally higher values that have less local sample site variation as shown by the duplicate samples.

The results from the tributary on the west side of Becker Creek indicate that while the erratic RGS values likely relate to the nugget effect of pan concentrate recoverable gold, a moderate fine fraction anomaly may suggest the presence of potentially significant mineralization upstream of site 2.

Erratic values from sites 9 and 10 suggest the potential for a coarse gold source upstream from site 10.

ICP results for the key gold indicator elements, silver, arsenic, and antimony, at Mt. Skukum show the fine fraction to contain much higher silver values, higher arsenic values and erratic antimony values. ICP detection limits for mercury are too high to be of practical use.


1698
SITE 6
SITE 5
SITE 7
SITE 8
Butte
Creek
1695
SITE 3
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Mt. Skukum
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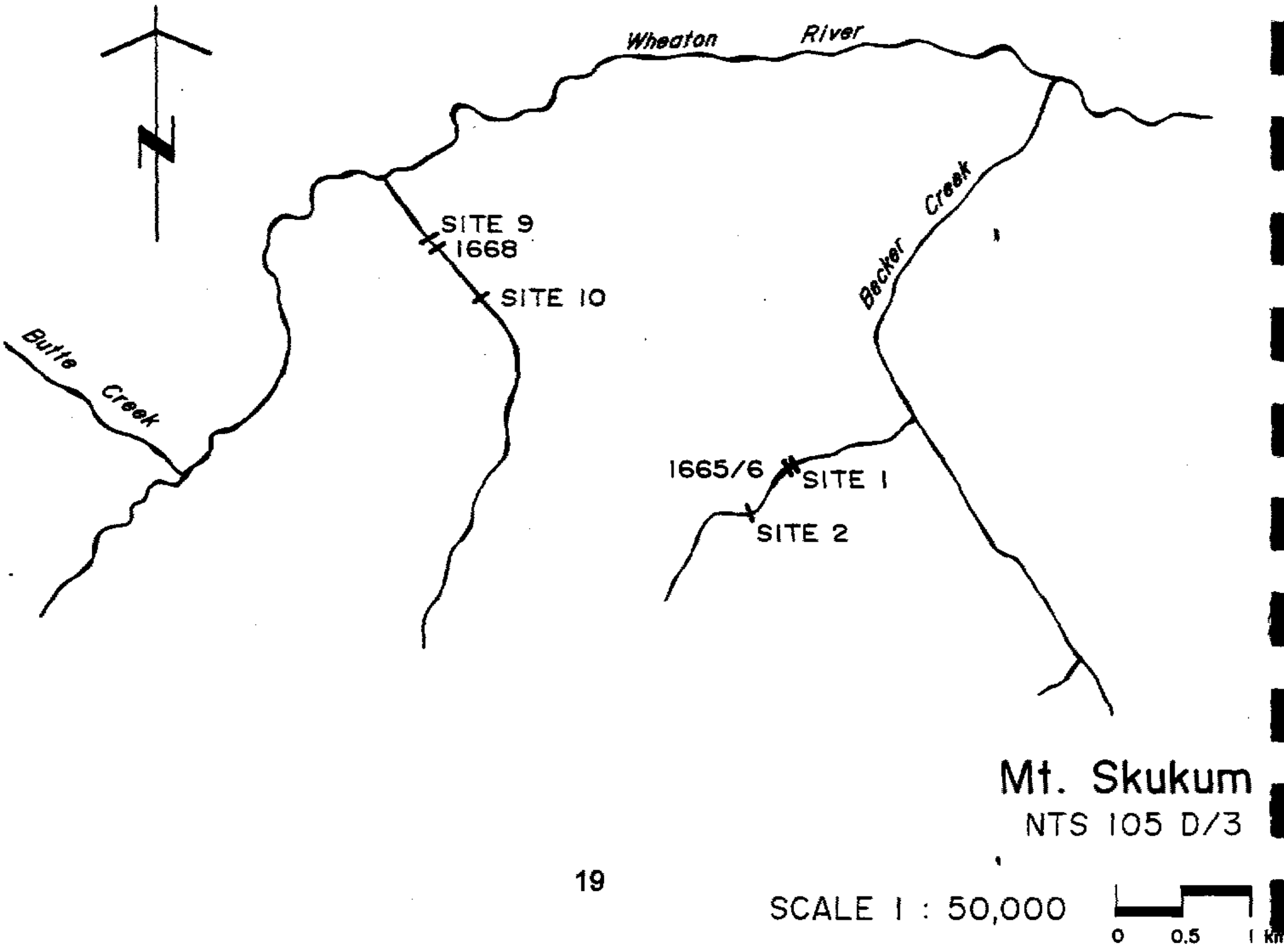
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River
SITE 9
1668
SITE 10
Becker
Creek
Butte
Creek
1665/6
SITE 1
SITE 2
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0.5
1 km

MOUNT SKUKUM

Gold Values

FINE FRACTION -53 MICRON				COARSE FRACTION -180+53 MICRON			
Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR	Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR
E-1A	45	40	20	E-1A	6	3	5
E-1B	23	30	15	E-1B	3	17	10
E-2A	49	50	20	E-2A	3	3	-5
E-2B	49	25	20	E-2B	17	30	5
M-3A	2532	2410	1380	M-3A	2255	2491	560
M-3B	1585	1550	920	M-3B	620	862	1000
M-4A	1410	1400	940	M-4A	1108	1101	700
M-4B	1525	1480	940	M-4B	2480	1858	1280
B-5	10	-5	5	B-5	8	4	-5
B-6	3	*1.9	-5	B-6	1	-1	-5
M-7A	2152	2220	1300	M-7A	684	752	380
M-7B	2566	2620	1600	M-7B	816	872	860
M-8A	2267	2280	1400	M-8A	639	607	400
M-8B	2143	2220	1460	M-8B	1067	1054	560
B-9	19	15	10	B-9	3	5	-5
B-10	32	-5	10	B-10	140	399	-5

* 30g AR column

MT SKUKUM							
Gold Indicator Elements							
FINE FRACTION -53 MICRONS				COARSE FRACTION -180+53 MICRONS			
Sample	Ag ppm	As ppm	Sb ppm	Sample	Ag ppm	As ppm	Sb ppm
E-1A	0.6	66	18	E-1A	-0.2	24	2
E-1B	0.4	44	4	E-1B	-0.2	24	2
E-2A	0.6	46	12	E-2A	-0.2	26	2
E-2B	0.6	44	2	E-2B	-0.2	36	-2
M-3A	2.4	62	-2	M-3A	0.6	56	-2
M-3B	2.0	70	44	M-3B	0.4	48	-2
M-4A	2.0	56	2	M-4A	0.6	40	-2
M-4B	2.0	78	-2	M-4B	1.0	54	2
B-5	0.4	2	-2	B-5	-0.2	8	-2
B-6	0.6	12	4	B-6	-0.2	10	-2
M-7A	2.2	62	2	M-7A	1.0	24	2
M-7B	2.8	64	-2	M-7B	0.4	44	-2
M-8A	1.8	62	2	M-8A	0.6	16	-2
M-8B	2.8	56	2	M-8B	1.6	38	-2
B-9	0.6	52	6	B-9	-0.2	18	2
B-10	0.6	44	2	B-10	-0.2	14	6

Ketza River

The tailings facility at the formerly producing Ketza mine is situated on the old streambed of Cache Creek at the approximate location of the anomalous RGS sample near the mine. The drainage has been routed around the tailings facility. Site 11 is located in the original drainage just below the tailings facility.

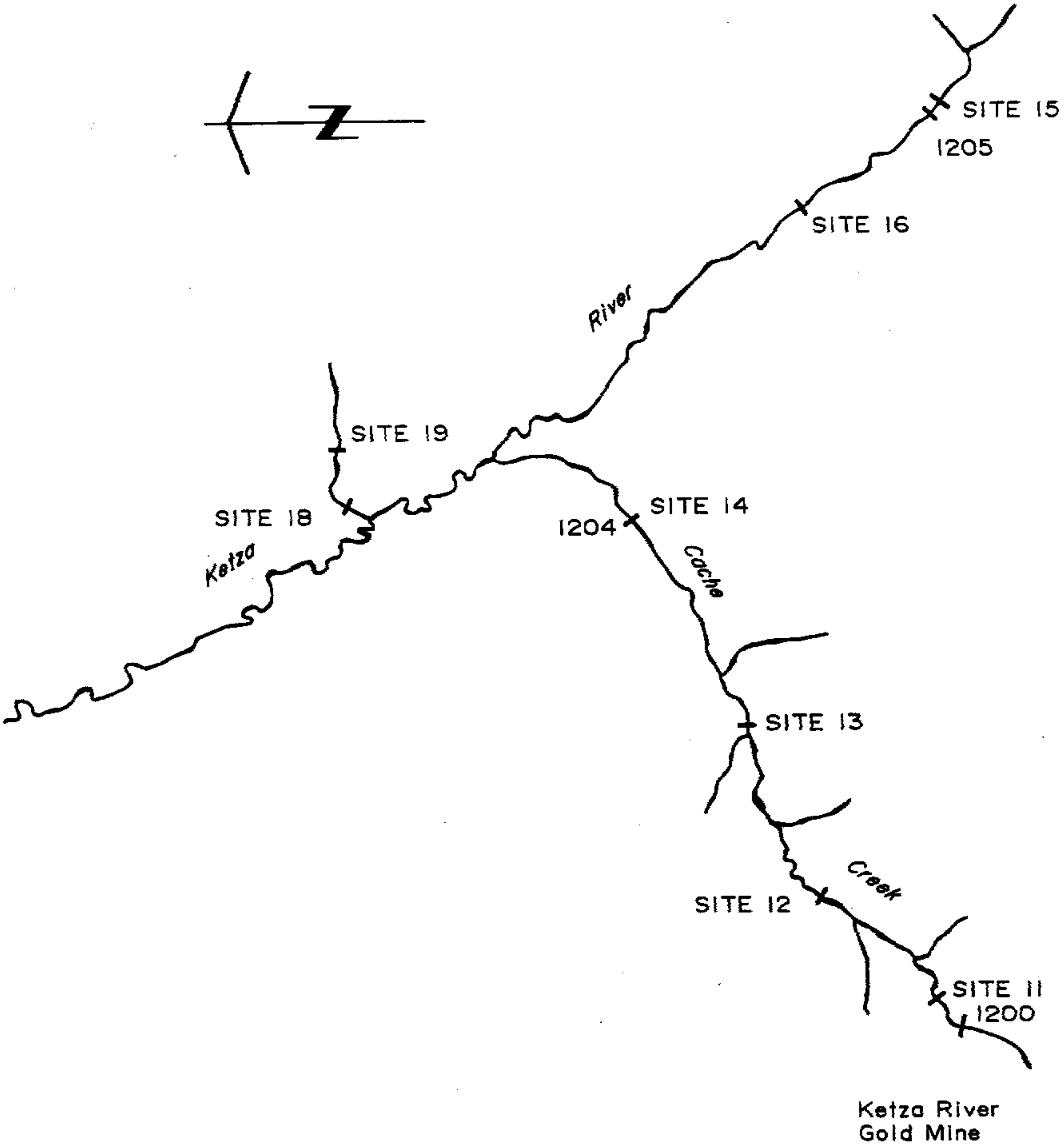
Sites 13 and 14 are located 3 km and 4.5 km downstream from the known mineralization respectively. At these two sites the duplicate samples(13B and 14B) were collected from low energy environments and did not require pre-sieving. While the primary samples collected from medium energy environments returned strongly anomalous values the samples from the low energy environments returned much lower values. This is in contradiction to the hypothesis that the fine fraction would show very little local sample site variation and not be significantly affected by hydraulic regime. The explanation for this may relate to the specific gravities of non-mineralized grains in the sediment. If the drainage contains a large proportion of light minerals (i.e.. micas) it could be expected that these minerals would be greatly over-represented in the low energy environments. If these minerals have background gold values they would be expected to dilute the gold in the low energy environments to background levels. This is believed to be the situation in Cache Creek.

Results from Sites 11 and 12, located closer to the former mine, show the fine fraction has less local sample site variation and duplicate analysis variation.

Gold dispersion in the fine fraction downstream of the Ketza mine.		
Average of analyses from each site, discounting samples 13B and 14B.		
Site 11	0.3 km downstream from Ketza mine	669 ppb
Site 12	1.3 km downstream from Ketza mine	272 ppb
Site 13	2.8 km downstream from Ketza mine	119 ppb
Site 14	4.8 km downstream from Ketza mine	99 ppb

ICP results for gold indicator elements show strong anomalies with good dispersion trains from the source for arsenic in both size fractions. However, silver values in the coarse fraction from Cache Creek are all at or below the detection limit, while the fine fraction shows moderate anomalies at the two sites closest to the mineralization. The pattern for silver is repeated for antimony.

High silver values for sample B-16 are likely related to silver lead veins in the district as that sample also returned high lead values.



Ketza River

NTS 105 F/9

SCALE 1 : 50,000

KETZA RIVER							
Gold Values							
FINE FRACTION -53 MICRON				COARSE FRACTION -180+53 MICRON			
Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR	Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR
M-11A	748	790	185	M-11A	700	610	900
M-11B	599	540	195	M-11B	270	187	55
M-12A	220	195	110	M-12A	86	262	30
M-12B	353	320	155	M-12B	157	799	65
M-13A	128	110	80	M-13A	275	58	30
M-13B	15	-5	-5	M-13B	3	3	-5
M-14A	99	100	50	M-14A	38	40	15
M-14B	5	*1.8	-5	M-14B	67	3	-5
B-15	1	*1.6	-5	B-15	1	-1	-5
B-16	8	*3.9	5	B-16	3	5	-5
B-18	1	*1.1	-5	B-18	-1	-1	-5
B-19	4	* -0.1	-5	B-19	1	-1	-5

* 30g AR column

KETZA RIVER

Gold Indicator Elements

FINE FRACTION -53 MICRONS				COARSE FRACTION -180+53 MICRONS			
Sample	Ag ppm	As ppm	Sb ppm	Sample	Ag ppm	As ppm	Sb ppm
M-11A	0.8	1168	12	M-11A	0.2	954	4
M-11B	0.8	1224	14	M-11B	0.2	724	2
M-12A	0.4	338	4	M-12A	-0.2	214	2
M-12B	0.2	412	4	M-12B	0.2	244	2
M-13A	0.2	138	2	M-13A	-0.2	120	4
M-13B	-0.2	28	2	M-13B	-0.2	18	-2
M-14A	0.2	162	4	M-14A	0.2	150	-2
M-14B	-0.2	24	4	M-14B	-0.2	30	-2
B-15	0.2	12	2	B-15	-0.2	-2	-2
B-16	1.8	34	8	B-16	0.8	26	4
B-18	-0.2	-2	4	B-18	-0.2	-2	-2
B-19	-0.2	2	-2	B-19	-0.2	10	-2

Dublin Gulch

Dublin Gulch has active placer mining operations and therefore sites 20 and 21 were located in very disrupted streambed. Sites 22 and 23 were located above the active placer operations.

