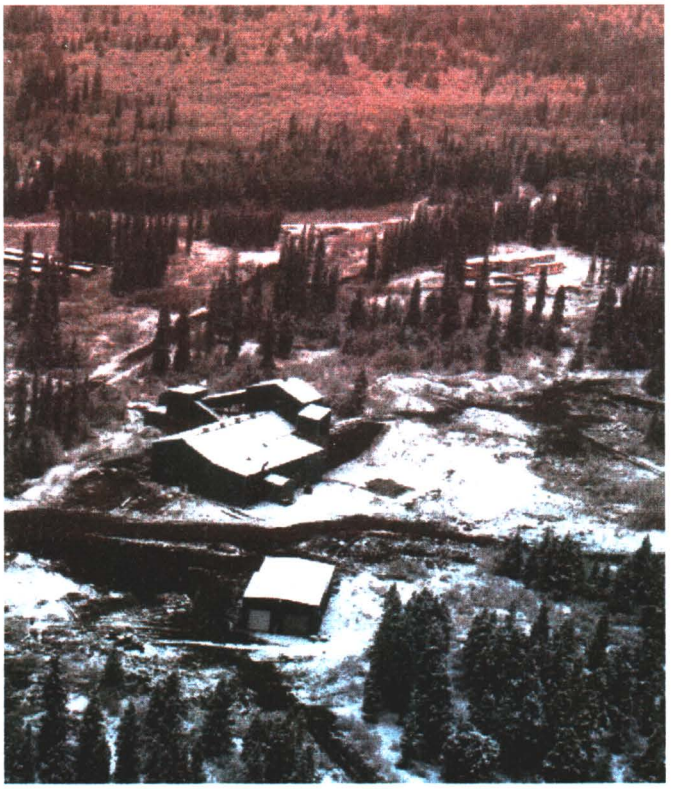
Environmental Assessment, Mount Skukum Gold Mine (MSGM), Yukon Region – Final Report

(Call Up No. 98-6195-02)



Prepared for:

Indian and Northern Affairs Canada

Contaminated Sites Office
345 – 300 Main Street
Whitehorse, Yukon

by

MDA Consulting Limited
Environmental Solutions

Unit B3
5109 Harvester Road
Burlington, ON

March, 2000

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1. Executive summary

MDA Consulting was obtained, by the Department of Indian and Northern Affairs, Waste Management Program, Yukon Region. To perform an environmental assessment of the Skukum Mountain Gold Mine (MSGM). MSGM, is located approximately 100 km southwest of Whitehorse at 60^0 11.5'N and 135^0 24.0'W, on the East side of Mt. Skukum. This detailed report is based on factual information, and offers a **detailed current condition report,** which is not intended to offer any recommendations, or provide a financial budget for possible future projects regarding this location.

Upon approval from the INAC to proceed with this assessment, a preliminary review of files was initiated. This involved a review of information within already existing files, located at the INAC offices, and which were part of a water licensing process. Also at this time, interviews were conducted with members of the INAC Contaminants/Waste Program, Yukon Region, and the Water Resources Division (INAC-YK). Additional interviews were conducted with an employee of NorthCan Environmental, who had worked on the decommissioning of the site, and provided a great deal of knowledge regarding the site location, and condition. Communication with the Carcross-Tagish First Nations revealed concerns regarding operation of the MSGM, and how it may affect all aspects of their environment. All of these discussions enabled MDA personnel to determine the best way to access the site as well as to assess the major concerns of INAC and the Carcross-Tagish First Nation in advance of a site inspection.

A site visit/inspection was carried out, to allow MDA personnel to complete a visual inspection of the site, and to collect various samples of water and soil, for analysis. These site visits included a representative from Carcross-Tagish First Nation. This also gave an opportunity to assess any concerns or issues that may have been identified in the preliminary files review, or that had come to the surface during the interviews.

Detailed reviews of information retained on file by the INAC, Water Resources Divisions as well as previous reports on the MSGM, were analyzed. These contained information regarding environmental chemistry, aquatic quality, sediment, tailings pond water and sediment, along with other environmental background information.

Environmental monitoring has been ongoing at the Mt. Skukum location since the mine's development. These reports dealt mainly with mine water discharge and the quality of that water, and it's affect on Butte Creek, which flows through the MSGM site. Biomonitoring studies of Butte Creek and Wheaton River during the operation of the mine all concluded that none of the benthic populations indicated a stressed or polluted environment with a healthy population of invertebrate fauna at all sites.

The tailing ponds and the concentrations of heavy metals and cyanide were a major concern with MSGM. Despite the fact that water was never released from the tailings ponds during the operation of the mine, mill effluent and pond water were frequently tested. In general the water quality of the tailings ponds was of good quality with low levels of cyanide and other heavy

metals. Although cyanide at the end of discharge pipe from the mill on average (6.6 ± 20.9 mg/L [n = 749]) exceeded the license objective of 1 mg/L, the absence of releases from the ponds substantiates the absence of effects on the receiving waters, namely Butte Creek and Wheaton River.

As part of this assessment, surface water samples from Butte Creek, Wheaton River and the tailings pond were analyzed for cyanide, dissolved and total metals. Dry and wet sediments from the tailings pond were analyzed for total metals and cyanide. Concentrations of dissolved and total metals in all samples are very low with most analytes less than detection. Metals are predominantly in the dissolved form and the frequency of dissolved metal exceeding total metal concentrations is not unusual at very low concentrations. Evidently, surface water quality has reverted back to pre-mining conditions within Butte Creek.

Even the small quantity of water remaining in the tailings ponds showed low metals concentrations and even the cyanide concentrations were non-detectable. Thus, a release of water from the tailings ponds would have no effect on receiving water with respect to cyanide. Although Ba exceeded the concentrations of Butte Cr., it was well below the license standard. Ca, Mg, P, Na, Sr and S in the water of the tailing pond tended to be high relative to surface waters at the time of this inspection but well below average concentrations of the surface waters from previous studies. Cu concentrations exceed the Canadian Council of Ministers of the Environment (CCME) guideline but did not exceed the license and are actually below the Cu concentrations of the surface waters. In summary, the surface water data suggest a pristine system.

Soils and sediments from the tailings pond were analyzed for metals and cyanide. Cu was the only metal that exceeded CCME guidelines. Cyanide, ranged from 0.22 to 7.6 mg/Kg. These were an order of magnitude less than Ontario Ministry of Environment soil/sediment guidelines and less than CCME guidelines for cyanide in soils.

Stained soils were tested for BTEX compounds and hydrocarbons. One area, referred to as the abandoned maintenance building site, is highly contaminated. This is a fairly substantial area (approximately 11 m x 23 m) but the depth of contamination was not established. Other minor soil staining from hydrocarbons occurs near small fuel storage tanks near the current maintenance building and at the rear of the accommodation trailers.

No heritage locations of importance were identified. Although it should be noted that the activities at the mill would have in fact destroyed any such evidence.

While the MSGM site undoubtedly remains as one of the better abandoned mine sites in the Yukon there are still some deficiencies in the condition of the site relative to the components of the abandonment plan. The components of the abandonment plan that are **not deficient**, can be listed as follows:

- Tailings ponds have been left essentially as outlined in the abandonment plan;
- The water supply line and pump house have been removed and remnants cleaned up;
- Power lines have been removed; and,

- Portals have been closed although the lower portal was blown out and could be accessible if the ice in the entrance melts.

Items that are deficient relative to the abandonment plan include:

- A quantity of debris has been exposed as a result of the wash out of the fill at the face of the lower portal;
- The interior of the mill site still contains some chemicals despite the fact that these were to have been removed;
- At least two debris sites remain in the vicinity of the mill - the electrical site is neat and orderly while the general debris site is not sorted and is disorderly;
- Although all fuel and oil was supposed to have been removed, some remains on site; and,
- The landfill has not been adequately covered.

Additionally, there appeared to be groundwater wells in the vicinity of the camp but we could not confirm the purpose of these wells as they were dry at the time of visit. We could find no record of their installation and/or purpose in the documentation reviewed. These should be removed or at least properly sealed as part of the abandonment.

Specific concerns at the site include:

1. Extensive oil staining at what appears to be the dirt floor of an old maintenance facility to the north of the mill.
2. Minor oil staining (approximately 2 to 4 m^2) has occurred at the northwest corner of the present maintenance building.
3. A scrap metal and other debris storage site south of the mill.
4. Waste oil drums stored outside of the generator shed near the camp trailers.
5. Several, minor stained oil sites about the mill and camp.
6. The presence of small quantities of an assortment of chemicals in the mill complex.
7. The landfill located to the east of the mill site has not been adequately covered.

2. Background

The Department of Indian and Northern Affairs, Waste Management Program, Yukon Region has asked MDA to undertake an environmental assessment of the Mount Skukum Gold Mine (MSGM) as a call up under the above named standing offer. This report is provided to summarize the fieldwork that has been undertaken to initiate this project.

MSGM is located approximately 100 km southwest of Whitehorse at 60° 11.5'N and 135° 24.0'W on the east side of Mt. Skukum. The exploitable minerals at this location include Au, Ag, Pb, Zn and Sb. There is a long history of exploration and mining at this location. The site was staked as early as 1922 with a 12 m adit and several shallow trenches and shafts developed by 1929. Subsequently, under the Stenbraten stake, a 40 m adit was completed in 1937. Additional exploration continued with Omni Resources Inc. conducting resistivity surveys, 18,231 m of drilling and 869 m of underground development from 1985 to 1987. In 1988, Skukum Gold Inc. explored with 6000 m of surface and underground diamond drilling, underground drifting on the Rainbow and Kuhn Zones and initiated an adit at the 1350m level.

Development of the site, completed as of December, 1988, included a mill and camp located approximately 2.5 km upstream of the confluence of the Butte Creek and Wheaton River; a tailings disposal area; an all weather haulage road to the mine site and water and sewage facilities at the camp site. Water supply was originally to be from Butte Creek but due to the absence of year round flow, a pipeline was constructed from Wheaton River. At the end of 1988, total underground workings included two main haulage tunnels, several drifts, ore passes and stopes, raises to the 1375 and 1400m levels, and a decline to the 1275 and 1250m levels. Between February 1986 and May, 1988, a total of 225,000 tons of ore was milled producing approximately 80,000 oz. of gold.

The record of ownership of MSGM is not totally clear. BYG Natural Resources. Trumpeter Gold and Omni Resources have all played a part in the development of the mine. In 1994, it appears that Omni Resources purchased 100% interest in the mine, presumably including the mill, from Wheaton River Minerals.

In August, 1990, Mt. Skukum Gold Mining Corporation applied to the Yukon Territorial Water Board (YTWB) for cancellation of its Water License Agreement as the current license did not expire until May, 1993. The mine had ceased to operate in 1988. The company prepared a detailed Decommissioning Plan for the mine in July, 1990, further to the Abandonment Plan filed in accordance with the Water License Requirement, and to address other concerns that have been raised by government agencies, First Nations, and local interest groups, about the abandonment of the mine. INAC accepted the decommissioning for the mine on Jan. 15, 1991 and the water license was cancelled on October 31, 1990. A reclamation plan for the mill site, detailing abandonment and restoration measures was to be submitted by Nov. 1, 1994 as the company was intending to maintain the surface lease until such time as the mill is sold. The files

contained no record as to whether or not the abandonment and restoration plan was ever submitted and accepted.

The objective of this environmental assessment is to provide a **detailed current condition,** environmental report on the site prior to devolution to the Yukon Territorial Government. This detailed current condition report will focus on the issues that have been identified as part of the Water License and on the Decommissioning and Abandonment Plans prepared by MSGM.

As instructed by INAC – Yukon personnel, the final report on this environmental assessment will not undertake an evaluation vis a vis regulations and criteria, neither will it provide recommendations or costs for future work at this site.

3. Preliminary Assessment

3.1. File Review

A preliminary review of the files retained by INAC-Whitehorse as part of the water licensing process was undertaken at the INAC offices immediately upon receipt of approval to undertake the work. Specific items of these files were copied for detailed review at MDA's office and for use in the preparation of the final report.

3.2. Interviews

Informal discussions were conducted with Mr. Brett Hartshorne and Mr. Pat Roach of INAC, Contaminants/Waste Program, Yukon. Informal information sessions were also conducted with Mr. H.F. McAlpine, Mr. G. Whitley and Mr. Dave Sherstone, all of the Water Resources Division, INAC-YK.

MDA and AES staff also met with Mr. Jim Wood of NorthCan Environmental Services Inc. of Whitehorse. Mr. Wood, with a previous employer, helped with the demobilization of the site and was of considerable assistance with respect to logistics planning and outlining the site conditions.

3.3. Reconnaissance Planning

Initially, it had been anticipated that the site would be accessible using four wheel drive vehicles. However, the main obstacle to vehicular access was the first Wheaton River crossing. The bridge had been washed out in the spring of 1999; however, if the flow was sufficiently low, it was possible that the river could be forded at this point. A visual inspection of the crossing was undertaken on September 24, 1999. At that time it was determined that the crossing would be too difficult for available four wheel drive vehicles and that helicopter access was necessary. This resulted in a revision of the project costs that was approved.

3.4. First Nations Communications

MSGM is along Butte Creek, a tributary of Wheaton River, which flows into Bennett Lake, east of Carcross. The Carcross-Tagish First Nation has had a long standing concern about the operation of the MSGM as it may affect the natural water resources as well as the wildlife and habitat of their traditional areas. Consequently, several telephone discussions were held with Mr. Harold Gatensby, Environmental/Lands Coordinator for the Carcross-Tagish First Nations. Specific concerns identified by Mr. Gatensby related to the condition of the mill, especially with respect to any hazardous material that may still be stored there and the state of the tailings pond. The concern with the latter related to the possible escape of cyanide, used in the milling process, from the tailings to the Wheaton River.

Mr Gatensby was invited to accompany the MDA team to the MSGM site during the field inspection. Unfortunately, due to prior commitments, this was not possible. Mr. Bill Barrett of the Band Office agreed to accompany the MDA team to the site.

A duplicate set of photographs, complete with annotations, was provided to Mr. Gatensby in November, 1999.

4. Mill Site Inspection

4.1. Outline of Site Inspection Activities

The site inspection was used to visually corroborate indications of possible hazardous materials and conditions uncovered during the review of historical information and interviews. Visual evidence of potential environmental concerns includes, but is not limited to, the following:

- Topography, surface water and drainage;
- Natural habitats, resources, and proximity to natural waterways;
- Physical infrastructure;
- Preliminary identification of physical hazards;
- Soil disturbances such as soil removal, filling, tilling, and grading;
- Barren, stained or discoloured surface conditions, including signs of dead and stressed vegetation;
- Waste rock deposits and tailings impoundments;
- Underground and above ground storage tanks and supply lines;
- Chemical, material and waste storage or disposal areas including sumps, pits, ponds and landfills;
- Evidence of groundwater wells, cisterns, cess pools, or septic tanks;
- Electrical transformers, capacitors, and other utilities;
- Evidence of spills or surface water discharge;
- Abnormal odours from on-site or off-site sources;

Pertinent observations were photographed and located for our own records at the time of the field reconnaissance. During the site inspection, information regarding the presence of PCB and asbestos-containing materials was collected in a preliminary manner only. The generalized plan of the mill site (not exactly as presently exists) is shown in Figure 1 and an overview photograph of the site is provided in Photograph 1.

The initial site visit to MSGM was scheduled for the morning of September 30, 1999. Due to weather conditions, the departure from Yellowknife was delayed until 12:30 PM. The initial intention had been to use a Jet Ranger helicopter to transport personnel and equipment to the site. However, due to poor weather conditions, and the likelihood of snow at any time, it was decided that a larger field party would be appropriate. Consequently, the Sept. 30th visit consisted of 3 MDA and AES personnel, plus Mr. Barrett of the Carcross-Tagish First Nation. The increased load required either the use of a Long Ranger or several trips to and from the site. Cost efficiencies dictated the use of the Long Ranger.

Photograph 1: Overhead view of mill and maintenance shed in foreground and camp in background

The Trans North helicopter departed Whitehorse at approximately 12:30 PM and arrived at the MSGM mill site at approximately 13:15 PM via Carcross to pick up Bill Barrett. Inspections at that time included the following:

- the vicinity of the mill including the core storage area and camp;
- the interior of the mill;
- the water pipeline route to Wheaton River including the location of the former pump house;
- the tailings pond area; and,
- assorted waste storage and abandoned buildings or former building sites.

Poor weather at elevation and loss of day light in general, precluded travel to the adits to complete the site inspection.

The plan was to return to MSGM to complete the survey on October 1. Again poor weather in the morning postponed departure from Whitehorse. The field team stood by until noon; however, the weather had not yet improved sufficiently to justify an attempt to access the adits at approximately 1300m. As a result, the team proceeded north to Carmacks to complete similar projects at more northerly sites where the weather was apparently better but the risk of permanent snow cover was greater.

Table 1 lists the samples that were collected, the matrix and the analyses requested.

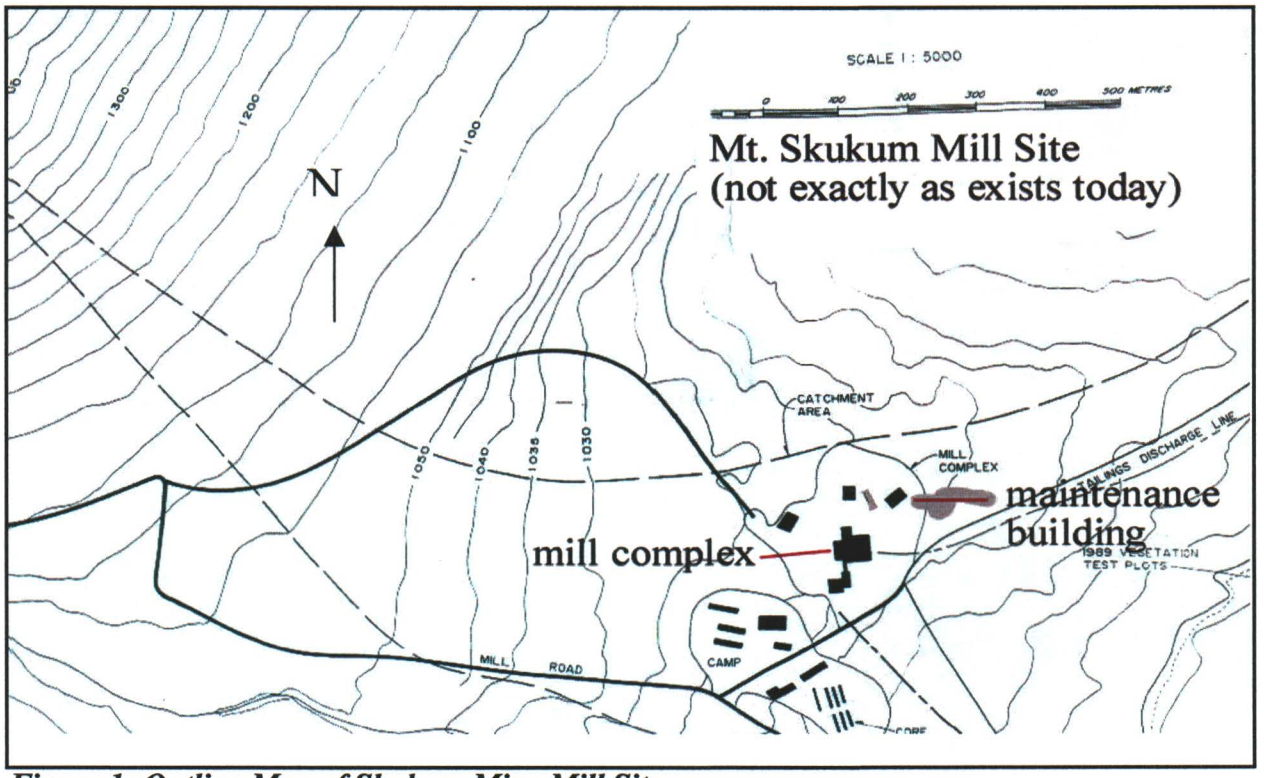


Figure 1: Outline Map of Skukum Mine Mill Site

4.2. Field Sampling Methods

4.3. Description of Mill Site Conditions

4.3.1. Equipment

No mobile equipment was left on-site, except for a ½ ton truck, which is still licensed for use, and is parked at the main entry gate. Stationary equipment included a complete mill and camp as well as a generator at the shop/core building.

4.3.2. Buildings/Structures

Maintenance Building

- Building locked, except for generator room.
- No apparent hazards. Building in good condition (see Photograph 2). One above ground storage tank (AST) (see Photograph 3) at back, which fuels a small diesel generator, was leaking. Soil sample taken, labelled as site MSGM-S2 (see AST 1 in Figure 2).

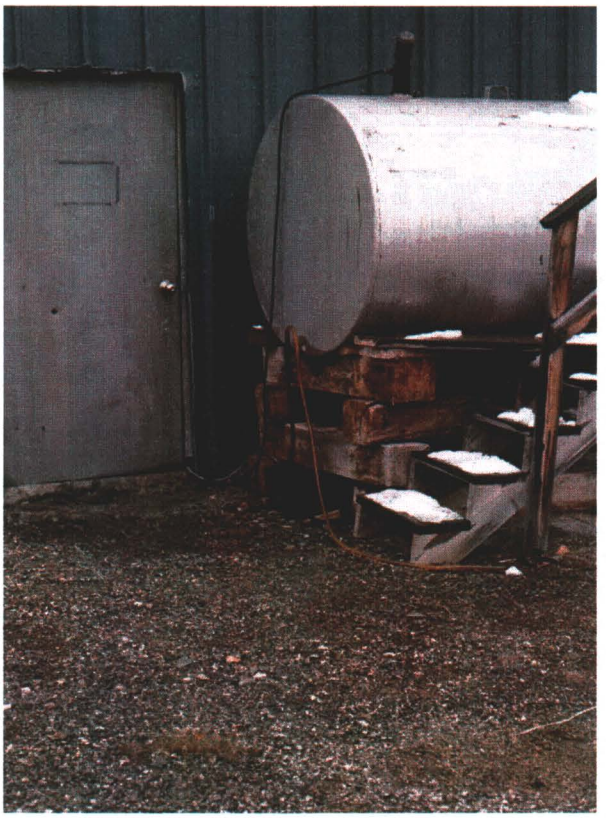
Mill and Ramp

- Building accessible (see Photograph 4).

- All ore in treatment vats have been removed. Mill is basically clean. Hazards include lack of lighting, fall hazards, assorted debris on floor, and confined space hazards.
- Some treatment chemicals and laboratory chemicals were present at the site (Photograph 5).

Photograph 2: Front of maintenance and core storage building

Photograph 3: Leaking diesel fuel tank for generator at rear of maintenance/core storage building (AST 1)



Camp Structures

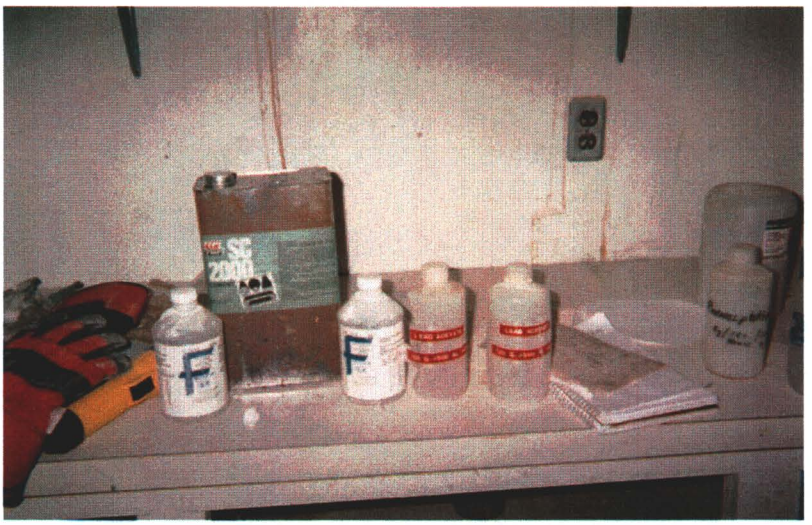
- Some camp quarters were open and accessible. Other parts were locked.
- Camp is suitable for re-occupation. Generator and septic system are still in place, as is propane tank (capacity of 3,735 L approximately 40% full) for heating. The propane tank could be a fire hazard if vandalized.

4.3.3. Mill Site Grounds

Concrete Slabs

- Concrete slabs around mill, and at former transformer yard (see Figure 2 and Photograph 6). The slabs around mill have wooden-covered openings, which extend below grade. Concrete structures are considered to offer fall hazards

Photograph 4: View of main mill complex

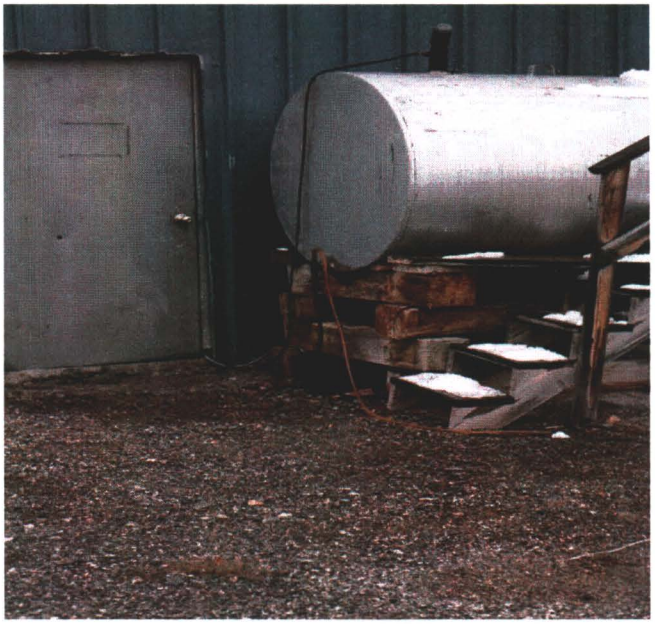


Photograph 5: Laboratory chemicals found remaining inside mill

Photograph 6: Concrete pad on east side of main mill building (likely former location of main generator) with hazardous openings visible

Fuel Tanks

- Fuel tanks include 4 AST's (see Figure 2 for location). Three are without secondary containment (one, which supplies fuel to shop generator, as noted above, leaks; however, it was observed to be almost empty).
- A single soil sample was collected at this site (MSGM-S2). Another tank located behind the camp is for an unknown purpose. It is empty but minor soil staining has occurred in the area (Photograph 7). The third tank at the main camp generator is empty and snow cover precluded identification of soil staining. The fourth tank has secondary containment, and offers no current hazard (Photograph 8).



Photograph 7: Leaking diesel fuel AST (AST 1 in Figure 2) located near generator in maintenance building

Photograph 8: Double walled AST (AST 2 in figure 2) located near mill

Debris Storage

- Two areas of debris storage are noted on Figure 2 as debris sites 1 and 2. The first consists essentially of electrical utility equipment (Photograph 9) and the other is a scrap steel storage area, including rails and pipes (Photograph 10). Both could pose risks to humans and wildlife.

Photograph 9: Electrical utility line debris (debris site 1 in Figure 2)

Photograph 10: Debris site 2 containing pipe and rails and drums full of concrete

Landfill

- The landfill site was difficult to find, and it is approximately located on Figure 2. The landfill (Photograph 11a, 11b) has been covered with soil, although metal debris including crushed drums are visible. Careful excavation of the site would be necessary to fully characterize the contents of this site, beyond the material which is exposed at the surface.

Photograph 11a: View of landfill (see Figure 2 for approximate location)

Photograph 11b: View of landfill (see Figure 2 for approximate location)

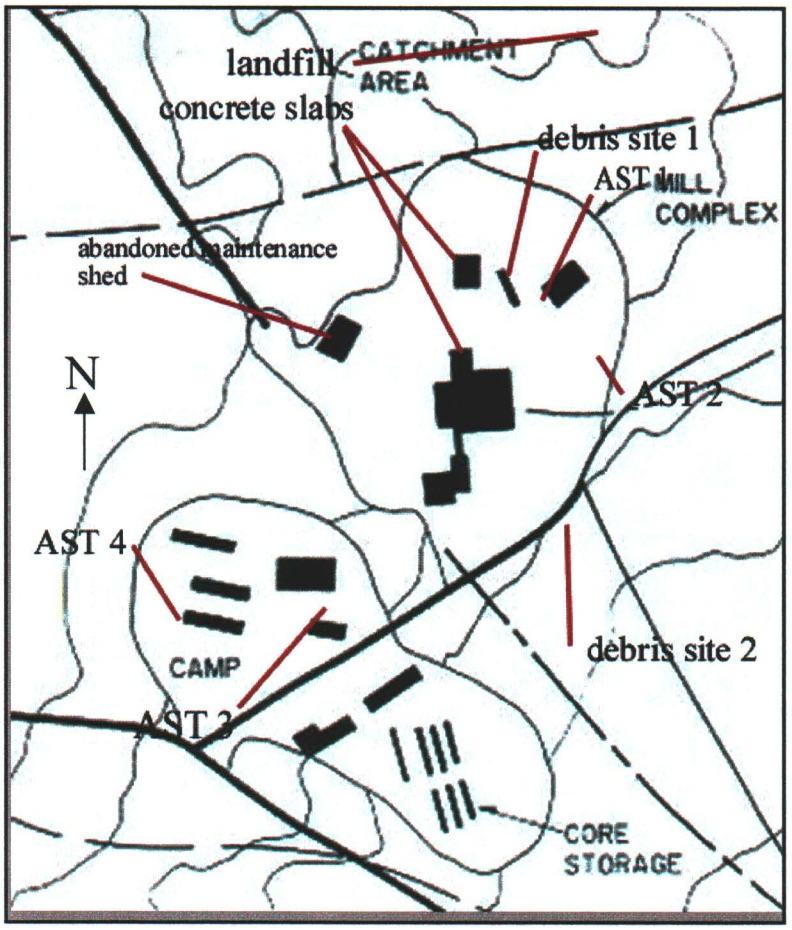
Former Maintenance Pad

- A former equipment maintenance pad is located to the north of the mill complex (see Figure 2). Although the building has been removed (apparently replaced by the new maintenance building) the timber footings and packed, oil stained floor are clearly visible (Photographs 1 and 12). Waste oil containers, and other debris are also present in this area Photograph 13). One soil sample (MSGM-S1) was collected from this site.

