Yankee Girl Tailings
Environmental Impact Assessment
Summary Report

November 2002

Ministry of Water, Land and Air Protection
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Nelson, BC
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Executive Summary

The Yankee Girl mill tailings are located on the east side of the Salmo River immediately across from the community of Ymir, BC. The tailings cover approximately two hectares, and are in close proximity to the Salmo River, a regionally significant fish bearing stream, with active water licenses downstream of the tailings. The tailings are easily accessible and recreational use of the site is common. Concerns about the tailings raised by the Salmo Watershed Streamkeepers Society prompted the Ministries of Water, Land and Air Protection and Energy and Mines to conduct limited site investigations involving water and soil sampling within or near the residues. Analytical tests of the soils revealed elevated levels of arsenic, cadmium, lead, silver and zinc concentrations exceeding numerical soil standards of the Contaminated Site Regulation. Cadmium and lead in soil were also demonstrated to have a high leachate potential. Based on comparison to leachate quality standards of the Special Waste Regulation, the sampled tailings qualify as special waste. The elevated concentration of arsenic in soil also qualifies the residues as special waste.

Water samples collected from a pond on the tailings had elevated levels of cadmium, cobalt, iron, silver and zinc. Respective concentrations exceeded BC Water Quality Guidelines (Criteria) for the protection of aquatic life. Portions of the tailings site are flooded during seasonal high water periods, leading to a potential for contaminants to be flushed into the Salmo River. It is of particular concern that cadmium, iron, lead, manganese and zinc levels in a water sample collected from the Salmo River adjacent to the tailings exceeded BC Water Quality Guidelines (Criteria). Further water sampling at several locations downstream of the tailings is required to confirm and quantify the impact to the Salmo River. This preliminary information indicates a potential for the Yankee Girl tailings to impact the aquatic ecosystem of the Salmo River, downstream water users, recreational users of the site and the community of Ymir. Site security measures and due diligence should be considered to limit public access to the tailings. Also, steps should be taken to conduct additional site characterization to evaluate risks and determine appropriate remedial strategies. Funding options and confirmation of legal responsibilities must first be identified.

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Introduction

There are many historic mine sites located within the Salmo River Watershed. The Yankee Girl mine tailings are situated between the towns of Nelson and Salmo in the West Kootenay region (Figure 1). Concerns about the Yankee Girl tailings site were brought to the attention of the Ministry of Water, Land and Air Protection (MWLAP; formerly Ministry of Environment, Lands and Parks) by the Salmo Watershed Streamkeepers Society in 2000/2001. The Yankee Girl tailings are located on the east bank of the Salmo River directly across the river from the community of Ymir, at the tributary of the Salmo River and Wildhorse (Ymir) Creek (49 17 07 N; 117 11 51 W; cover photo). The sources of the tailings were determined to be the Yankee Girl (MINFILE No. 082FSW067) and Dundee (MINFILE No. 082FSW068) mines which were amalgamated in 1940 (Ministry of Energy and Mines (MEM) 2002). Gold, silver, lead, zinc and cadmium were the primary commodities of the Yankee Girl and Dundee mines, which operated for approximately fifty-two years from 1899 to 1951 (MEM 2002). An initial Land Title search by the MWLAP indicated that all land titles registered to Ymir Yankee Girl Gold Mines Limited at this site had been forfeited to the Crown.

Methods

Site Inspections

Site inspections were conducted by MWLAP and MEM on August 9 2000, September 13 2000, October 26 2001 and November 1 2001. The tailings cover an area of approximately two hectares bordering Wildhorse Creek and the Salmo River located to the north and west, respectively. The tailings extend up to and into the Salmo River forming the riverbank for approximately 15 metres. The tailings primarily consist of fine grey/brown sand-like material. Residues also include blue clay-like and rust-coloured cemented material which appears to be highly oxidized. During freshet, the area of the tailings is flooded and contiguous with the Salmo River. Erosion channels were evident during lower water flows in the late summer and fall site inspections, and pools of stagnant water were observed within the tailings site. Iron bacteria were noted along the bank of the Salmo River.

There is sparse and patchy coverage of shrubs and grasses on the tailings and they are generally devoid of plant life. Certain areas on the tailings give off a sulphur odour. The Salmo Watershed Streamkeepers Society notes that during dry periods there are dust clouds arising from the tailings (Gerry Nellestijn, pers. comm.). The tailings are accessible to the public through an access road which enters the site off Wildhorse Creek Road. Tire marks and evidence of dirt-biking and bonfires were observed at the site indicating recreational use. The Yankee Girl tailings site is aesthetically unappealing and can be seen directly from the community of Ymir.

Field measurements of water temperature, pH, dissolved oxygen and conductivity were taken in the Salmo River upstream, near and downstream of the tailings, at a total of seven sites during the October 2001 site inspection. There was no appreciable difference in these parameters between sampling sites, except for a slight increase in conductivity at the downstream edge of the blue coloured deposit. Conductivity was used as a qualitative assessment to investigate whether or not runoff was entering the river. An increase in conductivity below the tailings may indicate that runoff is reaching the Salmo River. Note that this observation is based on one sample per site giving no indication of variability. pH measurements at all sites were within BC Water Quality Guidelines for the protection of aquatic life and drinking water.