Site 20 shows a good example of differences in local sample site variation between the two size fractions. Sample 20A returned values of 120 ppb and 135 ppb in the fine fraction and values of 70 ppb and 25 ppb in the coarse fraction. Sample 20B collected 2m away returned values of 205 ppb and 280 ppb in the fine fraction, and values of 1380 ppb and 1030 ppb in the coarse fraction.

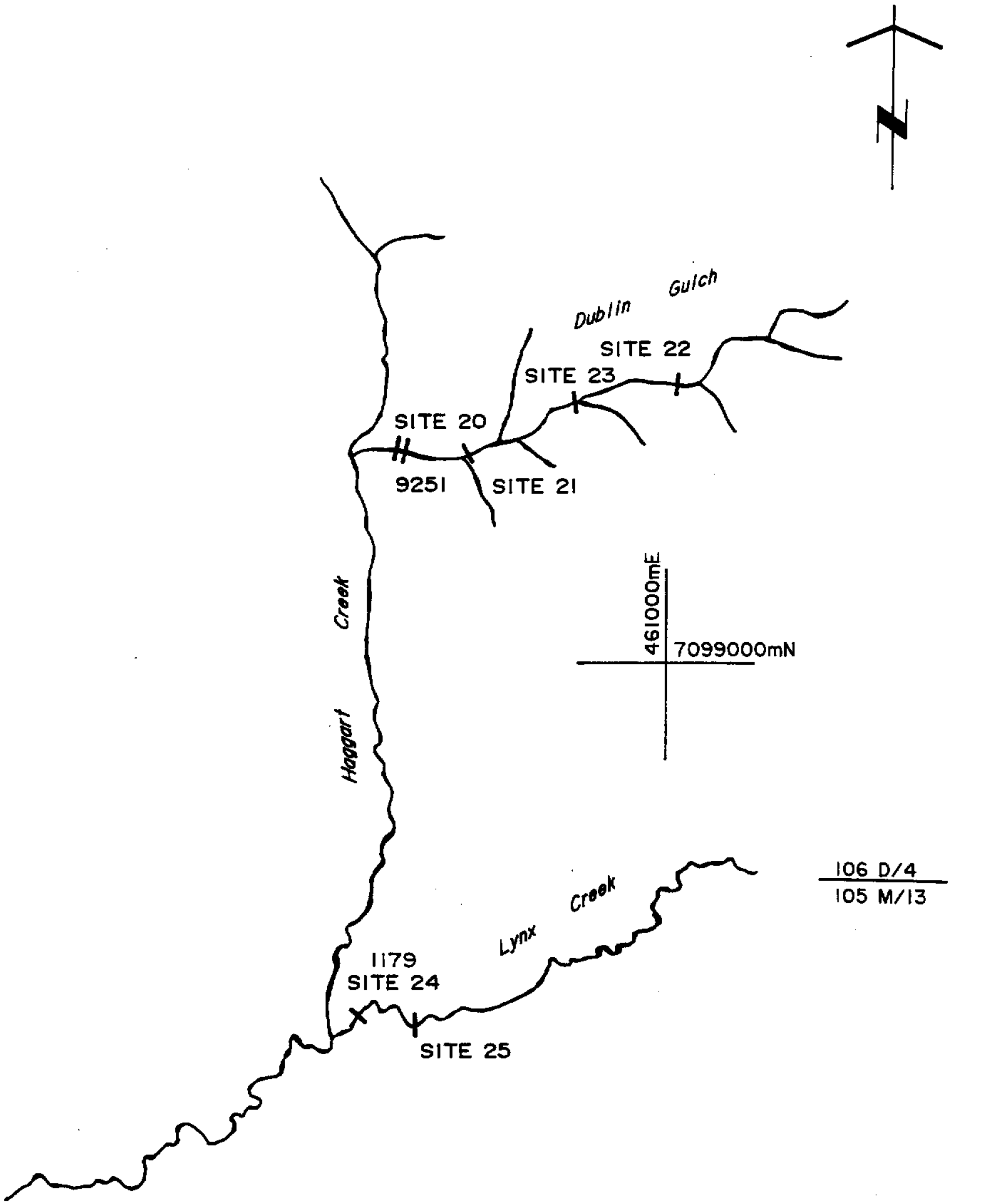
Not including sample 23B the coarse fraction values ranged from a high of 1380 ppb to a low of 20 ppb while the fine fraction values ranged from 280 ppb to 55 ppb.

Sample 23B was collected from a moss mat in a high energy portion of the stream. 30g analysis of the coarse fraction returned 5630 ppb and 5250 ppb gold and 600 ppm tungsten while the fine fraction returned 180 ppb and 170 ppb gold and 40 ppm tungsten. This indicates that moss mats may act as natural hydraulic concentrators for gold and other heavy minerals. This suggests the potential for moss mats to be an effective sample medium for placer gold, tungsten, cassiterite, or other heavy mineral deposits where the element of interest is coarse grained (+53 microns) and resistant to chemical dissolution.

Lynx Creek (Sites 24 and 25), which has erratic RGS results, shows the greatest disparity between the fine fraction and the coarse fraction. Three of the four samples returned very high though erratic values in the coarse fraction fire assay. In the fine fraction only one analysis out of eight was above 15 ppb, returning 50 ppb. Traditional sampling would possibly have placed Lynx Creek above Dublin Gulch for follow-up priority.

Site 26, located on Secret Creek, which returned background RGS results, also returned very high values in the coarse fraction and detection limit values in the fine fraction. Of the samples from Lynx and Secret Creeks that returned very high coarse fraction values only one returned a value in the coarse fraction 10g AR analysis that was above detection limit. It is expected that duplicate 10g analysis of these samples would randomly return gold values from detection limit to thousands of ppb's.

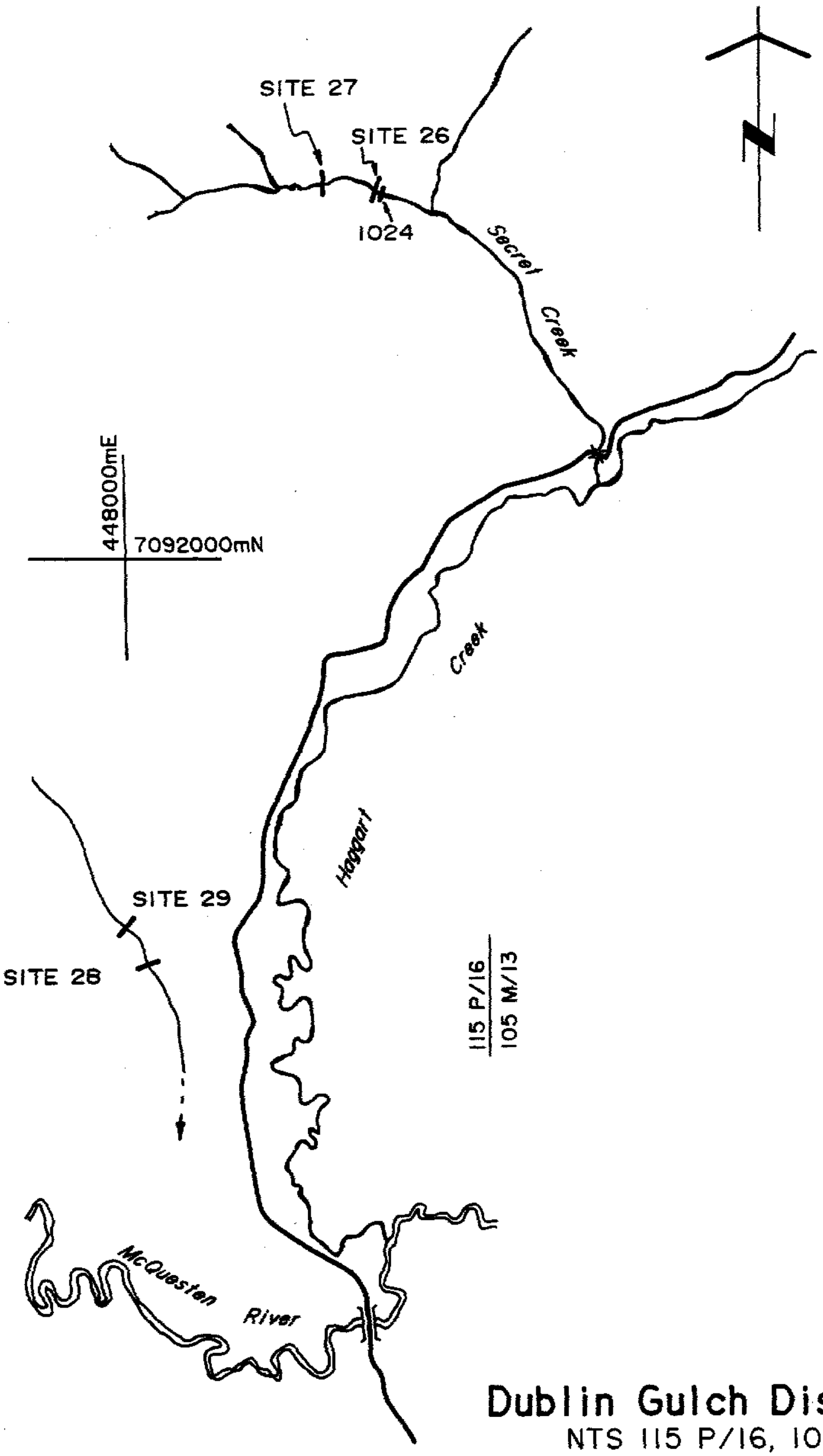
In Dublin Gulch silver values in the fine fraction are consistently above detection limit while two of the four samples returned less than detection limit values for silver in the coarse fraction. The fine fraction returned generally higher arsenic values and both fractions returned nearly identical antimony values. All values for bismuth from both fractions were below detection limit.



Dublin Gulch

NTS 106 D/4, 105 M/13

SCALE 1 : 50,000



Dublin Gulch District

NTS 115 P/16, 105 M/13

SCALE 1:50,000

0 0.5 1

DUBLIN GULCH

Gold Values

	FINE FRACTION -53 MICRON				COARSE FRACTION -180 +53 MICRON		
Sample Number	Au ppb 30g FA	Au ppb 30g FA	Au ppb 10g AR	Sample Number	Au ppb 30g FA	Au ppb 30g FA	Au ppb 10g AR
	1st run	2nd run			1st run	2nd run	
M-20A	120	135	85	M-20A	70	25	25
M-20B	205	280	110	M-20B	1380	1030	55
M-21A	95	95	110	M-21A	40	30	-5
M-21B	170	190	100	M-21B	20	45	-5
M-22A	80	80	55	M-22A	130	710	235
M-22B	60	70	15	M-22B	40	50	-5
M-23A	75	55	20	M-23A	935	1080	-5
M-23B	180	170	100	M-23B	5630	5250	2700
E-24A	5	*4.4	-5	E-24A	-5	-5	-5
E-24B	50	*4.8	5	E-24B	740	1520	1540
E-25A	15	10	55	E-25A	725	405	-5
E-25B	5	*3.0	5	E-25B	155	280	-5
B-26	-5	*7.1	-5	B-26	600	305	-5
B-27	-5	*2.7	-5	B-27	-5	-5	-5
B-28	25	*15.7	5	B-28	-5	-5	-5
B-29	-5	*0.7	5	B-29	-5	-5	-5

* 30g AR column

DUBLIN GULCH							
Gold Indicator Elements							
FINE FRACTION -53 MICRONS				COARSE FRACTION -180+53 MICRONS			
Sample	Ag ppm	As ppm	Sb ppm	Sample	Ag ppm	As ppm	Sb ppm
M-20A	0.2	300	6	M-20A	0.2	296	6
M-20B	1.0	804	20	M-20B	1.2	1188	20
M-21A	0.4	360	8	M-21A	-0.2	200	4
M-21B	0.2	502	8	M-21B	-0.2	374	6
M-22A	0.6	920	18	M-22A	-0.2	478	18
M-22B	0.6	1006	20	M-22B	-0.2	478	20
M-23A	0.4	528	4	M-23A	-0.2	314	4
M-23B	0.2	254	4	M-23B	0.4	198	4
E-24A	-0.2	148	-2	E-24A	-0.2	62	2
E-24B	0.2	152	2	E-24B	-0.2	66	4
E-25A	-0.2	204	2	E-25A	-0.2	82	-2
E-25B	-0.2	98	2	E-25B	-0.2	76	-2
B-26	0.4	46	10	B-26	-0.2	22	4
B-27	0.4	40	6	B-27	-0.2	20	4
B-28	0.2	24	2	B-28	-0.2	6	-2
B-29	-0.2	20	-2	B-29	-0.2	8	-2

Brewery Creek

Samples from Laura Creek, which drains the Brewery Creek gold deposit, returned consistent low anomalous values in the fine fraction, with no results at or below detection limit. Except for one erratic value of 150 ppb the coarse fraction sampling returned above detection limit values only in the two sites closest to the known mineralization.

Samples 31A and 33B were collected from low energy environments and did not require pre-sieving. Unlike similar samples 13B and 14B, collected from Cache Creek, results from samples 31A and 33B are not significantly different from the duplicate samples which were collected from higher energy environments.