Table 1: List of sample locations for Mt. Skukum Gold Mine, Sept/Oct., 1999

Field Sample ID	Sample Description	Latitude / Longitude	Sample Matrix	Date of Sample	Total Metals	Cyanide	BTEX Light Hydrocarbons	Dissolved Metals
MSGM6-1	Underwater from tailings pond	60° 13.14'N 135°18.43'W	Sed't.	Sept.30/99	♦	♦		
MSGM 6-2	Dry soil from tailings pond	60° 13.12"N 138° 18.25'W	Soil	Sept. 30/99	♦	♦		
MSGM T2	Soil from tailings pond	60° 13' 22"N 135° 18' 12"W	Soil	Oct. 4/99	♦	♦		
MSGM T3	Soil from tailings pond	60° 13' 22"N 135° 18' 08"W	Soil	Oct. 4/99	♦	♦		
MSGM T4	Soil from tailings pond	60° 13' 16"N 135° 18' 14"W	Soil	Oct. 4/99	♦	♦		
MSGM LA-1	Lower adit, stained soil	60° 12' 58"N 135° 27' 56"W	Soil	Oct. 4/99			♦	
MSGM UA-1	Upper adit, stained soil	60° 12' 41"N 135° 28' 07"W	Soil	Oct. 4/99			♦	
MSGM LF-1	Landfill sample east of mill	NA	Soil	Oct. 4/99			♦	
MSGM 1700m	Butte Cr. At lower adit	60° 12' 57"N 135° 27' 58"W	Water	Oct. 4/99		♦		
MSGM 6-2	Water sample from tailings pond	60° 13.12"N 138° 18.25'W	Water	Sept. 30/99	♦	♦		
MSGM 1800	Butte Cr. at upper adit	60° 12' 40"N 135° 27' 59"W	Water	Oct. 4/99	♦	♦		♦
MSGM 6-3	Water sample from tailings pond	60° 13.12"N 138° 18.25'W	Water	Sept. 30/99	♦	♦		
MSGM 9	Wheaton River at Butte Cr.	60° 12.44'N 135° 17.06'W	Water	Sept. 30/99	♦	♦		
MSGM 6-1	Water sample from tailings pond	60° 13.12"N 138° 18.25'W	Water	Sept. 30/99	♦	♦		
MSGM trib	Trib. To Butte Cr. At lower adit	NA	Water	Oct. 4/99		♦		♦
MSGM 1800A	Butte Cr. At upper adit	60° 12' 40"N 135° 27' 59"W	Water	Oct. 4/99	♦	♦		♦
MSGM Trib	Tributary to Butte Cr.	NA	Water	Oct. 4/99		♦		♦
MSGM 1700	Butte Cr. At lower adit	60° 12' 57"N 135° 27' 58"W	Water	Oct. 4/99	♦	♦		♦
MSGM-S1	Soil from floor of former shed		soil	Sept. 30/99			♦	
MSGM-S2	Soil from leaking AST		soil	Sept. 30/99			♦	

Figure 2: Approximate location of major features identified as part of the site inspection



Photograph 12: View of floor of abandoned maintenance shed with darkest areas showing main zones of hydrocarbon contamination

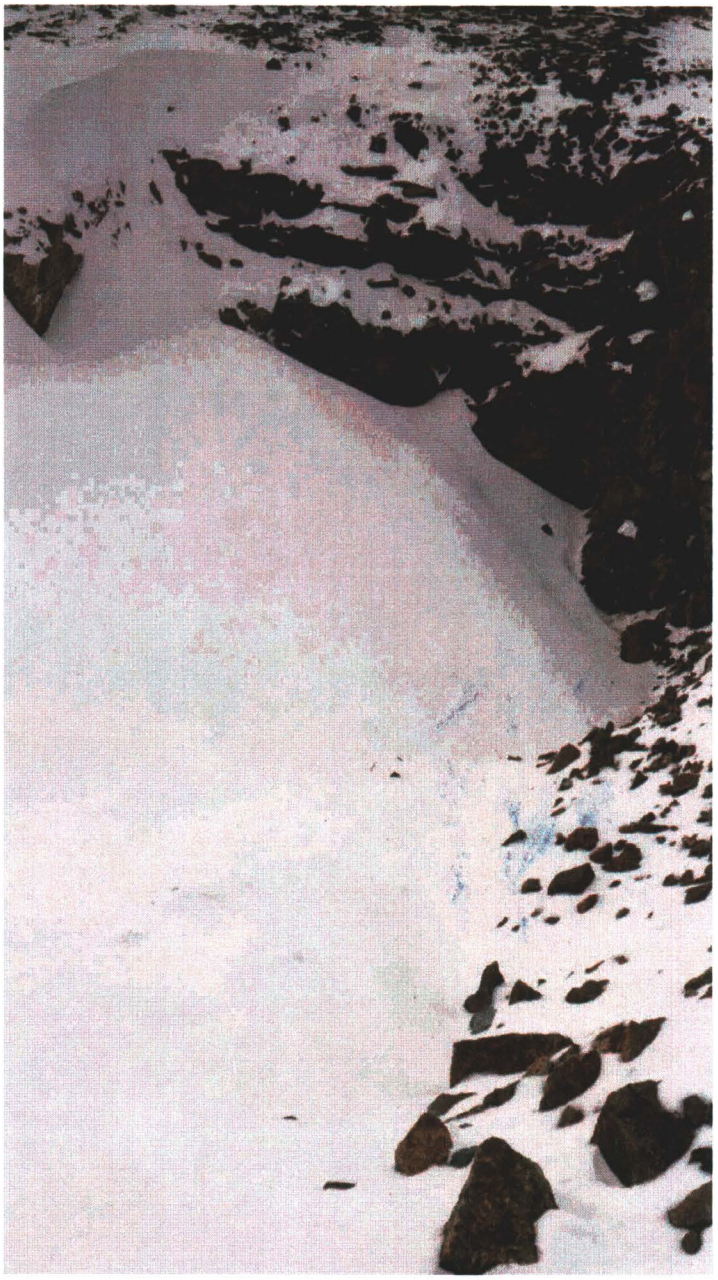
Photograph 13: Waste oil drums and containers in the vicinity of the abandoned maintenance shed

5. Description of Mine Site

5.1. Outline of Site Inspection Activities

On October 4, 1999, the weather in the Whitehorse/Skukum Mountain area was greatly improved, and a party of two departed for MSGM at 1:55PM. Unfortunately, a representative of the Carcross-Tagish First Nation was not available to accompany the team on such short notice. This small team flew by Jet Ranger directly to the mill site to undertake some additional sampling at the tailings pond, and to inspect a small dump site that had been observed from the air on departure from the site during the previous visit. Subsequently, the team flew to the upper adit and departed the helicopter; which flew to the lower adit to await the completion of the site investigation.

The upper adit (60° 12'41"N 135° 28'07"W) was apparently secured, although this could not be confirmed, due to the fact that the entrance was blocked by snow precluding any access (Photograph 14). Site inspection proceeded with partial snow cover possibly obscuring some items of interest. In general, the area adjacent to the upper adit had been extensively cleaned. The team proceeded on foot from the upper adit to the lower adit (60° 12'40"N 135° 27'59"W) undertaking sampling as necessary, and checking for debris and contamination. Butte Creek was still flowing at this elevation, although the lakes in the verticals were frozen.



Photograph 14: Upper portal blown in with snow – apparently closed behind snow and not accessible

The lower adit was not sealed due to a blowout some years ago as a result of the release of the water stored in the above mentioned verticals. However, entrance to the shaft was precluded by ice completely filling the opening (Photograph 15). There was no water escaping the adit from the corrugated steel pipe located at the mouth (Photograph 16) and thus a sample for laboratory analysis was not collected. Water sampling and soil sampling was conducted at various locations as listed in Table 1 and as considered further below.

5.2. Description of Mine Site Conditions

5.2.1. Upper Adit

- The site had been generally cleaned up. Some wood and metal debris remains adjacent to the portal as shown in Photograph 17. Some of this material could pose a human and wildlife safety risk.
- Although not all areas could be inspected due to the presence of snow, a single, small area (approximately 1 m^2) of stained soil was located adjacent to the portal. Further inspection of this site revealed evidence of burning as well as small metallic debris (Photographs 17 & 18). Sample MSGM LA-1 was collected from this site.

5.2.2. Lower Adit

- The lower adit had been extensively cleaned up. Clearly a large amount of debris had been buried, which has now been exposed and distributed widely as a result of the catastrophic hydrologic "blow out" of the mine as a result of the release of melt water. This debris includes timbers, pipes and steel underground track (Photograph 19). All of these items could pose a safety risk.
- A large concrete slab of unknown use, remains in place but has been undercut (Photograph 20) and the vertical drop at points could result in injury due to falls.
- Between the patches of snow, two small areas of stained soil were identified covering a zone of approximately 2 square metres each (Photograph 21). The depth of staining could not be determined due to the frozen ground. Soil sample MSGM LA-1 was collected at this site (60° 12'58"N 135° 27'56"W,)

Photograph 15: Lower adit portal filled with ice (just beyond visible extent) and showing the destruction caused by earlier washout

Photograph 16: Drainage pipe from lower adit with no flow

Photograph 17: Wood and metal debris at upper portal

Photograph 18: Soil stain site at upper portal

Photograph 19: Exposed wood and metal debris that originally comprised fill material at mouth of lower portal

Photograph 20: Concrete slab which was placed on fill at lower portal and which has been undercut on both sides and poses risks of further undermining and a vertical drop

Photograph 21: Stained soil in the vicinity of the lower portal

6. Tailings Ponds

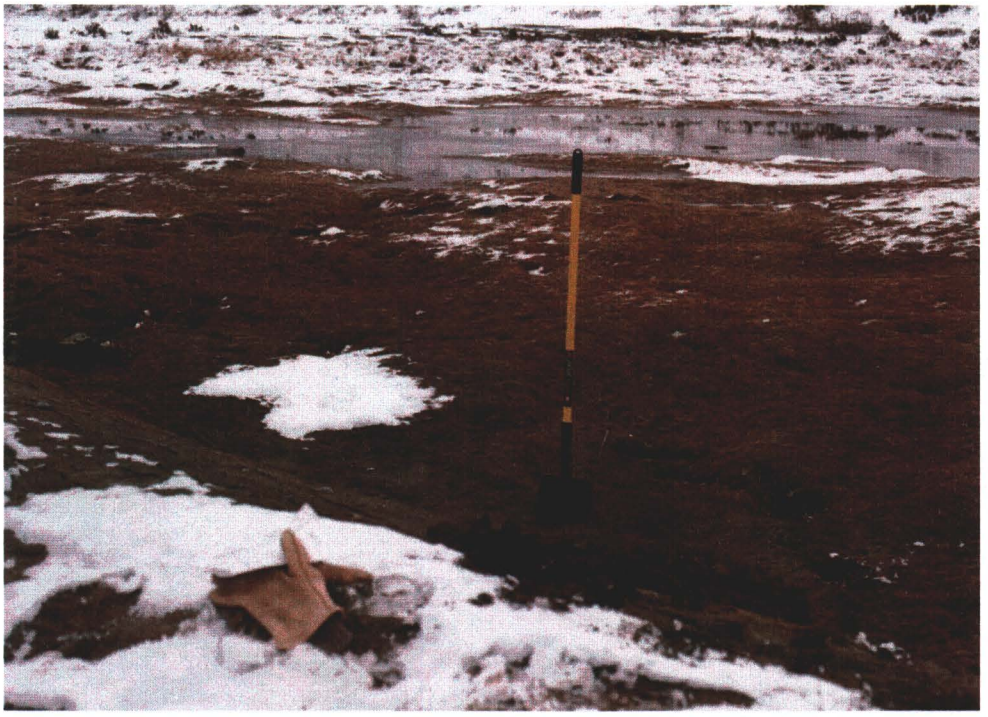
An aerial view of the primary tailings pond is shown in Photograph 22. The main dam is to the left of the photo. The secondary pond is out of the picture to the left. The path of the tailings pipe is shown along the upper right of the cleared area. Photograph 23 shows the emergency spillway in the primary pond dam, and is taken from the top of the dam for the secondary pond.

Only a small amount of water was present in the primary pond at the time of the visit (Photo 24) and the water sample and sediment sample was collected at the edge of the pond approximately at the location of the original decant structure. Soil sample MSGM-6-1 and 2 were collected in moist, partially grassed areas (see Photo 25). This area evidently had not received tailings as recently as the "upstream" areas of the pond where samples T2, T3 and T4 were collected (see Photo 25).

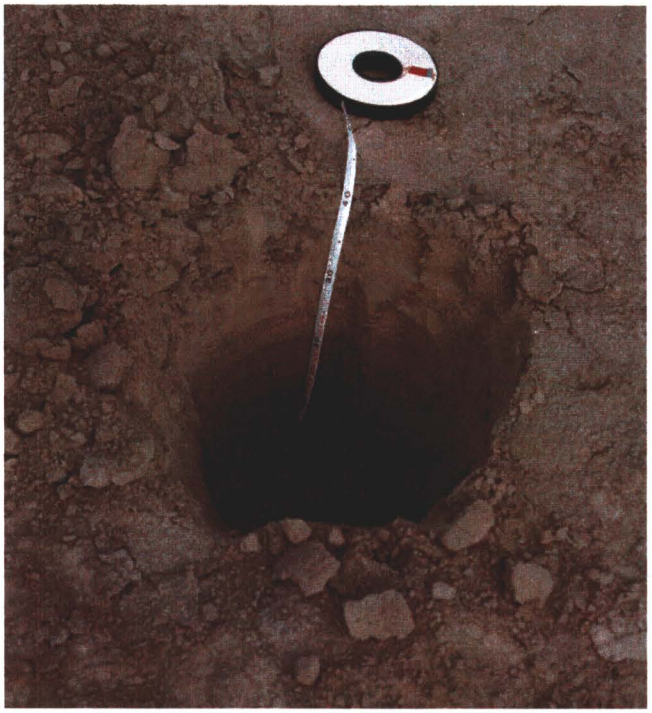
Photograph 22: aerial view of primary tailings pond with main dam to left and mill in background

Photograph 23: View of spillway in primary dam from the secondary tailings pond

Photograph 24: Water in primary tailings pond



Photograph 25: Wet soil with grassy vegetation to the northeast of water stored behind primary tailings pond



Photograph 26: Dried tailings from primary pond

Photograph 27: Ground squirrel pits in the dried tailings of the primary pond

7. Detailed File Review

7.1. Background

INAC – Water Resources maintains files on the mine as a result of the requirement for a Water License under the ***Yukon Waters Act***. Background information on the mine, required for the initial license application is required as well as reports on any license renewals and on conditions established for the license. MDA undertook a preliminary review of these files and identified key reports and documents for further review. These were copied and returned to MDA's offices for thorough review and the key points of these reviews are synthesized here.

Environmental chemistry data, including surface water, sediment from the tailings pond, tailings, and other background environmental chemistry data are contained in the INAC files. MDA has input these data into an electronic database (attached floppy disc) and has summarized key findings within the report.

While MDA has undertaken an extensive review of the hard copy material provided by INAC, MDA is not responsible for any errors and omissions that may occur in this review as a result of material not being available at the time of the file review. In addition, as opposed to referencing every report referred to or every piece of correspondence, only the author and date have been provided. This is sufficient information to permit anyone to find the referenced material in the chronological file reviewed at INAC, Water Resources, Whitehorse.

7.2. Yukon Territory Water Board – Water Licence

The Yukon Territory Water Board, issued a license for the MSGM effective August 5 1985, to expire on March 31, 1986. The license permitted the removal of up to 50,000 imperial gallons per day. The water was to be used in a mineral processing plant located in the Butte Cr. drainage and for the camp. After use, water would be returned to Butte Cr. via a cyanide destruction process, a primary and secondary tailings ponds and a drain from the secondary pond to the creek. The overriding concern with the application was water quality due to the cyanide treatment process. As a result, the application had been amended such that the cyanide destruction process would be entirely inside of the plant prior to release to the tailings pond. The original application had proposed partial destruction of the cyanide within the tailings pond by natural means and partial recirculation of the water through a cyanide treatment process and back to the plant.

As part of the license, The Board required the Mount Skukum Gold Mining Corporation to monitor effluent quality on a daily basis as it leaves the mill. Should cyanide (CN) levels in the mill effluent exceed 1 mg/L total cyanide, the licensee is required to cease discharge immediately. Moreover, if levels in the tailings pond rise above 1 mg/L total CN, the licensee is required to submit a plan for the monitoring of groundwater in the event that the soils underlying the pond are more permeable than indicated in the application.

Under the license, waste discharges including surface drainage from the mining site, dams and associated areas; all discharges from the waste treatment and recycling activities; and all

discharges from associated pumping and piping facilities prior to entering the receiving waters; must meet the effluent standards listed in Table 2. In addition, it was specified that no waste would be toxic to fish; no waste discharge shall contain floating solids or visible oil or grease; and no waste discharge shall have a pH of less than 6.0.

Table2: Effluent quality standards for all waste discharges as specified in the water license dated August 5, 1985

Parameter	Concentration (grab sample) mg/L
Arsenic (total)	0.5
Barium (total)	1.0
Copper (total)	0.3
Lead (total)	0.2
Nickel (total)	0.5
Silver (total)	0.1
Suspended solids	15.0
Zinc (total)	0.5

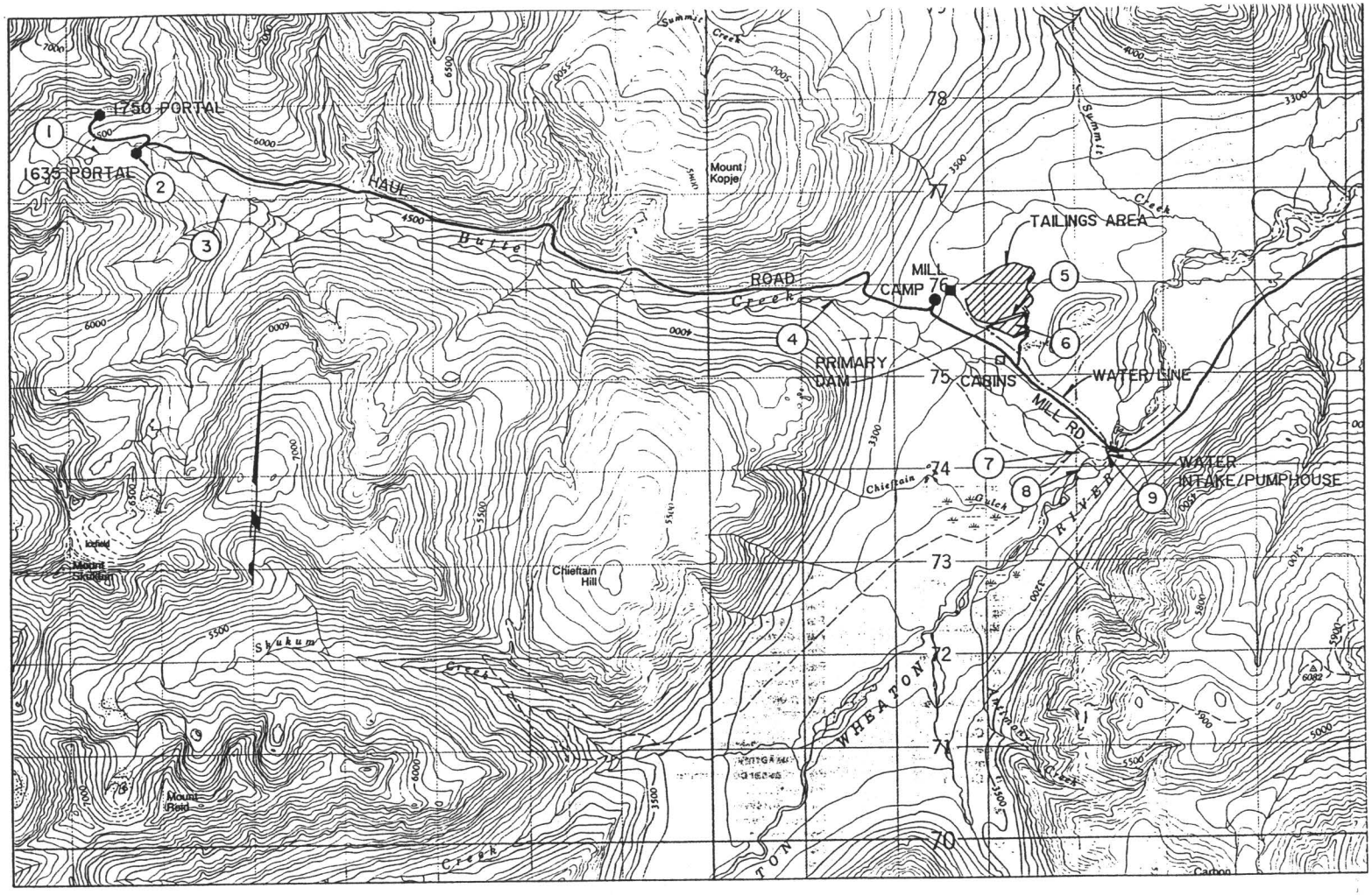
A monitoring program was required for monthly sampling upstream and downstream of the effluent discharge to Butte Creek assuming there was surface discharge from the settling facilities, the portal and the effluent at the discharge to the primary settling pond. Analyses was to include flow, pH, conductivity, temperature, Ttl. As, Ttl. Ba, Ttl. Cu, Ttl. Pb, Ttl. Ni, Ttl. Ag, sulphates, suspended solids, Ttl. Zn and ammonia.

The license dated July 4, 1986, changed this requirement to quarterly sampling for all but the effluent discharge to the primary settling pond. How this relates to the five year license that was dated May 6, 1985 is unclear. The latter license, in addition to specifying different water taking quantities, had different waste water quality standards (Table 3), and a more extensive environmental monitoring program. Additional licenses issued in the period 1985 to 1990 were dated March 21, 1986 and August 3, 1988. The latter expired in 1993 but was apparently cancelled on October 31, 1990. All of the licenses are copied and provided for reference in Appendix 1. The effluent quality standards for the license issued August 3, 1988 are summarized in Table 3. The sampling points and related frequencies are contained in the license in Appendix 1, while the sampling locations are shown in the map in Figure 3.

Table 3: Effluent quality standards for all waste discharges as specified in the water license dated August 3, 1998

Parameter	Concentration (grab sample)
Colour	< 20 Pt-Co units
pH	> 6.5
Turbidity	< 15 JTU
Oil and grease	None visible
Floating solids	None
96-hour LC_{50}	100%
Ammonia (total)	1.0 mg/L
Arsenic (total)	0.5 mg/L
Barium (total)	1.0 mg/L
Chlorine (free residual)	0.05 mg/L
Copper (total)	0.3 mg/L
Cyanide (as CN) (total)	1.0 mg/L
Cyanide (as CN) (available – free)	0.05 mg/L
Lead (total)	0.2 mg/L
Silver (total)	0.1 mg/L
Suspended solids	< 25.0 mg/L
Zinc (total)	0.5 mg/L

Figure 3: Location map for environmental surveillance network associated with the MSGM water license dated August 3, 1988



7.3. *Spills*

7.3.1. Tailings Spills

Two tailings spills were reported in the documentation reviewed for this project. The first occurred on May 20, 1987 and involved ice melt from the tailings pond overtopping a small dam on the north side of the pond (not the main tailings pond dam). According to the Total Erickson report dated June 3, 1987, the overflow had "cut a trench 3 feet wide by 3 feet deep through the clay material and was discharging from the pond at perhaps 30 gpm". This runoff was a result of the rapid melting of ice formed under the tailings deposited during the winter. The runoff was clear and free of sediment. Immediate action by the company included filling the cut and raising the height of the dam by approximately one foot was taken. No water samples were analysed; however, it was reported that this discharge did not reach Butte Creek.

A second minor spill occurred on November 27, 1987 when the slurry line from the mill separated just outside of the mill building. It was estimated (Total Erickson letter dated November 27, 1987) that less than 5 m^3 of solution and 3.6 m^3 of sand was released. The tailings assay for that day indicated that the tailings were within the discharge limits from the tailings pond (Ttl. CN = 0.94 mg/L) and thus no problem was anticipated. The spilled material was removed to the tailings pond with a loader.

7.3.2. Fuel Spills

Three fuel spills were reported in the files. The first, a source or cause was never identified but resulted in an investigation by the Water Quality Section, INAC, on December 3, 1985. The report by G. Whitley (Dec. 4., 1985) came as a result of complaints in November of fuel oil taste and odour in the camp water. The fuel facilities, consisting of two 7000 gallon tanks with lines crossing Butte Creek to feed a 1000 gallon day tank at the compressor at the portal were investigated. While there was no evidence of a major spill, there was evidence of small chronic leaks and the potential existed for major spills. Recommendations were made to manage these concerns. Coincidentally with the taste and odour problem, it was noted that the supply line to the camp had frozen and that the camp was being supplied with water from Wheaton River by tanker. It seems unlikely that taste and odour problems would occur in the Wheaton River water as a result of minor seepage of diesel fuel at the portal at a time when there was no flow in Butte Creek at the portal. However, other sources of contamination were apparently not investigated.

A minor fuel spill of an estimated 2 – 3 gallons occurred July 9, 1986 when the trestle at the mine site collapsed and damaged the fuel line.

On January 23, 1987, a spill of P40 diesel oil occurred between 3:00 AM and 8:00 AM at the lower portal. An estimated 400 gallons of oil escaped from the tank onto the earthen building floor due to overfilling of the day tank. The oiled sand on the floor was shovelled into barrels, however, oil apparently seeped through the coarse fill material to the Butte Creek culvert under the roadway (Total Erickson oil spill report, Jan. 30, 1987).

An INAC spill inspection report by D. Cornett (Jan. 28, 1987) indicated that three 45 gallon drums of oil soaked sand, and other absorbent material had been collected. Diesel fuel was found in the culvert, and in snow in the creek bed. It was further suggested that diesel fuel remained in the fill material above the culvert. According to D. Cornett's report (March 25, 1987) residual oil continued to be collected by absorbant material two months after the spill. It was estimated that about one half of the estimated spill was recovered. No record of further recovery, especially during the spring melt, was found. Neither was there any documentation regarding the fate of the oiled sand and absorbent material.

7.4. Cyanide Treatment

The predominant environmental concern with MSGM was the transport and use of cyanide in the mill process. Based upon the file review, there was no report of spills or other accidents occurring during the transport of cyanide or other chemicals. The original design of the mill had allowed for much of the reduction of the cyanide to occur naturally within the tailings pond; however, the license required that the mill effluent have a total cyanide concentration not in excess of 1 mg/L (memo from G. Whitley to J. Nickel, March 10, 1988). If the daily sample from the mill discharge to primary tailings pond exceeded this value, then the mill was to be immediately shut down until the situation was resolved. As well, the decant water from the tailings pond was to be recycled back to the mill to minimize releases to Butte Cr. Not surprisingly, the Ttl. CN concentrations were highly variable. In 1986, Ttl. CN was highly variable, sometimes ranging to 200 mg/L. In 1987, 153 samples out of 364 exceeded the license limit (1.0 mg/L). According to a memo from G. Whitley to J. Nickel (March 27, 1986) MSGM was actively trying to improve CN removal (one month after full operation commenced) in the treatment process and should be given time to optimize the treatment system for the following reasons:

- The company needs and opportunity and time to learn how to solve this problem using the treatment plant and are actively working on it including bringing in assistance from INCO;
- The company has multi-year storage within the tailings pond so that there will be no releases of decant water with high CN concentrations; and,
- There is no risk of release to the surface water at the present time.

MSGM was also required to annually sample the tailings pond prior to seasonal discharges. However, as effluent had not had to be discharged (due to re-use in the mill) no samples were analysed. INAC, Water Quality Section did sample the tailings pond in May 20, 1987 (mean total CN concentration was 0.12 mg/L) and again on September 29, 1987 (mean concentration of 0.085 mg/L). These low cyanide values indicated that the combination of treatment within the mill and the natural degradation is resulting in tailings pond remaining well below the value of 1.0 mg/L Total CN.

According to MSGM, both INAC Water Resources Division and Environment Canada's Environmental Protection Service recognized that the requirement to suspend mill operations when Ttl. CN concentrations in the discharge exceeded the license limit was unreasonable and unduly restrictive (MSGM presentation to the Yukon territory Water Board, April 15, 1988). Accordingly, MSGM sought flexibility in the operation of the CN destruction unit within the license renewal. The high evaporative losses from the pond, the absence of apparent subsurface

seepage, and the re-use potential of the decant water meant that there was unlikely to be environmental effects on surface waters from pond releases.

In conclusion, while initially a great deal of effort went into measuring Ttl. CN in the tailings, and these results were highly variable and frequently in excess of the License limit, there is little indication of there being a surface water contamination concern from CN or even other metals. However, a concern may remain with the fate of the tailings and high concentrations of CN within re-colonizing vegetation.

7.5. Tailings Ponds

The tailings pond covers approximately 3 hectares to the southeast of the mill. It is contained by a small dam to the north and a major dam to the southwest with surface decant releasing to a secondary pond and final release through a poorly defined channel to Butte Creek.

Tailings emission to the pond was along the northeast portion of the pond, essentially at the most upstream end from the decant outlet. In reality, most of the tailings were deposited along the northern perimeter of the pond and the remaining portion of the pond bottom is covered with natural soil or a thin layer of tailings (Geo-engineering (M.S.T.) Ltd., letter to Mr. H.F. McAlpine dated Feb. 5/92).

Column leach tests for the tailings (Coastech Research Inc., 80 Niobe Street, North Vancouver, B.C., August 9, 1989) confirmed that only Ca, Mg, Na and sulfate were extractable from these materials. These results indicated no real concern with respect to heavy metal leaching.

The EARP screening/decision report (Dec. 13, 1990) identified a concern about the uptake of metals in vegetation re-colonizing the tailings. High levels of Al, Cd, Fe, Mg, Mn and V were observed in grasses growing on the tailings and there was a concern raised about effects on animals (moose and horses) grazing on these grasses as these concentrations exceeded the maximum tolerable levels for cattle as reported by the National Academy of Sciences (letter from D. Cornett, EP, Environment Canada to Mr. K. Nordin, Yukon Territory Water Board, October 20, 1989). Therefore it was proposed to allow the tailings to naturally re-vegetate rather than seed the tailings area with grasses. Allowing the natural regeneration of willows would result in lower levels of contaminants migrating to the vegetation cover, thereby limiting uptake by grazing animals. It had been observed during the operation of the site that wind scour of the tailings is not significant.

Chemical leach tests from the tailings were undertaken in 1989. This work determined that the levels of cyanide, and other elements were well below levels that could pose environmental hazard due to leaching. In addition, water within the impoundment sampled in June, 1990, met drinking water standards. Thus there were apparently no outstanding water quality issues.

Groundwater monitoring in the vicinity of the ponds was often identified as a need. The Yukon Conservation society dug a test pit in the general area of the proposed tailings pond and found a fairly impermeable clay layer with permeability of $^{10-6}$ to 10^{-8} cm/s. An unattributed report,

dated as having been received by the Yukon Territory Water Board on January 15, 1985, indicates that six trenches were dug in the general area of the intended disposal sites. All six trenches exposed 10 to 25 cm of humus, overlying massive to laminated clay to a depth of 6.0 m. None of the trenches contained water but three indicated saturation and behaved plastically. The absence of fractures in the clay indicated that the area can be expected to be impermeable to tails solutions. The fact that the trenched area extended over 400 m by approximately 90 m, and the clay was uniform across all locations, strongly suggests that the entire preferred disposal area is underlain by a single clay deposit.

Mike Ross, MSGM prepared a tape recorded memo to the Yukon Territory Water Board on March 5, 1985. In this memo, it was calculated that based on a hydraulic gradient of 0.5, a pond area of approximately seven acres and a 10^{-8} cm/sec permeability factor, seepage from the dam would be about one U.S. gallon per hour.

Subsequently, Geo-engineering (M.S.T.) LTD. (see letter to Mr. H.F. McAlpine dated January 6, 1989) indicated that test holes into the dyke subgrade revealed the existence of sand and gravel layers or pockets. It was concluded that while these layers or pockets pose no problem for the stability of the dyke, they could be important with respect to seepage from the pond. However, our review of files failed to identify the installation of any wells with piezometers to determine water levels or the environmental testing of any water samples.

The MSGM decommisioning plan, prepared by N.A. Jacobsen, Civil Engineering consultant, dated July, 1990 was submitted to the Water Board in advance of a public meeting. This report confirmed that water quality and leach tests data showed that tailings pond water and tailings sand were benign. This is more or less academic as shortly after start-up, a 100% recycle system was engaged returning water from the pond behind dam No. 2 to the mill. The only water released from the pond was during the de-watering stage at closure. In this case, while water did flow across the access road, it percolated into the soil prior to reaching Butte Creek.

Clean-up at the tailings ponds included the following:

- Removal of pipelines and storage within the mill compound;
- Burial of drums and garbage present in and around the tailings area;
- Removal of decant tower and appurtenances at the primary dam; and,
- The construction of spillways in the dams.

7.6. Landfill

Only one issue with the landfill was identified in the file review. Specifically, an inspection by R. Pelkman, Resource Management Officer, INAC (April 3, 1986) noted eight empty steel sodium cyanide drums (100 Kg capacity) at the dump site. The drums contained powder residues of sodium cyanide as well as plastic drum liners with residues remaining. These drums and liners were supposed to be washed inside the mill and the wash material disposed of in the tailings pond. The acting mine manager was made aware of the situation and indicated that the drums would be appropriately cleaned and disposed of. There is no record as to whether or not this was an ongoing problem and no indication that sampling was done in the landfill.

7.7. Waste Rock and Acid Mine Drainage

In addition to a high arsenic content, the ore body has the potential to be acid generating (Geo-engineering (M.S.T.) Ltd., letter to Mr. H.F. McAlpine dated Feb. 5/92). This letter indicated that testing was limited, and that additional testing is being carried out. Records of the additional testing were not found in the files. Acid generating waste was to be disposed in underground stopes, which on abandonment, were to be either flooded or perched.

With respect to the mill and the tailings, the sulphides were to be recovered to ensure that the tailings were acid consuming, and relatively free of arsenic. It was noted in the EARP screening report (Dec. 13, 1990) that the ore mined at Skukum was not a sulphide ore and therefore is not acid generating. All water quality studies in the vicinity of the mine portals and at other downstream locations, indicate that the discharge water is slightly alkaline. This report concluded that there has never been a concern with acid mine drainage at the Mt. Skukum site.

7.8. Environmental Issues with Abandonment

7.8.1. Temporary Abandonment

An inspection was conducted by J. Gibson, Water Management Officer, on August 10, 1988 as a result of MSGM's announcement that the mine would be shut down for a longer term than originally planned (memo dated August 26, 1988). A two strand perimeter fence was requested for the vertical rises to at least control this obvious hazard. The fencing is presently in place. All equipment, chemicals, fuels, oils and rail tracks were to be removed at both portals. Wooden structures were removed and the area generally cleaned up, evidently, largely as it presently exists.