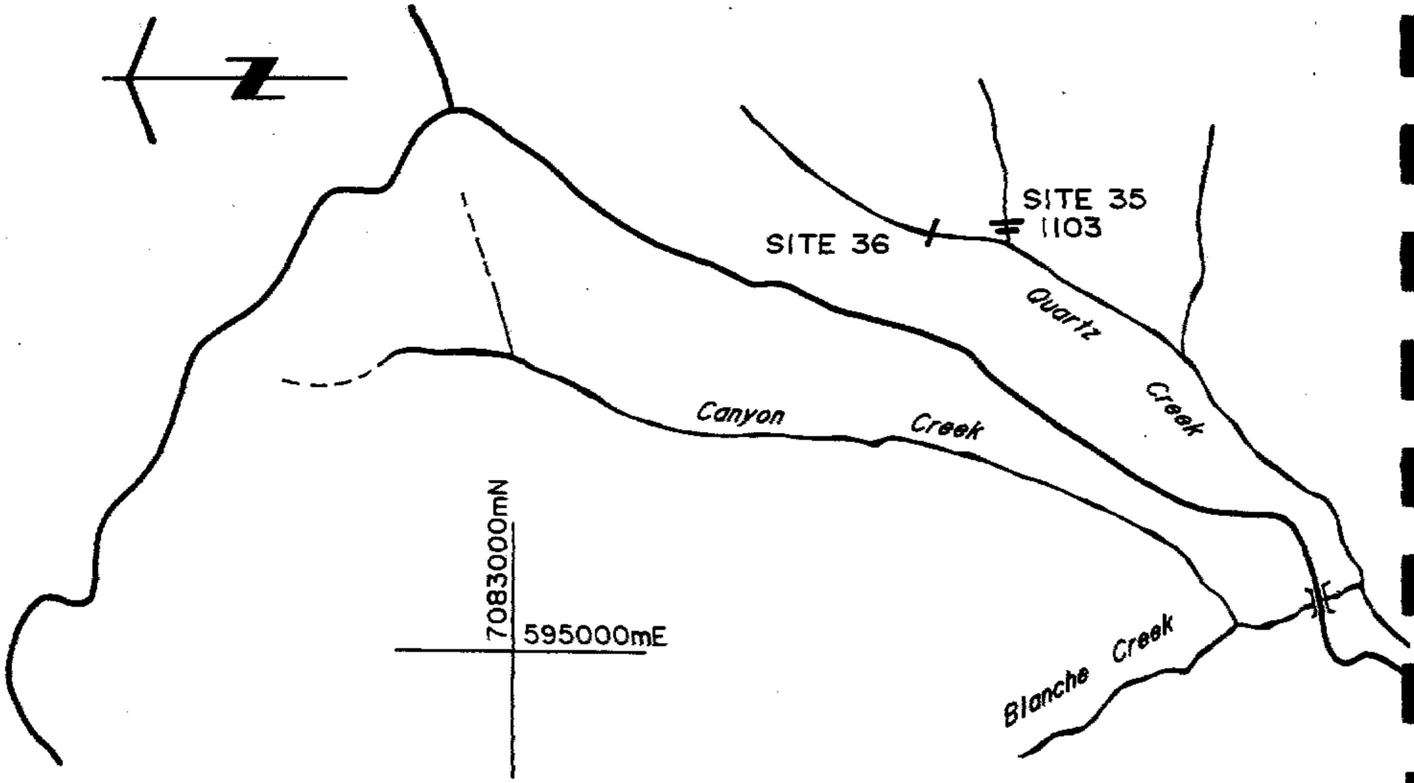
The lack of strong anomaly definition is believed to result from dilution caused by extensive loess deposits in the area. The average of the four analyses from each site show a regular dispersion train with the highest value within the area of the known mineralization.

Dispersion of gold in the fine fraction downstream of the Brewery Creek gold project. Values are average of 4 analyses from each site.		
Site 31	Canadian Zone	37.0 ppb
Site 33	1.5 km downstream from Site 31.	35.6 ppb
Site 32	3 km downstream from Site 31.	23.3 ppb
Site 30	8 km downstream from Site 31.	16.1 ppb

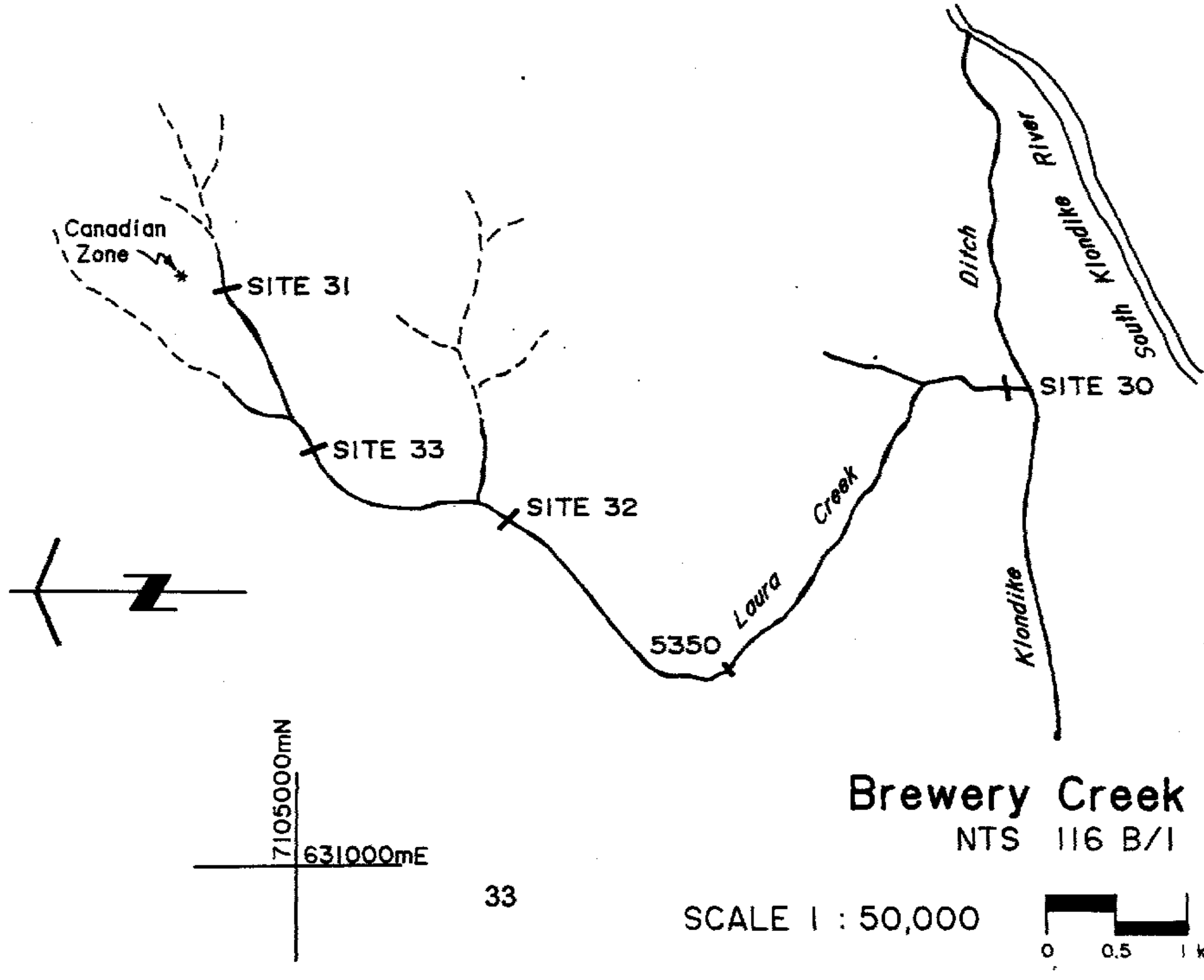
It was anticipated that values in the fine fraction at Site 31 would have been significantly higher and by Site 30 would have been diluted to detection limit. This is not the case and there is no obvious explanation.

Site 36 is located on the north fork of Quartz Creek. This drainage is located in the Klondike goldfields and was selected because of its erratic RGS values. Results from this site returned erratic coarse fraction values with a strong consistent anomaly in the fine fraction. This may suggest the potential for significant bedrock mineralization upstream.

All but one of the coarse fraction silver values from Laura Creek returned values at or below detection limit. Both fractions returned strong antimony and arsenic anomalies.



Quartz Creek
NTS 115 O/14



Brewery Creek
NTS 116 B/1

SCALE 1 : 50,000

0 0.5 1 km

BREWERY CREEK							
Gold Values							
FINE FRACTION -53 MICRON				COARSE FRACTION -180 +53 MICRON			
Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR	Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR
M-30A	25	*12.6	5	M-30A	-5	150	-5
M-30B	15	*11.9	5	M-30B	-5	-5	-5
M-31A	40	*30.5	20	M-31A	25	25	5
M-31B	45	*32.5	25	M-31B	10	15	10
M-32A	40	*17.6	10	M-32A	5	-5	10
M-32B	20	*15.5	10	M-32B	-5	-5	5
M-33A	45	*24.5	20	M-33A	10	10	5
M-33B	35	*37.9	20	M-33B	15	15	-5
B-34	-5	*1.9	-5	B-34	-5	-5	-5
E-35A	-5	*4.5	5	E-35A	-5	-5	-5
E-35B	10	*10.3	-5	E-35B	-5	-5	5
E-36A	65	70	20	E-36A	640	25	-5
E-36B	30	*48.6	10	E-36B	-5	-5	-5
* 30g AR column							

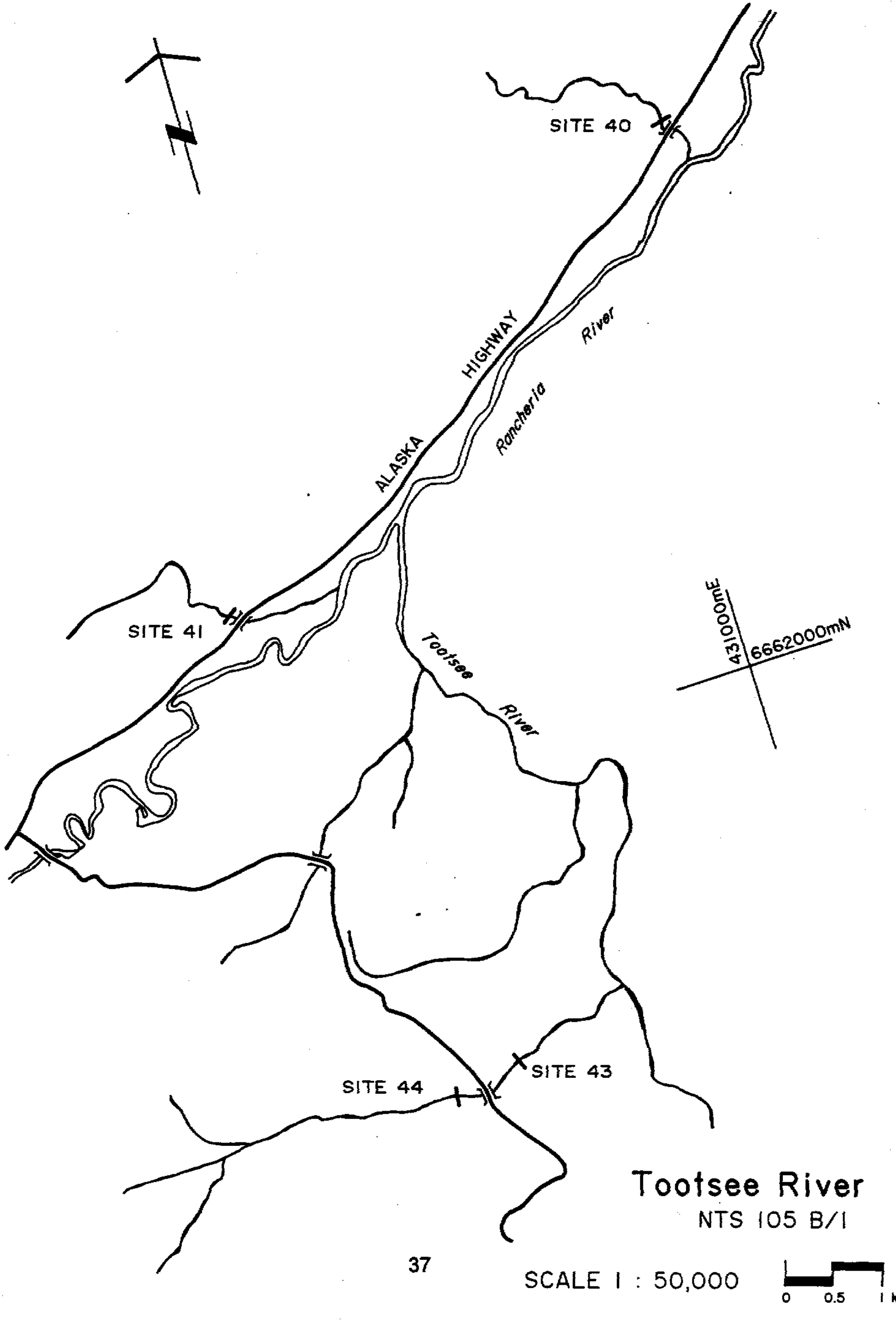
BREWERY CREEK							
Gold Indicator Elements							
FINE FRACTION -53 MICRONS				COARSE FRACTION -180+53 MICRONS			
Sample	Ag ppm	As ppm	Sb ppm	Sample	Ag ppm	As ppm	Sb ppm
M-30A	0.4	80	12	M-30A	0.2	56	8
M-30B	0.6	94	14	M-30B	-0.2	52	12
M-31A	0.6	80	48	M-31A	0.4	80	38
M-31B	0.6	140	44	M-31B	-0.2	88	54
M-32A	0.4	74	14	M-32A	0.2	66	12
M-32B	0.6	156	14	M-32B	-0.2	72	4
M-33A	0.8	130	44	M-33A	0.2	74	34
M-33B	0.6	52	24	M-33B	0.2	56	28
B-34	0.4	28	-2	B-34	-0.2	6	-2
E-35A	-0.2	14	-2	E-35A	-0.2	8	-2
E-35B	0.2	18	2	E-35B	-0.2	12	-2
E-36A	0.4	26	-2	E-36A	-0.2	12	-2
E-36B	0.4	42	-2	E-36B	-0.2	16	-2

Tootsee River

All the samples collected from the Tootsee River area returned background gold values.

It is possible that sites 43 and 44 that were intended to be collected from a drainage with erratic RGS gold values were not collected from the same drainage as the RGS samples. Accurate location of RGS sample sites can be difficult.

Results of gold indicator elements from the Tootsee River area help to confirm higher background values for the fine fraction.


SITE 40
ALASKA HIGHWAY
Rancheria River
SITE 41
Tootsee River
431000mE
6662000mN
SITE 43
SITE 44
Tootsee River
NTS 105 B/1
SCALE 1 : 50,000
0
0.5
1 km

TOOTSEE RIVER

Gold Values

FINE FRACTION -53 MICRON				COARSE FRACTION -180 +53 MICRON			
Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR	Sample Number	Au ppb 30g FA 1st run	Au ppb 30g FA 2nd run	Au ppb 10g AR
B-40	-5	*1.2	-5	B-40	-5	-5	-5
B-41	-5	*1.4	-5	B-41	-5	-5	-5
B-42	-5	*19.0	-5	B-42	-5	-5	-5
E-43A	-5	*1.9	-5	E-43A	-5	-5	-5
E-43B	-5	*1.7	-5	E-43B	-5	-5	-5
E-44A	-5	*0.9	-5	E-44A	-5	-5	-5
E-44B	-5	*1.1	-5	E-44B	-5	-5	-5
B-45	-5	*15.3	-5	B-45	-5	-5	-5

* 30g AR column

TOOTSEE RIVER							
Gold Indicator Elements							
FINE FRACTION -53 MICRONS				COARSE FRACTION -180+53 MICRONS			
Sample	Ag ppm	As ppm	Sb ppm	Sample	Ag ppm	As ppm	Sb ppm
B-40	-0.2	16	-2	B-40	-0.2	6	2
B-41	0.6	48	4	B-41	-0.2	12	2
B-42	0.4	12	-2	B-42	-0.2	-2	-2
E-43A	0.6	42	2	E-43A	-0.2	28	2
E-43B	0.4	68	2	E-43B	-0.2	22	-2
E-44A	0.4	58	-2	E-44A	-0.2	20	-2
E-44B	0.6	78	-2	E-44B	-0.2	28	-2
B-45	0.4	12	-2	B-45	-0.2	-2	-2

Pan Concentrate Sampling

Pan concentrate sampling was expected to return high values from mineralized drainages, as most significant mineralization is expected to have some gold occur as grains coarse enough to be recovered by pan concentrate sampling. High values were also expected from erratic drainages as it is believed that the erratic values result from rare coarse grains. Very low values were expected from drainages with background RGS results as no gold was expected in these drainages.

The pan concentrate sampling carried out in this program was ineffective in separating the three drainage types.

Samples were not collected at Dublin Gulch because the disruption caused by placer mining made location of established high energy environments very difficult.

PAN CONCENTRATE DATA

Gold values for pan concentrate represents complete digestion of concentrate panned from 20kg of -5000 micron sediment, reported in parts per billion (ppb).

CF is the 180 to 53 micron fraction with duplicate 30 FA analysis.
FF is the -53 micron fraction of the same sample.

Samples prefixed with M were collected from streams draining significant known mineralization.

Samples prefixed with E were collected from streams that returned erratic gold values from RGS silt sampling.

Samples prefixed with B were collected from streams that returned background gold values from RGS silt sampling.

Sample	pan con	CF 1st run	CF 2nd run	FF 1st run	FF 2nd run
E-01	3313	3	6	45	40
E-02	2758	3	3	49	50
M-03	>10000	2491	2255	2532	2410
M-08	4231	607	639	2267	2280
M-12A	>10000	262	86	220	195
M-12B	4719	799	157	353	320
M-14A	>10000	40	38	99	100
M-14B	241	3	67	5	1.8
B-15	7	-1	1	1	1.6
B-18	19	<1	<1	1	1.1
E-24A	9943	-5	-5	5	4.4
E-24B	7302	740	1520	50	4.8
E-25A	9076	725	405	15	10
E-25B	>10000	155	280	5	3
B-27	>10000	-5	-5	-5	2.7
B-28	3718	-5	-5	25	15.7
M-30A	613	-5	150	25	12.6
M-30B	29	-5	-5	15	11.9
M-33A	9	10	10	45	24.5
M-33B	31	15	15	35	37.9
E-35A	>10000	-5	-5	-5	4.5
B-40	41	-5	-5	-5	1.2
E-43A	383	-5	-5	-5	1.9
E-44	8	-5	-5	-5	0.9

CONCLUSION

The -2000 micron bulk samples were found to contain an average of 5.5% -53 micron sediment with a 2.8% standard deviation. Collection of the -2000 micron primary sample, using a flexible screen, takes 5 to 90 minutes depending on the wetness of the sample. Wet sieving of the -2000 micron bulk sample into the two size fractions selected for this study takes approximately 15 to 20 minutes using mechanical sieving equipment designed for this project.

The -53 micron fraction effectively identified drainages with known mineralization, providing good anomaly definition and long dispersion trains. Sub-sampling variation and local sample site variation are significantly reduced in the -53 micron fraction. The fine fraction and the coarse fraction created two sets of data that are distinctly different. The importance of being able to distinguish between Dublin Gulch and Lynx Creek at the earliest stage of exploration is dramatically magnified by the knowledge that for every Dublin Gulch there are a great many Lynx Creeks. Of even greater importance for the future of exploration and mineral development in the Yukon is the Brewery Creek example where fine fraction sediment geochemistry returned a moderate but consistent anomaly while the coarse fraction samples returned weak and erratic results.

Fine fraction sediment geochemistry (-53 microns) returns generally higher values for all elements. This moves anomalous values for elements, most notably silver, away from the detection limit.

RECOMMENDATIONS

Evidence from this orientation survey demonstrates the potential to improve the success rate of reconnaissance exploration for gold by collecting fine fraction sediment samples as a first step in exploration. Increased project cost at this stage could be greatly offset by more efficient and successful follow-up programs.

Field samples of approximately 5 kg of -2000 micron material should be collected from medium energy environments. Processing equipment requires electricity and water. Samples take approximately 15 minutes to process. The sample is collected with the water in a bucket, and allowed to settle for 24 hours. The water is then decanted and the wet sample is placed in a paper sample bag and allowed to dry in preparation for shipping.

The +1000 micron fraction can then be viewed under a microscope for evidence of mineralization, alteration, or broad drainage basin geology.

APPENDIX 1

GOLD AND MULTI-ELEMENT DATA

APPENDIX 1A

GOLD AND MULTI-ELEMENT DATA:

MT SKUKUM

MT. SKUKUM

Sample	Au ppb 30g FA	Au ppb 30g FA (* 30g AR column)	Au ppb 10g AR	Ag ppm	Al %	As ppm	Ba ppm	Be ppm
E53-1A	45	40	20	0.6	1.90	66	730	1.5
E180-1A	3	6	5	-0.2	0.72	24	320	-0.5
E53-1B	23	30	15	0.4	1.55	44	580	1.0
E180-1B	17	3	10	-0.2	0.80	24	290	0.5
E53-2A	49	50	20	0.6	1.80	46	670	1.5
E180-2A	3	3	-5	-0.2	0.81	26	350	0.5
E53-2B	49	25	20	0.6	1.69	44	600	1.0
E180-2B	30	17	5	-0.2	0.81	36	330	0.5
M53-3A	2532	2410	1380	2.4	3.27	62	420	2.0
M180-3A	2491	2255	560	0.6	1.68	56	180	0.5
M53-3B	1585	1550	920	2.0	3.23	70	460	2.0
M180-3B	862	620	1000	0.4	1.70	48	180	0.5
M53-4A	1410	1400	940	2.0	3.47	56	370	2.0
M180-4A	1101	1108	700	0.6	1.78	40	190	1.0
M53-4B	1525	1480	940	2.0	3.99	78	430	2.5
M180-4B	1858	2480	1280	1.0	1.94	54	230	1.0
B53-5	10	-5	5	0.4	3.70	2	310	2.0
B180-5	4	8	-5	-0.2	1.78	8	230	1.0
B53-6	3	*1.9	-5	0.6	3.97	12	340	2.0
B180-6	-1	1	-5	-0.2	1.83	10	220	0.5
M53-7A	2152	2220	1300	2.2	2.88	62	460	1.5
M180-7A	752	684	380	1.0	1.62	24	200	0.5
M53-7B	2566	2620	1600	2.8	2.62	64	350	1.5
M180-7B	872	816	860	0.4	1.72	44	220	0.5
M53-8A	2267	2280	1400	1.8	2.59	62	360	1.5
M180-8A	607	639	400	0.6	1.66	16	180	0.5
M53-8B	2143	2220	1460	2.8	2.70	56	350	1.5
M180-8B	1054	1067	560	1.6	1.84	38	260	1.0
B53-9	19	15	10	0.6	2.85	52	800	1.0
B180-9	5	3	-5	-0.2	1.31	18	550	0.5
B53-10	32	-5	10	0.6	2.64	44	840	1.0
B180-10	399	140	-5	-0.2	1.21	14	560	0.5

Appendix 1A

MT. SKUKUM

Sample	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm
E53-1A	2	0.66	0.5	14	124	236	3.74	10	-1
E180-1A	-2	0.37	-0.5	10	14	48	3.47	-10	-1
E53-1B	-2	0.72	1.5	13	34	74	3.84	10	-1
E180-1B	-2	0.43	-0.5	8	12	36	3.04	-10	-1
E53-2A	-2	0.62	1.5	14	67	94	3.96	10	-1
E180-2A	-2	0.36	-0.5	10	14	47	3.39	-10	-1
E53-2B	-2	0.59	1.0	12	27	76	3.80	10	-1
E180-2B	-2	0.35	-0.5	10	11	43	3.17	-10	-1
M53-3A	-2	1.02	1.0	20	33	51	4.80	10	-1
M180-3A	-2	0.94	-0.5	13	12	24	4.05	-10	-1
M53-3B	-2	0.94	0.5	20	41	49	4.77	10	-1
M180-3B	-2	0.99	-0.5	13	14	27	4.14	-10	-1
M53-4A	-2	0.98	1.0	20	37	38	4.72	10	-1
M180-4A	-2	1.16	-0.5	15	14	30	4.11	10	-1
M53-4B	-2	0.92	1.5	28	33	53	4.85	10	-1
M180-4B	-2	0.99	-0.5	17	14	48	4.05	10	-1
B53-5	2	1.15	1.0	11	28	50	3.54	10	-1
B180-5	-2	0.80	-0.5	9	15	28	3.18	-10	-1
B53-6	-2	1.09	0.5	11	26	57	3.73	10	-1
B180-6	-2	0.63	-0.5	8	14	33	3.31	-10	-1
M53-7A	-2	0.84	0.5	17	37	40	4.40	10	-1
M180-7A	-2	0.89	-0.5	12	14	20	3.71	-10	-1
M53-7B	-2	0.86	-0.5	15	26	30	4.12	10	-1
M180-7B	-2	0.89	-0.5	15	13	20	3.97	-10	-1
M53-8A	-2	0.94	0.5	15	30	33	4.28	10	-1
M180-8A	-2	1.06	0.5	11	12	20	3.81	-10	-1
M53-8B	-2	1.04	1.0	15	17	23	4.11	10	-1
M180-8B	-2	1.15	-0.5	15	12	19	3.86	-10	-1
B53-9	4	0.78	0.5	15	71	72	3.85	10	-1
B180-9	-2	0.53	-0.5	9	34	31	4.03	-10	-1
B53-10	2	0.81	1.0	14	55	94	3.77	10	-1
B180-10	-2	0.44	-0.5	10	28	32	3.80	-10	-1

MT. SKUKUM

Sample	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm
E53-1A	0.36	60	0.69	1590	9	0.02	48	1110	90
E180-1A	0.11	20	0.44	670	2	-0.01	7	830	30
E53-1B	0.21	50	0.68	1335	6	0.01	17	1150	64
E180-1B	0.11	20	0.50	680	4	-0.01	6	810	26
E53-2A	0.34	60	0.55	1635	8	0.02	17	1000	94
E180-2A	0.12	20	0.47	790	3	-0.01	7	750	42
E53-2B	0.27	60	0.59	1520	7	0.01	12	1010	78
E180-2B	0.12	20	0.44	830	4	-0.01	5	770	42
M53-3A	0.32	40	0.75	1530	7	0.03	12	1320	46
M180-3A	0.12	10	0.63	935	2	0.01	3	950	32
M53-3B	0.34	40	0.79	1825	4	0.03	11	1170	44
M180-3B	0.12	10	0.67	860	1	0.01	3	1010	24
M53-4A	0.39	40	0.76	1565	4	0.03	15	1170	58
M180-4A	0.12	20	0.66	960	2	0.02	6	910	42
M53-4B	0.37	50	0.74	2030	6	0.03	17	1290	50
M180-4B	0.16	20	0.63	1205	4	0.02	6	860	52
B53-5	0.25	30	0.73	1100	-1	0.03	11	1110	32
B180-5	0.15	20	0.53	620	-1	0.01	4	910	12
B53-6	0.30	40	0.76	1190	1	0.03	11	1180	32
B180-6	0.15	20	0.55	630	-1	0.01	4	870	18
M53-7A	0.29	40	0.73	1400	6	0.03	11	1210	22
M180-7A	0.13	20	0.64	835	3	0.02	3	930	24
M53-7B	0.22	30	0.67	1390	4	0.02	9	1190	28
M180-7B	0.12	20	0.65	1020	2	0.01	3	980	22
M53-8A	0.25	30	0.70	1270	5	0.03	10	1180	26
M180-8A	0.12	10	0.66	850	2	0.02	3	1030	14
M53-8B	0.23	30	0.69	1310	6	0.02	8	1150	32
M180-8B	0.14	20	0.65	1110	3	0.02	4	1060	28
B53-9	0.36	40	1.11	1265	8	0.02	30	1240	56
B180-9	0.14	20	0.87	565	2	0.01	18	1090	26
B53-10	0.33	40	1.03	1240	8	0.02	27	1300	60
B180-10	0.14	20	0.78	530	3	0.01	14	930	26

MT. SKUKUM

Sample	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
E53-1A	18	8	40	-0.01	-10	-10	56	-10	224
E180-1A	2	3	17	-0.01	-10	-10	68	-10	100
E53-1B	4	7	39	0.01	-10	-10	53	-10	156
E180-1B	2	3	18	0.01	-10	-10	52	-10	96
E53-2A	12	8	40	-0.01	-10	-10	46	-10	182
E180-2A	2	3	18	-0.01	-10	-10	56	-10	112
E53-2B	2	8	39	0.01	-10	-10	47	-10	170
E180-2B	-2	3	18	-0.01	-10	-10	50	-10	114
M53-3A	-2	8	85	0.02	-10	-10	40	-10	202
M180-3A	-2	4	54	0.07	-10	-10	34	-10	150
M53-3B	44	8	85	0.02	-10	-10	40	-10	198
M180-3B	-2	4	55	0.08	-10	-10	36	10	136
M53-4A	2	8	95	0.02	-10	-10	41	-10	196
M180-4A	-2	4	70	0.07	-10	-10	34	10	136
M53-4B	-2	8	96	0.01	-10	-10	40	-10	230
M180-4B	2	4	63	0.06	-10	-10	34	-10	140
B53-5	-2	7	101	0.06	-10	-10	48	-10	138
B180-5	-2	4	68	0.08	-10	-10	49	-10	98
B53-6	4	8	113	0.06	-10	-10	50	-10	140
B180-6	-2	4	66	0.09	-10	-10	48	-10	100
M53-7A	2	7	75	0.03	-10	-10	37	-10	160
M180-7A	2	4	53	0.08	-10	-10	36	-10	122
M53-7B	-2	6	73	0.02	-10	-10	34	-10	148
M180-7B	-2	4	57	0.07	-10	-10	35	-10	130
M53-8A	2	6	69	0.04	-10	-10	38	-10	142
M180-8A	-2	4	58	0.08	-10	-10	36	10	122
M53-8B	2	6	81	0.02	-10	-10	34	-10	144
M180-8B	-2	4	69	0.06	-10	-10	34	-10	132
B53-9	6	11	84	0.01	-10	10	66	-10	148
B180-9	2	4	46	0.02	-10	-10	93	-10	98
B53-10	2	11	83	0.01	-10	10	61	-10	156
B180-10	6	4	39	0.02	-10	-10	84	-10	106