The mill had been shut down since the spring. The chemicals that were on site at the time (see Table 4 below) were to be removed, including the sulphuric acid tanker for which an arrangement with Curragh Resources was being negotiated.

The water level in the primary tailings pond continued to drop following the cessation of discharges. Emergency spillways were constructed in both the primary and secondary dams. The report noted that the rip rap on the spillways was not adequate but the report did not say whether or not this would be resolved. Similarly, the report could not determine the amount of fuel that was to remain on the site. This report indicated that a further inspection would be done in September, 1988; however, no record of that inspection was found in the files.

Table 4: List of chemicals on-site at MSGM mill, August 10, 1988

Chemical	Quantity
Caustic soda	2 pallets
Soda ash	1 pallet
Diatomite	5 pallets
Copper sulphate	6 pallets
Sodium metabsulphate	20 pallets
Sodium nitrate	1 pallet
Silica	1 pallet
HCl	5 gal. X 8
Sodium cyanide	4 pallets of 4 x 45 gal
Superflox (polyacryamide in water/oil emulsion)	3 pallets
Sodium isopropyl xanthate	1 x 45 gal.
Sulphuric acid tanker	??? plus 31 x 5 gal kegs

7.8.2. Permanent Abandonment

The permanent abandonment of the mine site was to be done in accordance with requirements of various government departments. These were to include:

- Access or openings into the mine were to be securely boarded as per the requirements of the Mining Act;
- The mine was to be allowed to flood to a natural level thus covering all filter cake disposed underground in the mine;
- All buildings and facilities were to be removed from the site;
- All toxic materials to be removed;
- Site will be cleared with all garbage disposed in an acceptable manner; and
- All power lines were to be removed.

If the mill site was to be permanently abandoned, all abandonment was to be done as required by law through various departments, and would include:

- The fate of the buildings was to be determined with government approval;
- All toxic materials and reagents were to be removed or disposed of in a safe and miner-like manner acceptable to authorities;
- All power lines and required facilities were to be removed;
- The total site was to be cleaned up with all garbage being buried or disposed of in a safe manner; and,
- The question of acid generating and acid consuming tailings was to be determined following a report prepared by an independent consultant.

8. Environmental Monitoring

8.1. Synthesis of Historical Data

8.1.1. Environmental Chemistry

A large quantity of data has been amassed over the period of time that MSGM was being developed and operated. All relevant environmental chemistry data that met general criteria regarding quality of information has been assembled into a database (Excel 97), which is included here as a floppy disk. A hardcopy of the data has not been provided. The data are generally characterized here.

Mine Water Discharges

The water quality of the discharge from the mine could deleteriously affect Butte Creek. Only the lower adit (1635 m) had any discharge. The water quality was affected by mining operations, especially with respect to suspended solids and turbidity, as well as ammonia. Zinc, lead and copper were exceeded on a few occasions. Barium levels were also high during mining. High values for these compounds are to be expected, as barium is a component of drilling mud and explosives and ammonia is released during blasting. Blasting and other mining activities would result in the increased solids. The water quality of the portal water is compared to the surface water in the area of the mine (all Butte Creek and Wheaton River samples combined) in Table 5. Only those elements, which are measured as totals and have a large number of samples, are summarized here. Other data are available on dissolved elements and for a wide range of other analytes.

The mine portal water exceeded the license standard on average for a large number of the licensed analytes including turbidity, ammonia, arsenic, barium, copper, total cyanide, lead, silver, suspended solids, and zinc. It is difficult to assess from these data whether the oil and grease standard was also exceeded, but we suspect that it was. The effect of the mine on the surface water can best be determined by comparing the mean surface water quality data to the mine portal water data because the surface water data very commonly exceeds the license standards as well. Elevated ammonia is related to the blasting and other activities in the mine, as may also be silver. The high turbidity and the high concentration of suspended solids and high conductivity are a direct result of the blasting and operation of mine equipment. The high concentrations of cyanide, may be due to the disposal of mill waste solids in the mine but we can not establish this without a further assessment of these activities.

The surface water concentrations of As, Pb, Al, Ca, Fe, Mg, Na, and Sr, exceeded the mine outflow water concentrations. Clearly, the mine activities were not a source for these elements. Nevertheless, the mine water on average would have exceeded the license for As and Pb, as a result of the high concentrations in the inflow water.

Butte Creek Downstream of Mine

Station no. X3, approximately one kilometre downstream of the portal, was the only stream site significantly affected by discharge from the portal during mining. A few of the parameters exceeded the license limits but there was no evidence of an effect at station X4 or X5, 6.5 and 9.5 km downstream, respectively (report on Decommissioning Plan for MSGM by N.A. Jackson,

Civil Engineering Consultant, July, 1990). This was confirmed by the bio-monitoring studies (see below). With no impact observed on Butte Cr., it can be reasonably assumed that there was no impact on Wheaton River.

Tailings Ponds

Although no water was ever released from the tailings ponds during the operation of the mill, extensive sampling occurred for the effluent and for the water in the tailings pond. In general, the water quality of the tailings ponds was of good quality with low levels of cyanide and other heavy metals. Total cyanide, measured at the end of the effluent pipe in accordance with the requirements of the license, had a mean and standard deviation of 6.6 ± 20.9 mg/L (n = 749). This was clearly in excess of the objective of 1 mg/L. As there was in fact no discharges from the tailing ponds to the surface waters, this remains an academic question.

Table 5: Comparison of license requirements, portal discharge and surface water quality data for Butte Creek and Wheaton River from 1983 to 1991 (mean±1SD/number of samples)

Parameter	License Standard	Surface Water*	Portal Outflow*
pH	>6.5	7.3±0.34/177	7.7±0.3/36
Turbidity	< 15 JTU	14±48/92	1893±4930/26
Oil and grease	None visible	341±2679/31	19±31/25
Ammonia (total) (mg/L)	1.0	0.159±0.939/129	8.519±10.162/14
Arsenic (total) mg/L(mg/L)	0.5	1.78±34.87/145	0.785±5.440/23
Barium (total) (mg/L)	1.0	5.10±27.09/291	8.48±57.94/49
Chlorine (free residual) (mg/L)	0.05	NA	NA
Copper (total) (mg/L)	0.3	.490±2.613/160	1.08±7.67/42
Cyanide (as CN) (total) (mg/L)	1.0	.719±5.67/76	23.67±28.21/3
Cyanide (as CN) (available – free) (mg/L)	0.05	NA	NA
Lead (total) (mg/L)	0.2	1.52±10.43/195	0.53±3.26/30
Silver (total) (mg/L)	0.1	0.014±0.150/75	2.365±8.362/22
Suspended solids (mg/L)	<25.0	30±126/105	1589±2984/44
Zinc (total) (mg/L)	0.5	4.72±18.55/403	3.915±28.618/55
Conductivity (μmhos/cm) (lab)	NA	141.8±240.1/108	651.5±577.3/28
Al (total) (mg/L)	NA	1385±4570/109	62.5±154.7/36
Ca (total) (mg/L)	NA	379.7±3233.9/447	96.1±74.6/34
Fe (total) (mg/L)	NA	849±4509/394	43.0±72.2/38
Mg (total) (mg/L)	NA	490.1±1435.7/121	19.7±28.2/30
Mn (total) (mg/L)	NA	35.68±137.19/153	230.16±1295.6/32
Na (total) (mg/L)	NA	41.70±194.7/178	13.62±18.84/33
Nitrate (total) (mg/L)	NA	0.148±0.147/201	5.506±9.147/8
Si (total) (mg/L)	NA	169.5±573.1/120	144.6±286.0/29
SO_4 (total) (mg/L)	NA	15.98±36.40/109	91.28±125.72/29
Sr (total) (mg/L)	NA	5.46±17.55/129	1.42±1.31/34

*Means and standard deviations have been calculated taking non detect values equal to zero

While we have not undertaken a detailed evaluation of the water quality data, it is evident that the background water quality (i.e. the summary surface water quality data from Table 5) are

frequently higher than the license standards. Specifically, the average surface water quality data in the database (which included Wheaton River as well as Butte Creek upstream and downstream of the mine) exceeded the license standards for As, Ba, Cu, Pb, suspended solids and Zn. Frequently the averages were greatly in excess of the standards. Of particular interest is the fact that the Total Cyanide concentration averaged 0.72 mg/L out of 76 samples. This concentration is very close to the mill effluent standard, and it is clear that a number of surface water samples actually exceeded the license target. From this cursory examination of the data, it appears that the mine/mill may have had considerable difficulty meeting the license requirements due to the background concentrations of many of the compounds, including Total CN.

8.1.2. Biological Monitoring

Several reports were prepared as part of investigations into the environmental impacts of the MSGM mine on the aquatic quality of Butte Creek and Wheaton River.

The first such report was prepared by Norecol Environmental Consultants Ltd. (600-1281 West Georgia St., Vancouver, B.C.) in December, 1986. This study established the four sampling sites used in the subsequent studies with two sites on Butte Cr., the first upstream of the camp and the other near the confluence with Wheaton River. Two sample sites were also located on Wheaton River, upstream and downstream of the confluence with Butte Creek. This first study, using in-situ samplers, concluded that there were significant differences between the benthic communities (both in terms of percent contribution by species and taxonomic range) of Butte Cr. and Wheaton River. Upstream and downstream differences on Wheaton River were thought to be due to habitat or sampling differences. Above and below the MSGM mill site, there was little difference in total populations but there was a decrease in diversity downstream. These differences may be the result of habitat differences, sampling variability or a localized mine effect.

The second annual report was prepared by Leverton and Associates, Northern Consulting (December, 1987). This study, using in-situ samplers, concluded that there were significant differences between the benthic communities (both in terms of percent contribution by species and taxonomic range) above and below the MSGM mill site. The difference appeared to be due to the differences in the stream bottom materials rather than any direct effect of the mill. The upstream channel consisted of large boulders and gravel. The downstream site had a higher concentration of organic material comprised of tangled masses of roots and leaves. This downstream site was characterized by a decrease in diversity and an increase in overall productivity, likely due to natural factors. Overall, the data suggested that that there appeared to be little influence of the mine/mill site on Butte Creek and downstream on Wheaton River.

The 1988 biological monitoring was also conducted by Leverton and Associates (1988). There was again no evidence of a difference between the benthic communities above and below the Mt. Skukum mill site. There is no indication of the aquatic environments being stressed in Butte Cr. and no evidence indicating an influence of the site on Wheaton River.

A bio-monitoring study was undertaken in the late summer and fall of 1989 (Biological Monitoring Program at Mount Skukum Minesite, 1989; prepared by B.E. Burns, December, 1989). Four sites (two on Butte Cr. and two on Wheaton River upstream and downstream of the

confluence of Butte Cr.) were sampled using artificial substrate samplers. Chemical sampling was undertaken in association with the biological sampling. This study concluded that none of the benthic populations indicated a stressed or polluted environment with a healthy population of invertebrate fauna at all sites.

The final study was undertaken by Laberge Environmental Services and is titled "Biological Monitoring Program at Mount Skukum Minesite, 1990" (December, 1990). Two stations were sampled along Butte Creek (above the camp and near the confluence with Wheaton River) and two stations were sampled on Wheaton River (upstream and downstream of Butte Cr. confluence). The report concluded that healthy populations of invertebrate fauna were found at all sites. Differences with the 1989 report were a result of different sampling periods (summer, 1990 vs. fall, 1989 and higher flow levels in 1990).

9. Environmental Chemistry Data – This Assessment

9.1. Field Analysis - Water Chemistry Data

Water samples were collected at the mill road bridge across Wheaton River (MSGM-9) and in triplicate from the tailings pond near the breach of the dam (MSGM-6). Butte Creek in the vicinity of the mill and at Wheaton River was dry, probably due to infiltration of the limited flow to the highly permeable sand and gravel stream bed. Water samples were collected from Butte Cr. At the Upper Adit and at the Lower Adit and from a tributary that joined Butte Cr. in the vicinity of the Lower Adit. The results of these field analyses are presented in Table 6.

Table 6: Results of field analysis of water samples from Wheaton River, the tailings pond and Butte Creek and a tributary in the vicinity of the upper and lower adits

Station	PH	Specific Conductance (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Temperature (°C)
Wheaton R. at mill road bridge	7.51	25.0			2.8
Tailings Pond 1	9.26	112.0			2.6
Tailings Pond 2	9.47	123.7			3.0
Tailings Pond 3	9.42	121.2			2.8
Butte Cr. At Upper Adit	7.58	249		Nil	2.4
Butte Cr. At Lower Adit	7.64	324	0.12	4	0.7
Tributary to Butte Cr. At Lower Adit	7.33	47	nil	4	1.2

9.2. Laboratory Results from this Project

9.2.1. Surface Water Chemistry

The main potential concern with the mine and mill has been with increased metals concentrations and cyanide as a result of the mill process. Thus, all samples were analysed only for metals. Butte Cr. was sampled at the upper adit, and just above the culvert at the lower adit. Due to

concerns about a "blow out" of the stored water in the lower adit, a sample could not be collected at the normal location downstream of the culvert. As there was no drainage from the adit (pipe was already frozen) any sample below the portal should not be different from the upstream sample, except as a result of the contribution from the tributary that joins at the lower portal. The tributary that joins Butte Cr. at the lower portal was sampled above the confluence. Due to low flow in Butte Cr., downstream of the mill site, additional samples were not collected. The Wheaton River was sampled downstream of the confluence with Butte Cr. while the tailings pond water was sampled in triplicate. The Butte Cr. samples and the tributary to Butte Cr. at the lower adit were sampled for dissolved metals as well as total metals. These data are summarized in Tables 7 and 8 and the full laboratory report is provided in Appendix 2.

Concentrations of dissolved and total metals in all samples are very low with most analytes being less than detection. Agreement between replicate samples is very good, indicating that the limited data are reproducible. Ba is the only element detected in Butte Cr. and Wheaton River for which there is a specific license standard, and in all cases the concentration is more than one order of magnitude below the standard. All other detectable compounds in the surface waters were below the average surface water concentrations noted in Table 5, and well below the average portal outflow concentrations. The dissolved metals concentrations show that the majority of the elements detected in the surface waters are in a soluble form. The fact that the dissolved concentrations frequently exceed the total concentrations is not surprising in these waters with very low dissolved solids, and very low concentrations of any elements. Evidently, surface flows could be assumed to have reverted back to pre-mining conditions within Butte Cr.

The triplicate samples from the tailings pond also show very low concentrations of metals. Of particular note is the fact that even in these waters, the cyanide concentrations are non-detectable indicating that any surface waters released from the tailings pond would not affect surface water quality with respect to residual cyanide. Ba concentrations in the tailings pond are approximately four times those of Butte Cr. but still an order of magnitude below the license standard. Concentrations of Ca, Mg, P, Na, Sr and S were all considerably higher than the surface waters but well below the average concentrations of surface waters reported in Table 5.

Copper concentrations in the tailings pond water exceed the CCME (1999) guideline of 0.004 mg/L (hardness as $CaCO_3$ > 180 mg/L), but do not exceed the license standard of 0.3 mg/L. However, comparison of these concentrations with the average surface water concentrations for the site (Table 5) indicate that Cu in the surface water is generally in excess of the CCME guideline and the portal water is not greatly different from the surface water. In fact the tailings water has Cu concentrations one order of magnitude less than the average surface water Cu. These data indicate that the tailings pond water would not have an environmental impact on surface waters if there was a release of tailings water to the surface waters.

In summary, the surface water chemistry suggests a pristine system. The cessation of the mining activity has permitted the water chemistry to recover. Concentrations of some elements may be higher during higher flows in the summer time, but the low flow concentrations presented here indicate essentially a pristine water quality.

Table 7: Water chemistry data for MSGM, 1999

Analyte (mg/L)	MSGM 1800 – ButteCr. @ upper adit	MSGM 1800a Butte Cr. @ upper adit	MSGM 1700 Butte Cr. @ lower adit	MSGM 1700 Butte Cr. @ lower adit	MSGM TRIB @ lower adit	MSGM TRIB @ lower adit	MSGM 9 Wheaton R. @ Butte Cr.	MSGM 6-1 Tailings Pond water	MSGM 6-2 Tailings Pond water	MSGM 6-3 Tailings Pond water
Hardness (total)	120	131	165		21.0	23.4	42.8	365	374	361
Cyanide (SAD + thiocyanate	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Al (total)	<0.06	<0.06	<0.06				<0.06	0.07	<0.06	<0.06
Sb (total)	<0.02	<0.02	<0.02				<0.02	<0.02	<0.02	<0.02
As (total)	<0.04	<0.04	<0.04				<0.04	<0.04	<0.04	0.04
Ba (total)	0.011	0.011	0.014				0.020	0.043	0.044	0.043
Be (total)	<0.0002	<0.0002	<0.0002				<0.0002	<0.0002	<0.0002	<0.0002
Bi (total)	<0.02	<0.02	<0.02				<0.02	<0.02	<0.02	<0.02
B (total)	<0.04	<0.04	<0.04				<0.04	0.04	<0.04	0.05
Cd (total)	<0.002	<0.002	<0.002				<0.002	<0.002	<0.002	<0.002
Ca (total)	44.2	42.9	64.3				15	132	135	130
Cr (total)	0.002	<0.002	<0.002				<0.002	0.003	0.004	0.006
Co (total)	<0.004	<0.004	<0.004				<0.004	<0.004	<0.004	<0.004
Cu (total)	<0.003	<0.003	<0.003				<0.003	0.014	0.016	0.016
Fe (total)	<0.05	<0.05	<0.05				<0.05	<0.05	<0.05	<0.05
Pb (total)	<0.03	<0.03	<0.03				<0.03	<0.03	<0.03	<0.03
Mg (total)	2.34	2.21	3.67				1.31	8.68	8.89	8.74
Mn (total)	<0.002	<0.002	<0.002				0.003	<0.002	<0.002	<0.002
Hg (total)	<0.00005	<0.00005	<0.00005				<0.00005	<0.00005	<0.00005	<0.00005
Mo (total)	<0.005	<0.005	<0.005				<0.005	0.017	0.014	0.015
Ni (total)	<0.01	<0.01	<0.01				<0.01	<0.01	<0.01	<0.01
P (total)	<0.1	<0.1	<0.1				<0.1	<0.1	<0.1	<0.1
K (total)	<0.5	<0.5	<0.5				<0.5	5.3	5.6	5.7
Se (total)	<0.03	<0.03	<0.03				<0.03	<0.03	<0.03	<0.03
Ag (total)	<0.03	<0.03	<0.03				<0.03	<0.03	<0.03	<0.03
Na (total)	2.2	1.6	2.8				1.5	17.4	17.8	17.9
Sr (total)	0.189	0.179	0.272				0.084	0.514	0.529	0.520
S (total)	28.1	26.9	42.4				4.6	118	122	119
Te (total)	<0.02	<0.02	<0.02				<0.02	<0.02	<0.02	<0.02
Ti (total)	<0.03	<0.03	<0.03				<0.03	<0.03	<0.03	<0.03
Sn (total)	<0.02	<0.02	<0.02				<0.02	<0.02	<0.02	<0.02
Ti (total)	<0.003	<0.003	<0.003				<0.003	<0.003	<0.003	<0.003
V (total)	<0.003	<0.003	<0.003				<0.003	<0.003	<0.003	<0.003
Zn (total)	<0.01	<0.01	<0.01				<0.01	<0.01	<0.01	0.01
Zr (total)	<0.003	<0.003	<0.003				<0.003	<0.003	<0.003	<0.003

Table 8: Dissolved metal water chemistry data for MSGM, 1999

Analyte (mg/L) (Dissolved)	MSGM 1800 – ButteCr. @ upper adit	MSGM 1800a Butte Cr. @ upper adit	MSGM 1700 Butte Cr. @ lower adit	MSGM TRIB @ lower adit	MSGM TRIB @ lower adit
Al	<0.02	<0.02	<0.02	<0.02	<0.02
Sb	<0.015	<0.015	<0.015	<0.015	<0.015
As	<0.04	<0.04	<0.04	<0.04	<0.04
Ba	0.012	0.013	0.014	0.004	0.002
Be	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bi	<0.02	<0.02	<0.02	<0.02	<0.02
B	<0.008	<0.008	<0.008	<0.008	<0.008
Cd	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	47.3	48.5	60.1	7.83	8.87
Cr	<0.002	<0.002	<0.002	<0.002	<0.002
Co	<0.003	<0.003	<0.003	<0.003	<0.003
Cu	<0.001	<0.001	<0.001	0.001	<0.001
Fe	<0.003	<0.003	<0.003	0.003	0.006
Pb	<0.02	<0.02	<0.02	<0.02	<0.02
Mg	2.50	2.38	3.69	0.34	0.30
Mn	<0.002	0.016	<0.002	0.014	<0.002
Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mo	<0.004	<0.004	<0.004	<0.004	<0.004
Ni	<0.008	<0.008	<0.008	<0.008	<0.008
P	<0.04	<0.04	<0.04	<0.04	<0.04
K	<0.4	<0.4	<0.4	<0.4	<0.4
Se	<0.03	<0.03	<0.03	<0.03	<0.03
Ag	<0.01	<0.01	<0.01	<0.01	<0.01
Na	1.8	1.74	2.72	1.39	1.34
Sr	0.201	0.185	0.255	0.025	0.028
S	30.4	31.3	44.4	1.74	1.59
Te	<0.02	<0.02	<0.02	<0.02	<0.02
Tl	<0.02	<0.02	<0.02	<0.02	<0.02
Sn	<0.02	<0.02	<0.02	<0.02	<0.02
Ti	<0.003	<0.003	<0.003	<0.003	<0.003
V	<0.003	<0.003	<0.003	<0.003	<0.003
Zn	0.004	0.005	<0.005	0.004	<0.002
Zr	<0.003	<0.003	<0.003	<0.003	<0.003

9.2.2. Soil Chemistry

Due to the difficult work conditions at the time of the field work, (i.e. poor visibility, icing and snow) soil samples were collected and returned to the laboratory for the analysis of hydrocarbons rather that doing the field tests. For the five stained soil samples collected for analysis (see Table 9), only two were found to have significant hydrocarbons. Site 1 is the abandoned maintenance building and site 2 is the diesel fuel tank for the new maintenance shed generator. Both of these sites would require further investigation and likely require cleanup. The stained soil by the fuel tank behind the camp would also likely test with high concentrations of hydrocarbons, but was not sampled.

The two stained soil samples collected near the upper and lower adit did not show detectable concentrations of hydrocarbons, and the staining must be a result of rubbish burning at these sites. The one soil sample from the landfill did have low but detectable concentrations of benzene, but other BTEX compounds and TPH were below the detection limits.

The tailings pond sediment and soil (i.e. above the present day water line) total metals data are presented in Table 10. Three cyanide measurements are reported. The first includes thiocyanate. For the purpose of standardization with previous work (pers. comm. Mr. P. Roach), total cyanide was also reported without thiocyanate. The weak acid digestion (WAD) cyanide analysis is considered to be the best measurement of free cyanide. These concentrations in the sediment and the soil were low, ranging from 0.22 to 7.6 mg/Kg. The sediment concentrations, from the edge of the tailings pond are higher than the adjacent soil concentrations (MSGM-6-2), but lower than the concentrations of the other vertically composited soil samples (T-2 = 40 cm, T-3 = 50 cm and T-4 = 60 cm) closer to the recent (prior to closing) tailings discharge locations. To the best of our knowledge, the license did not set a standard for the tailings sediment/soil. However, these concentrations are well below the Ontario remediation criteria for recreational/agricultural soils which is set at 100 mg/Kg of free cyanide (MOE, 1999). The WAD concentrations are an order of magnitude below the much more stringent CCME guidelines (CCME, 1999) for agricultural/residential/parkland and commercial/industrial soils at 0.9 and 8.0 mg/Kg, respectively. These guidelines are to protect environmental health when soil contact occurs and thus the ground squirrels residing in the tailings (see Photo 26) should also be protected from cyanide at these concentrations.

Cu is the only metal that exceeds the CCME and MOE sediment and soil quality guidelines/criteria for the tailings pond. These concentrations are approximately 2 to 3 times greater than the guidelines. As noted above in section 9.2.1, Cu is naturally high in the surface waters and the high concentrations in the sediments/soil are likely typical of this environment.

Table 9: Total Extractable Hydrocarbon and Total Petroleum Hydrocarbon Analysis of Surface Soil

Sample Number/Location	Total Extractables, mg/kg (C11-C30+) (Northwest Labs)	Total Petroleum Hydrocarbons (mg/Kg) (PSC)	Benzene (mg/Kg) (PSC)	Ethylbenzene (mg/Kg) (PSC)	Toluene (mg/Kg) (PSC)	Xylenes (mg/Kg) (PSC)
Site 1, 0-15cm	**62900**					
Site 2, Generator Room AST	**96500**					
MSGM-LA-1 – lower adit		<10	<0.04	<0.10	<0.10	<0.1
MSGM-UA-1 – upper adit		<10	<0.04	<0.10	<0.10	<0.1
MSGM-LF-1 – land fill		<10	0.05	<0.10	<0.10	<0.1

Table 10: Total metals and cyanide data from tailings pond sediment and soil

Analyte	MSGM-6-1 (sediment)	CCME Sediment Quality Guidelines*	MSGM-6-2 (soil)	MSGM – T2 (soil)	MSGM-T3 (soil)	MSGM-T4 (soil)	CCME Soil Quality Guidelines* (residential)
Moisture (% W/W)	24.0		29.9	8.4	15.4	14.1	
Cyanide, (SAD) + thiocyanate (mg/Kg)	32		0.60	25	71	59	
Cyanide W.A.D. (mg/Kg)	<0.02		<0.02	0.04	0.08	0.07	0.9 [100]
Cyanide Total (mg/Kg)	2.2		0.22	2.3	7.6	4.5	
Al total (mg/Kg)	21500		16100	6190	8830	8180	
Sb total (mg/Kg)	<2		<2	<2	<2	<2	
As total (mg/Kg)	13	5.9	<8	69	42	58	12 [20]
Ba total (mg/Kg)	334		215	35.1	46.6	34.9	500 [750]
Be total (mg/Kg)	0.8		0.6	1.3	1.7	1.5	[1.2]
Bi total (mg/Kg)	<2		<2	<2	<2	<2	
Cd total (mg/Kg)	0.6	[0.6]#	0.4	<0.2	0.4	0.5	10 [12]
Ca total (mg/Kg)	8110		7240	42300	52100	51400	
Cr total (mg/Kg)	27.0	37.3 [26]	18.8	10.9	16.3	14.8	64 [750]
Co total (mg/Kg)	11.1	[50]	8.5	4.8	5.6	5.2	[40]
Cu total (mg/Kg)	132	35.7 [16]	76.6	89.9	184	135	63 [225]
Fe total (mg/Kg)	37000		28300	22500	25700	24400	
Pb total (mg/Kg)	25	35.0 [31]	18	13	24	22	140 [200]
Mg total (mg/Kg)	10900		9300	4790	7250	6570	
Mn total (mg/Kg)	818		722	525	676	613	
Hg total (mg/Kg)	<0.05	0.17 [0.2]	<0.05	<0.05	<0.05	<0.05	6.6 [10]
Mo total (mg/Kg)	<0.4		<0.4	1.9	1.7	2.2	[40]
Ni total (mg/Kg)	14.8	[16]	11.9	2.5	3.0	2.7	50 [150]
P total (mg/Kg)	821		767	520	619	596	
K total (mg/Kg)	3080		2400	779	1100	923	
Se total (mg/Kg)	<3		<3	<3	<3	<3	[10]
Ag total (mg/Kg)	<1	[0.5]	<1	<1	<1	<1	[20]
Na total (mg/Kg)	587		487	315	457	578	
Sr total (mg/Kg)	63.4		47.3	94.9	122	116	
S total (mg/Kg)	226		172	9440	8530	8790	
Te total (mg/Kg)	<5		<5	<5	<5	<5	
Ti total (mg/Kg)	<5		<5	<5	<5	<5	[4.1]
Sn total (mg/Kg)	<2		<2	<2	<2	<2	
Ti total (mg/Kg)	981		841	30.1	65.5	63.7	
Vn total (mg/Kg)	56.3		43.2	12.6	18.7	17.9	130 [200]
Zn total (mg/Kg)	164	123 [120]	111	94.8	150	121	200 [600]
Zr total (mg/Kg)	1.9		1.7	2.7	3.3	2.7	

*Canadian Environmental quality Guidelines, CCME, 1999, #MOE Sediment or Soil Quality Criteria

10. Archeological/Heritage/Historical Features

There was no evidence of archeological, heritage or historical features at the site; however, disturbances at the mill site and at the adits would have obliterated these. Personnel from the Carcross-Tagish First Nations did not alert us to any potential sites at this location either in pre-inspection discussions or during the site visits.

11. Results of Inspection and Review

11.1. General Observations vis a vis Abandonment Plans

While the site undoubtedly remains as one of the better abandoned mine sites in the Yukon there are still some deficiencies in the condition of the site relative to the components of the abandonment plan that are most relevant to this project. The components of the abandonment plan that are not deficient, can be listed as follows:

- Tailings ponds have been left essentially as outlined in the abandonment plan;
- The water supply line and pump house have been removed and remnants cleaned up;
- Power lines have been removed; and,
- Portals have been closed although the lower portal was blown out and could be accessible if the ice in the entrance way melts.

Items that are deficient relative to the abandonment plan include:

- A quantity of debris has been exposed as a result of the wash-out of the fill at the face of the lower portal, although the surface had apparently been cleaned up prior to the blow out;
- The interior of the mill site still contains some chemicals despite the fact that these were to have been removed (see below);
- At least two debris sites remain in the vicinity of the mill which from our review of the documents were not supposed to be left. The electrical site is neat and orderly while the other is a not sorted and is disorderly;
- Although all fuel and oil was supposed to have been removed, some remains on site; and,
- The landfill has not been adequately covered.

Additionally, there appeared to be groundwater wells in the vicinity of the camp but we could not confirm the purpose of these wells as they were dry at the time of visit. We could find no record of their installation and/or purpose in the documentation reviewed. These should be removed or at least properly sealed as part of the abandonment.

11.2. Listing of Potential Contaminants

11.3. Mill site

In general the site has been left in a better than average state with respect to tidiness. Specific

concerns at the site include:

1. Extensive oil staining at what appears to be the dirt floor of an old maintenance facility (60^0 13.27'N, 135^o 19.14'W) to the north of the mill. As noted in Table 9. These soils have very high concentrations of hydrocarbons. The surface area of the stained soil is approximately 11m by 23 m. Assuming that hydrocarbons have penetrated approximately 0.5 m vertically, it can be approximated that about 125 m^3 of contaminated soil may be present at this location.
2. Minor oil staining has occurred at the northwest corner of the present maintenance building (60^0 13.29'N, 135^o 18.96'W). This is a relatively small area, approximately 2 to 4 m^2.
3. A scrap metal and other debris storage site south of the mill (60^0 13.21'N, 135^o 18.94'W).
4. Waste oil drums stored outside of the generator shed near the camp trailers.
5. Several, minor stained oil sites about the mill and camp.
6. The presence of small quantities of an assortment of chemicals in the mill complex.
7. The landfill located to the east of the mill site has not been adequately covered.

Table 11: Listing of Potential Contaminants and Sources

Item	Condition	Description of Liability
2 AST's (map AST 1 & 2)	Empty, no secondary containment	None
2 fuel drums near generator building (map AST 2)	Full	440 litres of fuel could be released through rusting or vandalism.
7 pails of oil (map AST 2)	Full	Could be released by vandalism.
Septic system at camp (map location 4)		Confined space hazard.
Propane tank at camp (map location 4)		Vandalism concern. Fire and explosion hazard.
3 waste oil drums (map location 5)	Full, soil stains	Considerable soil staining here. Location of soil sample site
AST (map AST 3)	Proper secondary containment	Little concern unless vandalized.
AST (map item 7), ¼ barrel automatic transmission fluid (map item 7)	Stained ground	Little concern unless vandalized.
Propane tank (map item 8)		Vandalism concern. Fire and explosion hazard.
Garbage containers/dumpsters (map item 9)	½ full of non-organic debris	No concern beyond aesthetics.
Products in Generator room	2 gallons 4-Methyl-2 Pentanone, 1 battery, 1 new generator unit, 30KW	?
Products in main mill	Caustic soda storage area Transformers: **Westinghouse** • Type: ONAN • Style: C60L1150N7 • SN: LB26052 • Contains 20 gals of oil **Marcus** SN: 12392-686 Type WF 6 gallons corrosive backing material ABS pipe glue 6 sheets asbestos board Sodium nitrate, 150 lbs Borax, 100 lbs Manganese dioxide, 300 lbs	Clean-up required of residual product Apparently PCB free Apparently PCB free Corrosion hazard No hazard Asbestos hazard Extreme fire and explosion hazard. Will not self-denotate. ? ?