APPENDIX 1B

GOLD AND MULTI-ELEMENT DATA:

KETZA RIVER

KETZA RIVER

Sample	Au ppb 30g FA	Au ppb 30g FA (* 30g AR Column)	Au ppb 10g AR	Ag ppm	Al %	As ppm	Ba ppm	Be ppm
M53-11A	748	790	185	0.8	1.94	1168	140	0.5
M180-11A	610	700	900	0.2	1.48	954	30	-0.5
M53-11B	599	540	195	0.8	1.77	1224	80	0.5
M180-11B	187	270	55	0.2	1.68	724	30	-0.5
M53-12A	220	195	110	0.4	0.97	338	50	0.5
M180-12A	262	86	30	-0.2	0.82	214	30	-0.5
M53-12B	353	320	155	0.2	1.05	412	60	-0.5
M180-12B	799	157	65	0.2	0.77	244	20	-0.5
M53-13A	128	110	80	0.2	1.01	138	60	-0.5
M180-13A	58	275	30	-0.2	0.98	120	80	-0.5
M53-13B	15	-5	-5	-0.2	0.76	28	30	-0.5
M180-13B	3	3	-5	-0.2	0.80	18	30	-0.5
M53-14A	99	100	50	0.2	0.89	162	80	-0.5
M180-14A	40	38	15	0.2	0.88	150	120	-0.5
M53-14B	5	*1.8	-5	-0.2	0.67	24	30	-0.5
M180-14B	3	67	-5	-0.2	0.67	30	20	-0.5
B53-15	1	*1.6	-5	0.2	1.72	12	640	0.5
B180-15	-1	1	-5	-0.2	1.17	-2	1070	-0.5
B53-16	8	*3.9	5	1.8	0.66	34	300	0.5
B180-16	5	3	-5	0.8	0.61	26	370	-0.5
B53-18	1	*1.1	-5	-0.2	2.15	-2	110	0.5
B180-18	-1	-1	-5	-0.2	2.19	-2	110	0.5
B53-19	4	* -0.1	-5	-0.2	2.05	2	100	0.5
B180-19	-1	1	-5	-0.2	2.21	10	80	0.5

KETZA RIVER

Sample	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm
M53-11A	14	4.26	1.0	29	90	134	6.50	-10	-1
M180-11A	6	6.75	-0.5	20	28	81	5.54	-10	-1
M53-11B	4	5.39	0.5	25	42	169	6.56	-10	-1
M180-11B	4	10.11	-0.5	18	30	78	5.01	-10	-1
M53-12A	2	9.05	1.5	27	35	65	4.01	-10	-1
M180-12A	-2	11.04	-0.5	17	21	45	3.52	-10	-1
M53-12B	-2	8.91	1.0	25	40	73	4.00	-10	-1
M180-12B	-2	10.28	-0.5	13	17	46	3.05	-10	-1
M53-13A	-2	7.25	0.5	24	43	36	3.58	-10	-1
M180-13A	-2	9.72	-0.5	16	22	37	3.68	-10	-1
M53-13B	-2	6.44	-0.5	15	28	21	3.39	-10	-1
M180-13B	-2	8.74	-0.5	11	17	23	3.59	-10	-1
M53-14A	-2	8.30	1.0	20	40	36	3.82	-10	-1
M180-14A	-2	8.55	-0.5	15	20	31	3.93	-10	-1
M53-14B	4	8.22	-0.5	13	30	20	3.35	-10	-1
M180-14B	-2	9.14	-0.5	11	16	20	3.43	-10	-1
B53-15	-2	3.38	1.0	19	131	38	3.92	-10	-1
B180-15	-2	4.82	-0.5	13	80	33	2.97	-10	-1
B53-16	-2	5.63	3.0	15	47	37	3.76	-10	-1
B180-16	-2	7.23	0.5	13	31	25	3.03	-10	-1
B53-18	-2	5.59	0.5	19	137	35	3.66	-10	-1
B180-18	-2	5.79	-0.5	19	132	31	3.84	-10	-1
B53-19	-2	5.26	-0.5	19	123	36	3.63	-10	-1
B180-19	-2	5.73	-0.5	17	133	32	3.90	-10	-1

KETZA RIVER

Sample	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm
M53-11A	0.22	30	0.90	2805	4	0.06	129	850	110
M180-11A	0.04	20	1.33	1535	1	0.03	71	690	62
M53-11B	0.10	20	0.90	1550	1	0.04	56	810	86
M180-11B	0.08	30	1.19	900	-1	0.05	34	590	42
M53-12A	0.03	10	1.11	785	3	0.01	44	730	50
M180-12A	0.02	20	1.66	560	1	0.01	30	820	38
M53-12B	0.04	10	1.11	1125	2	0.01	48	610	48
M180-12B	0.02	10	1.65	560	1	0.01	29	660	32
M53-13A	0.03	10	1.22	715	1	0.01	37	590	44
M180-13A	0.02	20	1.57	520	-1	0.01	25	800	90
M53-13B	0.03	-10	1.37	530	-1	0.01	24	510	20
M180-13B	0.01	-10	1.65	490	-1	-0.01	23	790	14
M53-14A	0.04	10	1.44	955	1	0.01	38	710	70
M180-14A	0.02	10	1.71	815	-1	-0.01	27	960	116
M53-14B	0.02	10	1.52	535	1	0.01	25	680	14
M180-14B	0.02	-10	1.54	495	-1	-0.01	19	760	14
B53-15	0.27	20	2.07	1080	5	0.01	63	970	26
B180-15	0.12	10	2.86	500	3	0.01	48	1200	26
B53-16	0.08	-10	1.55	820	4	0.01	50	850	184
B180-16	0.07	-10	2.35	705	2	-0.01	36	1080	116
B53-18	0.12	20	1.97	475	-1	0.01	57	820	18
B180-18	0.07	20	2.17	425	-1	-0.01	52	950	12
B53-19	0.07	20	1.91	410	-1	-0.01	53	800	4
B180-19	0.07	20	2.16	415	-1	-0.01	55	910	16

KETZA RIVER

Sampe	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
M53-11A	12	6	105	-0.01	-10	-10	25	-10	206
M180-11A	4	3	133	-0.01	-10	-10	18	20	148
M53-11B	14	6	125	0.01	-10	-10	22	-10	174
M180-11B	2	3	211	0.01	-10	-10	18	30	110
M53-12A	4	4	137	-0.01	-10	-10	17	-10	160
M180-12A	2	3	158	-0.01	-10	-10	17	20	128
M53-12B	4	4	132	-0.01	-10	-10	19	-10	156
M180-12B	2	2	141	-0.01	-10	-10	15	20	116
M53-13A	2	4	140	-0.01	-10	-10	14	-10	130
M180-13A	4	4	193	-0.01	-10	-10	17	20	126
M53-13B	2	5	140	-0.01	-10	-10	10	-10	70
M180-13B	-2	6	201	-0.01	-10	-10	12	20	86
M53-14A	4	4	164	-0.01	-10	-10	16	-10	124
M180-14A	-2	4	186	-0.01	-10	-10	17	20	120
M53-14B	4	6	168	-0.01	-10	-10	11	-10	72
M180-14B	-2	6	203	-0.01	-10	-10	10	20	82
B53-15	2	7	81	0.04	-10	-10	56	-10	216
B180-15	-2	4	92	0.07	-10	-10	46	10	156
B53-16	8	6	145	-0.01	-10	-10	39	-10	496
B180-16	4	5	176	-0.01	-10	-10	36	20	320
B53-18	4	6	120	0.04	-10	-10	37	-10	72
B180-18	-2	6	139	0.08	-10	-10	43	10	88
B53-19	-2	6	111	0.04	-10	-10	34	-10	72
B180-19	-2	6	134	0.06	-10	-10	42	10	90

APPENDIX 1C

GOLD AND MULTI-ELEMENT DATA:

DUBLIN GULCH

DUBLIN GULCH

* 30g AR column

Sample	Au ppb 30g FA	Au ppb 30g FA	Au ppb 10g AR	Ag ppm	Al %	As ppm	Ba ppm	Be ppm
M53-20A	120	135	85	0.2	0.99	300	200	-0.5
M180-20A	70	25	25	0.2	0.57	296	90	-0.5
M53-20B	205	280	110	1.0	1.81	804	370	0.5
M180-20B	1380	1030	55	1.2	0.49	1188	60	-0.5
M53-21A	95	95	110	0.4	1.48	360	230	0.5
M180-21A	40	30	-5	-0.2	0.47	200	40	0.5
M53-21B	170	190	100	0.2	1.29	502	280	-0.5
M180-21B	20	45	-5	-0.2	0.54	374	90	0.5
M53-22A	80	80	55	0.6	2.31	920	370	0.5
M180-22A	130	710	235	-0.2	1.03	478	170	0.5
M53-22B	60	70	15	0.6	2.51	1006	390	0.5
M180-22B	40	50	-5	-0.2	1.03	478	170	0.5
M53-23A	75	55	20	0.4	2.01	528	340	-0.5
M180-23A	935	1080	-5	-0.2	0.78	314	140	-0.5
M53-23B	180	170	100	0.2	1.63	254	260	-0.5
M180-23B	5630	5250	2700	0.4	0.71	198	110	-0.5
E53-24A	5	*4.4	-5	-0.2	2.10	148	340	-0.5
E180-24A	-5	-5	5	-0.2	0.79	62	90	-0.5
E53-24B	50	*4.8	5	0.2	2.15	152	340	-0.5
E180-24B	740	1520	1540	-0.2	0.82	66	100	-0.5
E53-25A	15	10	55	-0.2	1.63	204	250	-0.5
E180-25A	725	405	-5	-0.2	0.89	82	110	-0.5
E53-25B	5	*3.0	5	-0.2	2.10	98	330	-0.5
E180-25B	155	280	-5	-0.2	0.96	76	130	-0.5
B53-26	-5	*7.1	-5	0.4	1.80	46	280	-0.5
B180-26	600	305	-5	-0.2	0.56	22	80	-0.5
B53-27	-5	*2.7	-5	0.4	2.17	40	320	-0.5
B180-27	-5	-5	-5	-0.2	0.61	20	80	-0.5
B53-28	25	*15.7	5	0.2	1.41	24	340	-0.5
B180-28	-5	-5	-5	-0.2	0.45	6	100	-0.5
B53-29	-5	*0.7	5	-0.2	1.27	20	220	-0.5
B180-29	-5	-5	-5	-0.2	0.44	8	70	-0.5

DUBLIN GULCH

Sample	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm
M53-20A	-2	0.55	-0.5	14	53	33	3.22	-10	-1
M180-20A	-2	0.34	0.5	11	18	28	2.66	-10	-1
M53-20B	-2	0.40	-0.5	21	53	69	5.08	10	-1
M180-20B	-2	0.21	2.5	11	13	35	2.86	-10	-1
M53-21A	2	0.33	-0.5	24	45	47	4.20	10	-1
M180-21A	-2	0.12	0.5	13	14	25	2.70	-10	-1
M53-21B	-2	0.49	-0.5	16	91	37	3.59	10	-1
M180-21B	-2	0.19	0.5	11	17	27	2.67	-10	-1
M53-22A	-2	0.71	-0.5	18	66	25	4.13	10	-1
M180-22A	-2	0.31	1.0	12	27	15	2.79	-10	-1
M53-22B	-2	0.71	-0.5	19	93	26	4.29	10	-1
M180-22B	-2	0.30	1.0	11	28	14	2.79	-10	-1
M53-23A	-2	0.57	-0.5	18	77	32	4.06	10	-1
M180-23A	-2	0.26	0.5	11	26	19	2.73	-10	-1
M53-23B	-2	0.50	-0.5	15	64	24	3.14	10	-1
M180-23B	-2	0.28	-0.5	9	21	14	2.12	-10	-1
E53-24A	-2	0.63	-0.5	15	142	32	3.34	10	-1
E180-24A	-2	0.33	-0.5	7	15	11	1.77	-10	-1
E53-24B	-2	0.67	0.5	16	99	34	3.47	10	-1
E180-24B	-2	0.35	-0.5	7	21	14	1.86	-10	-1
E53-25A	2	0.62	1.0	18	85	35	3.84	-10	-1
E180-25A	2	0.34	-0.5	9	16	16	2.10	-10	-1
E53-25B	-2	0.63	-0.5	15	124	28	3.12	10	-1
E180-25B	-2	0.49	0.5	10	23	21	2.28	-10	-1
B53-26	-2	0.49	-0.5	17	61	29	3.64	10	-1
B180-26	-2	0.24	-0.5	8	14	16	2.07	-10	-1
B53-27	-2	0.47	-0.5	22	97	34	4.22	10	-1
B180-27	-2	0.18	-0.5	10	19	19	2.72	-10	-1
B53-28	-2	1.03	-0.5	12	70	23	2.99	10	-1
B180-28	-2	0.44	-0.5	5	10	8	1.35	-10	-1
B53-29	-2	0.91	-0.5	13	60	29	2.77	-10	-1
B180-29	-2	0.40	-0.5	6	10	12	1.57	-10	-1