	Silica, 300 lbs	no hazard
	Soda ash, 200 lbs	?
	Jade Set Super (AP Green Refractories), 2 gals	?
	Alchem D-215-W, lot #B3510, 32 kg	?
	Superfloc 1128 flocculant (Cyanimid), 12 drums	?
Products in mill lab	Sodium hydroxide buffer, 2 bottles	Caustic hazard
	SC 2000 cement, 1 gallon	Corrosive
	Lead acetate, 2 bottles	May be explosive
	Phenolphthalalein, 1 bottle	No hazard
	Potassium permanganate (strong oxide)	Powerful oxidant. Mixtures could be explosive.
	Potassium iodide indicator	?
	Cadmium sulfate powder	Cadmium is a carcinogen.

11.4. Mine site

Soil samples from the mine site did not indicate the presence of hydrocarbons and thus the stained soil at these sites appears to be nothing more than old burn sites. A considerable amount of debris has been exposed by the washout at the lower portal and the site is dangerous due to vertical drops from concrete pads, undercutting of fill and the potential for other blowouts to occur. Some minor debris is also exposed at the upper adit. This debris should be removed or at least buried as it is unsightly and potentially dangerous and the lower portal should be fenced to restrict access to the zone that could be affected by subsequent blowouts.

12. Reference

CCME, 1999. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, c/o Manitoba Statutory Publications, 200 Vaughan Street, Winnipeg, MB, Canada.

Appendix 1: Copies of Yukon Territory Water board Licenses for Mount Skukum Gold Mine

YUKON TERRITORY WATER BOARD

Pursuant to the Northern Inland, Waters Act and Regulations the Yukon Territory Water Board, hereinafter referred to as the Board, hereby grants to

Mount Skukum Gold Mining Corporation
(Licensee)

of 500 - 171 West Esplanade Street Vancouver, B.C. V7M 1A1
(Mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence:

Licence Number YIN85-01RL (renewal of Industrial licence YIN84-05L)

Water Management Area 02 Yukon

Location Butte Creek, a tributary of the Wheaton River (Mount Skukum area)

Purpose to obtain, store and return a flow of water

Description Industrial use in underground hardrock mining

Quantity of Water Not to be Exceeded 50,000 imperial gallons per day

Rate of Use of Water Not to be Exceeded N/A

Effective Date of Licence August 5, 1985

Expiry Date of Licence March 31, 1986

This Licence issued and recorded at Whitehorse includes and is subject to the annexed conditions.

Dated this 18th day of July, 1985

Witness

Yukon Territory Water Board

Chairman Diane Granger

Dated this 5th day of August, 1985

Witness

Approved by

Minister of Indian and Northern Affairs Canada

GENERAL CONDITIONS

Part 'A'

1. Definitions:

   (a) "Act" means Northern Inland Waters Act. R.S.C. 1970 (first supplement) Chapter 28 and any amendments thereto;

   (b) "Regulations" means the Regulations made under the Act;

   (c) "Board" means the Yukon Territory Water Board;

   (d) "Inspector" means any person designated as an inspector under Section 29 of the Act.

   All Terms in this licence, unless otherwise explicitly stated, shall be defined in the same manner as in the Act and Regulations.

2. Fees

   The Licensee shall pay the water use fees prescribed in Section 10 of the Regulations. The water use fees shall be payable for each and every year of the term of the licence within thirty (30) days of the receipt of an invoice by the Licensee.

3. Waste Discharge Standards

   This licence is issued to the Licensee, subject to the conditions contained herein, with respect to the use or return of water, or the depositing or permitting the deposit of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, it is also a condition of granting of this licence to the Licensee that, whenever future Regulations are made by the Governor in Council under the Northern Inland Waters Act, or any other statute imposing conditions relating to the quantity and types of waste that may be so deposited or under which any such waste may be so deposited that are more stringent than conditions included in this licence, this licence shall be deemed, upon prescription of such Regulations, to be automatically amended to conform with such Regulations.

4. Non-Compliance

   In the event the Licensee fails to comply with any provision or condition of this licence the Board may, subject to the Act, cancel the licence, and without limiting its rights to cancellation of the licence, if the Licensee has failed to perform the works as specified in the licence, or has performed works contrary to the licence, the Board may apply to the Courts for a mandatory injunction to compel the Licensee to perform the works or for an injunction to restrain the Licensee from performing the works, as the case may be.

5. Correspondence

   Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

   (a) to the Licensee, if left at or mailed by registered mail to the following address:

   Name: Mount Skukum Gold Mining Corporation
   Address: 500 - 171 West Esplanade Street
   Town: Vancouver, B.C.
   Postal Code: V7M 1A1

   and shall be deemed to have been given to the Licensee on the day it was left or seven (7) days after the day it was so mailed as the case may be;

(b) to the Board, if left at or sent by registered mail to the following address:

Yukon Territory Water Board
Suite 200, 4114 - 4th Avenue
Whitehorse, Yukon
Y1A 4N7

and shall be deemed to have been given to the Board on the day it was left or seven (7) days after the day it was so mailed as the case may be.

6. Interpretation

Where a Licensee wishes to appeal an interpretation of a licence condition by an Inspector, he may do so by applying to the Board within ten (10) days of receiving the interpretation.

7. Annual Report

On or before December 31 of each year during which this licence is in effect, the Licensee shall submit to the Board an annual report pursuant to Section 15 of the Northern Inland Waters Regulations. In addition to the information required by the Regulations the annual report shall:

(a) describe the Licensee's water use operations during that year;

(b) explain any difference between what was proposed in the Licensee's application for licence and what was done; and

(c) present all monitoring data collected under the licence during the year reported.

8. Spills and Unauthorized Discharges

The Licensee shall immediately contact the Water Resources Division of Indian and Northern Affairs Canada in Whitehorse (403) 668-5151, or the 24-hour Yukon Spill Report number (403) 667-7244, should a spill or an unauthorized discharge occur or seem likely to occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to the Board not later than fifteen (15) days after its occurrence.

9. Term of Licence

The term of this licence is for the period from the effective date to March 31, 1986.

OPERATING CONDITIONS

Part 'B'

1. Description of Water Use

   (a) Industrial
   The Licensee is hereby authorized:
   i) to obtain water for the purpose of drilling and underground hard rock mining from an unnamed tributary of Butte Creek at a rate not to exceed 50,000 imperial gallons per day
   ii) to obtain groundwater released by drilling and mining operations
   iii) to store drilling wastewater and released groundwater in settling ponds located at the mine portal on Quartz Claims KUKU 17 to 20 and 22
   iv) to discharge effluent from the settling ponds to an unnamed tributary of Butte Creek

   as proposed in water use application IN85-01RL and subject to this licence.

   (b) Camp
   The Licensee is hereby authorized to obtain water from Butte Creek drainage for camp use at a rate not to exceed 600 imperial gallons per day.

2. Water Use Structures

   (a) The Licensee shall maintain in good repair all works associated with the undertaking, including, but not limited to, all dams, weirs, spillways, stream crossings, ditches, gates, water intakes, culverts, and settling ponds.

   (b) The Licensee shall provide settling ponds and associated drains and spillways of adequate construction and capacity to convey the maximum rate of water discharge experienced during the term of this licence.

   (c) On or prior to December 31, 1985, the Licensee shall submit to the Board a plan for the disposal of all mine waste rock materials.

   (d) The plan referred to under Part B, Section 2(c) of this Licence shall provide for placement of waste materials in such locations and in such a manner that water quality and stability of adjacent watercourses are not adversely affected.

3. Industrial Waste Disposal

   (a) Without restricting the generality of the definition of "waste" in the Northern Inland Waters Act, a discharge of waste in this licence includes: surface drainage from the mining site, dams and associated areas; all discharges from the waste treatment and recycling facilities; and all discharges from associated pumping and piping facilities prior to entering the receiving waters.

(b) All waste discharge shall meet the following effluent quality standards:

Parameter	Concentration (grab sample)
Arsenic (total)	0.5 mg/L
Barium (total)	1.0 mg/L
Copper (total)	0.3 mg/L
Lead (total)	0.2 mg/L
Nickel (total)	0.5 mg/L
Silver (total)	0.1 mg/L
Suspended Solids	15.0 mg/L
Zinc (total)	0.5 mg/L

(c) No waste discharge shall be toxic to fish.

(d) No waste discharge shall contain floating solids or visible oil or grease.

(e) No waste discharge shall have a PH of not less than 6.0 units.

4. Security

No security is required under this licence.

5. Fish Passage

No fish passage is required under this licence.

6. General Operating Conditions

(a) The Licensee shall not withdraw, store, consume, discharge or otherwise use water except in accordance with provisions of this licence.

(b) The Licensee shall ensure that stationary fuel storage and pumping sites comply with the provisions of the Gasoline Handling Act and Regulations of Yukon Territory and are located and prepared to avoid pollution of any watercourse, should a fuel spill occur.

(c) The Licensee shall ensure that sewage, including all human excreta and wastewater associated with daily camp operations, is disposed of in accordance with the Public Health Act of Yukon Territory.

(d) The Licensee shall ensure that all garbage and refuse is removed from the site or, where appropriate, incinerated and buried under not less than one (1) metre of compacted soil, in pits located not less than thirty (30) metres from any water supply, lake, stream, or other watercourse.

(e) The Licensee shall provide reasonable assistance to any Inspector to enable such Inspector to carry out his/her duties under the Act.

(f) Nothing in the Act or Regulations, or in a licence issued under the Act constitutes a defense to a claim for loss or damage sustained by any person by reason of the construction of any works forming part of an appurtenant undertaking, or by reason of the operation of such undertaking.

7. Site Abandonment and Restoration

(a) Discontinuance, abandonment, cancellation, or termination of this licence does not relieve the Licensee from any obligations arising under terms and conditions of this section, the Act and Regulations, or from complying with any notice, direction, or order issued by the Board under this section.

(b) The Licensee shall ensure that all waste materials, excluding silt and other natural materials, including but not limited to, scrap metal, discarded machinery and parts, barrels and containers, are removed from the operation site prior to the expiry date of this licence, or upon site abandonment.

(c) Prior to the expiry date of this licence or upon cessation of drilling operations, the Licensee shall submit to the Board for approval a plan and schedule for abandonment and restoration of the site.

(d) Upon approval by the Board of the plan and schedule referred to in Part B Section 7(c) of this licence, the Licensee shall implement the plan according to the schedule contained therein.

MONITORING PROGRAM

Part 'C'

1. The Licensee shall keep true and detailed books and records of the quantity and quality of water used during the term of this licence.

2. An Inspector may examine books, records, or other documents kept by the Licensee relating to water and the Licensee shall, at the Inspector's request, make these records available for examination.

3. The Licensee shall submit to the Board monthly reports based on the previous month's monitoring data and shall include the date and time each sample was taken and analyzed.

4. The Licensee shall submit to the Board, as required, monitoring or other data and information upon the Board's request.

5. The Licensee shall comply with the Monitoring Schedule described under Part C, Section 6 of this licence with any variations thereof made by the Board and shall comply with all the provisions for sampling, sample preservation and analysis specified by the Board. The Licensee shall provide to the Board a description of sampling locations and facilities as established prior to each season's operations.

6. Monitoring Schedule

Parameters	Stations			
	Upstream of Effluent Discharge(1)	Downstream of Effluent Discharge(1)(2)	Portal (Adit)	Effluent(1)(3)
Flow	M	M	W	M
pH	M	M	M	M
Conductivity	M	M	M	M
Temperature	M	M	M	M
Arsenic (total)	M	M	M	M
Barium (total)	M	M	M	M
Copper (total)	M	M	M	M
Lead (total)	M	M	M	M
Nickel (total)	M	M	M	M
Silver (total)	M	M	M	M
Sulphates	M	M	M	M
Suspended Solids	M	M	M	M
Zinc (total)	M	M	M	M
Ammonia	M	M	M	M

(1) Water sampling not required unless a surface discharge of effluent from the settling facilitiess is occurring.

(2) Approximately 100 meters downstream of confluence of effluent and receiving stream.

(3) Sampled at discharge from settling pond system.

(4) Sampled when flows are occurring.

W = Weekly
M = Monthly

YUKON TERRITORY WATER BOARD

Pursuant to the Northern Inland Waters Act and Regulations, the Yukon Territory Water Board, hereinafter referred to as the Board, hereby grants to

MOUNT SKUKUM GOLD MINING CORPORATION
(Licensee)

of 500 - 171 West Esplanade Street, Vancouver, B.C. V7M 1A1
(mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence:

Licence Number Y-IN86-01RL (Renewal of Licence Y-IN85-01RL)

Water Management Area 02 Yukon

Location Butte Creek, a tributary of the Wheaton River (Mount Skukum area)

Purpose To obtain, store and return a flow of water

Description Industrial Use in Underground Hardrock Mining

Quantity of Water Not to be Exceeded 50,000 imperial gallons per day

Rate of Use of Water Not to be Exceeded N/A

Effective Date of Licence July 4, 1986

Expiry Date of Licence is for a period of one (1) year from the effective date.

This Licence issued and recorded at Whitehorse includes and is subject to the annexed conditions.

Dated this 19th day of June, 1986

Witness

YUKON TERRITORY WATER BOARD

Chairman, Diane Granger

Dated this 4th day of July, 1986

Witness

Approved by

Minister of Indian and Northern Affairs Canada

GENERAL CONDITIONS

Part 'A'

1. Definitions:

(a) "Act" means Northern Inland Waters Act R.S.C. 1970 (first supplement) Chapter 28 and any amendments thereto:
(b) "Regulations" means the Regulations made under the Act.
(c) "Board" means the Yukon Territory Water Board.
(d) "Inspector" means any person designated as an Inspector under Section 29 of the Act.

All terms in this licence, unless otherwise explicitly stated shall be defined in the same manner as in the Act and Regulations.

2. Fees

The Licensee shall pay the water use fees prescribed in Section 10 of the Regulations. The water use fees shall be payable for each and every year of the term of the licence within thirty (30) days of the receipt of an invoice by the Licensee.

3. Waste Discharge Standards

This licence is issued to the Licensee, subject to the conditions contained herein, with respect to the use or return of water, or the depositing or permitting the deposit of waste of any type in any waters or in any place under any condition where such waste or any other waste that results from the deposit of such waste may enter any waters. However, it is also a condition of the granting of this licence to the Licensee that, whenever future Regulations are made by the Governor in Council under the Northern Inland Waters Act, or any other statute imposing conditions relating to the quantity and types of waste that may be so deposited or under which any such waste may be so deposited that are more stringent than conditions included in this licence, this licence shall be deemed, upon prescription of such Regulations, to be automatically amended to conform with such Regulations.

4. Non-Compliance

In the event the Licensee fails to comply with any provision or condition of this licence the Board may, subject to the Act, cancel the licence, and without limiting its rights to cancellation of the licence, if the Licensee has failed to perform the works as specified in the licence, or has performed works contrary to the licence, the Board may apply to the Courts for a mandatory injunction to compel the Licensee to perform the works or for an injunction to restrain the Licensee from performing the works, as the case may be.

5. Correspondence

Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

(a) to the Licensee, if left at or mailed by registered mail to the following address:

Mount Skukum Gold Mining Corporation
500 - 171 West Esplanade Street
Vancouver, B.C.
V7M 1A1

and shall be deemed to have been given to the Licensee on the day it was left or seven (7) days after the day it was so mailed as the case may be;

(b) to the Board, if left at or sent by registered mail to the following address:

Yukon Territory Water Board
Suite 302, 4114 - 4th Avenue
Whitehorse, Yukon
Y1A 4N7

and shall be deemed to have been given to the Board on the day it was left or seven (7) days after the day it was so mailed as the case may be.

6. Interpretation

Where a Licensee wishes to appeal an interpretation of a licence condition by an Inspector, he may do so by applying to the Board within ten (10) days of receiving the interpretation.

7. Annual Report

On or before December 31 of each year during which this licence is in effect, the Licensee shall submit to the Board an annual report pursuant to Section 15 of the Northern Inland Waters Regulations. In addition to the information required by the Regulations the annual report shall:

a) describe the Licensee's water use operations during that year;

b) explain any difference between what was proposed in the Licensee's application for licence and what was done, and;

c) present all monitoring data collected under the licence during the year reported.

8. Spills and Unauthorized Discharges

The Licensee shall immediately contact the Water Resources Division of Indian and Northern Affairs Canada in Whitehorse (403) 667-3100, or the 24-hour Yukon Spill Report number (403) 667-7244, should a spill or an unauthorized discharge occur or seem likely to occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to the Board not later than fifteen (15) days after its occurrence.

9. Term of Licence

The term of this licence is for a period of one year from the effective date.

PART 'B'

1. Description of Water Use

(a) Industrial

The Licensee is hereby authorized:

i) to obtain water for the purpose of drilling and underground hard rock mining from an unnamed tributary of Butte Creek at a rate not to exceed 50,000 imperial gallons per day

ii) to obtain groundwater released by drilling and mining operations

iii) to store drilling wastewater and released groundwater in settling ponds located at the mine portal on Quartz Claims KUKU 17 to 20 and 22

iv) to discharge effluent from the settling ponds to an unnamed tributary of Butte Creek

as proposed in water use application IN86-01R and subject to this licence.

(b) Camp

The Licensee is hereby authorized to obtain water from Butte Creek drainage for camp use at a rate not to exceed 600 imperial gallons per day.

2. Water Use Structures

(a) The Licensee shall maintain in good repair all works associated with the undertaking, including, but not limited to, all dams, weirs, spillways, stream crossings, ditches, gates, water intakes, culverts, and settling ponds.

(b) The Licensee shall provide settling ponds and associated drains and spillways of adequate construction and capacity to convey the maximum rate of water discharge experienced during the term of this licence.

3. Industrial Waste Disposal

(a) Without restricting the generality of the definition of "waste" in the Northern Inland Waters Act, a discharge of waste in this licence includes: surface drainage from the mining site, dams and associated areas; all discharges from the waste treatment and recycling facilities; and all discharges from associated pumping and piping facilities prior to entering the receiving waters.

(b) All waste discharge shall meet the following effluent quality standards:

Parameter	Concentration (grab sample)
Arsenic (total)	0.5 mg/L
Barium (total)	1.0 mg/L
Copper (total)	0.3 mg/L
Lead (total)	0.2 mg/L
Nickel (total)	0.5 mg/L
Silver (total)	0.1 mg/L
Zinc (total)	0.5 mg/L

(c) No waste discharge shall be toxic fish.

(d) No waste discharge shall contain floating solids or visible oil or grease.

(e) No waste discharge shall have a PH of not less than 6.0 units.

4. Security

No security is required under this licence.

5. Fish Passage

No fish passage is required under this licence.

6. General Operating Conditions

(a) The Licensee shall not withdraw, store, consume, discharge or otherwise use water except in accordance with provisions of this licence.

(b) The Licensee shall ensure that stationary fuel storage and pumping sites comply with the provisions of the Gasoline Handling Act and Regulations of Yukon Territory and are located and prepared to avoid pollution of any watercourse, should a fuel spill occur.

(c) The Licensee shall ensure that sewage, including all human excreta and wastewater associated with daily camp operations, is disposed of in accordance with the Public Health Act of Yukon Territory.

(d) The Licensee shall ensure that all garbage and refuse is removed from the site or, where appropriate, incinerated and buried under not less than one (1) meter of compacted soil, in pits located not less than thirty (30) meters from any water supply, lake, stream, or other watercourse.

(e) The Licensee shall provide reasonable assistance to any Inspector to enable such Inspector to carry out his/her duties under the Act.

(f) Nothing in the Act or Regulations, or in a licence issued under the Act constitutes a defense to a claim for loss or damage sustained by any person by reason of the construction of any works forming part of an appurtenant undertaking, or by reason of the operation of such undertaking.

7. Site Abandonment and Restoration

(a) Discontinuance, abandonment, cancellation, or termination of this licence does not relieve the Licensee from any obligations arising under terms and conditions of this section, the Act and Regulations, or from complying with any notice, direction, or order issued by the Board under this section.

(b) The Licensee shall abandon the mine site in accordance with the provisions of the Yukon Mine Safety Act and Regulations.

(c) The Licensee shall ensure that all waste materials, excluding silt and other natural materials, including but not limited to, scrap metal, discarded machinery and parts, barrels and containers, fuels and hazardous materials, are removed from the operation site prior to the expiry date of this licence, or upon site abandonment.

(d) Prior to the expiry date of this licence or upon cessation of drilling operations, the Licensee shall submit to the Board for approval a plan and schedule for abandonment and restoration of the site.

(e) Upon approval by the Board of the plan and schedule referred to in Part B, Section 7(c) of this licence, the Licensee shall implement the plan according to the schedule contained therein.

MONITORING PROGRAM

PART 'C

1. The Licensee shall keep true and detailed books and records of the quantity and quality of water used during the term of this licence.

2. An Inspector may examine books, records, or other documents kept by the Licensee relating to water and the Licensee shall, at the Inspector's request, make these records available for examination.

3. The Licensee shall submit to the Board monthly reports based on the previous month's monitoring data and shall include the date and time each sample was taken and analyzed.

4. The Licensee shall submit to the Board, as required, monitoring or other data and information upon the Board's request.

5. The Licensee shall comply with the Monitoring Schedule described under Part C, Section 6 of this licence with any variations thereof made by the Board and shall comply with all the provisions for sampling, sample preservation and analysis specified by the Board. The Licensee shall provide to the Board a description of sampling locations and facilities as established prior to each season's operations.

6. Monitoring Schedule

Parameters Stations: Butte Creek

	Upstream of Effluent Discharge (1)	Downstream of Effluent Discharge (2)	Portal (adit) (3)
Flow	Q	Q	Q
pH	Q	Q	Q
Conductivity	Q	Q	Q
Temperature	Q	Q	Q
Arsenic (total)	Q	Q	Q
Barium (total)	Q	Q	Q
Copper (total)	Q	Q	Q
Lead (total)	Q	Q	Q
Nickel (total)	Q	Q	Q
Silver (total)	Q	Q	Q
Sulphates	Q	Q	Q
Zinc (total)	Q	Q	Q
Ammonia	Q	Q	Q

(1) Approximately 500 metres upstream of the adit.

(2) Approximately 1500 metres downstream of the adit.

(3) Sampled at the entrance to the culvert that collects the water from the adit.

Q = Quarterly.

Indian and Northern Affairs Affaires indiennes et du Nord

YUKON TERRITORY WATER BOARD

Pursuant to the Northern Inland,Waters Act and Regulations the Yukon Territory Water Board, hereinafter referred to as the Board, hereby grants to

Mount Skukum Gold Mining Corporation
(Licensee)

of 171 West Esplanade Street, Suite 500, North Vancouver, B.C.
(Mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this licence:

Licence Number Y-IN84-09L

Water Management Area 02 Yukon

Location Butte Creek, a tributary of the Wheaton River

Purpose To obtain, store and return a flow of water

Description Industrial use in milling process, a tailings impoundment and camp use

Quantity of Water Not to be Exceeded Industrial: 57,000 imperial gallons per day.
Camp: 10,000 imperial gallons per day.

Rate of Use of Water Not to be Exceeded Industrial: 2,400 imperial gallons per hour.

Effective Date of Licence May 6 1985

Expiry Date of Licence May 5 1990

This Licence issued and recorded at Whitehorse includes and is subject to the annexed conditions.

Dated this 15th day of April, 1985

Witness

Yukon Territory Water Board

Chairman Diane Granger

Dated this 6th day of May, 1985

Witness

Approved by

Minister of Indian Affairs
and Northern Development

IAND 52-230 (10-73)

1. Definitions

(a) "Act" means Northern Inland Waters Act, R.S.C. 1970 (first supplement) Chapter 28, and any amendments thereto.

(b) "Regulations" means the Regulations made under the Act.

(c) "Board" means The Yukon Territory Water Board.

(d) "Inspector" means any person designated as an inspector under Section 29 of the Act.

All terms in this licence, unless otherwise explicitly stated, shall be defined in the same manner as in the Act and Regulations.

2. Fees

The Licensee shall pay the water use fees prescribed in Section 10 of the Regulations. The water use fees shall be payable for each and every year, or portion of a year, of the term of the licence.

3. Security

The Licensee shall provide security prior to the commencement of milling operations, in accordance with the Regulations, Section 13 (2), in the amount of $15,000. Such security shall remain in effect for no less than two years past the expiry date of the licence. Such security shall provide for the protection of the owners and occupiers of property who may be adversely affected as a result of the issuance of this licence.

4. Waste Discharge Standards

This licence is issued to the Licensee, subject to the conditions contained herein, with respect to the use or return of water, or the depositing or permitting the deposit of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, it is also a condition of granting of this licence to the Licensee that, whenever future Regulations are made by the Governor in Council under the Northern Inland Waters Act, or any other statute imposing conditions relating to the quantity and types of waste that may be so deposited or under which any such waste may be so deposited that are more stringent than conditions included in this licence, this licence shall be deemed, upon prescription of such Regulations, to be automatically amended to conform with such Regulations.

5. Non-Compliance

In the event the Licensee fails to comply with any provision or condition of this licence the Board may, subject to the Act, cancel the licence, and without limiting its rights to cancellation of the licence, if the Licensee has failed to perform the works as specified in the licence, or has performed works contrary to the licence, the Board may apply to the Courts for a mandatory injunction to compel the Licensee to perform the works or for an injunction to restrain the Licensee from performing the works, as the case may be.

6. Correspondence

Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

(a) to the Licensee, if left at or mailed by registered mail to the following address:

Mount Skukum Gold Mining Corporation
171 West Esplanade Street, Suite 200
North Vancouver, B.C.
V7M 1A1

and shall be deemed to have been given to the Licensee on the day it was left or seven (7) days after the day it was mailed as the case may be;

(b) to the Board, if left at or sent by registered mail to the following address:

Yukon Territory Water Board
4114 - 4th Avenue, Suite 200
Whitehorse, Yukon
Y1A 4N7

and shall be deemed to have been given to the Board on the day it was left or seven (7) days after the day it was mailed as the case may be.

7. Interpretation

Where a Licensee wishes to appeal an interpretation of a licence condition by an Inspector, he may do so by applying to the Board within ten (10) days of receiving the interpretation.

8. Annual Reports

(a) On or before March 1 of each year during which this licence is in effect, the Licensee shall submit to the Board an Annual Report pursuant to Section 15 of the Northern Inland Waters Regulations. The Annual Report shall detail all water quantities used during the year with a summary and interpretation of any trends or variations in the data;

(b) The Annual Report shall, in addition, contain:

i) both tabular and graphical summaries of all data collected under Schedules A and B of this licence, including analysis and interpretation by a qualified person or firm and a discussion of variation from base line or previous year's conditions;

ii) a detailed record of any major maintenance work carried out on the water supply, tailings pond or associated works on the property which may affect water;

iii) a report by a competent engineer of his inspection of all dykes;

iv) any other information on water use or waste disposal requested by the Board.

9. Spills and Unauthorized Discharges

(a) The Licensee shall immediately contact the Water Resources Division of Indian and Northern Affairs Canada in Whitehorse (403) 668-5151, or the 24-hour Yukon Spill Report number (403) 667-7244, should a spill or an unauthorized discharge occur or seem likely to occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to Water Resources Division not later than fifteen (15) days after its occurrence.

(b) The Licensee shall ensure that stationary fuel storage and pumping sites comply with the provisions of the Gasoline Handling Act and Regulations of the Yukon Territory and are located and prepared to avoid pollution of any watercourse, should a fuel spill occur.

(c) The Licensee shall ensure that all shipments of hazardous materials are accompanied from Whitehorse to the mill site by a radio-equipped vehicle and shall immediately advise residents of the affected watershed, should a discharge of hazardous material to the environment occur or should a container of hazardous material be released into a watercourse.

10. Term of Licence

The term of this licence is for five (5) years from the effective date of this licence.

Part 'B'

OPERATING CONDITIONS

1. Description of Water Use

(a) Industrial

i) The Licensee shall not withdraw, store, consume, discharge or otherwise use water except in accordance with provisions of this licence.

ii) The Licensee is hereby authorized:

to obtain water from Butte Creek, a tributary to the Wheaton River, or from wells adjacent to Butte Creek, at a rate not to exceed 2400 imperial gallons per hour;

(2) to convey water via pump and pipeline;

(3) to use water for mineral processing on lease 105-D03-0000-00002-03;

(4) to store water in tailings ponds;

(5) to discharge wastewater to Butte Creek.

(b) Camp

i) The Licensee is hereby authorized to obtain water from Butte Creek or wells adjacent to Butte Creek for camp use at a rate not to exceed 10,000 imperial gallons per day.

ii) The Licensee shall ensure that sewage, including all human excreta and wastewater associated with daily camp operations, is disposed of in accordance with the Public Health Act of Yukon Territory.

2. Water Use Structures

Industrial

(a) The Licensee shall file with the Board final design and construction plans and specifications for structures for the water supply and associated facilities, the tailings dykes and related waste treatment facilities prior to the start of any construction work. The plans shall bear the seal of a duly qualified engineer. The plans shall be accompanied by a statement discussing where the plans vary from the intent of the licence application.

(b) The Licensee shall have the construction of all dykes supervised by a competent engineer in accordance with the plans submitted to the Board.

(c) The Licensee shall provide 'as built' drawings of all structures referred to in Part B, Section 2 (a) of this licence, noting changes from the original design.

(d) The Licensee shall maintain in good repair all works associated with the undertaking, including, but not limited to, all dams, weirs, spillways, stream crossings, ditches, gates, water intakes, culverts, and settling ponds.

(e) The waste treatment system constructed by the Licensee shall:

i) treat all mill effluents;

ii) maintain a minimum available storage capacity of 20 million imperial gallons in the primary tailings pond in order to store spring runoff and meltwater from glaciated tailings;

iii) provide for an emergency spillway on all tailings dykes;

iv) include a primary tailings pond constructed at the location described in Drawing SK-1 "Proposed Tailing Disposal Site, January 1985".

3. Operation

Industrial

(a) The Licensee shall ensure that all wastewater from the milling operation is directed:

i) through a cyanide destruction system of appropriate capacity to ensure that waste discharge standards prescribed in this licence are met;

ii) through a primary tailings pond and a secondary tailings pond located downstream of the primary tailings pond before entering Butte Creek.

(b) The Licensee shall provide the secondary tailings pond spillway with a means of controlling flow.

(c) The Licensee shall immediately cease discharging tailings from the mill, should either of the following conditions occur:

i) a failure in the cyanide destruction system;

ii) cyanide levels in mill effluent prior to discharge to the primary tailings pond which exceed 1.0 mg/L total cyanide.

(d) In the event that the average total cyanide concentration in the primary tailings pond effluent exceeds 1.0 mg/L the Licensee shall provide the Board with a plan to monitor groundwater and shall carry out said plan at the Board's direction.

4. Waste Discharge Standards

(a) Without restricting the generality of the definition of "waste" in the Northern Inland Waters Act, a discharge of waste in this licence includes: surface drainage from the mill site, dams and associated areas; all discharges from the waste treatment and recycling facilities; and all discharges from associated pumping and piping facilities prior to entering the receiving waters.

(b) All waste discharged shall not exceed the following effluent quality standards:

Parameter	Maximum Concentration for any Grab Sample
Suspended solids	not greater than 25 mg/L
pH	not less than 6.5 pH Units
Colour	not greater than 20 Pt-Co Units
Turbidity	not greater than 15 Jackson Turbidity Units
Oil and Grease	none visible
Floating Solids	none
96-hour LC_{50}	100%

Parameter			Maximum Concentration for Any Grab Sample
Ammonia	(as N)	total	1.0 mg/L
Arsenic	(As)	dissolved	0.05 mg/L
Barium	(Ba)	total	0.05 mg/L
Chlorine	(Cl)	free residual	0.05 mg/L
Copper	(Cu)	total	0.3 mg/L
Cyanide	(as CN)	total	1.0 mg/L
Cyanide	(as CN)	available (free)	0.05 mg/L
Lead	(Pb)	total	0.05 mg/L
Silver	(Ag)	total	0.05 mg/L
Zinc	(Zn)	total	0.1 mg/L

(c) The wastewater discharge standards contained in Part B Section 4 (b) shall be met at station X2, as described in Schedule A to this licence, and at all points of entry to receiving waters, unless otherwise specified by the Board.

PART C - CONTINGENCY PLANS

1. The Licensee shall provide the Board, prior to commencement of milling operations, with contingency plans for dealing with the following circumstances:

   (a) Cyanide levels in the tailings pond that exceed or are likely to exceed licence levels;

   (b) A spill or discharge that exceeds, or is likely to exceed, licence levels, and which reaches, or is likely to reach Butte Creek.