DUBLIN GULCH

Sample	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm
M53-20A	0.19	60	0.44	415	-1	0.01	42	1030	38
M180-20A	0.14	20	0.31	355	1	-0.01	27	520	38
M53-20B	0.35	40	0.59	665	-1	0.01	54	650	124
M180-20B	0.12	20	0.26	320	1	-0.01	25	430	108
M53-21A	0.32	50	0.50	645	-1	0.01	45	720	50
M180-21A	0.13	10	0.22	350	-1	-0.01	25	320	38
M53-21B	0.23	60	0.46	465	1	0.01	59	1000	54
M180-21B	0.15	20	0.27	345	1	-0.01	27	480	44
M53-22A	0.23	60	0.67	1225	9	0.01	45	1170	96
M180-22A	0.19	40	0.48	700	6	-0.01	26	610	76
M53-22B	0.29	60	0.68	1345	9	0.02	46	1120	100
M180-22B	0.20	30	0.49	710	6	-0.01	26	600	60
M53-23A	0.32	50	0.69	865	3	0.01	56	950	46
M180-23A	0.19	20	0.41	415	4	-0.01	30	640	34
M53-23B	0.21	50	0.51	575	2	0.01	39	970	34
M180-23B	0.13	20	0.33	285	3	-0.01	20	740	20
E53-24A	0.40	30	0.61	1065	2	0.07	44	860	28
E180-24A	0.04	10	0.35	345	-1	0.01	17	640	14
E53-24B	0.37	30	0.66	1170	1	0.06	44	900	28
E180-24B	0.05	10	0.36	385	-1	0.01	19	600	14
E53-25A	0.14	30	0.63	1340	3	0.02	60	920	30
E180-25A	0.06	20	0.39	515	1	0.01	21	600	14
E53-25B	0.38	30	0.60	930	1	0.07	39	800	22
E180-25B	0.06	20	0.40	660	1	0.01	22	570	16
B53-26	0.27	40	0.49	1055	1	0.02	42	710	54
B180-26	0.03	30	0.23	340	-1	-0.01	20	360	22
B53-27	0.37	40	0.53	1635	1	0.03	57	700	52
B180-27	0.02	30	0.24	455	-1	-0.01	25	340	22
B53-28	0.19	40	0.49	620	1	0.02	38	770	24
B180-28	0.02	10	0.25	235	-1	-0.01	12	450	4
B53-29	0.11	40	0.47	620	-1	0.01	44	710	24
B180-29	0.01	10	0.23	305	-1	-0.01	15	390	12

DUBLIN GULCH

Sample	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
M53-20A	6	3	38	0.05	-10	-10	34	20	98
M180-20A	6	2	22	0.03	-10	-10	19	20	86
M53-20B	20	6	49	0.04	-10	-10	46	20	182
M180-20B	20	2	16	0.02	-10	-10	17	320	96
M53-21A	8	4	39	0.05	-10	-10	37	-10	108
M180-21A	4	1	12	0.01	-10	-10	14	-10	64
M53-21B	8	4	39	0.06	-10	-10	43	40	116
M180-21B	6	2	16	0.03	-10	-10	19	20	92
M53-22A	18	8	53	0.08	-10	-10	62	20	204
M180-22A	18	4	21	0.09	-10	-10	32	280	138
M53-22B	20	9	55	0.08	-10	-10	64	20	208
M180-22B	20	4	20	0.10	-10	-10	33	110	140
M53-23A	4	8	48	0.09	-10	-10	61	20	146
M180-23A	4	3	19	0.07	-10	-10	30	280	86
M53-23B	4	6	40	0.08	-10	-10	54	40	106
M180-23B	4	3	17	0.04	-10	-10	26	600	68
E53-24A	-2	4	49	0.07	-10	-10	48	-10	144
E180-24A	2	1	24	0.02	-10	-10	18	10	72
E53-24B	2	4	50	0.07	-10	-10	49	-10	156
E180-24B	4	1	26	0.02	-10	-10	19	30	76
E53-25A	2	4	47	0.03	-10	-10	41	-10	166
E180-25A	-2	2	27	0.02	-10	-10	21	10	86
E53-25B	2	4	49	0.07	-10	-10	47	-10	132
E180-25B	-2	2	35	0.02	-10	-10	22	-10	90
B53-26	10	4	46	0.04	-10	-10	39	-10	156
B180-26	4	1	20	0.01	-10	-10	16	-10	82
B53-27	6	4	48	0.04	-10	-10	43	-10	190
B180-27	4	1	16	-0.01	-10	-10	17	-10	100
B53-28	2	3	89	0.03	-10	-10	33	-10	104
B180-28	-2	1	34	0.01	-10	-10	13	-10	46
B53-29	-2	3	70	0.02	-10	-10	29	-10	92
B180-29	-2	1	29	-0.01	-10	-10	11	-10	48

APPENDIX 1D

GOLD AND MULTI-ELEMENT DATA:

BREWERY CREEK

BREWERY CREEK

Sample	Au ppb 30g FA	Au ppb 30g FA (* 30g AR column)	Au ppb 10g AR	Ag ppm	Al %	As ppm	Ba ppm	Be ppm
M53-30A	25	*12.6	5	0.4	1.73	80	890	0.5
M180-30A	-5	150	-5	0.2	0.87	56	560	0.5
M53-30B	15	*11.9	5	0.6	1.93	94	1030	0.5
M180-30B	-5	-5	-5	-0.2	1.04	52	1110	0.5
M53-31A	40	*30.5	20	0.6	1.57	80	1050	-0.5
M180-31A	25	25	5	0.4	0.82	80	780	0.5
M53-31B	45	*32.5	25	0.6	1.35	140	1220	-0.5
M180-31B	10	15	10	-0.2	0.62	88	1030	0.5
M53-32A	40	*17.6	10	0.4	1.38	74	600	-0.5
M180-32A	5	-5	10	0.2	1.18	66	640	0.5
M53-32B	20	*15.5	10	0.6	2.09	156	810	1.0
M180-32B	-5	-5	5	-0.2	1.17	72	380	0.5
M53-33A	45	*24.5	20	0.8	1.30	130	1100	-0.5
M180-33A	10	10	5	0.2	0.53	74	590	-0.5
M53-33B	35	*37.9	20	0.6	1.31	52	950	-0.5
M180-33B	15	15	-5	0.2	0.62	56	590	0.5
B53-34	-5	*1.9	-5	0.4	2.04	28	530	-0.5
B180-34	-5	-5	-5	-0.2	0.81	6	270	-0.5
E53-35A	-5	*4.5	5	-0.2	2.06	14	450	-0.5
E180-35A	-5	-5	-5	-0.2	1.25	8	210	-0.5
E53-35B	10	*10.3	-5	0.2	2.20	18	530	-0.5
E180-35B	-5	-5	5	-0.2	1.17	12	250	-0.5
E53-36A	65	70	20	0.4	2.62	26	510	-0.5
E180-36A	640	25	-5	-0.2	1.15	12	130	-0.5
E53-36B	30	*48.6	10	0.4	2.63	42	580	-0.5
E180-36B	-5	-5	-5	-0.2	1.27	16	180	-0.5

BREWERY CREEK

Sample	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm
M53-30A	-2	0.86	0.5	16	75	33	3.15	-10	-1
M180-30A	-2	0.57	0.5	8	28	21	2.06	-10	-1
M53-30B	-2	0.91	0.5	17	87	36	3.51	-10	-1
M180-30B	-2	0.59	0.5	10	31	22	2.34	-10	-1
M53-31A	-2	0.73	3.0	12	78	29	2.35	-10	-1
M180-31A	-2	0.82	3.0	10	21	32	2.24	-10	-1
M53-31B	2	0.63	5.0	14	64	33	3.22	-10	-1
M180-31B	-2	0.43	3.0	9	13	24	2.27	-10	-1
M53-32A	-2	0.65	0.5	15	72	27	2.94	-10	-1
M180-32A	-2	0.64	1.0	12	38	27	2.78	-10	-1
M53-32B	-2	0.81	1.5	30	107	38	4.92	10	-1
M180-32B	-2	0.54	0.5	13	39	23	2.92	-10	-1
M53-33A	-2	0.70	2.0	16	68	41	3.80	-10	-1
M180-33A	-2	0.42	1.5	7	12	28	2.21	-10	-1
M53-33B	-2	0.75	4.0	13	80	38	2.56	-10	-1
M180-33B	2	0.62	3.0	9	16	33	2.09	-10	-1
B53-34	-2	0.86	-0.5	34	118	18	5.27	-10	-1
B180-34	-2	0.86	-0.5	20	32	9	2.84	-10	-1
E53-35A	-2	0.71	-0.5	10	67	26	2.79	-10	-1
E180-35A	-2	0.52	-0.5	11	17	21	2.51	-10	-1
E53-35B	-2	0.75	-0.5	12	61	32	3.10	-10	-1
E180-35B	-2	0.45	-0.5	11	14	22	2.52	-10	-1
E53-36A	-2	0.72	-0.5	19	80	44	4.49	10	-1
E180-36A	-2	0.42	-0.5	9	10	17	2.40	-10	-1
E53-36B	-2	0.75	-0.5	20	69	41	4.33	10	-1
E180-36B	-2	0.46	-0.5	11	14	18	2.55	-10	-1

BREWERY CREEK

Sample	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm
M53-30A	0.16	30	0.63	940	1	0.01	53	1070	18
M180-30A	0.08	20	0.41	405	2	0.01	29	920	20
M53-30B	0.19	30	0.70	1020	3	0.02	60	1180	18
M180-30B	0.11	30	0.45	440	2	0.01	31	1050	12
M53-31A	0.20	30	0.44	370	2	0.02	60	800	16
M180-31A	0.08	20	0.31	430	4	-0.01	50	790	22
M53-31B	0.19	30	0.35	650	6	0.01	70	950	30
M180-31B	0.08	20	0.19	315	5	-0.01	39	960	18
M53-32A	0.15	20	0.50	710	2	0.01	49	980	16
M180-32A	0.13	30	0.57	475	2	0.01	41	1050	16
M53-32B	0.28	40	0.78	1770	4	0.02	85	1380	30
M180-32B	0.11	30	0.63	495	2	-0.01	40	1030	12
M53-33A	0.19	30	0.36	845	6	0.01	64	1110	30
M180-33A	0.07	10	0.18	295	4	-0.01	32	870	22
M53-33B	0.16	20	0.42	520	3	0.01	61	910	18
M180-33B	0.07	10	0.25	410	3	-0.01	41	740	20
B53-34	0.14	20	0.72	4285	2	0.01	58	1200	20
B180-34	0.02	10	0.63	2725	2	-0.01	25	690	12
E53-35A	0.23	20	0.71	530	-1	0.09	27	600	6
E180-35A	0.02	10	0.82	630	-1	-0.01	14	820	12
E53-35B	0.21	20	0.68	550	1	0.08	30	620	12
E180-35B	0.02	10	0.63	700	1	-0.01	15	700	12
E53-36A	0.21	30	1.45	1535	1	0.03	38	790	28
E180-36A	0.02	10	0.88	475	-1	-0.01	8	1250	12
E53-36B	0.20	20	1.60	1280	1	0.03	34	820	36
E180-36B	0.02	10	1.04	505	-1	-0.01	11	1290	18

BREWERY CREEK

Sample	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
M53-30A	12	6	78	0.06	-10	-10	87	-10	192
M180-30A	8	3	55	0.03	-10	-10	49	-10	128
M53-30B	14	7	84	0.06	-10	-10	103	-10	214
M180-30B	12	3	65	0.04	-10	-10	64	-10	150
M53-31A	48	6	86	0.03	-10	-10	67	-10	270
M180-31A	38	4	88	0.01	-10	-10	46	-10	264
M53-31B	44	6	89	0.01	-10	-10	77	-10	410
M180-31B	54	2	63	-0.01	-10	-10	42	-10	292
M53-32A	14	4	67	0.04	-10	-10	67	-10	186
M180-32A	12	4	73	0.04	-10	-10	61	-10	194
M53-32B	14	7	90	0.04	-10	-10	113	-10	300
M180-32B	4	3	65	0.04	-10	-10	56	-10	184
M53-33A	44	6	100	0.01	-10	-10	89	-10	336
M180-33A	34	3	60	-0.01	-10	-10	39	-10	222
M53-33B	24	6	84	0.03	-10	-10	78	-10	268
M180-33B	28	3	69	-0.01	-10	-10	49	-10	228
B53-34	-2	6	42	0.08	-10	-10	93	-10	222
B180-34	-2	2	28	0.05	-10	-10	40	-10	120
E53-35A	-2	6	46	0.12	-10	-10	64	-10	70
E180-35A	-2	3	25	0.02	-10	-10	36	-10	60
E53-35B	2	7	51	0.11	-10	-10	70	-10	74
E180-35B	-2	3	24	0.03	-10	-10	38	-10	54
E53-36A	-2	8	45	0.10	-10	-10	62	-10	146
E180-36A	-2	2	17	0.01	-10	-10	22	-10	80
E53-36B	-2	7	47	0.10	-10	-10	66	10	156
E180-36B	-2	2	21	0.02	-10	-10	27	-10	90

APPENDIX 1E

GOLD AND MULTI-ELEMENT DATA:

TOOTSEE RIVER

TOOTSEE RIVER

Sample	Au ppb 30g FA	Au ppb 30g FA (* 30g AR Column)	Au ppb 10g AR	Ag ppm	Al %	As ppm	Ba ppm	Be ppm
B53-40	-5	*1.2	-5	-0.2	1.78	16	90	-0.5
B180-40	-5	-5	-5	-0.2	0.68	6	20	-0.5
B53-41	-5	*1.4	-5	0.6	0.90	48	100	-0.5
B180-41	-5	-5	-5	-0.2	0.25	12	20	-0.5
B53-42	-5	*19.0	-5	0.4	2.21	12	190	1.5
B180-42	-5	-5	-5	-0.2	0.43	-2	30	-0.5
E53-43A	-5	*1.9	-5	0.6	1.62	42	230	0.5
E180-43A	-5	-5	-5	-0.2	0.58	28	80	-0.5
E53-43B	-5	*1.7	-5	0.4	1.67	68	250	0.5
E180-43B	-5	-5	-5	-0.2	0.47	22	60	-0.5
E53-44A	-5	*0.9	-5	0.4	1.70	58	170	0.5
E180-44A	-5	-5	-5	-0.2	0.50	20	30	-0.5
E53-44B	-5	*1.1	-5	0.6	1.69	78	150	0.5
E180-44B	-5	-5	-5	-0.2	0.43	28	30	-0.5
B53-45	-5	*15.3	-5	0.4	1.87	12	330	-0.5
B180-45	-5	-5	-5	-0.2	0.70	-2	100	-0.5

TOOTSEE RIVER

Sample	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm
B53-40	-2	4.64	-0.5	21	72	39	3.42	-10	-1
B180-40	-2	5.01	-0.5	7	12	15	1.71	-10	-1
B53-41	-2	3.85	-0.5	22	45	39	3.53	-10	-1
B180-41	-2	4.36	-0.5	7	8	8	1.43	-10	-1
B53-42	-2	0.67	-0.5	11	95	26	2.87	10	-1
B180-42	-2	0.29	-0.5	3	14	4	2.33	-10	-1
E53-43A	-2	3.06	-0.5	10	110	16	2.62	10	-1
E180-43A	-2	2.16	-0.5	4	15	5	1.42	-10	-1
E53-43B	-2	2.89	-0.5	11	90	17	2.84	10	-1
E180-43B	-2	2.20	-0.5	3	12	4	1.14	-10	-1
E53-44A	-2	1.52	0.5	10	91	11	2.82	10	1
E180-44A	-2	1.10	-0.5	3	11	2	1.13	-10	-1
E53-44B	-2	1.80	0.5	10	115	12	2.84	10	-1
E180-44B	-2	1.11	-0.5	2	9	2	1.04	-10	-1
B53-45	-2	1.13	-0.5	19	202	37	3.13	-10	-1
B180-45	-2	0.50	-0.5	7	64	8	1.35	-10	-1

TOOTSEE RIVER

Sample	K %	La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm
B53-40	0.17	20	1.29	605	-1	0.02	46	850	30
B180-40	0.04	-10	0.94	240	-1	0.01	16	500	14
B53-41	0.15	30	0.85	950	-1	0.01	64	930	26
B180-41	0.03	-10	1.27	320	-1	-0.01	20	570	6
B53-42	0.22	70	0.50	665	1	0.02	42	1190	32
B180-42	0.04	20	0.29	160	-1	-0.01	12	840	6
E53-43A	0.25	30	0.97	2205	1	0.03	48	960	56
E180-43A	0.06	20	0.81	660	-1	0.01	10	610	30
E53-43B	0.27	30	0.96	2325	1	0.04	39	940	58
E180-43B	0.05	20	0.80	635	-1	0.01	8	580	22
E53-44A	0.21	40	0.78	2220	1	0.04	39	1090	88
E180-44A	0.05	20	0.59	560	-1	0.01	5	720	26
E53-44B	0.21	40	0.81	2230	1	0.03	47	1070	88
E180-44B	0.04	20	0.57	460	-1	0.01	4	690	32
B53-45	0.14	20	1.50	570	-1	0.03	149	980	8
B180-45	0.03	10	0.72	195	-1	0.01	51	480	2

TOOTSEE RIVER

Sample	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
B53-40	-2	3	141	0.01	-10	-10	24	10	102
B180-40	2	1	145	0.01	-10	-10	10	-10	52
B53-41	4	4	58	0.03	-10	-10	25	10	110
B180-41	2	1	41	0.01	-10	-10	11	-10	30
B53-42	-2	4	61	0.08	-10	-10	46	-10	94
B180-42	-2	1	15	0.03	-10	-10	37	-10	28
E53-43A	2	3	101	0.04	-10	-10	29	-10	214
E180-43A	2	1	58	0.02	-10	-10	13	-10	106
E53-43B	2	4	106	0.04	-10	-10	29	-10	208
E180-43B	-2	1	52	0.02	-10	-10	10	-10	74
E53-44A	-2	4	75	0.06	-10	-10	31	-10	304
E180-44A	-2	1	27	0.02	-10	-10	11	-10	94
E53-44B	-2	4	86	0.05	-10	-10	30	-10	298
E180-44B	-2	1	27	0.02	-10	-10	10	-10	86
B53-45	-2	9	56	0.12	-10	-10	70	-10	72
B180-45	-2	2	20	0.06	-10	-10	33	-10	26

APPENDIX 2

SAMPLE SITE REPORTS

APPENDIX 2A

SAMPLE SITE REPORTS:

MT SKUKUM

SKUKUM

Site 1

Samples: EFS93-1A, EFS93-1B, EHM93-1
Date: July 13 NTS: 105 D/3

UTM: east: 488780 north: 6674010
Stream: West Becker #2 Trib.
Width: 1.5m Depth: 15cm Flow: Rapid and turbulent.
Geology: Equigranular to porphyritic granite, felsic volcanics, minor quartz breccia.
Bank Type: Unsorted locally derived till and fluvial deposits.
Sampling time: 42 min., 48 min.
Sample weight: 5369 g, 5771 g
Notes:
Fine sediment bulk sample collected in a plastic lined 4 l container. Sample was sieved through 1700 micron stainless steel sieve within a brass frame. Damp nature of sediment dramatically slows sample collection time.
Heavy mineral sample consists of the panned concentrate from 10 l of sample that is pre-sieved through a 5000 micron galvanized wire screen. Sample collection time for the heavy mineral bulk sample was not measured, however it appeared to average ~15 min.. The large discrepancy between the fine sed. bulk and the heavy mineral bulk is directly due to a large proportion of the stream sediment being in the 2000 to 5000 micron range, and the tendency for the finer screen to plug.
Original RGS sample UTM: 488594 E, 6674090 N
#1665 105ppb Au, 6ppb Au.
#1666 1ppb Au, <11 Au.

Site 2

Samples: EFS93-2A, EFS93-2B, EHM93-2
Date: July 13 NTS: 105 D/3

UTM: east: 488400 north: 6673650
Stream: West Becker #2 Trib.
Width: 1m Depth: 10cm Flow: Rapid and Turbulent
Geology: Equigranular granite in outcrop, felsic volcanics.
Bank Type: Outcrop and colluvial sediments
Sampling time: 25 min., 45 min.
Sample weight: 5480 g, 4514 g
Notes:
Samples collected above treeline. Much of the creek still covered by snow. Significant contamination from colluvial material melted out of the snow seems likely.

Site 3

Samples: MFS93-3A, MFS93-3B, MHM93-3
Date: July 14 NTS: 105 D/3

UTM: east: 474850 north: 6676200
Stream: Butte Ck.
Width: 3m Depth: 30cm Flow: Rapid and Turbulent
Geology: Outcrop: Pink and Green mottled Syenite with quartz eyes. Float material consists of bimodal volcanics.
Bank Type: Outcrop, colluvial sediments
Sampling time: 65 min., 48 min.
Sample weight: 5707 g, 5455 g

Notes:
Layer of fine sed. deposited in the drainage may relate to high water depositing fine sediment on top of ice with in the stream channel. The other possibility is that the fine sediment were deposited by snow slides and would then represent sample contamination from non-stream derived sediments. First scenario is favored as similar deposits are seen at site 8 which is below bush line where no snowslide damage was observed.
Heavy mineral sample contains an abundance of fine pyrite crystals.
RGS sample UTM: 474764E, 6676185N
#1695 277 ppb Au, 130 ppb Au

Site 4

Samples: MFS93-4A, MFS93-4B,
Date: July 14 NTS: 105 D/3

UTM: east: 474500 north: 6675700
Stream: Butte
Width: 2.5 m Depth: 25 cmFlow: Rapid and turbulent
Geology: Felsic and mafic volcanics and Quartz carbonate breccias.
Bank Type: colluvial
Sampling time: 60 min., 59 min.
Sample weight: 4935 g, 5009 g

Notes:
Sample site approximately 500 m downstream from Mt. Skukum Gold Mine waste dump.

Site 5

Samples: BFS93-5
Date: July 15 NTS: 105 D/3

UTM: east: 47350 north: 6677550
Stream: NW Butte Trib.
Width: 1 m Depth: 10 cm Flow: Rapid
Geology: Float: Granite with minor metavolcanics.
Bank Type: Fluvial outwash.
Sampling time: 80 min.
Sample weight: 3701 g

Notes:
Significant organic content to sample.

Site 6

Samples: BFS93-6
Date: July 15 NTS: 105 D/3

UTM: east: 474200 north: 6678050
Stream: NW Butte Trib.
Width: 1m Depth: 10cm Flow: Rapid and turbulent
Geology: Granite and metavolcanics
Bank Type: Glacial moraine, locally derived.
Sampling time: 63 min.
Sample weight: 2435 g

Notes:
Stream bed consists of boulders and gravel, very few fines.
RGS sample #1698 <1ppb Au
UTM: 474182E, 6678245N

Site 7

Samples: MFS93-7A, MFS93-7B
Date: July 15 NTS: 105 D/3

UTM: east: 475700 north: 6676550
Stream: Butte Ck.
Width: 3.5m Depth: 30cm Flow: Rapid and turbulent
Geology: Float: Mafic and felsic volcanics minor granite.
Bank Type: Unsorted glacial and fluvial debris.
Sampling time: 90 min., 46 min.
Sample weight: 4010 g, 5502 g

Notes:
MFS-7A: Collected from a gravel dominated bar while 7B was collected from a sand dominated bar.

Site 8

Samples: MFS93-8A, MFS93-8B, MHM93-8
Date: July 15/16 NTS: 105 D/3

UTM: east: 476750 north: 6676600
Stream: Butte
Width: 4m Depth: 35cm Flow: Rapid and turbulent
Geology: Float: Bimodal volcanics with minor granite.
Bank Type: Fluvial
Sampling time: 65 min., 20 min.
Sample weight: 3986 g, 5583 g

Notes:
MFS-8A: Collected from gravel bar, 8B collected from sediment deposited between the main channel and a dry flood channel. An even coating of fine material appears to have been deposited from melting ice. The dryness and fineness of this material greatly sped collection of 8B.

Site 9

Samples: BFS93-9
Date: July 16 NTS: 105 D/3

UTM: east: 476750 north: 6676600
Stream: Wheaton Trib.
Width: 1m Depth: 10 cmFlow: Rapid
Geology: Float: Granite
Bank Type: Fluvial outwash
Sampling time: 25 min.
Sample weight: 6000 g

Notes:
RGS sample #1668 19.4 ppm As, 178 ppb Hg, 6.0 ppm Sb
<1ppb Au. UTM: 486366E 6675684N

Site 10

Samples: BFS93-10
Date: July 16 NTS: 105 D/3

UTM: east:486500 north:6675300
Stream: Wheaton Trib.
Width: 1m Depth: 10 cmFlow: Rapid
Geology: Outcrop: Medium grained quartz feldspar augite granite.
Bank Type: Fluvial
Sampling time: not timed
Sample weight: 4626 g

Notes:
Sample collected from north bank .5 m from active stream. Slightly overgrown sand and gravel.

APPENDIX 2B

SAMPLE SITE REPORTS:

KETZA RIVER

KETZA RIVER

Site 11

Samples: MFS93-11A, MFS93-11B
Date: July 28, '93   NTS: 105 F/9

UTM: east:646250 north: 682550
Stream: Cache
Width: 1m   Depth: 10cm Flow: moderate
Geology: Clastic seds. and Limestone, some hornfels.
Bank Type: Local Glacial Moraine.
Sampling time: 1:30 min., 0:34 min.
Sample weight: 6364 g, 7374 g
Notes:

Samples were collected from original drainage ~100m below mine tailings facility. Stream has been diverted around tailings facilities. A small tailings outflow runs in the original stream bed. Samples were collected from 5 - 30 cm depth.

Site 12

Samples: MFS93-12A, MFS93-12B, MHM93-12A, MHM93-12B
Date: July 28   NTS: 105 F/9

UTM: east: 647150 north: 6826550
Stream: Cache
Width: 2.5m Depth: 20cm Flow: Moderate/fast
Geology: Limestone and clastic seds., abundance of coarse white quartz vein material.
Bank Type: Fluvial
Sampling time: :30 min., :30 min.
Sample weight: 7973 g, 8078 g
Notes:

Stream contains an orange biological? precipitate.

MFS-12A: Collected half from a gravel bar and half from fine silt and sand deposits.
MFS-12B: Collected from sandbar deposit.
MHM-12A: Collected from a bar head. Red oxide heavies, some pyrite (galvanize from screen).
MHM-12B: Sample collected from bar head cobble pavement. Only half a sample collected approximately 10kg.

Site 13

Samples: MFS93-13A, MFS93-13B
Date: July 29 NTS: 105 F/9

UTM: east:648450 north: 6827050
Stream: Cache
Width: 5m Depth: 20cm Flow: Moderate
Geology: Hornfels clastic and limy seds..
Bank Type: Fluvial
Sampling time: :44 min., :not sieved
Sample weight: 7894 g, 10071 g
Notes:
MFS-13A: Collected from sand and gravel bar.
MFS-13B: Collected 2m downstream from 13A. Fine sand and clay deposit. Approximately 1-2 cm clay covering 10 cm fine sand and clay overlying gravel bar.

Site 14

Samples: MFS93-14A, MFS93-14B, MHM93-14A, MHM93-14B
Date: July 29 NTS: 105 F/9

UTM: east: 650175 north: 6828000
Stream: Cache
Width: 5M Depth:30 cm Flow: Fast
Geology: Meta sediments
Bank Type: Fluvial - minor colluvial
Sampling time: :05 min., :03 min.
Sample weight: 7324 g, 6115 g
Notes:
MFS-14A: Sample collected from sand and gravel bar.
Dry material greatly speeds sieving.
MFS-14B: Fine silt, collected 2M from 14A.
Sampling time 3 Min. No sieving required.
Fine silt and sand.
MHM-14A: Sample collected from between 3 large boulders.
Very little sediment.
Coarse pyrite in heavies.
MHM-14B: Collected from a barhead within the stream,
coarse pyrite in heavies.

Site 15

Samples: BFS93-15, BHM93-15
Date: July 29 NTS: 105 F/9

UTM: east: 653500 north: 6825450
Stream: Upper Ketza
Width:1.5 M Depth:15 cm Flow: Rapid
Geology: Clastic and limy sediments, some hornfels.
Bank Type: Fluvial
Sampling time: : 25 min.
Sample weight: 6627 g
Notes:
Sand and gravel bar
BHM-15: Collected 5 m up from BFS-15 very few heavies.

Site 16

Samples: BFS93-16
Date: July 29 NTS: 105 F/9

UTM: east: 652650 north: 6826550
Stream: Upper Ketza
Width: 7m Depth: 20 cmFlow: Moderate
Geology: Meta sediments with coarse white quartz float.
Bank Type: Fluvial
Sampling time: : not sieved
Sample weight: 9021 g
Notes:
Sample site in a small back eddy.
Fine sand and clay.

***** No Site 17**

Site 18

Samples: BFS93-18, BHM93-18
Date: July 30 NTS: 105 F/9

UTM: east:650350 north: 6830175
Stream: Ketza Trib E
Width: 1M Depth: 10 cm Flow: Rapid turbulent
Geology: Meta sediments with prominent quartz carbonate veining.
Bank Type: Fluvial
Sampling time: : 12 min.
Sample weight: 8056 g
Notes
BFS18 sand and gravel bar between two arms of creek.
BHM18 2 m up from FS 18
Sample contaminated with Galvanize from screen.
Generally unsorted material.
Some iron oxide heavies.

Site 19

Samples:BFS93-19
Date: July 30 NTS: 105 F/9

UTM: east: 650700 north:6830250
Stream: Ket Trib E
Width: 1 M Depth:15 cm Flow: Fast turbulent
Geology: Meta sediment - phyllite, quartz Carbonate altered ultra mafic breccia (mylonite).
Bank Type: Colluvial
Sampling time: : 35 min.
Sample weight: 7720 g
Notes
Steep stream.