2. The contingency plans shall include the requirements of Part A Section 9 of this licence and shall cover the subjects of reporting, alerting and response.

PART D - SITE ABANDONMENT AND RESTORATION PLAN

1. The Licensee shall, within one year of start-up, provide to the Board an abandonment and restoration plan for the long-term physical and chemical stability of the site to protect the waters of Butte Creek. The plan shall include, but not be limited to, the mill site, tailings ponds, garbage dump and chemical storage areas.

2. The plan shall be based cn the concept presented by the Licensee at the public hearing "Yukon Territory Water Board in the Matter of Mount Skukum Gold Mining Corporation, February 14, 1985", transcript: page 12 - line 22, to page 13 - line 6.

3. The plan shall provide for progressive restoration where appropriate.

4. The plan shall provide for both temporary shutdown and indefinite cessation of abandonment and restoration measures will be undertaken.

PART E - GENERAL PROVISIONS FOR REPORTS, SAMPLING AND ANALYSIS

1. The Licensee shall submit to the Board monthly reports based cn the previous month's Surveillance Network program data and shall include the date and time each sample was taken and analyzed.

2. The Licensee shall collect and conduct four (4) bioassays each year from sampling point XI on dates approved by the Board.

3. Procedures for the bioassays shall be obtained from the Environmental Protection Service and approved by the Board.

4. The Licensee shall comply with the Surveillance Network Program attached as Schedule "A" hereto and with any variations thereof made by the Board and shall comply with all provisions for sampling, sample preservations, reporting and analysis specified by the Board.

5. Unless otherwise specified or approved by the Board all analyses shall be conducted in accordance with the current edition of "Standard Methods for the Examination of Water and Waste Water", prepared and published jointly by the American Water Works Association and the Water Pollution Control Federation.

6. All analyses shall be performed in a laboratory approved by the Board.

7. The Licensee shall perform the analysis for cyanide in accordance with a method to be specified by the Board.

8. The licensee shall comply with the program of biological monitoring attached as Schedule "B" hereto and with any variations thereof made by the Board and shall comply with all provisions for sampling perservation, reporting and analysis specified by the Board.

SCHEDULE "A"

SURVEILLANCE NETWORK PROGRAM
FOR MT. SKUKUM GOLD MINING CORPORATION LTD.

LICENCE NUMBER Y-IN84-09L

Sampling Points for This Program

Yukon Territory Water Board Idendification Number	Sampling Station
X1	Secondary tailings pond decant
X2	Primary tailings pond decant
X3	Mill discharge to the primary tailings pond
X4	Butte Creek above secondary tailings pond decant
X5	Butte Creek below secondary tailings pond decant
X6	Wheaton River upstream of the confluence with Butte Creek
X7	Wheaton River 100 meters downstream of the confluence with Butte Creek
X8	Grid sampling within primary tailings pond.

SCHEDULE "A" ontinued)

SURVEILLANCE NETWORK PROGRAM

	X1* Secondary pond discharge	X2* Primary pond discharge	X3 Mill discharge to primary pond	X4 Butte Cr. U/S Effluent	X5 Butte Cr. D/S Effluent	X6* Wheaton R. U/S Butte Cr.	X7* Wheaton R. D/S Butte Cr.	X8** Primary pond grid
pH	W	W	-	M	M	M	M	A
Temperature (^{o}C)	W	W	-	M	M	M	M	-
Flow (M^3/S)	D	D	D	M	M	M	M	-
Ammonia (MH_4-N)	M	M	-	M	M	M	M	A
Arsenic (dissolved)	M	M	-	M	M	M	M	A
Barium (total)	M	M	-	M	M	M	M	-
Calcium	M	M	-	M	M	M	M	-
Chlorine (free)***	D	-	-	D	D	D	D	A
Copper (total	W	W	-	M	M	M	M	A
Cyanide (total)	W	W	D	M	M	M	M	A
Cyanide (free)	W	W	-	W*	W*	M	M	A
Iron (total)	M	M	-	M	M	M	M	-
Lead (total	W	W	-	M	M	M	M	A
Silver (total	W	W	-	M	M	M	M	A
Nitrate $(N)_3$-N)	M	M	-	M	M	M	M	-
Zinc (total	W	W	-	M	M	M	M	A

Notes: * - Sampled only during periods of discharge
** - Sampled prior to seasonal discharge from primary tailings pond
*** - Required only if chlorine is used in the waste treatment system

D - Daily
W - Weekly
M - Monthly
A - Yearly

SCHEDULE "B"

BIOLOGICAL MONITORING PROGRAM
FOR MT. SKUKUM GOLD MINING CORPORATION

1. Sampling Points

X4	Biological Station #1 On Butte Creek above the influence of the processing mill and above the entry of any discharge from the tailings pond.
X5	Biological Station #2 On Butte Creek below the point of discharge from the tailings pond and above the confluence of Butte Creek with the Wheaton River.
X6	Biological Station #3 On Wheaton River upstream of the point of confluence of the Wheaton River and Butte Creek
X7	Biological Station #4 On Wheaton River downstream of the mixing zone of the Wheaton River and Butte Creek.

2. The Licensee shall ensure that three replicate samples of invertebrate fauna are collected by a qualified person annually from each station, using an artificial substrate sample which has been installed for approximately five weeks.

3. The Licensee shall, on each visit, perform tests for pH, conductivity, temperature, and dissolved oxygen. Water samples shall be collected and analyzed for cyanide, copper, lead, zinc, manganese, iron, arsenic, calcium and sodium.

YUKON TERRITORY WATER BOARD

Pursuant to the Northern Inland Waters Act and Regulations, the Yukon Territory Water Board, hereinafter referred to as the Board, hereby grants to

Mount Skukum Gold Mining Corporation

(Licensee)

of 171 West Esplanade Street, Suite 500, North Vancouver, B.C.

(mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence:

Licence Number Y-IN85-08AL

Water Management Area 02 Yukon

Location Wheaton River, a tributary of Bennett Lake

Purpose to obtain, store and return a flow of water

Description Industrial use in milling process, a tailings impoundment and camp use

Quantity of Water Not to be Exceeded Industrial: 57,000 imperial gallons per day
Camp: 10,000 imperial gallons per day

Rate of Use of Water Not to be Exceeded Industrial: 2,400 imperial gallons per hou

Effective Date of Licence March 21, 1986

Expiry Date of Licence May 5, 1990

This Licence issued and recorded at Whitehorse includes and is subject to the annexed conditions.

Dated this 10th day of March, 1986

Witness

Yukon Territory Water Board

Chairman Diane Granger

Dated this 31st day of March, 1986

Witness

Approved by:

Minister of Indian and Northern Affairs Canada

PART A - GENERAL CONDITIONS

1. Definitions

(a) "Act" means Northern Inland Waters Act. R.S.C. 1970 (first supplement) Chapter 28, and any amendments thereto.

(b) "Regulations" means the Regulations made under the Act.

(c) "Board" means the Yukon Territory Water Board.

(d) "Inspector" means any person designated as an Inspector under Section 29 of the Act.

All Terms in this licence, unless otherwise explicitly stated, shall be defined in the same manner as in the Act and Regulations.

2. Fees

The Licensee shall pay the water use fees prescribed in Section 10 of the Regulations. The water use fees shall be payable for each and every year, or portion of a year, of the term of the licence.

3. Security

The Licensee shall provide security prior to the commencement of milling operations, in accordance with the Regulations, Section 13 (2), in the amount of $15,000. Such security shall remain in effect for no less than two years past the expiry date of the licence. Such security shall provide for the protection of the owners and occupiers of property who may be adversely affected as a result of the issuance of this licence.

4. Waste Disposal Standards

This licence is issued to the Licensee, subject to the conditions contained herein, with respect to the use or return of water, or the depositing or permitting the deposit of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, it is also a condition of granting of this licence to the Licensee that, whenever future Regulations are made by the Governor in Council under the Northern Inland Waters Act, or any other statute imposing conditions relating to the quantity and types of waste that may be so deposited or under which any such waste may be so deposited that are more stringent than conditions included in this licence, this licence shall be deemed, upon prescription of such Regulations, to be automatically amended to conform with such Regulations.

5. Non-Compliance

In the event the Licensee fails to comply with any provision or condition of this licence the Board may, subject to the Act, cancel the licence, and without limiting its rights to cancellation of the licence, if the Licensee has failed to perform the works as specified in the licence, or has performed works contrary to the licence, the Board may apply to the Courts for a mandatory injunction to compel the Licensee to perform the works or for an injunction to restrain the Licensee from performing the works, as the case may be.

6. Correspondence

Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

(a) to the Licensee, if left at or mailed by registered mail to the following address:

Mount Skukum Gold Mining Corporation
171 West Esplanade Street, Suite 500
North Vancouver, B.C.
V7M 1A1

and shall be deemed to have been given to the Licensee on the day it was left or seven (7) days after the day it was mailed as the case may be;

(b) to the Board, if left at or sent by registered mail to the following address:

Yukon Territory Water Board
4114 - 4th Avenue, Suite 200
Whitehorse, Yukon
Y1A 4N7

and shall be deemed to have been given to the Board on the day it was left or seven (7) days after the day it was mailed as the case may be.

7. Interpretation

Where a Licensee wishes to appeal an interpretation of a licence condition by an Inspector, he may do so by applying to the Board within ten (10) days of receiving the interpretation.

8. Annual Report

(a) On or before March 1 of each year during which this licence is in effect, the Licensee shall submit to the Board an Annual Report pursuant to Section 15 of the Northern Inland Waters Regulations. The Annual Report shall detail all water quantities used during the year with a summary and interpretation of any trends or variations in the data;

(b) The Annual Report shall, in addition, contain:

i) both tabular and graphical summaries of all data collected under Schedules A and B of this licence, including analysis and interpretation by a qualified person or firm and a discussion of variation from base line or previous year's conditions;

ii) a detailed record of any major maintenance work carried out on the water supply, tailings pond or associated works on the property which may affect water;

iii) a report by a competent engineer of his inspection of all dykes;

iv) any other information on water use or waste disposal requested by the Board.

9. Spills and Unauthorized Discharges

(a) The Licensee shall immediately contact the Water Resources Division of Indian and Northern Affairs Canada in Whitehorse (403) 668-5151, or the 24-hour Yukon Spill Report number (403) 667-7244, should a spill or an unauthorized discharge occur or seem likely to occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to Water Resources Division not later than fifteen (15) days after its occurrences.

(b) The Licensee shall ensure that stationary fuel storage and pumping sites comply with the provisions of the Gasoline Handling Act and Regulations of the Yukon Territory and are located and prepared to avoid pollution of any watercourse, should a fuel spill occur.

(c) The Licensee shall ensure that all shipments of hazardous materials are accompanied from Whitehorse to the mill site by a radio-equipped vehicle and shall immediately advise residents of the affected watershed, should a discharge of hazardous material to the environment occur or should a container of hazardous material be released into a watercourse.

10. Term of Licence

The term of this licence is from the effective date to May 5, 1990.

11. This licence shall be deemed to be an amendment of Water Licence Y-IN84-09L, and all rights and obligations conferred by Licence Y-IN84-09L are continued in full force and effect, save as such rights and obligations are amended by this amending licence.

PART B

1. Description of Water Use

(a) Industrial

i) The Licensee shall not withdraw, store, consume discharge or otherwise use water except in accordance with provisions of this licence.

ii) The Licensee is hereby authorized:

(1) to obtain water from the Wheaton River, a tributary of Bennett Lake, at a rate not to exceed 2400 imperial gallons per hour;

(2) to convey water via pump and pipelines;

(3) to use water for mineral processing on lease 105-D03-0000-00002-03;

(4) to store water in tailings ponds;

(5) to discharge wastewater to Butte Creek.

(b) Camp

i) The Licensee is hereby authorized to obtain water from Butte Creek or wells adjacent to Butte Creek for camp use at a rate not to exceed 10,000 imperial gallons per day.

ii) The Licensee shall ensure that sewage, including all human excreta and wastewater associated with daily camp operations, is disposed of in accordance with the Public Health Act of Yukon Territory.

2. Water Use Structures

Industrial

(a) The Licensee shall file with the Board final design and construction plans and specifications for structures for the water supply and associated facilities, the tailings dykes and related waste treatment facilities prior to the start of any construction work. The plans shall bear the seal of a duly qualified engineer. The plans shall be accompanied by a statement discussing where the plans vary from the intent of the licence application.

(b) The Licensee shall have the construction of all dykes supervised by a competent engineer in accordance with the plans submitted to the Board.

(c) The Licensee shall provide 'as built' drawings of all structures with the undertaking, including, but not limited to, all dams, weirs, spillways, stream crossings, ditches, gates, water intakes, culverts, and settling ponds.

(e) The waste treatment system constructed by the Licensee shall:

i) treat all mill effluents;

ii) maintain a minimum available storage capacity of 20 million imperial gallons in the primary tailings pond in order to store spring runoff and melt water from glaciated tailings;

iii) provide for an emergency spillway on all tailings dykes;

iv) include a primary tailings pond constructed at a location described in Drawing SK-1 "Proposed Tailing Disposal Site, January 1985".

3. Operation

Industrial

(a) The Licensee shall ensure that all wastewater from the milling operation is directed:

i) through a cyanide destruction system of appropriate capacity to ensure that waste discharge standards prescribed in this licence are met;

ii) through a primary tailings pond and a secondary tailings pond located downstream of the primary tailings pond before entering Butte Creek.

(b) The Licensee shall provide the secondary tailings pond spillway with a means of controlling flow.

(c) The Licensee shall immediately cease discharging tailings from the mill, should either of the following conditions occur:

i) a failure in the cyanide destruction system;

ii) cyanide levels in mill effluent prior to discharge to the primary tailings pond which exceed 1.0 mg/L total cyanide.

(d) In the event that the average total cyanide concentration in the primary tailings pond effluent exceeds 1.0 mg/L the Licensee shall provide the Board with a plan to monitor groundwater and shall carry out said plan at the Board's direction.

4. Waste Discharge Standards

(a) Without restricting the generality of the definition of "waste" in the Northern Inland Waters Act, a discharge of waste in this licence includes: surface drainage from the mill site, dams and associated areas; all discharges from the waste treatment and recycling facilities; and all discharges from associated pumping and piping facilities prior to entering the receiving waters.

(b) All waste discharged shall not exceed the following effluent quality standards:

Parameter	Maximum Concentration for any Grab Sample
Suspended solids	not greater than 25 mg/L
pH	not less than 6.5 pH units
Colour	not greater than 20 Pt-Co units
Turbidity	not greater than 15 Jackson Turbidity units
Oil and grease	none visible
Floating solids	none
96-hour LC_{50}	100%

4. (b) (continued)

Parameter		Maximum Concentration for Any Grab Sample	
Ammonia	(as N)	total	1.0 mg/L
Arsenic	(As)	dissolved	0.05 mg/L
Barium	(Ba)	total	0.05 mg/L
Chlorine	(Cl)	free residual	0.05 mg/L
Copper	(Cu)	total	0.4 mg/L
Cyanide	(as CN)	total	1.0 mg/L
Cyanide	(as CN)	available (free)	0.05 mg/L
Lead	(Pb)	total	0.05 mg/L
Silver	(Ag)	total	0.05 mg/L
Zinc	(Zn)	total	0.1 mg/L

(c) The wastewater discharge standards contained in Part B, Section 4 (b) shall be met at Station X2, as described in Schedule A to this licence, and at all points of entry to receiving waters, unless otherwise specified by the Board.

PART C - CONTINGENCY PLANS

1. The Licensee shall provide the Board, prior to commencement of milling operations, with contingency plans for dealing with the following circumstances:

   (a) Cyanide levels in the tailings pond that exceed or are likely to exceed licence levels;

   (b) A spill or discharge that exceeds, or is likely to exceed, licence levels, and which reaches, or is likely to reach Butte Creek.

2. The contingency plans shall include the requirements of Part A, Section 9 of this licence and shall cover the subjects of reporting, alerting and response.

PART D - SITE ABANDONMENT AND RESTORATION PLAN

1. The Licensee shall, within one year of start-up, provide to the Board an abandonment and restoration plan for the long-term physical and chemical stability of the site to protect the waters of Butte Creek. The plan shall include, but not be limited to, the mill site, tailings ponds, garbage dump and chemical storage areas.

2. The plan shall be based on the concept presented by the Licensee at the public hearing "Yukon Territory Water Board in the Matter of Mount Skukum Gold Mining Corporation, February 14, 1985", transcript: Page 12, Line 22 to Page 13, Line 6.

3. The plan shall provide for progressive restoration where appropriate.

4. The plan shall provide for both temporary shutdown and indefinite cessation of abandonment and restoration measures will be undertaken.

PART E - GENERAL PROVISIONS FOR REPORTS, SAMPLING AND ANALYSIS

1. The Licensee shall submit to the Board monthly reports based on the previous month's Surveillance Network Program data and shall include the date and time each sample was taken and analyzed.

2. The Licensee shall collect and conduct four (4) bioassays each year from sampling point XI on dates approved by the Board.

3. Procedures for the bioassays shall be obtained from the Environmental Protection Service and approved by the Board.

4. The Licensee shall comply with the Surveillance Network Program attached as Schedule "A" hereto and with any variations thereof made by the Board and shall comply with all provisions for sampling, sample preservations, reporting and analysis specified by the Board.

5. Unless otherwise specified or approved by the Board all analyses shall be conducted in accordance with the current edition of "Standard Methods for the Examination of Water and Waste Water", prepared and published jointly by the American Water Work Association and the Water Pollution Control Federation.

6. All analyses shall be performed in a laboratory approved by the Board.

7. The Licensee shall perform the analysis for cyanide in accordance with a method to be specified by the Board.

8. The Licensee shall comply with the program of biological monitoring attached as Schedule "B" hereto and with any variations thereof made by the Board and shall comply with all provisions for sampling preservation, reporting and analysis specified by the Board.

SCHEDULE "A"

SURVEILLANCE NETWORK PROGRAM
FOR MT. SKUKUM GOLD MINING CORPORATION LTD.

LICENCE NUMBER Y-IN84-09L

Sampling Points for This Program

Yukon Territory Water Board Identification Number	Sampling Station
X1	Secondary tailings pond decant
X2	Primary tailings pond decant
X3	Mill discharge to the primary tailings pond
X4	Butte Creek above secondary tailings pond decant
X5	Butte Creek below secondary tailings pond decant
X6	Wheaton River upstream of the confluence with Butte Creek
X7	Wheaton River 100 meters downstream of the confluence with Butte Creek
X8	Grid sampling within primary tailings pond

chedule "A" (continued)

SURVE '.ANCE NETWORK PROGRAM

	X1* Secondary pond discharge	X2* Primary pond discharge	X3 Mill discharge to primary pond	X4 Butte Cr. U/S Effluent	X5 Butte Cr. D/S Effluent	X6* Wheaton R. U/S Butte Cr.	X7* Wheaton R. D.S Butte Cr.	X8** Primary pond grid
pH	W	W	-	M	M	M	M	A
Temperature (^{o}C)	W	W	-	M	M	M	M	-
Flow (M^3/S)	D	D	D	M	M	M	M	-
Ammonia (MH_4-N)	M	M	-	M	M	M	M	A
Arsenic (dissolved)	M	M	-	M	M	M	M	A
Barium (total)	M	M	-	M	M	M	M	-
Calcium	M	M	-	M	M	M	M	-
Chlorine (free)***	D	-	-	D	D	D	D	A
Copper (total)	W	W	-	M	M	M	M	A
Cyanide (total)	W	W	D	M	M	M	M	A
Cyanide (free)	W	W	-	W*	W*	M	M	A
Iron (total)	M	M	-	M	M	M	M	-
Lead (total)	W	W	-	M	M	M	M	A
Silver (total)	W	W	-	M	M	M	M	A
Nitrate ($(N)_3$-N)	M	M	-	M	M	M	M	-
Zinc (total)	W	W	-	M	M	M	M	A

Notes: * - Sampled only during periods of discharge
** - Sampled prior to seasonal discharge from primary tailings pond
*** - Required only if chlorine is used in the waste treatment system

D - Daily
W - Weekly
M - Monthly
A - Yearly

YIN85-08AL

SCHEDULE "B"

BIOLOGICAL MONITORING PROGRAM
FOR MOUNT SKUKUM GOLD MINING CORPORATION

1. Sampling Points

X4	Biological Station # 1 On Butte Creek above the influence of the processing mill and above the entry of any discharge from the tailings pond.
X5	Biological Station #2 On Butte Creek below the point of discharge from the tailings pond and above the confluence of Butte Creek with the Wheaton River.
X6	Biological Station #3 On Wheaton River upstream of the point of confluence of the Wheaton River and Butte Creek.
X7	Biological Station #4 On Wheaton River downstream of the mixing zone of the Wheaton River and Butte Creek.

2. The Licensee shall ensure that three replicate samples of invertebrate fauna are collected by a qualified person annually from each station, using an artificial substrate sample which has been installed for approximately five weeks.

3. The Licensee shall, on each visit, perform tests for p^H, conductivity, temperature, and dissolved oxygen. Water samples shall be collected and analyzed for cyanide, copper, lead, zinc, manganese, iron, arsenic, calcium and sodium.

Indian and Northern Affairs Affaires indiennes et du Nord

WATER LICENCE

issued pursuant to
Northern Inland Waters Act and Regulations

Mount Skukum Gold Mining Corporation
(Licensee)

Licence Number Y-IN85-08AL issued on August 3 19 88
(Amendment #1 (one))

Location Wheaton River, a tributary of Bennett Lake

IAND 52-230 (10-73)

YUKON TERRITORY WATER BOARD

Pursuant to the Northern Inland Waters Act and Regulations, the Yukon Territory Water Board, hereinafter referred to as the Board, hereby grants to

Mount Skukum Gold Mining Corporation
(Licensee)

of 171 West Esplanade Street, Suite 500, North Vancouver, B.C.
(mailing address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the Northern Inland Waters Act and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence:

Licence Number Y-IN85-08AL

Water Management Area 02 Yukon

Location Wheaton River, a tributary of Bennett Lake

Purpose To obtain, store and return a flow of water

Description Industrial use in milling process, a tailings impoundment and camp use

Quantity of Water Not to be Exceeded: Industrial: 120,000 imperial gallons per day
Camp: 20,000 imperial gallons per day

Rate of Use of Water not to be Exceeded: Industrial: 5,000 imperial gallons per hour

Effective Date of Licence August 3, 1988

Expiry Date of Licence May 1, 1993

This Licence issued and recorded at Whitehorse includes and is subject to the annexed conditions.

Dated this 11 day of July, 1988

Witness

YUKON TERRITORY WATER BOARD

Chairman, Diane Granger

Dated this 9th day of August, 1988

Witness

Approved by

Minister of Indian and Northern Affairs Canada

PART A - GENERAL CONDITIONS

1. Definitions:

(a) "Act" means Northern Inland Waters Act R.S.C. 1970 (first supplement) Chapter 28 and any amendments thereto:

(b) "Regulations" means the Regulations made under the Act.

(c) "Board" means the Yukon Territory Water Board.

(d) "Inspector" means any person designated as an Inspector under Section 29 of the Act.

All terms in this licence, unless otherwise explicitly stated shall be defined in the same manner as in the Act and Regulations.

2. Fees

The Licensee shall pay the water use fees prescribed in Section 10 of the Regulations. The water use fees shall be payable for each and every year, or portion of a year, of the term of the licence.

3. Security

The Licensee shall provide security prior to the commencement of milling operations, in accordance with the Regulations, Section 13 (2), in the amount of $15,000. Such security shall remain in effect for no less than two years past the expiry date of the licence. Such security shall provide for the protection of the owners and occupiers of property who may be adversely affected as a result of the issuance of this licence.

4. Waste Disposal Standards

This licence is issued to the Licensee, subject to the conditions contained herein, with respect to the use or return of water, or the depositing or permitting the deposit of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters. However, it is also a condition of the granting of this licence to the Licensee that, whenever future Regulations are made by the Governor in Council under the Northern Inland Waters Act, or any other statute imposing conditions relating to the quantity and types of waste that may be so deposited or under which any such waste may be so deposited that are more stringent than conditions included in this licence, this licence shall be deemed, upon prescription of such Regulations, to be automatically amended to conform with such regulations.

5. Non-Compliance

In the event the Licensee fails to comply with any provision or condition of this licence the Board may, subject to the Act, cancel the licence, and without limiting its rights to cancellation of the licence, if the Licensee has failed to perform the works as specified in the licence, or has performed works contrary to the licence, the Board may apply to the Courts for a mandatory injunction to compel the Licensee to perform the works or for an injunction to restrain the Licensee from performing the works, as the case may be.

6. Correspondence

Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

(a) to the Licensee, if left at or mailed by registered mail to the following address:

Mount Skukum Gold Mining Corporation
171 West Esplanade Street, Suite 500
North Vancouver, B.C.
V7M 1A1

and shall be deemed to have been given to the Licensee on the day it was left or seven (7) days after the day it was mailed as the case may be;

(b) to the Board, if left at or sent by registered mail to the following address:

Yukon Territory Water Board
302 - 4114 Fourth Avenue
Whitehorse, Yukon
Y1A 4N7

and shall be deemed to have been given to the Board on the day it was left or seven (7) days after the day it was mailed as the case may be.

7. Interpretation

Where a Licensee wishes to appeal an interpretation of a licence condition by an Inspector, he may do so by applying to the Board within ten (10) days of receiving the interpretation.

8. Annual Report

(a) On or before March 1 of each year during which this licence is in effect, the Licensee shall submit to the Board an Annual Report pursuant to Section 15 of the Northern Inland Waters Regulations. The Annual Report shall detail all water quantities used during the year with a summary and interpretation of any trends or variations in the data;

b) The Annual Report shall, in addition, contain:

i) both tabular and graphical summaries of all data collected under Schedules A and B of this licence, including analysis and interpretation by a qualified person or firm and a discussion of variation from base line or previous year's conditions;

ii) a detailed record of any major maintenance work carried out on the water supply, tailings pond or associated works on the property which may affect water;

iii) a report by a competent engineer of his inspection of all dykes;

iv) any other information on water use or waste disposal requested by the Board.

9. Spills and Unauthorized Discharges

(a) The Licensee shall immediately contact the Water Resources Division of Indian and Northern Affairs Canada in Whitehorse (403) 668-5151, or the 24-hour Yukon Spill Report number (403) 667-7244, should a spill or an unauthorized discharge occur or seem likely to occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to Water Resources Division of Indian and Northern Affairs, not later than fifteen (15) days after its occurrence.

(b) The Licensee shall ensure that stationary fuel storage and pumping sites comply with the provisions of the Gasoline Handling Act and Regulations of the Yukon Territory and are located and prepared to avoid pollution of any watercourse, should a fuel spill occur.

(c) Subject to 9(d), the Licensee shall ensure that all shipments of hazardous materials are accompanied from the junction of the Klondike Highway and Annie Lake Road to the mill site by a radio-equipped vehicle and shall immediately advise residents of the affected watershed should a discharge of hazardous material to the environment occur or should a container of hazardous material be released into a watercourse.

(d) The Licensee shall comply with the requirements of Part A, Section 9(c) of this licence until the Licensee has submitted evidence to the Board that it has in place a Transportation Accident Contingency Plan in accordance with the Dangerous Goods Transportation Act and that said plan has been approved by the Territorial Co-ordinator of Dangerous Goods.

10. Term of Licence

The term of this licence is from the effective date to May 1, 1993.

11. This licence shall be deemed to be an amendment of Water Licence Y-IN84-09L, and all rights and obligations conferred by Licence Y-IN84-09L are continued in full force and effect, save as such rights and obligations are amended by this amending licence.

PART B MONITORING CONDITIONS

1. Description of Water Use

(a) Industrial

i) The Licensee shall not withdraw, store, consume discharge or otherwise use water except in accordance with provisions of this licence.

ii) The Licensee is hereby authorized:

(1) to obtain water from the Wheaton River, a tributary of Bennett Lake, at a rate not to exceed 120,000 imperial gallons per day.

(2) to convey water via pump and pipelines;

(3) to use water for mineral processing on lease 105-D03-0000-00002-03;

(4) to store water in tailings ponds;

(5) to discharge wastewater to Butte Creek.

(b) Camp

i) The Licensee is hereby authorized to obtain water from the Wheaton River or wells adjacent to The Wheaton River for camp use at a rate not to exceed 20,000 imperial gallons per day.

ii) The Licensee shall ensure that sewage, including all human excreta and wastewater associated with daily camp operations, is disposed of in accordance with the Public Health Act of Yukon Territory.

2. Water Use Structures

Industrial

(a) The Licensee shall file with the Board final design and construction plans and specifications for structures and/or modifications to existing structures for the water supply and associated facilities; the tailings dykes and related waste treatment facilities prior to the start of any construction work, and receive a letter of approval from the Board, prior to the start of any construction. The plans shall bear the seal of a duly qualified engineer. The plans shall be accompanied by a statement discussing where the plans vary from the intent of the licence application.

(b) The Licensee shall have the construction and/or modifications of all dykes supervised by a competent engineer in accordance with the plans submitted to the Board.

(c) The Licensee shall provide 'as built' drawings of all structures, and/or modifications to existing structures with the undertaking, including, but not limited to, all dams, weirs, spillways, stream crossings, ditches, gates, water intakes, culverts, and settling ponds. The Licensee shall provide an explanation for any variation from original design.

(d) The Licensee shall maintain in good repair all works associated with the undertaking including, but not limited to, all dams, weirs, spillways, stream crossings, ditches, gates, water intakes, culverts and settling ponds.

(e) The waste treatment system constructed by the Licensee shall:

i) treat all mill effluents;

ii) maintain a minimum available storage capacity of 20 million imperial gallons in the primary tailings pond in order to store spring runoff and melt water from glaciated tailings;

iii) provide for an emergency spillway on all tailings dykes;

iv) include a primary tailings pond constructed at a location described in Drawing SK-1 "Proposed Tailing Disposal Site, January 1985".

(f) The Licensee shall, within six months of the effective date of this amendment, modify the primary tailings ponds dikes to provide a factor of safety of 1.5 and shall submit a report to the Board, signed by a duly qualified engineer, to the effect that these reconstructions have been completed.

3. Operation

Industrial

(a) The Licensee shall ensure that all wastewater from the milling operation is directed:

i) through a cyanide destruction system of appropriate capacity to ensure that waste discharge standards prescribed in this licence are met;

ii) through a primary tailings pond and a secondary tailings pond located downstream of the primary tailings pond before entering Butte Creek.

iii) the objective of the cyanide destruction system referred to in Part B Section 3(a) (i) of this license shall be a cyanide level in the mill effluent of less than 1.0 milligrams per litre.

(b) The Licensee shall provide the secondary tailings pond spillway with a means of controlling flow.

(c) The Licensee shall, within six months of the effective date of this Amendment, provide the Board with an acceptable plan for the monitoring of groundwater and shall implement said plan in the event that cyanide concentrations in the tailings pond exceed 1.0 mg/litre.

4. Waste Discharge Standards

(a) Without restricting the generality of the definition of "waste" in the Northern Inland Waters Act, a discharge of waste in this licence includes: surface drainage from the mill site, dams and associated areas; all discharges from the waste treatment and recycling facilities; and all discharges from associated pumping and piping facilities prior to entering the receiving waters.

(b) All waste discharged shall not exceed the following effluent quality standards:

Parameter	Maximum Concentration for any Grab Sample
Suspended solids	not greater than 25 mg/L
pH	not less than 6.5 pH units
Colour	not greater than 20 Pt-Co units
Turbidity	not greater than 15 Jackson Turbidity units
Oil and grease	none visible
Floating solids	none
96-hour LC_{50}	100%

Ammonia	(as N)	total	1.0 mg/L
Arsenic	(As)	dissolved	0.05 mg/L
Barium	(Ba)	total	0.05 mg/L
Chlorine	(Cl)	free residual	0.05 mg/L
Copper	(Cu)	total	0.4 mg/L
Cyanide	(as CN)	total	1.0 mg/L
Cyanide	(as CN)	available (free)	0.05 mg/L
Lead	(Pb)	total	0.05 mg/L
Silver	(Ag)	total	0.05 mg/L
Zinc	(Zn)	total	0.1 mg/L

(c) The wastewater discharge standards contained in Part B, Section 4 (b) shall be met at Station X2, as described in Schedule A to this licence, and at all points of entry to receiving waters, unless otherwise specified by the Board.

PART C - CONTINGENCY PLANS

1. The Licensee shall provide the Board, prior to commencement of milling operations, with contingency plans for dealing with the following circumstances:

   (a) Cyanide levels in the tailings pond that exceed or are likely to exceed licence levels;

   (b) A spill or discharge that exceeds, or is likely to exceed, licence levels, and which reaches, or is likely to reach Butte Creek.