APPENDIX 2C

SAMPLE SITE REPORTS:

DUBLIN GULCH

DUBLIN GULCH

Site 20

Samples: MFS93-20A MFS93-20B
Date: July 31 NTS: 106 D/4

UTM: east: 458550 north: 7100850
Stream: Dublin Gulch
Width: 1m Depth:20 cmFlow: Moderate to fast.
Geology: Meta sediments; schist, quartzite; equigranular biotite granite
Bank Type: Fluvial
Sampling time: : not sieved min., :05 min.
Sample weight: 7933 g, 8723 g

Notes:
Active placer mining.
20A: Collected from fine silt deposit and not sieved.
MFS-20B Collected from sand and gravel deposits.
Deposition of fine sediments during placer mining may make the sample unrepresentative of entire drainage, as the area of placer mining will be over represented.

Site 21

Samples:MFS93-21A, MFS93-21B
Date: July 31 NTS: 106 D/4

UTM: east: 459200 north: 7100850
Stream: Dublin Gulch
Width: 1m Depth: 10 cmFlow: Moderate
Geology: Meta Sediments and granite.
Bank Type: Placer tailings.
Sampling time: : 7 min., : Not sieved min.
Sample weight: 7792 g, 6407 g

Notes:
MFS-21A: Sieved from approximately dry material.
MFS-21B: Collected from fine silt.
Stream bed totally disrupted, original stream bed is gone.

Site 22

Samples: MFS93-22A, MFS93-22B
Date: July 31 NTS: 106 D/4

UTM: east: 461075 north: 7101450
Stream: Dublin Gulch
Width: 1 M Depth: 15 cmFlow: Rapid and turbulent
Geology:Meta Sediments and veined granite.
Bank Type: Fluvial/ colluvial.
Sampling time: not timed.
Sample weight: 7515 g, 8225 g

Notes:
Site located above active placer mining. Hardrock exploration roads and trenches may contribute significantly to sediment.
MFS-22A: Sand gravel and silt from an overflow channel.
MFS-22B: Collected from sand and gravel at an overflow channel adjacent to the stream approximately 5 m downstream from 22A.
Very few fines, reddish brown sediments.

Site 23

Samples: MFS93-23A, MFS93-23B
Date: July 31 NTS: 106 D/4

UTM: east: 460150 north: 7101350
Stream: Dublin Gulch
Width: 1m Depth: 15 cmFlow: Rapid and turbulent
Geology: Granite and meta sediments.
Bank Type: Fluvial
Sampling time: : 26 min., : not sieved
Sample weight: 7413 g, 6091 g

Notes:
Minor placer activity upstream from sample site. Stream at sample site undisturbed.
Sandy gravel.
MFS-23B: Approximately 10 Kg of moss mat collected.

Site 24

Samples: EFS93-24A ,EFS93-24B, EHM93-24A, EHM93-24B

Date: Aug. 1 NTS: 115 M/13
UTM: east: 485150 north: 7095800
Stream: Lynx Creek
Width: 3 M Depth: 10 cmFlow: Slow
Geology: Mica schist
Bank Type: Fluvial
Sampling time: : 15 min., : 20 min.
Sample weight: 9076 g, 8196 g

Notes:
Undisturbed. Stream meanders through swampy area.
EFS-24A: Dry.
EHM-24A: Sample collected from barhead pavement site. Unsorted.
Numerous grains (4-5) visible Au approximately 100 micron to 500 micron range.
EFS-24B: Collected from sand and gravel bar (pavement) coarse, very few fines.
Dry.
EHM-24B: Sample collected from barhead.

Site 25

Samples: EFS93-25A EFS93-25B, EHM93-25A, HM93-25B
Date: Aug. 1 NTS: 105 M/13

UTM: east: 458600 north: 7095700
Stream: Lynx
Width: 2.5 M Depth: 15 cmFlow: Slow to moderate
Geology: Schist (mica)
Bank Type: Fluvial
Sampling time: : 7 min., : 15 min.
Sample weight: 11702 g, 8885 g

Notes:
EFS-25A: Sample collected from sand bar very few fines.
Light gray, tan.
EFS-25B: Sample collected from sand and gravel deposit.
EHM-25A: Collected from barhead, contaminated with galvanize.
EHM-25B: Sample collected from poorly developed pavement at the head of a small rapid. 4 grains Au in 50-250 micron range, 1 grain possibly < 50 microns.

Site 26

Samples: BFS93-26
Date: Aug. 2 NTS: 115 P/16

UTM: east: 450100 north: 7095050
Stream: Secret Creek
Width: 1.5m Depth: 10 cmFlow: Moderate
Geology: Meta sediments and sandstone.
Bank Type: Fluvial
Sampling time: : 12 min.
Sample weight: 8994 g

Notes:
Past placer activity approximately 2 years ago has disrupted original stream.
Coarse gravel and sand bar.

Site 27

Samples: BFS93-27 ,BHM93-27
Date: Aug. 2 NTS: 115 P/16

UTM: east: 449700 north: 7095075
Stream: Secret Creek
Width: 1 M Depth: 10 cmFlow: Moderate to fast
Geology: Meta sediments; quartzite and schist.
Bank Type: Fluvial with minor colluvial.
Sampling time: : 14 min.
Sample weight: 8144 g

Notes:
Sand and gravel bar.
Minor placer testing work upstream approximately 2-5 years ago. Some drilling, one pit approximately 2 acres disturbed.
BHM-27: 3 grains Gold 100-250 microns in size.

Site 28

Samples: BFS93-28 ,BHM93-28
Date: Aug. 2 NTS: 115 P/16

UTM: east: 448150 north: 7088600
Stream: McQuesten Trib
Width: 1 m Depth: 5 cm Flow: Moderate
Geology: Phylite and schist.
Bank Type: Fluvial and glacial.
Sampling time: not sieved.
Sample weight: 5566 g

Notes:
Stream is running through alder forest.
Silt and fine sand.
Sampled with significant organic content.
BHM-28: Contains magnetite and very minor amounts of pyrite and silvery-gray sulfides.

Site 29

Samples: BFS93-29
Date: Aug. 2 NTS: 115 P/16

UTM: east: 447950 north: 7088900
Stream: McQuesten Trib
Width: 0.5 M Depth: 5 cm Flow: Wet inactive
Geology: Phyllite and schist.
Bank Type: Fluvial
Sampling time: not sieved
Sample weight: 6083 g

Notes:
Sample collected from sand and silt not sieved.

APPENDIX 2D

SAMPLE SITE REPORTS:

BREWERY CREEK

BREWERY CREEK

Site 30

Samples: MFS93-30A, MFS93-30B, MHM93-30A, MHM93-30B
Date: Aug. 3 NTS: 116 B/1

UTM: east: 634500 north: 7099800
Stream: Laura Creek
Width: 1.5 m Depth: 15 cm Flow: Moderate
Geology: Quartzite, chert and shale. Minor altered fine grained intrusive.
Bank Type: Fluvial
Sample Weight: 7354 g, 7165 g
Notes:
MFS-30A: Dark and tan, salt and pepper appearance. Sand and gravel bar.
MHM-30A: Collected from the barhead of a midstream gravel bar. Barite heavies.
MFS-30B: Sample collected from sand and gravel bar at the ditch. Mostly dry.
MHM-30B: Collected from barhead one very small Au grain visible in approximately 50 micron range.

Site 31

Samples: MFS93-31A, MFS93-31B
Date: Aug. 3 NTS: 116 B/1

UTM: east: 635225 north: 7105450
Stream: Laura Creek
Width: 1 m Depth: 10 cm Flow: Moderate
Geology: Black argillite and altered intrusive.
Bank Type: Fluvial and colluvial.
Sampling time: Not Sieved.
Sample weight: 1578 g, 7738 g.
Notes:
MFS-31A: Sediment influx possibly caused by local trenching. Fine sediment, not sieved.
MFS-31B: Sand and silt from sandbar within the stream.
Samples collected from near the bottom of the C-1 trench.

Appendix 1D

Site 32

Samples: MFS93-32A, MFS93-32B
Date: Aug. 4 NTS: 116 B/1

UTM: east: 633500 north: 7103425
Stream: Laura Creek
Width: 1.5 m Depth: 15 cm Flow: Moderate
Geology: Shale and sandstone with minor altered intrusive.
Bank Type: Fluvial and colluvial.
Sampling time: 5 min. : 5min.
Sample weight: 9164 g, 9837 g.
Notes:
Trenching and road cuts approximately 2 km upstream.
MFS-32A: Collected from gravel bar. Appears to be good cross section of grainsizes. Dry.
MFS-32B: collected 0.5 m from 32A. Sieved from dry sand deposit significantly more sorted than 32A.

Site 33

Samples: MFS93-33A, MFS93-33B, MHM93-33A, MHM93-33B
Date: Aug. 4 NTS: 116 B/1

UTM: east: 634050 north: 7104850
Steam: Laura Creek
Width: 1 m Depth: 15 cm Flow: Moderate
Geology: Argillite and clastic sediments. Minor altered intrusive.
Bank Type: Fluvial and colluvial.
Sample Weight: 8223 g, 4628 g
Notes:
Roads and trenches 500 m upstream.
MFS-33A: Black and tan, salt and pepper appearance. Collected from sand and up to 3/4 inch gravel bar.
MHM-33A: Sample collected from within the active channel in a narrow chute. Barite heavies.
MFS-33B: Sample collected just upstream from culvert. Silt and fine sand. Darker colour than 33A, likely a higher organic content.
MHM-33B: Collected from active channel in faster water. Fewer heavies than 33A. Barite in heavies.

Site 34

Samples: BFS93-34
Date: Aug. 5 NTS: 116 B/16

UTM: east: 628800 north: 7201450
Stream: Demp?
Width: Dry Depth: Flow: seasonal
Geology:
Bank Type: Glacial fluvial.
Sampling time: 20 min.
Sample weight: 6123 g
Notes:
Sand and gravel deposited in dry streambed.

Site 35

Samples: EFS93-35A, EFS93-35B, EHM93-35A
Date: Aug. 5 NTS: 115 O/14

UTM: east: 597750 north: 7079700
Steam: Right Quartz Creek
Width: .5 m Depth: 5 cm Flow: Moderate
Geology: Klondike schist.
Bank Type: Fluvial and colluvial, permafrost.
Sample Weight: 2713 g, 2365 g
Notes:
EFS-35A: Stream bed has been stripped of vegetation along the creek. Sample collected from silt and fine sand deposit in the creek.
EHM-35A: Sample collected from coarse gravel, silt and mud in disturbed stream. Large amount of black sand. 3 grains of gold (~50 to 200 microns).
EFS-35B: Sample collected from fine silt and sand. 10 m upstream from EFS-35A.

Site 36

Samples: EFS93-36A, EFS93-36B
Date: Aug. 5 NTS: 115 O/14

UTM: east: 597750 north: 7080225
Steam: Left Quartz Creek
Width: .5 m Depth: 5 cm Flow: Moderate
Geology: Klondike schist.
Bank Type: Fluvial and colluvial.
Sampling time: 17 min. : 15 min.
Sample Weight: 6379 g, 6367 g
Notes:
EFS-36A: Stream bed very disturbed. Sample collected from stream running in ~2 year old diversion. Fine sand and gravel.
EFS-36B: 10 m upstream from EFS-36A.

APPENDIX 2E

SAMPLE SITE REPORTS:

TOOTSEE RIVER

TOOTSEE RIVER

Site 40

Samples: BFS93-40 ,BHM93-40
Date: Aug.8 NTS: 105 B/1

UTM: east: 431775 north: 6667650
Stream: Spencer Creek
Width: 5 M Depth: 50 cmFlow: Fast
Geology: Granite and Meta Sediment.
Bank Type: Fluvial
Sampling time: unsieved min.
Sample weight: 7526 g
Notes:
BFS-40: Collected from fine sand and silt deposit. Some >2000 microns.
BHM-40: Pan collected from barhead. Heavies are 90% Magnetite.

Site 41

Samples: BFS93-41
Date: Aug.8 NTS:105 B/1

UTM: east: 426025 north: 6664100
Stream: SW of Spence
Width: 0.5 M Depth: 10 cmFlow: Rapid and turbulent
Geology: Granites and sediments.
Bank Type: Fluvial
Sampling time: :20 min., : min.
Sample weight: 6518 g
Notes:
Sample collected from an overflow channel.

Site 42

Samples: BFS93-42
Date: Aug.8 NTS: 105 B/2

UTM: east: 412450 north: 6661200
Stream: Ranch Motel Trib.
Width: Dry M Depth: cm Flow:
Geology: Granite
Bank Type: Glacial/ Fluvial
Sampling time: :15 min.
Sample weight: 7215 g
Notes:
Sample collected from dry creek bed 2 M wide, steep.

Site 43

Samples: EFS93-43A EFS93-43B ,EHM93-43
Date: Aug.9 NTS:105B/1

UTM: east: 427450 north: 6658850
Stream: W. Tootsee Trib
Width: 1 M Depth: 20 cmFlow: Fast
Geology: Med-course grained granite with sediments and minor breccia.
Bank Type: Glacial with minor fluvial.
Sampling time: not sieved.
Sample weight: 5998 g, 6856 g
Notes:
EFS-43A: Approximately 500M down stream from road crossing with culvert. Collected from sand and silt deposits on the edge of the active channel.
EHM-43: Collected from within the active channel 0.5M from EFS-43A: Large boulder channel.
EFS-43B: Swamp, glacial and fluvial. Collected from sand and silt deposit in overflow channel.

Site 44

Samples: EFS93-44A EFS93-44B, EHM93-44
Date: Aug.9 NTS: 105 B/1

UTM: east: 426725 north: 6658650
Stream: W Tootsee Trib
Width: 1.5 M Depth: 25 cmFlow: Slow
Geology: Granite erratics.
Bank Type: Glacial.
Sampling time: not sieved
Sample weight: 6186 g, 6670 g
Notes:
EFS-44A: Collected from sand and silt deposit within active channel.
EFS-44B: Fine sand and silt with organics. Collected from within active stream. Not sieved.
EHM-44: Collected from sand and gravel deposit within the stream. No good high energy sites. Sites contain sand and boulders.

Site 45

Samples: BFS93-45
Date: Aug. 9 NTS:105 D/?

UTM: east: *** north: ***
Stream: Judas Creek
Width: 6 M Depth: 30 cmFlow: Slow
Geology: unseen
Bank Type: Glacial/Fluvial
Sampling time: : not sieved
Sample weight: 2516 g
Notes:
Sample collected from fine sand and silt deposits.

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