2. The contingency plans shall include the requirements of Part A, Section 9 of this licence and shall cover the subjects of reporting, alerting and response.

PART D - SITE ABANDONMENT AND RESTORATION PLAN

1. The Licensee shall, by December 31, 1988, provide to the Board an abandonment and restoration plan for the long-term physical and chemical stability of the site to protect the waters of Butte Creek. The plan shall include, but not be limited to, the mill site, tailings ponds, garbage dump and chemical storage areas.

2. The plan shall be based on the concept presented by the Licensee at the public hearing "Yukon Territory Water Board in the Matter of Mount Skukum Gold Mining Corporation, February 14, 1985", transcript: Page 12, Line 22 to Page 13, Line 6.

3. The plan shall provide for progressive restoration where appropriate.

4. The plan shall provide for both temporary shutdown and permanent cessation of operations and shall, for both circumstances, detail the abandonment and restoration measures to be undertaken.

PART E - GENERAL PROVISIONS FOR REPORTS, SAMPLING AND ANALYSIS

1. The Licensee shall submit to the Board monthly reports based on the previous month's Surveillance Network Program data and shall include the date and time each sample was taken and analyzed.

2. The Licensee shall collect and conduct four (4) bioassays each year from sampling point XI on dates approved by the Board.

3. Procedures for the bioassays shall be obtained from the Environmental Protection Service and approved by the Board.

4. The Licensee shall comply with the Surveillance Network Program attached as Schedule "A" hereto and with any variations thereof made by the Board and shall comply with all provisions for sampling, sample preservations, reporting and analysis specified by the Board.

5. Unless otherwise specified or approved by the Board all analyses shall be conducted in accordance with the current edition of "Standard Methods for the Examination of Water and Waste Water", prepared and published jointly by the American Water Works Association and the Water Pollution Control Federation.

6. All analyses shall be performed in a laboratory approved by the Board.

7. The Licensee shall perform the analysis for cyanide in accordance with a method to be specified by the Board.

8. The Licensee shall comply with the program of biological monitoring attached as Schedule "B" hereto and with any variations thereof made by the Board and shall comply with all provisions for sampling preservation, reporting and analysis specified by the Board.

SCHEDULE "A"

SURVEILLANCE NETWORK PROGRAM
FOR MT. SKUKUM GOLD MINING CORPORATION LTD.
LICENCE NUMBER Y-IN84-09L

Sampling Points for This Program

Yukon Territory Water Board Identification Number	Sampling Station
X1	Secondary tailings pond decant
X2	Primary tailings pond decant
X3	Mill discharge to the primary tailings pond
X4	Butte Creek above secondary tailings pond decant
X5	Butte Creek below secondary tailings pond decant
X6	Wheaton River upstream of the confluence with Butte Creek
X7	Wheaton River 100 meters downstream of the confluence with Butte Creek
X8	Grid sampling within primary tailings pond

SCHEDULE "A" (continued)

SURVEILLANCE NETWORK PROGRAM

	X1* Secondary pond discharge	X2* Primary pond discharge	X3 Mill discharge to primary pond	X4 Butte Cr. U/S Effluent	X5 Butte Cr. D/S Effluent	X6* Wheaton R. U/S Butte Cr.	X7* Wheaton R. D/S Butte Cr.	X8** Primary pond grid
pH	W	W	-	M	M	M	M	M
Temperature (^{o}C)	W	W	-	M	M	M	M	-
Flow (M^3/S)	D	D	D	M	M	M	M	-
Ammonia (MH_4-N)	M	M	-	M	M	M	M	M
Arsenic (dissolved)	M	M	-	M	M	M	M	M
Barium (total)	M	M	-	M	M	M	M	-
Calcium	M	M	-	M	M	M	M	-
Chlorine (free)***	D	-	-	D	D	D	D	M
Copper (total	W	W	-	M	M	M	M	M
Cyanide (total)	W	W	D	M	M	M	M	M
Cyanide (free)	W	W	-	W*	W*	M	M	M
Iron (total)	M	M	-	M	M	M	M	-
Lead (total	W	W	-	M	M	M	M	M
Silver (total	W	W	-	M	M	M	M	M
Nitrate ($(N)_3$-N)	M	M	-	M	M	M	M	-
Zinc (total	W	W	-	M	M	M	M	M
Cyanide (weak acid dissociable)	-	-	M	-	-	-	-	M
Copper (dissolved)	-	-	M	-	-	-	-	M
Iron (dissolved)	-	-	M	-	-	-	-	M
Zinc (dissolved)	-	-	M	-	-	-	-	M

Notes: * - Sampled only during periods of discharge
*** Required only if chlorine is used in the waste treatment system

D - Daily
W - Weekly
M - Monthly

SCHEDULE "B"

BIOLOGICAL MONITORING PROGRAM FOR MOUNT SKUKUM GOLD MINING CORPORATION

1. Sampling Points

X4	Biological Station #1 On Butte Creek above the influence of the processing mill and above the entry of any discharge from the tailings pond.
X5	Biological Station #2 On Butte Creek below the point of discharge from the tailings pond and above the confluence of Butte Creek with the Wheaton River.
X6	Biological Station #3 On Wheaton River upstream of the point of confluence of the Wheaton River and Butte Creek.
X7	Biological Station #4 On Wheaton River downstream of the mixing zone of the Wheaton River and Butte Creek.

2. The Licensee shall ensure that three replicate samples of invertebrate fauna are collected by a qualified person annually from each station, using an artificial substrate sample which has been installed for approximately five weeks.

3. The Licensee shall, on each visit, perform tests for p^H, conductivity, temperature, and dissolved oxygen. Water samples shall be collected and analyzed for cyanide, copper, lead, zinc, manganese, iron, arsenic, calcium and sodium.

Appendix 2: Complete analytical reports from Philip analytical and Norwest Laboratories

PHILIP SERVICES

PHILIP ANALYTICAL
8577 Commerce Court
Burnaby, B.C.
Canada V5A 4N5
Tel 604 444 4808
Fax 604 444 4511

10-Nov-99

Certificate of Analysis

Reported To :

Client Code 87

#163-3017 ST. CLAIR AVE
BURLINGTON, ON.
L7N 3P5

Attention : D. GREGOR
Phone : (905) 333-0427
FAX : (905) 333-9723

Project Information :

Project ID : MDA-99-1
Submitted By: D. GREGOR

REVISED 99/11/10

Requisition Forms :

Form 08040421 received on 07-Oct-99 logged on 7-Oct-99 completed on 14-Oct-99
Form 08040420 received on 07-Oct-99 logged on 7-Oct-99 completed on 16-Oct-99
Form 08040422 received on 07-Oct-99 logged on 7-Oct-99 completed on 19-Oct-99

Remarks :

- All organic data is blank corrected except for PCDD/F, Hi-res MS and CLP volatile analyses
- 'MDL' = Method Detection Limit, '<' = Less than MDL, '—' = Not analyzed
- Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
- Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
- All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
- This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Philip are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 19th Edition, published by the American Public Health Association, or on US EPA protocols found in the 'Test Methods For Evaluating Solid Waste, Physical/Chemical Method, SW846', 3rd Edition. Other procedures are based on methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Philip for a period of 30 days from receipt of data or as per contract.

PHILIP Project Manager: James Teshima

TOTAL CYANIDE ADDED TO SOIL SAMPLES.

PHILIP SERVICES

PHILIP ANALYTICAL
10-Nov-99

ANALYTICAL REPORT

Client : -
Project : MDA-99-1

Sparcode	Parameter	Unit	MDL	Philip ID: 99056561 Client ID: MSGM-6-1	99056562 MSGM-6-2	99056563 MSGM-T2	99056564 MSGM-T3	99056565 MSGM-T4	99056566 MSGM-LA-1
PHYSICAL									
00250760	Moisture	%(W/W)	0.1	24.0	29.9	8.4	15.4	14.1	4.2
GENERAL INORGANICS									
2105AA06	Cyanide(SAD) + Thiocyanate	ug/g	0.02	32	0.60	25	71	59 (1)	---
0157AA09	Cyanide W.A.D.	ug/g	0.02	< 0.02	< 0.02	0.04	0.08	0.07 (2)	---
CN-TAA05	Cyanide Total	ug/g	0.02	2.2	0.22	2.3	7.6	4.5	---
METALS TOTAL									
Al-T200S	Aluminum	ug/g	10	21500	16100	6190	8830	8180	---
Sb-T200S	Antimony	ug/g	2	< 2	< 2	< 2	< 2	< 2	---
As-T200S	Arsenic	ug/g	8	13	< 8	69	42	58	---
Ba-T200S	Barium	ug/g	0.1	334	215	35.1	46.6	34.9	---
Be-T200S	Beryllium	ug/g	0.1	0.8	0.6	1.3	1.7	1.5	---
Bi-T200S	Bismuth	ug/g	2	< 2	< 2	< 2	< 2	< 2	---
Cd-T200S	Cadmium	ug/g	0.2	0.6	0.4	< 0.2	0.4	0.5	---
Ca-T200S	Calcium	ug/g	40	8110	7240	42300	52100	51400	---
Cr-T200S	Chromium	ug/g	0.2	27.0	18.8	10.9	16.3	14.8	---
Co-T200S	Cobalt	ug/g	0.3	11.1	8.5	4.8	5.6	5.2	---
Cu-T200S	Copper	ug/g	0.5	132	76.6	89.9	184	135	---
Fe-T200S	Iron	ug/g	10.0	37000	28300	22500	25700	24400	---
Pb-T200S	Lead	ug/g	2	25	18	13	24	22	---
Mg-T200S	Magnesium	ug/g	10	10900	9300	4790	7250	6570	---
Mn-T200S	Manganese	ug/g	0.2	818	722	525	676	613	---
Hg-T200M	Mercury	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	---
Mo-T200S	Molybdenum	ug/g	0.4	< 0.4	< 0.4	1.9	1.7	2.2	---
Ni-T200S	Nickel	ug/g	0.8	14.8	11.9	2.5	3.0	2.7	---
P__T200S	Phosphorus	ug/g	4	821	767	520	619	596	---
K__T200S	Potassium	ug/g	100	3080	2400	779	1100	923	---
Se-T200S	Selenium	ug/g	3	< 3	< 3	< 3	< 3	< 3	---
Ag-T200S	Silver	ug/g	1	< 1	< 1	< 1	< 1	< 1	---
Na_T200S	Sodium	ug/g	10	587	487	315	457	578	---
Sr-T200S	Strontium	ug/g	0.1	63.4	47.3	94.9	122	116	---
S__T200S	Sulphur	ug/g	10	226	172	9440	8530	8790	---
Te-T200S	Tellurium	ug/g	5	< 5	< 5	< 5	< 5	< 5	---
Tl-T200S	Thallium	ug/g	5	< 5	< 5	< 5	< 5	< 5	---
Sn-T200S	Tin	ug/g	2	< 2	< 2	< 2	< 2	< 2	---
Ti-T200S	Titanium	ug/g	0.3	981	841	30.1	65.5	63.7	---
				Matrix : Soil	Soil	Soil	Soil	Soil	Soil
				Sampled on: 99/09/30	99/09/30	99/10/04	99/10/04	99/10/04	99/10/04

CONTINUED on page 3

PHILIP SERVICES corp

PHILIP ANALYTICAL

10-Nov-99
Page 4 of 39

ANALYTICAL REPORT

Client : -
Project : MDA-99-1

	Philip ID :	99056567	99056568	99056569	99056570	99056571	99056572
	Client ID :	MSGM-UA-1	MSGM-LF-1	WC-HL-1	WC-CAMP-1	MSGM-1700m	MSGM-6-2
Sparcode	**Parameter**	**Unit**	**MDL**						
PHYSICAL									
0107CALC	Hardness Total -T	mg/L		---	---	---	---	---	374
00250760	Moisture	%(W/W)	0.1	10.0	20.6	8.4	22.9	---	---
GENERAL INORGANICS									
2105AA04	Cyanide(SAD) + Thiocyanate	mg/L	0.001	---	---	---	---	< 0.001	< 0.001
METALS TOTAL									
Al-T0042	Aluminum	mg/L	0.06	---	---	---	---	---	< 0.06
Sb-T0042	Antimony	mg/L	0.02	---	---	---	---	---	< 0.02
As-T0042	Arsenic	mg/L	0.04	---	---	---	---	---	< 0.04
Ba-T0042	Barium	mg/L	0.001	---	---	---	---	---	0.044
Be-T0042	Beryllium	mg/L	0.0002	---	---	---	---	---	< 0.0002
Bi-T0042	Bismuth	mg/L	0.02	---	---	---	---	---	< 0.02
B--T0042	Boron	mg/L	0.04	---	---	---	---	---	< 0.04
Cd-T0042	Cadmium	mg/L	0.002	---	---	---	---	---	< 0.002
Ca-T0042	Calcium	mg/L	0.05	---	---	---	---	---	135
Cr-T0042	Chromium	mg/L	0.002	---	---	---	---	---	0.004
Co-T0042	Cobalt	mg/L	0.004	---	---	---	---	---	< 0.004
Cu-T0042	Copper	mg/L	0.003	---	---	---	---	---	0.016
Fe-T0042	Iron	mg/L	0.05	---	---	---	---	---	< 0.05
Pb-T0042	Lead	mg/L	0.03	---	---	---	---	---	< 0.03
Mg-T0042	Magnesium	mg/L	0.05	---	---	---	---	---	8.89
Mn-T0042	Manganese	mg/L	0.002	---	---	---	---	---	< 0.002
Hg-T0310	Mercury	mg/L	0.00005	---	---	---	---	---	< 0.00005
Mo-T0042	Molybdenum	mg/L	0.005	---	---	---	---	---	0.014
Ni-T0042	Nickel	mg/L	0.01	---	---	---	---	---	< 0.01
P__T0042	Phosphorus	mg/L	0.1	---	---	---	---	---	< 0.1
K__T0042	Potassium	mg/L	0.5	---	---	---	---	---	5.6
Se-T0042	Selenium	mg/L	0.03	---	---	---	---	---	< 0.03
Ag-T0042	Silver	mg/L	0.03	---	---	---	---	---	< 0.03
Na_T0042	Sodium	mg/L	0.5	---	---	---	---	---	17.8
Sr-T0042	Strontium	mg/L	0.001	---	---	---	---	---	0.529
S__T0042	Sulphur	mg/L	0.1	---	---	---	---	---	122
Te-T0042	Tellurium	mg/L	0.02	---	---	---	---	---	< 0.02
Tl-T0042	Thallium	mg/L	0.03	---	---	---	---	---	< 0.03
Sn-T0042	Tin	mg/L	0.02	---	---	---	---	---	< 0.02
Ti-T0042	Titanium	mg/L	0.003	---	---	---	---	---	< 0.003
	Matrix :			Soil	Soil	Soil	Soil	Water	Water
	Sampled on:			99/10/04	99/10/04	99/10/05	99/10/05	99/10/04	99/09/30

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PHILIP SERVICES CORP.

PHILIP ANALYTICAL

10-Nov-99

ANALYTICAL REPORT

Client : -
Project : MDA-99-1

Sparcode	Parameter	Unit	MDL	Philip ID: 99056561 Client ID: MSGM-6-1	99056562 MSGM-6-2	99056563 MSGM-T2	99056564 MSGM-T3	99056565 MSGM-T4	99056566 MSGM-LA-1
V--T200S	Vanadium	ug/g	0.3	56.3	43.2	12.6	18.7	17.9	---
Zn-T200S	Zinc	ug/g	0.5	164	111	94.8	150	121	---
Zr-T200S	Zirconium	ug/g	0.3	1.9	1.7	2.7	3.3	2.7	---
HYDROCARBONS									
H104PT12	Hydrocarbons C5-C10	ug/g	10	---	---	---	---	---	< 10
VOLATILE ORGANICS-MAH									
EX995170	Volat. Soil Extract.	date		---	---	---	---	---	991008
B020PT12	Benzene	ug/g	0.04	---	---	---	---	---	< 0.04
B021PT12	Ethylbenzene	ug/g	0.10	---	---	---	---	---	< 0.10
T001PT12	Toluene	ug/g	0.10	---	---	---	---	---	< 0.10
X_882_10	Xylenes	ug/g	0.1	---	---	---	---	---	< 0.1
VOC SURROGATE RECOVERY									
VS01PT12	Bromofluorobenzene	%	0	---	---	---	---	---	94
VS03PT12	d8-Toluene	%	0	---	---	---	---	---	101
		Matrix :		Soil	Soil	Soil	Soil	Soil	Soil
		Sampled on:		99/09/30	99/09/30	99/10/04	99/10/04	99/10/04	99/10/04

Result comments and/or text results :

(1) POST LEACH SPIKE.
(2) LOW SAMPLE SPIKE RECOVERY DUE TO MATRIX INTERFERENCE.

PHILIP SERVICES

PHILIP ANALYTICAL

ANALYTICAL REPORT

10-Nov-99

Client : -
Project : MDA-99-1

	Philip ID :	99056567	99056568	99056569	99056570	99056571	99056572
	Client ID :	MSGM-UA-1	MSGM-LF-1	WC-HL-1	WC-CAMP-1	MSGM-1700m	MSGM-6-2
Sparcode	Parameter	Unit	MDL						
V--T0042	Vanadium	mg/L	0.003	---	---	---	---	---	< 0.003
Zn-T0042	Zinc	mg/L	0.01	---	---	---	---	---	< 0.01
Zr-T0042	Zirconium	mg/L	0.003	---	---	---	---	---	< 0.003
HYDROCARBONS									
HC04PT12	Hydrocarbons C5-C10	ug/g	10	< 10	< 10	< 10	< 10	---	---
VOLATILE ORGANICS-MAH									
EX995170	Volat. Soil Extract.	date		991008	991008	991008	991008	---	---
B020PT12	Benzene	ug/g	0.04	< 0.04	0.05	< 0.04	< 0.04	---	---
B021PT12	Ethylbenzene	ug/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10	---	---
T001PT12	Toluene	ug/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10	---	---
X_882_10	Xylenes	ug/g	0.1	< 0.1	< 0.1	< 0.1	< 0.1	---	---
VOC SURROGATE RECOVERY									
VS01PT12	Bromofluorobenzene	%	0	91	98	96	95	---	---
VS03PT12	d8-Toluene	%	0	101	99	99	99	---	---
	Matrix :			Soil	Soil	Soil	Soil	Water	Water
	Sampled on:			99/10/04	99/10/04	99/10/05	99/10/05	99/10/04	99/09/30

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PHILIP ANALYTICAL

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ANALYTICAL REPORT

Client : -
Project : MDA-99-1

	Philip ID :	99056573	99056574	99056575	99056576	99056577	99056578
	Client ID :	MSGM-AD1 T-1800m	MSGM-6-3	MSGM-9	MSGM-6-1	WC-DS	WC-US
Sparcode	Parameter	Unit	MDL					
PHYSICAL								
0107CALC	Hardness Total -T	mg/L		120	361	42.8	365	163	156
1107CALC	Hardness Total -D	mg/L		128	---	---	---	177	171
GENERAL INORGANICS								
2105AA04	Cyanide(SAD) + Thiocyana	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
METALS TOTAL								
Al-T0042	Aluminum	mg/L	0.06	< 0.06	< 0.06	< 0.06	0.07	< 0.06	< 0.06
Sb-T0042	Antimony	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
As-T0042	Arsenic	mg/L	0.04	< 0.04	0.04	< 0.04	< 0.04	< 0.04	< 0.04
Ba-T0042	Barium	mg/L	0.001	0.011	0.043	0.020	0.043	0.040	0.041
Be-T0042	Beryllium	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Bi-T0042	Bismuth	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
B--T0042	Boron	mg/L	0.04	< 0.04	0.05	< 0.04	0.04	< 0.04	< 0.04
Cd-T0042	Cadmium	mg/L	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Ca-T0042	Calcium	mg/L	0.05	44.2	130	15.0	132	46.8	38.2
Cr-T0042	Chromium	mg/L	0.002	0.002	0.006	< 0.002	0.003	< 0.002	< 0.002
Co-T0042	Cobalt	mg/L	0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Cu-T0042	Copper	mg/L	0.003	< 0.003	0.016	< 0.003	0.014	< 0.003	< 0.003
Fe-T0042	Iron	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	0.10
Pb-T0042	Lead	mg/L	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Mg-T0042	Magnesium	mg/L	0.05	2.34	8.74	1.31	8.68	11.2	14.6
Mn-T0042	Manganese	mg/L	0.002	< 0.002	< 0.002	0.003	< 0.002	0.007	0.014
Hg-T0310	Mercury	mg/L	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Mo-T0042	Molybdenum	mg/L	0.005	< 0.005	0.015	< 0.005	0.017	< 0.005	< 0.005
Ni-T0042	Nickel	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
P__T0042	Phosphorus	mg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
K__T0042	Potassium	mg/L	0.5	< 0.5	5.7	< 0.5	5.3	< 0.5	< 0.5
Se-T0042	Selenium	mg/L	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Ag-T0042	Silver	mg/L	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Na_T0042	Sodium	mg/L	0.5	2.2	17.9	1.5	17.4	10.0	15.8
Sr-T0042	Strontium	mg/L	0.001	0.189	0.520	0.084	0.514	0.470	0.434
S__T0042	Sulphur	mg/L	0.1	28.1	119	4.6	118	14.8	11.2
Te-T0042	Tellurium	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tl-T0042	Thallium	mg/L	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Sn-T0042	Tin	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
	Matrix :			Water	Water	Water	Water	Water	Water
	Sampled on:			99/10/04	99/09/30	99/09/30	99/09/30	99/10/02	99/10/02

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ANALYTICAL REPORT

Client : -
Project : MDA-99-1

	Philip ID :	99056573	99056574	99056575	99056576	99056577	99056578
	Client ID :	MSGM-AD1 T-1800m	MSGM-6-3	MSGM-9	MSGM-6-1	WC-DS	WC-US
Spurcode	Parameter	Unit	MDL					
Ti-T0042	Titanium	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
V--T0042	Vanadium	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Zn-T0042	Zinc	mg/L	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zr-T0042	Zirconium	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
METALS DISSOLVED									
Al-D0031	Aluminum Dissolved	mg/L	0.02	< 0.02	---	---	---	< 0.02	< 0.02
Sb-D0031	Antimony Dissolved	mg/L	0.015	< 0.015	---	---	---	< 0.015	< 0.015
As-D0031	Arsenic Dissolved	mg/L	0.04	< 0.04	---	---	---	< 0.04	< 0.04
Ba-D0031	Barium Dissolved	mg/L	0.001	0.012 (1)	---	---	---	0.042 (1)	0.043
Be-D0031	Beryllium Dissolved	mg/L	0.0010	< 0.0010	---	---	---	< 0.0010	< 0.0010
Bi-D0031	Bismuth Dissolved	mg/L	0.02	< 0.02	---	---	---	< 0.02	< 0.02
B--D0031	Boron Dissolved	mg/L	0.008	< 0.008	---	---	---	0.012	0.010
Cd-D0031	Cadmium Dissolved	mg/L	0.002	< 0.002	---	---	---	< 0.002	< 0.002
Ca-D0031	Calcium Dissolved	mg/L	0.01	47.3	---	---	---	50.8	42.0
Cr-D0031	Chromium Dissolved	mg/L	0.002	< 0.002	---	---	---	< 0.002	< 0.002
Co-D0031	Cobalt Dissolved	mg/L	0.003	< 0.003	---	---	---	< 0.003	< 0.003
Cu-D0031	Copper Dissolved	mg/L	0.001	< 0.001	---	---	---	< 0.001	< 0.001
Fe-D0031	Iron Dissolved	mg/L	0.003	< 0.003	---	---	---	0.075	0.094
Pb-D0031	Lead Dissolved	mg/L	0.02	< 0.02	---	---	---	< 0.02	< 0.02
Mg-D0031	Magnesium Dissolved	mg/L	0.02	2.50 (1)	---	---	---	12.2	16.1
Mn-D0031	Manganese Dissolved	mg/L	0.002	< 0.002	---	---	---	0.008 (1)	0.016
Hg-D0310	Mercury Dissolved	mg/L	0.00005	< 0.00005	---	---	---	< 0.00005	< 0.00005
Mo-D0031	Molybdenum Dissolved	mg/L	0.004	< 0.004	---	---	---	< 0.004	< 0.004
Ni-D0031	Nickel Dissolved	mg/L	0.008	< 0.008	---	---	---	< 0.008	< 0.008
P__D0031	Phosphorus Dissolved	mg/L	0.04	< 0.04	---	---	---	< 0.04	< 0.04
K__D0031	Potassium Dissolved	mg/L	0.4	< 0.4	---	---	---	< 0.4	< 0.4
Se-D0031	Selenium Dissolved	mg/L	0.03	< 0.03	---	---	---	< 0.03	< 0.03
Ag-D0031	Silver Dissolved	mg/L	0.01	< 0.01	---	---	---	< 0.01	< 0.01
Na_D0031	Sodium Dissolved	mg/L	0.01	1.80	---	---	---	10.8	17.4
Sr-D0031	Strontium Dissolved	mg/L	0.001	0.201 (1)	---	---	---	0.501 (1)	0.474
S__D0031	Sulfur Dissolved	mg/L	0.05	30.4	---	---	---	16.1	12.3
Te-D0031	Tellurium Dissolved	mg/L	0.02	< 0.02	---	---	---	< 0.02	< 0.02
Tl-D0031	Thallium Dissolved	mg/L	0.02	< 0.02	---	---	---	< 0.02	< 0.02
Sn-D0031	Tin Dissolved	mg/L	0.02	< 0.02	---	---	---	< 0.02	< 0.02
Ti-D0031	Titanium Dissolved	mg/L	0.003	< 0.003	---	---	---	< 0.003	< 0.003
V--D0031	Vanadium Dissolved	mg/L	0.003	< 0.003	---	---	---	< 0.003	< 0.003
Zn-D0031	Zinc Dissolved	mg/L	0.002	0.004	---	---	---	< 0.002	< 0.002
	Matrix :		Water	Water	Water	Water	Water	Water
	Sampled on:		99/10/04	99/09/30	99/09/30	99/09/30	99/10/02	99/10/02

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ANALYTICAL REPORT

Client : -
Project : MDA-99-1

Philip ID :	99056573	99056574	99056575	99056576	99056577	99056578
Client ID :	MSGM-ADI T-1800m	MSGM-6-3	MSGM-9	MSGM-6-1	WC-DS	WC-US
Sparcode	**Parameter**	**Unit**	**MDL**						
Zr-D0031	Zirconium Dissolved	mg/L	0.003	< 0.003	—	—	---	< 0.003	< 0.003
Matrix :	Water	Water	Water	Water	Water	Water
Sampled on:	99/10/04	99/09/30	99/09/30	99/09/30	99/10/02	99/10/02

Result comments and/or text results :

(1) Diss > Total, within precision of analytical method.

PHILIP SERVICES

PHILIP ANALYTICAL

10-Nov-99

ANALYTICAL REPORT

Client : -
Project : MDA-99-1

	Philip ID :	99056579	99056580	99056581	99056582	99056554	99056555
	Client ID :	MSGM-TRIB	MSGM-ADIT-1800A	MSGM-TRIB	MSGM-1700m	CM-PIPE 1	CM-PIPE 2
Sparcode	**Parameter**	**Unit**	**MDL**					
PHYSICAL								
1107CALC	Hardness Total -D	mg/L		21.0	131	23.4	165	---	---
0107CALC	Hardness Total -T	mg/L		---	116	---	176	96.7	99.0
GENERAL INORGANICS									
2105AA04	Cyanide(SAD) + Thiocyanate	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	---	---
METALS TOTAL									
Al-T0042	Aluminum	mg/L	0.06	---	< 0.06	---	< 0.06	< 0.06	< 0.06
Sb-T0042	Antimony	mg/L	0.02	---	< 0.02	---	< 0.02	< 0.02	< 0.02
As-T0042	Arsenic	mg/L	0.04	---	< 0.04	---	< 0.04	< 0.04	< 0.04
Ba-T0042	Barium	mg/L	0.001	---	0.011	---	0.014	0.190	0.195
Be-T0042	Beryllium	mg/L	0.0002	---	< 0.0002	---	< 0.0002	< 0.0002	< 0.0002
Bi-T0042	Bismuth	mg/L	0.02	---	< 0.02	---	< 0.02	< 0.02	< 0.02
B--T0042	Boron	mg/L	0.04	---	< 0.04	---	< 0.04	< 0.04	< 0.04
Cd-T0042	Cadmium	mg/L	0.002	---	< 0.002	---	< 0.002	< 0.002	< 0.002
Ca-T0042	Calcium	mg/L	0.05	---	42.9	---	64.3	27.7	28.4
Cr-T0042	Chromium	mg/L	0.002	---	< 0.002	---	< 0.002	< 0.002	< 0.002
Co-T0042	Cobalt	mg/L	0.004	---	< 0.004	---	< 0.004	< 0.004	< 0.004
Cu-T0042	Copper	mg/L	0.003	---	< 0.003	---	< 0.003	< 0.003	< 0.003
Fe-T0042	Iron	mg/L	0.05	---	< 0.05	---	< 0.05	< 0.05	< 0.05
Pb-T0042	Lead	mg/L	0.03	---	< 0.03	---	< 0.03	< 0.03	< 0.03
Mg-T0042	Magnesium	mg/L	0.05	---	2.21	---	3.67	6.68	6.83
Mn-T0042	Manganese	mg/L	0.002	---	< 0.002	---	< 0.002	< 0.002	< 0.002
Hg-T0310	Mercury	mg/L	0.00005	---	< 0.00005	---	< 0.00005	< 0.00005	< 0.00005
Mo-T0042	Molybdenum	mg/L	0.005	---	< 0.005	---	< 0.005	< 0.005	< 0.005
Ni-T0042	Nickel	mg/L	0.01	---	< 0.01	---	< 0.01	< 0.01	< 0.01
P__T0042	Phosphorus	mg/L	0.1	---	< 0.1	---	< 0.1	< 0.1	< 0.1
K__T0042	Potassium	mg/L	0.5	---	< 0.5	---	< 0.5	0.9	0.7
Se-T0042	Selenium	mg/L	0.03	---	< 0.03	---	< 0.03	< 0.03	< 0.03
Ag-T0042	Silver	mg/L	0.03	---	< 0.03	---	< 0.03	< 0.03	< 0.03
Na_T0042	Sodium	mg/L	0.5	---	1.6	---	2.8	4.6	4.6
Sr-T0042	Strontium	mg/L	0.001	---	0.179	---	0.272	0.231	0.236
S__T0042	Sulphur	mg/L	0.1	---	26.9	---	42.4 (1)	6.4	6.5
Te-T0042	Tellurium	mg/L	0.02	---	< 0.02	---	< 0.02	< 0.02	< 0.02
Tl-T0042	Thallium	mg/L	0.03	---	< 0.03	---	< 0.03	< 0.03	< 0.03
Sn-T0042	Tin	mg/L	0.02	---	< 0.02	---	< 0.02	< 0.02	< 0.02
	Matrix :			Water	Water	Water	Water	Water	Water
	Sampled on:			99/10/04	99/10/04	99/10/04	99/10/04	99/10/03	99/10/03

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ANALYTICAL REPORT

Client : -
Project : MDA-99-1

Sparcode	Parameter	Unit	MDL	Philip ID: 99056579 / Client ID: MSGM-TRIB	99056580 MSGM-ADI T-1800A	99056581 MSGM-TRIB	99056582 MSGM-1700m	99056554 CM-PIPE 1	99056555 CM-PIPE 2
Ti-T0042	Titanium	mg/L	0.003	—	< 0.003	—	< 0.003	< 0.003	< 0.003
V--T0042	Vanadium	mg/L	0.003	—	< 0.003	—	< 0.003	< 0.003	< 0.003
Zn-T0042	Zinc	mg/L	0.01	—	< 0.01	—	< 0.01	0.01	< 0.01
Zr-T0042	Zirconium	mg/L	0.003	—	< 0.003	—	< 0.003	< 0.003	< 0.003
METALS DISSOLVED									
Al-D0031	Aluminum Dissolved	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	---
Sb-D0031	Antimony Dissolved	mg/L	0.015	< 0.015	< 0.015	< 0.015	< 0.015	---	---
As-D0031	Arsenic Dissolved	mg/L	0.04	< 0.04	< 0.04	< 0.04	< 0.04	---	---
Ba-D0031	Barium Dissolved	mg/L	0.001	0.004	0.013	0.002	0.014 (1)	---	---
Be-D0031	Beryllium Dissolved	mg/L	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	---	---
Bi-D0031	Bismuth Dissolved	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	---
B--D0031	Boron Dissolved	mg/L	0.008	< 0.008	< 0.008	< 0.008	< 0.008	---	---
Cd-D0031	Cadmium Dissolved	mg/L	0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---
Ca-D0031	Calcium Dissolved	mg/L	0.01	7.83	48.5	8.87	60.1	---	---
Cr-D0031	Chromium Dissolved	mg/L	0.002	< 0.002	< 0.002	< 0.002	< 0.002	---	---
Co-D0031	Cobalt Dissolved	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	---	---
Cu-D0031	Copper Dissolved	mg/L	0.001	0.001	< 0.001	< 0.001	< 0.001	---	---
Fe-D0031	Iron Dissolved	mg/L	0.003	0.003	< 0.003	0.006	< 0.003	---	---
Pb-D0031	Lead Dissolved	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	---
Mg-D0031	Magnesium Dissolved	mg/L	0.02	0.34	2.38	0.30	3.69 (1)	---	---
Mn-D0031	Manganese Dissolved	mg/L	0.002	0.014	0.016	< 0.002	< 0.002	---	---
Hg-D0310	Mercury Dissolved	mg/L	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	---	---
Mo-D0031	Molybdenum Dissolved	mg/L	0.004	< 0.004	< 0.004	< 0.004	< 0.004	---	---
Ni-D0031	Nickel Dissolved	mg/L	0.008	< 0.008	< 0.008	< 0.008	< 0.008	---	---
P__D0031	Phosphorus Dissolved	mg/L	0.04	< 0.04	< 0.04	< 0.04	< 0.04	---	---
K__D0031	Potassium Dissolved	mg/L	0.4	< 0.4	< 0.4	< 0.4	< 0.4	---	---
Se-D0031	Selenium Dissolved	mg/L	0.03	< 0.03	< 0.03	< 0.03	< 0.03	---	---
Ag-D0031	Silver Dissolved	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	---	---
Na_D0031	Sodium Dissolved	mg/L	0.01	1.39	1.74 (1)	1.34	2.72	---	---
Sr-D0031	Strontium Dissolved	mg/L	0.001	0.025	0.185 (1)	0.028	0.255	---	---
S__D0031	Sulfur Dissolved	mg/L	0.03	1.74	31.3	1.59	44.4	---	---
Te-D0031	Tellurium Dissolved	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	---
Tl-D0031	Thallium Dissolved	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	---
Sn-D0031	Tin Dissolved	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	---	---
Ti-D0031	Titanium Dissolved	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	---	---
V--D0031	Vanadium Dissolved	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	---	---
Zn-D0031	Zinc Dissolved	mg/L	0.002	0.004	0.005	< 0.002	< 0.002	---	---
	Matrix :			Water	Water	Water	Water	Water	Water
	Sampled on:			99/10/04	99/10/04	99/10/04	99/10/04	99/10/03	99/10/03

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ANALYTICAL REPORT

Client : -
Project : MDA-99-1

	Philip ID :	99056579	99056580	99056581	99056582	99056554	99056555
	Client ID :	MSGM-TRIB	MSGM-ADIT-1800A	MSGM-TRIB	MSGM-1700m	CM-PIPE 1	CM-PIPE 2
Sparcode	**Parameter**	**Unit**	**MDL**				
Zr-D0031	Zirconium Dissolved	mg/L	0.003	< 0.003	< 0.003	< 0.003	< 0.003	---	---
	Matrix :			Water	Water	Water	Water	Water	Water
	Sampled on:			99/10/04	99/10/04	99/10/04	99/10/04	99/10/03	99/10/03

Result comments and/or text results :

(1) Diss > Total, within precision of analytical method.

PHILIP SERVICES corp

PHILIP ANALYTICAL

10-Nov-99

ANALYTICAL REPORT

Client : -
Project : MDA-99-1

	Philip ID :	99056556	99056557	99056558	99056559	99056560
	Client ID :	CM-W7-US	CM-CAMP-DS 1	CM-CAMP-DS 2	CM-CAMP -PIPE 1	CM-CAMP -PIPE 2
Sparcode	**Parameter**	**Unit**	**MDL**			
PHYSICAL						
0107CALC	Hardness Total -T	mg/L		45.5	97.8	97.0	---	---
1107CALC	Hardness Total -D	mg/L		44.3	---	---	167	169
METALS TOTAL								
Al-T0042	Aluminum	mg/L	0.06	< 0.06	< 0.06	< 0.06	---	---
Sb-T0042	Antimony	mg/L	0.02	< 0.02	< 0.02	< 0.02	---	---
As-T0042	Arsenic	mg/L	0.04	< 0.04	< 0.04	< 0.04	---	---
Ba-T0042	Barium	mg/L	0.001	0.046	0.193	0.192	---	---
Be-T0042	Beryllium	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	---	---
Bi-T0042	Bismuth	mg/L	0.02	< 0.02	< 0.02	< 0.02	---	---
B--T0042	Boron	mg/L	0.04	< 0.04	< 0.04	< 0.04	---	---
Cd-T0042	Cadmium	mg/L	0.002	< 0.002	< 0.002	< 0.002	---	---
Ca-T0042	Calcium	mg/L	0.05	13.8	28.0	27.8	---	---
Cr-T0042	Chromium	mg/L	0.002	< 0.002	< 0.002	< 0.002	---	---
Co-T0042	Cobalt	mg/L	0.004	< 0.004	< 0.004	< 0.004	---	---
Cu-T0042	Copper	mg/L	0.003	< 0.003	< 0.003	< 0.003	---	---
Fe-T0042	Iron	mg/L	0.05	< 0.05	< 0.05	< 0.05	---	---
Pb-T0042	Lead	mg/L	0.03	< 0.03	< 0.03	< 0.03	---	---
Mg-T0042	Magnesium	mg/L	0.05	2.67	6.76	6.71	---	---
Mn-T0042	Manganese	mg/L	0.002	< 0.002	0.002	0.002	---	---
Hg-T0310	Mercury	mg/L	0.00005	< 0.00005	< 0.00005	< 0.00005	---	---
Mo-T0042	Molybdenum	mg/L	0.005	< 0.005	< 0.005	< 0.005	---	---
Ni-T0042	Nickel	mg/L	0.01	< 0.01	< 0.01	< 0.01	---	---
P__T0042	Phosphorus	mg/L	0.1	< 0.1	< 0.1	< 0.1	---	---
K__T0042	Potassium	mg/L	0.5	< 0.5	1.0	1.0	---	---
Se-T0042	Selenium	mg/L	0.03	< 0.03	< 0.03	< 0.03	---	---
Ag-T0042	Silver	mg/L	0.03	< 0.03	< 0.03	< 0.03	---	---
Na_T0042	Sodium	mg/L	0.5	4.7	4.6	4.5	---	---
Sr-T0042	Strontium	mg/L	0.001	0.092	0.235	0.234	---	---
S__T0042	Sulphur	mg/L	0.1	13.5	6.5	6.4	---	---
Te-T0042	Tellurium	mg/L	0.02	< 0.02	< 0.02	< 0.02	---	---
Tl-T0042	Thallium	mg/L	0.03	< 0.03	< 0.03	< 0.03	---	---
Sn-T0042	Tin	mg/L	0.02	< 0.02	< 0.02	< 0.02	---	---
Ti-T0042	Titanium	mg/L	0.003	< 0.003	< 0.003	< 0.003	---	---
V--T0042	Vanadium	mg/L	0.003	< 0.003	< 0.003	< 0.003	---	---
Zn-T0042	Zinc	mg/L	0.01	< 0.01	0.01	0.01	---	---
		Matrix :		Water	Water	Water	Water	Water
		Sampled on:		99/10/03	99/10/03	99/10/03	99/10/03	99/10/03

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PHILIP SERVICES corp

PHILIP ANALYTICAL

ANALYTICAL REPORT

10-Nov-99

Client : -
Project : MDA-99-1

	Philip ID :	99056556	99056557	99056558	99056559	99056560
	Client ID :	CM-W7-US	CM-CAMP-DS 1	CM-CAMP-DS 2	CM-CAMP -PIPE 1	CM-CAMP -PIPE 2
Sparcode Parameter	Unit	MDL				
Zr-T0042 Zirconium	mg/L	0.003	< 0.003	< 0.003	< 0.003	---	---
METALS DISSOLVED							
Al-D0031 Aluminum Dissolved	mg/L	0.02	< 0.02	---	---	< 0.02	< 0.02
Sb-D0031 Antimony Dissolved	mg/L	0.015	< 0.015	---	---	< 0.015	< 0.015
As-D0031 Arsenic Dissolved	mg/L	0.04	< 0.04	---	---	< 0.04	< 0.04
Ba-D0031 Barium Dissolved	mg/L	0.001	0.043	---	---	0.038	0.038
Be-D0031 Beryllium Dissolved	mg/L	0.0010	< 0.0010	---	---	< 0.0010	< 0.0010
Bi-D0031 Bismuth Dissolved	mg/L	0.02	< 0.02	---	---	< 0.02	< 0.02
B--D0031 Boron Dissolved	mg/L	0.008	< 0.008	---	---	< 0.008	< 0.008
Cd-D0031 Cadmium Dissolved	mg/L	0.002	< 0.002	---	---	0.063	0.063
Ca-D0031 Calcium Dissolved	mg/L	0.01	13.3	---	---	46.5	46.9
Cr-D0031 Chromium Dissolved	mg/L	0.002	< 0.002	---	---	< 0.002	< 0.002
Co-D0031 Cobalt Dissolved	mg/L	0.003	< 0.003	---	---	< 0.003	< 0.003
Cu-D0031 Copper Dissolved	mg/L	0.001	0.002	---	---	0.087	0.091
Fe-D0031 Iron Dissolved	mg/L	0.003	0.005	---	---	0.028	0.017
Pb-D0031 Lead Dissolved	mg/L	0.02	< 0.02	---	---	< 0.02	< 0.02
Mg-D0031 Magnesium Dissolved	mg/L	0.02	2.70 (1)	---	---	12.4	12.5
Mn-D0031 Manganese Dissolved	mg/L	0.002	< 0.002	---	---	0.818	0.834
Hg-D0310 Mercury Dissolved	mg/L	0.00005	< 0.00005	---	---	< 0.00005	< 0.00005
Mo-D0031 Molybdenum Dissolved	mg/L	0.004	0.005	---	---	< 0.004	< 0.004
Ni-D0031 Nickel Dissolved	mg/L	0.008	< 0.008	---	---	< 0.008	< 0.008
P__D0031 Phosphorus Dissolved	mg/L	0.04	< 0.04	---	---	< 0.04	< 0.04
K__D0031 Potassium Dissolved	mg/L	0.4	0.8 (1)	---	---	1.7	1.8
Se-D0031 Selenium Dissolved	mg/L	0.03	< 0.03	---	---	< 0.03	< 0.03
Ag-D0031 Silver Dissolved	mg/L	0.01	< 0.01	---	---	< 0.01	< 0.01
Na_D0031 Sodium Dissolved	mg/L	0.01	4.52	---	---	5.07	5.19
Sr-D0031 Strontium Dissolved	mg/L	0.001	0.089	---	---	0.414	0.422
S__D0031 Sulfur Dissolved	mg/L	0.03	13.6 (1)	---	---	22.9	23.1
Te-D0031 Tellurium Dissolved	mg/L	0.02	< 0.02	---	---	< 0.02	< 0.02
Tl-D0031 Thallium Dissolved	mg/L	0.02	< 0.02	---	---	< 0.02	< 0.02
Sn-D0031 Tin Dissolved	mg/L	0.02	< 0.02	---	---	< 0.02	< 0.02
Ti-D0031 Titanium Dissolved	mg/L	0.003	< 0.003	---	---	< 0.003	< 0.003
V--D0031 Vanadium Dissolved	mg/L	0.003	< 0.003	---	---	< 0.003	< 0.003
Zn-D0031 Zinc Dissolved	mg/L	0.002	0.006	---	---	3.88	3.95
Zr-D0031 Zirconium Dissolved	mg/L	0.003	< 0.003	---	---	< 0.003	< 0.003
	Matrix :		Water	Water	Water	Water	Water
	Sampled on:		99/10/03	99/10/03	99/10/03	99/10/03	99/10/03

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PHILIP SERVICES

PHILIP ANALYTICAL

ANALYTICAL REPORT

Client : -
Project : MDA-99-1

Result comments and/or text results :

(1) Diss > Total, within precision of analytical method.

PHILIP SERVICES

PHILIP ANALYTICAL

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DUPLICATE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Duplicate Conc.	MDL	Unit	Relative % Diff.
Cyanide Total	MSGM-6-2	99056562	0.22	0.21	0.02	ug/g	4.65
Cyanide(SAD) + Thiocyanate	MSGM-T4	99056565	59	61	0.02	ug/g	-3.33
Cyanide W.A.D.	MSGM-T4	99056565	0.07	0.08	0.02	ug/g	-13.33
Mercury	MSGM-6-3	99056574	< 0.00005	< 0.00005	0.00005	mg/L	0.00
Silver	MSGM-1700m	99056582	< 0.03	< 0.03	0.03	mg/L	0.00
Aluminum	MSGM-1700m	99056582	< 0.06	< 0.06	0.06	mg/L	0.00
Arsenic	MSGM-1700m	99056582	< 0.04	< 0.04	0.04	mg/L	0.00
Boron	MSGM-1700m	99056582	< 0.04	< 0.04	0.04	mg/L	0.00
Barium	MSGM-1700m	99056582	0.014	0.014	0.001	mg/L	0.00
Beryllium	MSGM-1700m	99056582	< 0.0002	< 0.0002	0.0002	mg/L	0.00
Bismuth	MSGM-1700m	99056582	< 0.02	< 0.02	0.02	mg/L	0.00
Calcium	MSGM-1700m	99056582	64.3	63.8	0.05	mg/L	0.78
Cadmium	MSGM-1700m	99056582	< 0.002	< 0.002	0.002	mg/L	0.00
Cobalt	MSGM-1700m	99056582	< 0.004	< 0.004	0.004	mg/L	0.00
Chromium	MSGM-1700m	99056582	< 0.002	< 0.002	0.002	mg/L	0.00
Copper	MSGM-1700m	99056582	< 0.003	< 0.003	0.003	mg/L	0.00
Iron	MSGM-1700m	99056582	< 0.05	< 0.05	0.05	mg/L	0.00
Potassium	MSGM-1700m	99056582	< 0.5	< 0.5	0.5	mg/L	0.00
Magnesium	MSGM-1700m	99056582	3.67	3.64	0.05	mg/L	0.82
Manganese	MSGM-1700m	99056582	< 0.002	< 0.002	0.002	mg/L	0.00
Molybdenum	MSGM-1700m	99056582	< 0.005	< 0.005	0.005	mg/L	0.00
Sodium	MSGM-1700m	99056582	2.8	2.8	0.5	mg/L	0.00
Nickel	MSGM-1700m	99056582	< 0.01	< 0.01	0.01	mg/L	0.00
Phosphorus	MSGM-1700m	99056582	< 0.1	< 0.1	0.1	mg/L	0.00
Lead	MSGM-1700m	99056582	< 0.03	< 0.03	0.03	mg/L	0.00
Sulphur	MSGM-1700m	99056582	42.4	42.0	0.1	mg/L	0.95
Antimony	MSGM-1700m	99056582	< 0.02	< 0.02	0.02	mg/L	0.00
Selenium	MSGM-1700m	99056582	< 0.03	< 0.03	0.03	mg/L	0.00
Tin	MSGM-1700m	99056582	< 0.02	< 0.02	0.02	mg/L	0.00
Strontium	MSGM-1700m	99056582	0.272	0.269	0.001	mg/L	1.11
Tellurium	MSGM-1700m	99056582	< 0.02	< 0.02	0.02	mg/L	0.00
Titanium	MSGM-1700m	99056582	< 0.003	< 0.003	0.003	mg/L	0.00
Thallium	MSGM-1700m	99056582	< 0.03	< 0.03	0.03	mg/L	0.00
Vanadium	MSGM-1700m	99056582	< 0.003	< 0.003	0.003	mg/L	0.00
Zinc	MSGM-1700m	99056582	< 0.01	< 0.01	0.01	mg/L	0.00
Zirconium	MSGM-1700m	99056582	< 0.003	< 0.003	0.003	mg/L	0.00
Cyanide(SAD) + Thiocyanate	MSGM-1700m	99056582	< 0.001	< 0.001	0.001	mg/L	0.00
Silver	CM-CAMP-DS 1	99056557	< 0.03	< 0.03	0.03	mg/L	0.00

PHILIP SERVICES CORP

PHILIP ANALYTICAL

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DUPLICATE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Duplicate Conc.	MDL	Unit	Relative % Diff.
Aluminum	CM-CAMP-DS 1	99056557	< 0.06	< 0.06	0.06	mg/L	0.00
Arsenic	CM-CAMP-DS 1	99056557	< 0.04	< 0.04	0.04	mg/L	0.00
Boron	CM-CAMP-DS 1	99056557	< 0.04	< 0.04	0.04	mg/L	0.00
Barium	CM-CAMP-DS 1	99056557	0.193	0.190	0.001	mg/L	1.57
Beryllium	CM-CAMP-DS 1	99056557	< 0.0002	< 0.0002	0.0002	mg/L	0.00
Bismuth	CM-CAMP-DS 1	99056557	< 0.02	< 0.02	0.02	mg/L	0.00
Calcium	CM-CAMP-DS 1	99056557	28.0	28.2	0.05	mg/L	-0.71
Cadmium	CM-CAMP-DS 1	99056557	< 0.002	< 0.002	0.002	mg/L	0.00
Cobalt	CM-CAMP-DS 1	99056557	< 0.004	< 0.004	0.004	mg/L	0.00
Chromium	CM-CAMP-DS 1	99056557	< 0.002	< 0.002	0.002	mg/L	0.00
Copper	CM-CAMP-DS 1	99056557	< 0.003	< 0.003	0.003	mg/L	0.00
Iron	CM-CAMP-DS 1	99056557	< 0.05	< 0.05	0.05	mg/L	0.00
Potassium	CM-CAMP-DS 1	99056557	1.0	1.0	0.5	mg/L	0.00
Magnesium	CM-CAMP-DS 1	99056557	6.76	6.69	0.05	mg/L	1.04
Manganese	CM-CAMP-DS 1	99056557	0.002	0.002	0.002	mg/L	0.00
Molybdenum	CM-CAMP-DS 1	99056557	< 0.005	< 0.005	0.005	mg/L	0.00
Sodium	CM-CAMP-DS 1	99056557	4.6	4.5	0.5	mg/L	2.20
Nickel	CM-CAMP-DS 1	99056557	< 0.01	< 0.01	0.01	mg/L	0.00
Phosphorus	CM-CAMP-DS 1	99056557	< 0.1	< 0.1	0.1	mg/L	0.00
Lead	CM-CAMP-DS 1	99056557	< 0.03	< 0.03	0.03	mg/L	0.00
Sulphur	CM-CAMP-DS 1	99056557	6.5	6.4	0.1	mg/L	1.55
Antimony	CM-CAMP-DS 1	99056557	< 0.02	< 0.02	0.02	mg/L	0.00
Selenium	CM-CAMP-DS 1	99056557	< 0.03	< 0.03	0.03	mg/L	0.00
Tin	CM-CAMP-DS 1	99056557	< 0.02	< 0.02	0.02	mg/L	0.00
Strontium	CM-CAMP-DS 1	99056557	0.235	0.232	0.001	mg/L	1.28
Tellurium	CM-CAMP-DS 1	99056557	< 0.02	< 0.02	0.02	mg/L	0.00
Titanium	CM-CAMP-DS 1	99056557	< 0.003	< 0.003	0.003	mg/L	0.00
Thallium	CM-CAMP-DS 1	99056557	< 0.03	< 0.03	0.03	mg/L	0.00
Vanadium	CM-CAMP-DS 1	99056557	< 0.003	< 0.003	0.003	mg/L	0.00
Zinc	CM-CAMP-DS 1	99056557	0.01	< 0.01	0.01	mg/L	0.00
Zirconium	CM-CAMP-DS 1	99056557	< 0.003	< 0.003	0.003	mg/L	0.00

PHILIP SERVICES CORP

PHILIP ANALYTICAL

SPIKE SUMMARY

10-Nov-99

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Cyanide(SAD) + Thiocyanate	Blank Spike, Batch :	94101657	< 0.02	0.40	.4	ug/g	96
Cyanide W.A.D.	Blank Spike, Batch :	94101659	< 0.02	0.41	.4	ug/g	101
Aluminum	Blank Spike, Batch :	94203406	< 10	8070	9518	ug/g	85
Barium	Blank Spike, Batch :	94203406	< 0.1	104	102	ug/g	102
Calcium	Blank Spike, Batch :	94203406	< 40	137000	137000	ug/g	100
Cadmium	Blank Spike, Batch :	94203406	< 0.2	33.1	34	ug/g	97
Cobalt	Blank Spike, Batch :	94203406	< 0.3	28.5	28	ug/g	102
Chromium	Blank Spike, Batch :	94203406	0.2	45.1	44.35	ug/g	101
Copper	Blank Spike, Batch :	94203406	< 0.5	747	690	ug/g	108
Iron	Blank Spike, Batch :	94203406	< 10.0	21100	20406	ug/g	103
Magnesium	Blank Spike, Batch :	94203406	< 10	6190	6086	ug/g	102
Manganese	Blank Spike, Batch :	94203406	< 0.2	430	425	ug/g	101
Nickel	Blank Spike, Batch :	94203406	< 0.8	230	231	ug/g	100
Lead	Blank Spike, Batch :	94203406	< 2	230	233	ug/g	99
Strontium	Blank Spike, Batch :	94203406	< 0.1	197	202	ug/g	98
Vanadium	Blank Spike, Batch :	94203406	< 0.3	17.0	19	ug/g	89
Zinc	Blank Spike, Batch :	94203406	0.6	6990	6775	ug/g	103
Mercury	Blank Spike, Batch :	94203410	< 0.05	6.40	6.25	ug/g	102
Cyanide Total	Blank Spike, Batch :	94101861	< 0.02	0.32	.4	ug/g	80
Cyanide(SAD) + Thiocyanate	MSGM-T4	99056565	59	96	46.5641	ug/g	81
Cyanide W.A.D.	MSGM-T4	99056565	0.07	0.21	.465641	ug/g	30
Benzene	Blank Spike, Batch :	95204563	< 0.04	2.3	2.15	ug/g	105
Toluene	Blank Spike, Batch :	95204563	< 0.10	2.1	2.15	ug/g	98
Ethylbenzene	Blank Spike, Batch :	95204563	< 0.10	2.1	2.15	ug/g	97
Benzene	Blank Spike, Batch :	95204560	< 0.04	2.1	2.15	ug/g	99
Toluene	Blank Spike, Batch :	95204560	< 0.10	2.1	2.15	ug/g	97
Ethylbenzene	Blank Spike, Batch :	95204560	< 0.10	2.1	2.15	ug/g	99
Cyanide(SAD) + Thiocyanate	Blank Spike, Batch :	94101657	< 0.001	0.020	.02	mg/L	98
Aluminum	Blank Spike, Batch :	94203402	< 0.06	3.86	4	mg/L	97
Boron	Blank Spike, Batch :	94203402	< 0.04	0.96	1	mg/L	96
Barium	Blank Spike, Batch :	94203402	< 0.001	0.095	.1	mg/L	95
Beryllium	Blank Spike, Batch :	94203402	< 0.0002	0.0906	.1	mg/L	91
Bismuth	Blank Spike, Batch :	94203402	< 0.02	1.94	2	mg/L	97
Calcium	Blank Spike, Batch :	94203402	0.06	10.2	10	mg/L	101
Cadmium	Blank Spike, Batch :	94203402	< 0.002	0.191	.2	mg/L	95
Cobalt	Blank Spike, Batch :	94203402	< 0.004	0.286	.3	mg/L	95
Chromium	Blank Spike, Batch :	94203402	< 0.002	0.289	.3	mg/L	96
Copper	Blank Spike, Batch :	94203402	< 0.003	0.196	.2	mg/L	98

PHILIP SERVICES CORP

PHILIP ANALYTICAL

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SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Iron	Blank Spike. Batch :	94203402	< 0.05	0.97	1	mg/L	97
Potassium	Blank Spike. Batch :	94203402	< 0.5	43.3	44.7	mg/L	97
Magnesium	Blank Spike. Batch :	94203402	< 0.05	4.86	5	mg/L	97
Manganese	Blank Spike. Batch :	94203402	< 0.002	0.191	.2	mg/L	95
Molybdenum	Blank Spike. Batch :	94203402	< 0.005	0.394	.4	mg/L	98
Sodium	Blank Spike. Batch :	94203402	< 0.5	5.0	5	mg/L	99
Nickel	Blank Spike. Batch :	94203402	< 0.01	0.78	.8	mg/L	97
Phosphorus	Blank Spike. Batch :	94203402	< 0.1	3.9	4	mg/L	97
Sulphur	Blank Spike. Batch :	94203402	< 0.1	9.8	10	mg/L	98
Antimony	Blank Spike. Batch :	94203402	< 0.02	1.68	1.62	mg/L	104
Tin	Blank Spike. Batch :	94203402	< 0.02	1.93	2	mg/L	96
Strontium	Blank Spike. Batch :	94203402	< 0.001	0.095	.1	mg/L	95
Tellurium	Blank Spike. Batch :	94203402	< 0.02	1.99	2	mg/L	99
Titanium	Blank Spike. Batch :	94203402	< 0.003	0.288	.28	mg/L	103
Thallium	Blank Spike. Batch :	94203402	< 0.03	1.84	2	mg/L	92
Vanadium	Blank Spike. Batch :	94203402	< 0.003	0.479	.5	mg/L	96
Zinc	Blank Spike. Batch :	94203402	< 0.01	0.19	.2	mg/L	96
Zirconium	Blank Spike. Batch :	94203402	< 0.003	0.288	.3	mg/L	96
Mercury	Blank Spike. Batch :	94203381	< 0.00005	0.00047	.0005	mg/L	94
Aluminum Dissolved	Blank Spike. Batch :	94203403	< 0.02	3.97	4	mg/L	99
Arsenic Dissolved	Blank Spike. Batch :	94203403	< 0.04	3.94	4	mg/L	98
Boron Dissolved	Blank Spike. Batch :	94203403	< 0.008	1.01	1	mg/L	101
Barium Dissolved	Blank Spike. Batch :	94203403	< 0.001	0.097	.1	mg/L	97
Beryllium Dissolved	Blank Spike. Batch :	94203403	< 0.0010	0.0945	.1	mg/L	95
Bismuth Dissolved	Blank Spike. Batch :	94203403	< 0.02	2.04	2	mg/L	102
Calcium Dissolved	Blank Spike. Batch :	94203403	< 0.01	10.6	10	mg/L	106
Cadmium Dissolved	Blank Spike. Batch :	94203403	< 0.002	0.198	.2	mg/L	99
Cobalt Dissolved	Blank Spike. Batch :	94203403	< 0.003	0.296	.3	mg/L	99
Chromium Dissolved	Blank Spike. Batch :	94203403	< 0.002	0.299	.3	mg/L	100
Copper Dissolved	Blank Spike. Batch :	94203403	< 0.001	0.203	.2	mg/L	101
Iron Dissolved	Blank Spike. Batch :	94203403	< 0.003	1.01	1	mg/L	101
Potassium Dissolved	Blank Spike. Batch :	94203403	< 0.4	44.8	44.7	mg/L	100
Magnesium Dissolved	Blank Spike. Batch :	94203403	< 0.02	5.04	5	mg/L	101
Manganese Dissolved	Blank Spike. Batch :	94203403	< 0.002	0.197	.2	mg/L	99
Molybdenum Dissolved	Blank Spike. Batch :	94203403	< 0.004	0.403	.4	mg/L	101
Sodium Dissolved	Blank Spike. Batch :	94203403	< 0.01	5.21	5	mg/L	104
Nickel Dissolved	Blank Spike. Batch :	94203403	< 0.008	0.814	.8	mg/L	102
Phosphorus Dissolved	Blank Spike. Batch :	94203403	< 0.04	4.00	4	mg/L	100

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SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Lead Dissolved	Blank Spike. Batch :	94203403	< 0.02	1.96	2	mg/L	98
Sulfur Dissolved	Blank Spike. Batch :	94203403	< 0.03	10.1	10	mg/L	101
Antimony Dissolved	Blank Spike. Batch :	94203403	< 0.015	1.77	1.62	mg/L	109
Selenium Dissolved	Blank Spike. Batch :	94203403	< 0.03	3.01	3	mg/L	100
Tin Dissolved	Blank Spike. Batch :	94203403	< 0.02	1.98	2	mg/L	99
Strontium Dissolved	Blank Spike. Batch :	94203403	< 0.001	0.098	.1	mg/L	98
Tellurium Dissolved	Blank Spike. Batch :	94203403	< 0.02	2.06	2	mg/L	103
Titanium Dissolved	Blank Spike. Batch :	94203403	< 0.003	0.299	.28	mg/L	107
Thallium Dissolved	Blank Spike. Batch :	94203403	< 0.02	1.95	2	mg/L	97
Vanadium Dissolved	Blank Spike. Batch :	94203403	< 0.003	0.496	.5	mg/L	99
Zinc Dissolved	Blank Spike. Batch :	94203403	< 0.002	0.199	.2	mg/L	100
Zirconium Dissolved	Blank Spike. Batch :	94203403	< 0.003	0.298	.3	mg/L	99
Mercury Dissolved	Blank Spike. Batch :	94203395	< 0.00005	0.00045	.0005	mg/L	90
Mercury	MSGM-6-3	99056574	< 0.00005	0.00053	.0005	mg/L	110
Aluminum Dissolved	Blank Spike. Batch :	94203413	< 0.02	3.80	4	mg/L	95
Arsenic Dissolved	Blank Spike. Batch :	94203413	< 0.04	3.92	4	mg/L	98
Boron Dissolved	Blank Spike. Batch :	94203413	< 0.008	0.963	1	mg/L	96
Barium Dissolved	Blank Spike. Batch :	94203413	< 0.001	0.090	.1	mg/L	90
Beryllium Dissolved	Blank Spike. Batch :	94203413	< 0.0010	0.0934	.1	mg/L	93
Bismuth Dissolved	Blank Spike. Batch :	94203413	< 0.02	2.07	2	mg/L	104
Calcium Dissolved	Blank Spike. Batch :	94203413	< 0.01	9.73	10	mg/L	97
Cadmium Dissolved	Blank Spike. Batch :	94203413	< 0.002	0.207	.2	mg/L	103
Cobalt Dissolved	Blank Spike. Batch :	94203413	< 0.003	0.312	.3	mg/L	104
Chromium Dissolved	Blank Spike. Batch :	94203413	< 0.002	0.302	.3	mg/L	101
Copper Dissolved	Blank Spike. Batch :	94203413	< 0.001	0.191	.2	mg/L	96
Iron Dissolved	Blank Spike. Batch :	94203413	< 0.003	1.01	1	mg/L	101
Potassium Dissolved	Blank Spike. Batch :	94203413	< 0.4	42.6	44.7	mg/L	96
Magnesium Dissolved	Blank Spike. Batch :	94203413	< 0.02	4.86	5	mg/L	97
Manganese Dissolved	Blank Spike. Batch :	94203413	< 0.002	0.199	.2	mg/L	100
Molybdenum Dissolved	Blank Spike. Batch :	94203413	< 0.004	0.412	.4	mg/L	103
Sodium Dissolved	Blank Spike. Batch :	94203413	< 0.01	4.83	5	mg/L	97
Nickel Dissolved	Blank Spike. Batch :	94203413	< 0.008	0.820	.8	mg/L	103
Phosphorus Dissolved	Blank Spike. Batch :	94203413	< 0.04	4.06	4	mg/L	101
Lead Dissolved	Blank Spike. Batch :	94203413	< 0.02	2.07	2	mg/L	104
Sulfur Dissolved	Blank Spike. Batch :	94203413	< 0.03	10.1	10	mg/L	101
Antimony Dissolved	Blank Spike. Batch :	94203413	< 0.015	1.79	1.62	mg/L	111
Selenium Dissolved	Blank Spike. Batch :	94203413	< 0.03	2.97	3	mg/L	100
Tin Dissolved	Blank Spike. Batch :	94203413	< 0.02	2.12	2	mg/L	106

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SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Strontium Dissolved	Blank Spike. Batch :	94203413	< 0.001	0.091	.1	mg/L	91
Tellurium Dissolved	Blank Spike. Batch :	94203413	< 0.02	2.07	2	mg/L	103
Titanium Dissolved	Blank Spike. Batch :	94203413	< 0.003	0.288	.28	mg/L	103
Thallium Dissolved	Blank Spike. Batch :	94203413	< 0.02	2.03	2	mg/L	101
Vanadium Dissolved	Blank Spike. Batch :	94203413	< 0.003	0.483	.5	mg/L	97
Zinc Dissolved	Blank Spike. Batch :	94203413	< 0.002	0.204	.2	mg/L	102
Zirconium Dissolved	Blank Spike. Batch :	94203413	< 0.003	0.290	.3	mg/L	97
Mercury Dissolved	Blank Spike. Batch :	94203443	< 0.00005	0.00045	.0005	mg/L	90
Cobalt	MSGM-1700m	99056582	< 0.004	2.04	2	mg/L	102
Chromium	MSGM-1700m	99056582	< 0.002	2.03	2	mg/L	101
Copper	MSGM-1700m	99056582	< 0.003	2.11	2	mg/L	106
Manganese	MSGM-1700m	99056582	< 0.002	2.03	2	mg/L	102
Zinc	MSGM-1700m	99056582	< 0.01	2.08	2	mg/L	104
Cyanide(SAD) + Thiocyanate	MSGM-1700m	99056582	< 0.001	0.021	.02	mg/L	107
Aluminum Dissolved	Blank Spike. Batch :	94203444	< 0.02	3.70	4	mg/L	92
Arsenic Dissolved	Blank Spike. Batch :	94203444	< 0.04	3.76	4	mg/L	94
Boron Dissolved	Blank Spike. Batch :	94203444	< 0.008	0.904	1	mg/L	90
Barium Dissolved	Blank Spike. Batch :	94203444	< 0.001	0.087	.1	mg/L	87
Beryllium Dissolved	Blank Spike. Batch :	94203444	< 0.0010	0.0861	.1	mg/L	86
Bismuth Dissolved	Blank Spike. Batch :	94203444	< 0.02	1.92	2	mg/L	96
Calcium Dissolved	Blank Spike. Batch :	94203444	< 0.01	9.48	10	mg/L	95
Cadmium Dissolved	Blank Spike. Batch :	94203444	< 0.002	0.191	.2	mg/L	96
Cobalt Dissolved	Blank Spike. Batch :	94203444	< 0.003	0.285	.3	mg/L	95
Chromium Dissolved	Blank Spike. Batch :	94203444	< 0.002	0.283	.3	mg/L	94
Copper Dissolved	Blank Spike. Batch :	94203444	< 0.001	0.187	.2	mg/L	93
Iron Dissolved	Blank Spike. Batch :	94203444	< 0.003	0.950	1	mg/L	95
Potassium Dissolved	Blank Spike. Batch :	94203444	< 0.4	42.0	44.7	mg/L	93
Magnesium Dissolved	Blank Spike. Batch :	94203444	< 0.02	4.68	5	mg/L	93
Manganese Dissolved	Blank Spike. Batch :	94203444	< 0.002	0.187	.2	mg/L	93
Molybdenum Dissolved	Blank Spike. Batch :	94203444	< 0.004	0.395	.4	mg/L	98
Sodium Dissolved	Blank Spike. Batch :	94203444	< 0.01	4.64	5	mg/L	93
Nickel Dissolved	Blank Spike. Batch :	94203444	< 0.008	0.770	.8	mg/L	96
Phosphorus Dissolved	Blank Spike. Batch :	94203444	< 0.04	3.77	4	mg/L	94
Lead Dissolved	Blank Spike. Batch :	94203444	< 0.02	1.92	2	mg/L	96
Sulfur Dissolved	Blank Spike. Batch :	94203444	< 0.03	9.49	10	mg/L	95
Antimony Dissolved	Blank Spike. Batch :	94203444	< 0.015	1.65	1.62	mg/L	102
Selenium Dissolved	Blank Spike. Batch :	94203444	< 0.03	2.75	3	mg/L	91
Tin Dissolved	Blank Spike. Batch :	94203444	< 0.02	1.93	2	mg/L	97

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SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Strontium Dissolved	Blank Spike. Batch :	94203444	< 0.001	0.089	.1	mg/L	89
Tellurium Dissolved	Blank Spike. Batch :	94203444	< 0.02	1.93	2	mg/L	96
Titanium Dissolved	Blank Spike. Batch :	94203444	< 0.003	0.279	.28	mg/L	100
Thallium Dissolved	Blank Spike. Batch :	94203444	< 0.02	1.87	2	mg/L	93
Vanadium Dissolved	Blank Spike. Batch :	94203444	< 0.003	0.465	.5	mg/L	93
Zinc Dissolved	Blank Spike. Batch :	94203444	< 0.002	0.189	.2	mg/L	95
Zirconium Dissolved	Blank Spike. Batch :	94203444	< 0.003	0.274	.3	mg/L	91
Mercury Dissolved	Blank Spike. Batch :	94203470	< 0.00005	0.00046	.0005	mg/L	92
Cobalt	CM-CAMP-DS 1	99056557	< 0.004	2.03	2	mg/L	102
Chromium	CM-CAMP-DS 1	99056557	< 0.002	2.02	2	mg/L	101
Copper	CM-CAMP-DS 1	99056557	< 0.003	2.09	2	mg/L	104
Manganese	CM-CAMP-DS 1	99056557	0.002	2.02	2	mg/L	101
Zinc	CM-CAMP-DS 1	99056557	0.01	2.05	2	mg/L	102
Aluminum Dissolved	Blank Spike. Batch :	94203438	< 0.02	3.97	4	mg/L	99
Arsenic Dissolved	Blank Spike. Batch :	94203438	< 0.04	3.94	4	mg/L	98
Boron Dissolved	Blank Spike. Batch :	94203438	< 0.008	1.01	1	mg/L	101
Barium Dissolved	Blank Spike. Batch :	94203438	< 0.001	0.097	.1	mg/L	97
Beryllium Dissolved	Blank Spike. Batch :	94203438	< 0.0010	0.0945	.1	mg/L	95
Bismuth Dissolved	Blank Spike. Batch :	94203438	< 0.02	2.04	2	mg/L	102
Calcium Dissolved	Blank Spike. Batch :	94203438	< 0.01	10.6	10	mg/L	106
Cadmium Dissolved	Blank Spike. Batch :	94203438	< 0.002	0.198	.2	mg/L	99
Cobalt Dissolved	Blank Spike. Batch :	94203438	< 0.003	0.296	.3	mg/L	99
Chromium Dissolved	Blank Spike. Batch :	94203438	< 0.002	0.299	.3	mg/L	100
Copper Dissolved	Blank Spike. Batch :	94203438	< 0.001	0.203	.2	mg/L	101
Iron Dissolved	Blank Spike. Batch :	94203438	< 0.003	1.01	1	mg/L	101
Potassium Dissolved	Blank Spike. Batch :	94203438	< 0.4	44.8	44.7	mg/L	100
Magnesium Dissolved	Blank Spike. Batch :	94203438	< 0.02	5.04	5	mg/L	101
Manganese Dissolved	Blank Spike. Batch :	94203438	< 0.002	0.197	.2	mg/L	99
Molybdenum Dissolved	Blank Spike. Batch :	94203438	< 0.004	0.403	.4	mg/L	101
Sodium Dissolved	Blank Spike. Batch :	94203438	< 0.01	5.21	5	mg/L	104
Nickel Dissolved	Blank Spike. Batch :	94203438	< 0.008	0.814	.8	mg/L	102
Phosphorus Dissolved	Blank Spike. Batch :	94203438	< 0.04	4.00	4	mg/L	100
Lead Dissolved	Blank Spike. Batch :	94203438	< 0.02	1.96	2	mg/L	98
Sulfur Dissolved	Blank Spike. Batch :	94203438	< 0.03	10.1	10	mg/L	101
Antimony Dissolved	Blank Spike. Batch :	94203438	< 0.015	1.77	1.62	mg/L	109
Selenium Dissolved	Blank Spike. Batch :	94203438	< 0.03	3.01	3	mg/L	100
Tin Dissolved	Blank Spike. Batch :	94203438	< 0.02	1.98	2	mg/L	99
Strontium Dissolved	Blank Spike. Batch :	94203438	< 0.001	0.098	.1	mg/L	98

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SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Tellurium Dissolved	Blank Spike. Batch :	94203438	< 0.02	2.06	2	mg/L	103
Titanium Dissolved	Blank Spike. Batch :	94203438	< 0.003	0.299	.28	mg/L	107
Thallium Dissolved	Blank Spike. Batch :	94203438	< 0.02	1.95	2	mg/L	97
Vanadium Dissolved	Blank Spike. Batch :	94203438	< 0.003	0.496	.5	mg/L	99
Zinc Dissolved	Blank Spike. Batch :	94203438	< 0.002	0.199	.2	mg/L	100
Zirconium Dissolved	Blank Spike. Batch :	94203438	< 0.003	0.298	.3	mg/L	99
Mercury Dissolved	Blank Spike. Batch :	94203442	< 0.00005	0.00045	.0005	mg/L	90

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ANALYSIS DATES

	Philip ID:	99056561	99056562	99056563	99056564
	Client ID:	MSGM-6-1	MSGM-6-2	MSGM-T2	MSGM-T3
00250760	Moisture	08-OCT-1999	08-OCT-1999	08-OCT-1999	08-OCT-1999
2105AA06	Cyanide(SAD) + Thiocyanate	08-OCT-1999	08-OCT-1999	08-OCT-1999	08-OCT-1999
0157AA09	Cyanide W.A.D.	08-OCT-1999	08-OCT-1999	08-OCT-1999	08-OCT-1999
CN-TAA05	Cyanide Total	03-NOV-1999	03-NOV-1999	03-NOV-1999	03-NOV-1999
Hg-T200M	Mercury	13-OCT-1999	13-OCT-1999	13-OCT-1999	13-OCT-1999
ICP-200S	Metals Pkg:ICP Soil	12-OCT-1999	12-OCT-1999	12-OCT-1999	12-OCT-1999
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	30-SEP-1999	30-SEP-1999	4-OCT-1999	4-OCT-1999

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ANALYSIS DATES

	Philip ID:	99056565	99056566	99056567	99056568
	Client ID:	MSGM-T4	MSGM-LA-1	MSGM-UA-1	MSGM-LF-1
00250760	Moisture	08-OCT-1999	08-OCT-1999	08-OCT-1999	08-OCT-1999
2105AA06	Cyanide(SAD) + Thiocyanate	08-OCT-1999	---	---	---
0157AA09	Cyanide W.A.D.	08-OCT-1999	---	---	---
CN-TAA05	Cyanide Total	03-NOV-1999	---	---	---
Hg-T200M	Mercury	13-OCT-1999	---	---	---
ICP-200S	Metals Pkg:ICP Soil	12-OCT-1999	---	---	---
PKG-BT18	BTEX by P&T	---	12-OCT-1999	12-OCT-1999	10-OCT-1999
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	4-OCT-1999	4-OCT-1999	4-OCT-1999	4-OCT-1999

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ANALYSIS DATES

	Philip ID:	99056569	99056570	99056571	99056572
	Client ID:	WC-HL-1	WC-CAMP-1	MSGM-1700m	MSGM-6-2
00250760	Moisture	08-OCT-1999	08-OCT-1999	---	---
2105AA06	Cyanide(SAD) + Thiocyanate	---	---	08-OCT-1999	08-OCT-1999
Hg-T200M	Mercury	---	---	---	12-OCT-1999
MET-F	Metals ICP Water Total	---	---	---	12-OCT-1999
PKG-BT18	BTEX by P&T	10-OCT-1999	10-OCT-1999	---	---
	Matrix:	Soil	Soil	Water	Water
	Sampled on:	5-OCT-1999	5-OCT-1999	4-OCT-1999	30-SEP-1999

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ANALYSIS DATES

	Philip ID:	99056573	99056574	99056575	99056576
	Client ID:	MSGM-AD1 T-1800m	MSGM-6-3	MSGM-9	MSGM-6-1
2105AA06	Cyanide(SAD) + Thiocyanate	08-OCT-1999	08-OCT-1999	08-OCT-1999	08-OCT-1999
Hg-T200M	Mercury	12-OCT-1999	12-OCT-1999	12-OCT-1999	12-OCT-1999
MET-F	Metals ICP Water Total	12-OCT-1999	12-OCT-1999	12-OCT-1999	12-OCT-1999
Hg-D0310	Mercury Dissolved	14-OCT-1999	---	---	---
PKG_G	Metals ICP Water Dissolved	12-OCT-1999	---	---	---
	Matrix:	Water	Water	Water	Water
	Sampled on:	4-OCT-1999	30-SEP-1999	30-SEP-1999	30-SEP-1999

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ANALYSIS DATES

	Philip ID:	99056577	99056578	99056579	99056580
	Client ID:	WC-DS	WC-US	MSGM-TRIB	MSGM-ADI T-1800A
2105AA06	Cyanide(SAD) + Thiocyanate	08-OCT-1999	08-OCT-1999	08-OCT-1999	08-OCT-1999
Hg-T200M	Mercury	12-OCT-1999	12-OCT-1999	---	12-OCT-1999
MET-F	Metals ICP Water Total	12-OCT-1999	12-OCT-1999	---	12-OCT-1999
Hg-D0310	Mercury Dissolved	14-OCT-1999	14-OCT-1999	15-OCT-1999	14-OCT-1999
PKG_G	Metals ICP Water Dissolved	12-OCT-1999	12-OCT-1999	13-OCT-1999	13-OCT-1999
	Matrix:	Water	Water	Water	Water
	Sampled on:	2-OCT-1999	2-OCT-1999	4-OCT-1999	4-OCT-1999

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ANALYSIS DATES

	Philip ID:	99056581	99056582	99056554	99056555
	Client ID:	MSGM-TRIB A	MSGM-1700m	CM-PIPE 1	CM-PIPE 2
2105AA06	Cyanide(SAD) + Thiocyanate	08-OCT-1999	08-OCT-1999	—	—
Hg-T200M	Mercury	—	12-OCT-1999	12-OCT-1999	12-OCT-1999
MET-F	Metals ICP Water Total	—	12-OCT-1999	12-OCT-1999	12-OCT-1999
Hg-D0310	Mercury Dissolved	14-OCT-1999	15-OCT-1999	—	—
PKG_G	Metals ICP Water Dissolved	12-OCT-1999	13-OCT-1999	—	—
	Matrix:	Water	Water	Water	Water
	Sampled on:	4-OCT-1999	4-OCT-1999	3-OCT-1999	3-OCT-1999

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ANALYSIS DATES

	Philip ID:	99056556	99056557	99056558	99056559
	Client ID:	CM-W7-Us	CM-CAMP-DS 1	CM-CAMP-DS 2	CM-CAMP -PIPE 1
Hg-T200M	Mercury	12-OCT-1999	12-OCT-1999	12-OCT-1999	---
MET-F	Metals ICP Water Total	12-OCT-1999	12-OCT-1999	12-OCT-1999	---
Hg-D0310	Mercury Dissolved	15-OCT-1999	---	---	14-OCT-1999
PKG_G	Metals ICP Water Dissolved	14-OCT-1999	---	---	14-OCT-1999
	Matrix:	Water	Water	Water	Water
	Sampled on:	3-OCT-1999	3-OCT-1999	3-OCT-1999	3-OCT-1999

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ANALYSIS DATES

	Philip ID:	99056560
	Client ID:	CM-CAMP -PIPE 2
Hg-D0310	Mercury Dissolved	14-OCT-1999
PKG_G	Metals ICP Water Dissolved	14-OCT-1999
	Matrix:	Water
	Sampled on:	3-OCT-1999

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BATCH NUMBERS

	Philip ID:	99056561	99056562	99056563	99056564
	Client ID:	MSGM-6-1	MSGM-6-2	MSGM-T2	MSGM-T3
00250760	Moisture	94403600	94403600	94403600	94403600
2105AA06	Cyanide(SAD) + Thiocyanate	94101657	94101657	94101657	94101657
0157AA09	Cyanide W.A.D.	94101659	94101659	94101659	94101659
CN-TAA05	Cyanide Total	94101861	94101861	94101861	94101861
Hg-T200M	Mercury	94203410	94203410	94203410	94203410
ICP-200S	Metals Pkg:ICP Soil	94203406	94203406	94203406	94203406
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	30-SEP-1999	30-SEP-1999	4-OCT-1999	4-OCT-1999

PHILIP SERVICES

PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056565	99056566	99056567	99056568
	Client ID:	MSGM-T4	MSGM-LA-1	MSGM-UA-1	MSGM-LF-1
00250760	Moisture	94403600	94403600	94403600	94403600
2105AA06	Cyanide(SAD) + Thiocyanate	94101657	---	---	---
0157AA09	Cyanide W.A.D.	94101659	---	---	---
CN-TAA05	Cyanide Total	94101861	---	---	---
Hg-T200M	Mercury	94203410	---	---	---
ICP-200S	Metals Pkg:ICP Soil	94203406	---	---	---
PKG-BT18	BTEX by P&T	---	95204563	95204563	95204560
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	4-OCT-1999	4-OCT-1999	4-OCT-1999	4-OCT-1999

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PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056569	99056570	99056571	99056572
	Client ID:	WC-HL-1	WC-CAMP-1	MSGM-1700m	MSGM-6-2
00250760	Moisture	94403600	94403600	---	---
2105AA06	Cyanide(SAD) + Thiocyanate	---	---	94101657	94101657
Hg-T200M	Mercury	---	---	---	94203381
MET-P	Metals ICP Water Total	---	---	---	94203402
PKG-BT18	BTEX by P&T	95204560	95204560	---	---
	Matrix:	Soil	Soil	Water	Water
	Sampled on:	5-OCT-1999	5-OCT-1999	4-OCT-1999	30-SEP-1999

PHILIP SERVICES CORP

PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056573	99056574	99056575	99056576
	Client ID:	MSGM-AD1 T-1800m	MSGM-6-3	MSGM-9	MSGM-6-1
2105AA06	Cyanide(SAD) + Thiocyanate	94101657	94101657	94101657	94101657
Hg-T200M	Mercury	94203381	94203381	94203381	94203381
MET-F	Metals ICP Water Total	94203402	94203402	94203402	94203402
Hg-D0310	Mercury Dissolved	94203395	---	---	---
PKG_G	Metals ICP Water Dissolved	94203403	---	---	---
	Matrix:	Water	Water	Water	Water
	Sampled on:	4-OCT-1999	30-SEP-1999	30-SEP-1999	30-SEP-1999

PHILIP SERVICES CORP

PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056577	99056578	99056579	99056580
	Client ID:	WC-DS	WC-US	MSGM-TRIB	MSGM-ADI T-1800A
2105AA06	Cyanide(SAD) + Thiocyanate	94101657	94101657	94101657	94101657
Hg-T200M	Mercury	94203381	94203381	---	94203381
MET-F	Metals ICP Water Total	94203402	94203402	---	94203402
Hg-D0310	Mercury Dissolved	94203395	94203395	94203443	94203395
PKG_G	Metals ICP Water Dissolved	94203403	94203403	94203413	94203413
	Matrix:	Water	Water	Water	Water
	Sampled on:	2-OCT-1999	2-OCT-1999	4-OCT-1999	4-OCT-1999

PHILIP SERVICES

PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056581	99056582	99056554	99056555
	Client ID:	MSGM-TRIB A	MSGM-1700m	CM-PIPE 1	CM-PIPE 2
2105AA06	Cyanide(SAD) + Thiocyanate	94101657	94101657	—	—
Hg-T200M	Mercury	—	94203381	94203381	94203381
MET-F	Metals ICP Water Total	—	94203402	94203402	94203402
Hg-D0310	Mercury Dissolved	94203395	94203443	—	—
PKG_G	Metals ICP Water Dissolved	94203403	94203413	—	—
	Matrix:	Water	Water	Water	Water
	Sampled on:	4-OCT-1999	4-OCT-1999	3-OCT-1999	3-OCT-1999

PHILIP SERVICES CORP

PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056556	99056557	99056558	99056559
	Client ID:	CM-W7-US	CM-CAMP-DS 1	CM-CAMP-DS 2	CM-CAMP -PIPE 1
Hg-T200M	Mercury	94203381	94203381	94203381	---
MET-F	Metals ICP Water Total	94203402	94203402	94203402	---
Hg-D0310	Mercury Dissolved	94203470	---	---	94203442
PKG_G	Metals ICP Water Dissolved	94203444	---	---	94203438
	Matrix:	Water	Water	Water	Water
	Sampled on:	3-OCT-1999	3-OCT-1999	3-OCT-1999	3-OCT-1999

PHILIP SERVICES

PHILIP ANALYTICAL

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BATCH NUMBERS

	Philip ID:	99056560
	Client ID:	CM-CAMP -PIPE 2
Hg-D0310	Mercury Dissolved	94203442
PKG_G	Metals ICP Water Dissolved	94203438
	Matrix:	Water
	Sampled on:	3-OCT-1999

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BLANK SUMMARY

All method blanks were less than MDL, except the following:

Parameter	Batch	Sparcode	Blank Conc.	MDL	Unit
Chromium	94203406	Cr-T200S	0.2	0.2	ug/g
Zinc	94203406	Zn-T200S	0.6	0.5	ug/g
Calcium	94203402	Ca-T0042	0.06	0.05	mg/L

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES
8577 Commerce Court
Burnaby, B.C. V5A 4N5
Ph: (604) 444-4808
Fax: (604) 444-4511
Toll Free: 1-800-440-4808

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

ANALYSIS REQUEST 80404

COMPANY NAME: MDA CONSULTING LIMITED	PH. #: 905-333-0427 FAX #: 905-333-9723
COMPANY ADDRESS: #163, 3017 St Clair Ave. BURLINGTON, ON L7N 3P5	CLIENT PROJECT ID: (#) MDA-99-1
SAMPLER NAME (PRINT): D. GREGOR	PROJECT MANAGER: D. GREGOR

	FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	SURFACE WATER	SOIL	OTHER	# CONTAINERS	SAMPLING: DATE	TIME	HEADSPACE VAPOUR	TOTAL METALS (Cd, Cu, Ni, Pb, Zn)	CYANIDE (WAD)	BTEX/LIGHT HC (GRAV + FT)
1	MSGM-6-1	56561			✓		1	SEPT 30/99	1631		✓	✓	
2	MSGM-6-2	56562			✓		1	"	1630		✓	✓	
3	MSGM-T2	56563			✓		1	OCT 4/99	14:28		✓	✓	
4	MSGM-T3	56564			✓		1	OCT 4/99	14:30		✓	✓	
5	MSGM-T4	56565			✓		1	OCT 4/99	14:44		✓	✓	
6	MSGM-LA-1	56566			✓		1	OCT 4/99	15:26				✓
7	MSGM-UA-1	56567			✓		1	OCT 4/99	15:36				✓
8	MSGM-LF-1	56568			✓		1	OCT 4/99	16:30				✓
9	WC-HL-1	56569			✓		1	OCT 5/99	11:20				✓
10	WC-CAMP-1	56570			✓		1	OCT 5/99	11:30				✓
11													
12													

TAT
- Two Week ☑
- One Week ☐
- 48 Hours ☐
- 24 Hours ☐
- Other: _____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 4.0
LAB INFORMATION: Oct 15 THIOCYANATE Dec 9 P07

ACCOUNTING CONTACT: D. GREGOR

SPECIAL REPORTING OR BILLING INSTRUCTIONS

EDT ☐

CUSTODY RECORD

RELINQUISHED BY SAMPLER: D. GREGOR	DATE: OCT 5/99	TIME: 1830	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE: OCT 7/99	TIME: 1040	RECEIVED BY LABORATORY:

PHILIP SERVICES CORP

PHILIP ANALYTICAL SERVICES
8577 Commerce Court
Burnaby, B.C. V5A 4N5
Phone: (604) 444-4808
Fax: (604) 444-4511
Toll Free: 1-800-440-4808

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 2

ANALYSIS REQUEST 8040420

COMPANY NAME: MDA CONSULTING LIMITED	PH. #: 905-333-0427
COMPANY ADDRESS: #163-3017 ST. CLAIR AVE. BURLINGTON, ON L7N 3P5	FAX #: 905-333-9723
CLIENT PROJECT ID: (#) MDA-99-1	
SAMPLER NAME (PRINT): D. GREGOR/P. ZURACHENKO	PROJECT MANAGER: D. GREGOR

FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	SURFACE WATER	SOIL	OTHER	# CONTAINERS	SAMPLING: DATE	TIME	HEADSPACE VAPOUR	TOTAL METALS ICP + HG	CYANIDE WAD	DISS. METALS SAD *
1 MSGM-1700M	56571		✓			1	OCT 4/99	1645			✓	○
2 MSGM-6-2	56572		✓			II	SEP/30/99	1602		✓	✓	
3 MSGM-ADIT-1800	56573		✓			III	OCT 4/99	15:55		✓	✓	✓
4 MSGM-6-3	56574		✓			II	SEPT 30/99	16:10		✓	✓	
5 MSGM-9	56575		✓			II	SEPT 30/99	15:10		✓	✓	
6 MSGM-6-1	56576		✓			II	SEPT 30/99	1600		✓	✓	
7 WC-DS	56577		✓			III	Oct 2/99	1200		✓	✓	✓
8 WC-US	56578		✓			III	OCT 2/99	1200		✓	✓	✓
9 MSGM-TRIB	56579		✓			II	OCT 4/99	1630			✓	✓
10 MSGM-ADIT-1800A	56580		✓			III	OCT 4/99	1555		✓	✓	✓
11 MSGM-TRIBA	56581		✓			II	OCT 4/99	1630			✓	✓
12 MSGM-1700M	56582		✓			III	OCT 4/99	1645		✓	✓	✓

TAT
- Two Week ☑
- One Week ☐
- 48 Hours ☐
- 24 Hours ☐
- Other: _____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:
* NOTE - DISSOLVED METALS HAVE NOT BEEN FILTERED

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 4°
LAB INFORMATION: Oct 15 4 PM

ACCOUNTING CONTACT: D. GREGOR

SPECIAL REPORTING OR BILLING INSTRUCTIONS
EDT ☐

CUSTODY RECORD

RELINQUISHED BY SAMPLER: D. GREGOR	DATE: OCT 5/99	TIME: 2130	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE: Oct 7/99	TIME: 1046	RECEIVED BY LABORATORY:

11/15/99 12:05 FAX 604 444 4511 PHILIP ANALYTICAL-B.C. ☑041/045

PHILIP SERVICES CORP

8577 Commerce Court
Burnaby, B.C. V5A 4N5

Phone: (604) 444-4808
Fax: (604) 444-4511
Toll Free: 1-800-440-4808

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

ANALYSIS REQUEST 8040422

COMPANY NAME: MDA CONSULTING	PH. #: 905-333-0427
	FAX #: 905-333-9723
COMPANY ADDRESS: #163-3017 ST. CAIR AVE BURLINGTON ON, L7N 3P5	CLIENT PROJECT ID: (#) MDA-99-1
SAMPLER NAME (PRINT): D. GREGOR/P. ZURACHENKO	PROJECT MANAGER: D. GREGOR

	FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	MATRIX: SURFACE WATER	MATRIX: SOIL	MATRIX: OTHER	# CONTAINERS	SAMPLING: DATE	SAMPLING: TIME	HEADSPACE VAPOUR	DISS. METALS ICP+ITS	TTL. METALS
1	CM-PIPE 1	56554	✓	✓			1	Oct 3/99	1400		✓	✓
2	CM-PIPE 2	56555	✓	✓			1	"	1400		✓	
3	~~CM-PIPE 3~~	~~56556~~	~~✓~~	~~✓~~			~~1~~	~~"~~	~~1400~~		~~✓~~	
4	~~CM-PIPE 4~~	~~56557~~	~~✓~~	~~✓~~			~~1~~	~~"~~	~~1400~~		~~✓~~	
5	CM-WZ-DS	56558		✓			11	Oct 3/99	1200		✓	✓
6	CM-CAMP-DS	56559		✓			1	Oct 3/99	1400			✓
7	CM-CAMP-DS2	56560		✓			1	Oct 3/99	1400			✓
8	Cm-Camp-pipe1	56538									X	
9	Cm-camp-pipe2	56560									X	
10												
11												
12												

TAT
- Two Week ☐
- One Week ☐
- 48 Hours ☐
- 24 Hours ☐
- Other: _____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE: DISS. METALS - NOT FILTERED

ACCOUNTING CONTACT: D. GREGOR

SPECIAL REPORTING OR BILLING INSTRUCTIONS

EDT ☐

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 4°
LAB INFORMATION: Oct 15 PM

CUSTODY RECORD

RELINQUISHED BY SAMPLER:	DATE Oct 5/99	TIME 21:30	RECEIVED BY:
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:
RELINQUISHED BY:	DATE Oct 7/99	TIME 1640	RECEIVED BY LABORATORY: M

11/15/99 12:06 FAX 604 444 4511 PHILIP ANALYTICAL-B.C. ☑042/045

SAMPLE INTEGRITY RECORD

Client: MDA CONSULTING

Date: OCT 7/99 **Initials:** OCT 7/99 **COC Form #:** 8040422.

The following bottles were received for the above project:

Lab ID	100mL AG	180mL AG	1L AG	1L CG	1L PL	500mL PL	500mL AG	500mL CG	250mL PL HNO3	250mL PL H2SO4	250mL PL	250mL PL Filt/Pres	250mL PL Filt	MICRO	100mL AG	40mL vials	Trip/Field Blk	Plastic Bag	Air sample	Other
1									1											
2									1											
3									2			1								
4									1											
5																				
6																				
7																				
8									1											
9									1											
10																				
11																				
12																				

The following observations were made regarding the above project:

- ☐ Sample Requisition Form/Written Instruction
- ☐ Missing Sample
- ☐ Extra Sample
- ☐ Incorrect Sample ID
- ☐ Physical Damage and/or Contamination
- ☐ Inappropriate Sample Temperature
- ☐ Preservative Required
- ☐ Hold Time Exceeded
- ☐ Incompatible Sample Container(s)
- ☐ Inadequate Sample Volume
- ☐ Headspace Present
- ☐ Filtering Required

Diss bottle for pipe 1 & 2 samples

Comments: 2 extra samples cm-camp-pipe1 cm-camp-pipe2

assumed CMPipe1 CMPipe2 could not be filtered

Diss metals sample SM-W7V3 arb lab. Preserved in field

SAMPLE INTEGRITY RECORD

Client: MPA
Date: Oct 7/99 **Initials:** A.J. **COC Form #:** 804042-1.

The following bottles were received for the above project:

	100mL AG	250mL AG	1L AG	1L CG	1L PL	500mL PL	500mL AG	500mL CG	250mL PL HNO3	250mL PL H2SO4	250mL PL	250mL PL Filt/Pres	250mL PL Filt	MICRO	100mL AG	40mL vials	Trip/Field Blk	Plastic Bag	Air sample	Other
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10		4																		
11																				
12																				

The following observations were made regarding the above project:

- ☐ Sample Requisition Form/Written Instruction
- ☐ Missing Sample
- ☐ Extra Sample
- ☐ Incorrect Sample ID
- ☐ Physical Damage and/or Contamination
- ☐ Inappropriate Sample Temperature
- ☐ Preservative Required
- ☐ Hold Time Exceeded
- ☐ Incompatible Sample Container(s)
- ☐ Inadequate Sample Volume
- ☐ Headspace Present
- ☐ Filtering Required

Comments:

PHILIP ANALYTICAL SERVICES

SAMPLE INTEGRITY RECORD

Client: MDA
Date: Oct 7/99 Initials: AJ COC Form #: 8040420

The following bottles were received for the above project:

Sample #	100mL AG	180mL AG	1L AG	1L CG	1L PL	500mL PL	500mL AG	500mL CG	250mL PL HNO3	250mL PL H2SO4	250mL PL	250mL PL Filt/Pres	250mL PL Filt	MICRO	100mL AG	40mL vials	Trip/Field Blk	Plastic Bag	Air sample	Other 250mL (PL) NaOH
1											1									1
2									1											1
3									1		1									1
4									1											1
5									1											1
6									1											1
7									2											1
8									2											1
9									2		1									1
10									1		1									1
11									1											1
12									1											1

The following observations were made regarding the above project:

- ☐ Sample Requisition Form/Written Instruction
- ☐ Missing Sample
- ☐ Extra Sample
- ☐ Incorrect Sample ID
- ☐ Physical Damage and/or Contamination
- ☐ Inappropriate Sample Temperature
- ☐ Preservative Required
- ☐ Hold Time Exceeded
- ☐ Incompatible Sample Container(s)
- ☐ Inadequate Sample Volume
- ☐ Headspace Present
- ☐ Filtering Required

Comments: D.s. metals for WC-05 could not be filtered
WC-05 by lab. Preserved
MS&M-Trib A in field

PHILIP ANALYTICAL SERVICES