Water and Soil Sampling

Water and soil sampling was conducted by MWLAP on August 9 2000 and November 1 2001. In an initial impact assessment of the tailings in August 2000, water samples were collected from three locations: at a control site along Ymir (Wildhorse) Creek, in the Salmo River near the tailings and in a stagnant pond on the tailings. Soil samples were also collected from tailing residues with different appearances (iron colour deposit; blue-grey coloured deposit; mineral deposit). The water samples were analysed for specific conductance, anions, total metals (ICP) and total cyanide. The soil samples were analysed for total metals (ICP), mercury and total cyanide.

MEM conducted limited water sampling on September 13, 2000. Water sampled from a stagnant pond on the tailings was analysed for total and dissolved metals (MEM 2002).

MWLAP sampled soil at three locations on the tailings on November 1, 2001. Samples were taken at both the surface (0 – 10 cm composite) and depth (15 – 25 cm composite) from the grey-blue coloured deposit and the grey coloured, sandy deposit. One rust-coloured sample was taken the approximate 100 cm depth on the exposed river bank. The samples were analysed for total metals (ICP; ICP-MS), soil pH, total and weak acid dissociable (WAD) cyanide and total mercury. Soil samples taken from the same locations and depths were also processed by the Special Waste Extraction Procedure (SWEP) test and analysed for dissolved metals (ICP; ICP-MS), total and WAD cyanide and total mercury. Results were compared to Special Waste Regulation (SWR) leachate quality standards.

Results and Discussion

August 2000 Water Samples

The BC Water Quality Guidelines (Ministry of Environment, Lands and Parks 1998) or BC Working Water Quality Guidelines for the Protection of Aquatic Life (Nagpal et al. 1998) were exceeded for cadmium, chromium, iron, lead, manganese, and zinc in the water sample taken from the Salmo River directly adjacent to the tailings (Site 1; Table

1). The protection of aquatic life is the most sensitive water use with respect to heavy metals. Therefore, exceedance of the aquatic life guideline does not imply exceedance of drinking water and recreation standards. The exceptions in this case are lead and manganese in which the guidelines for protection of drinking water are more stringent than those for the protection of aquatic life. Concentrations of most heavy metals ranged from levels at the same to one order of magnitude above the guidelines. Cadmium levels were up to three orders of magnitude above the guidelines (Table 1). Iron and zinc concentrations were two orders of magnitude above the respective guidelines (Table 1).

The Water Quality Guidelines were exceeded for sulphate, cadmium, cobalt, iron, manganese and zinc in the water sample taken from the pond on the tailings (Site 2). Similar to river water, concentrations of most metals ranged from levels at the same to one order of magnitude above the guidelines. Cadmium levels were three orders of magnitude above the guidelines (Table 1). Cobalt levels in the pond sample were two orders of magnitude above the guideline (Table 1).

In comparison, only cobalt was in exceedance of the BC Water Quality Guidelines in the water sample collected from Ymir Creek which enters the Salmo River upstream of the tailings (Site 3; reference site). Cobalt levels in the Wildhorse Creek sample were two orders of magnitude above the guideline (Table 1). For results for all three sites, the method detection limit (MDL) of the metals analysis exceeded the Water Quality Guideline for aluminium, antimony, arsenic, chromium, cobalt, iron, lead, nickel, selenium and silver. Therefore comparisons to the Water Quality Guideline could not be made where the result was less than the MDL.

August 2000 Soil Samples

Contaminated Sites Regulation (CSR) generic and matrix numerical soil standards indicate acceptable contaminant concentrations for specific land use. Matrix numerical standards consider site specific factors such as risk due to intake of contaminated soil, toxicity to soil invertebrates and plants and groundwater flow to surface water used by aquatic life. The CSR numerical soil standards applicable to urban park land use were exceeded for arsenic, lead and zinc in the sample collected from the iron coloured deposit (Site 2A; Table 2). Arsenic levels were two orders of magnitude above the CSR standards (Table 2). Lead and zinc levels were one order of magnitude above CSR standards (Table 2). Antimony, arsenic, cadmium, chromium, lead, silver and zinc exceeded the applicable CSR numerical soil standards (Urban Park/Residential) in the blue-grey coloured deposit (Site 2B). Arsenic and lead levels were two orders of magnitude above CSR standards (Table 2). For the other exceedances, metal levels ranged from the same to one order of magnitude above CSR standards at Site 2B.

Antimony, arsenic, copper, lead, silver, tin and zinc exceeded the applicable CSR numerical soil standards in the mineral deposit (Site 2C). Arsenic and lead levels were two orders of magnitude above CSR standards (Table 2). For the other exceedances, metal levels ranged from the same to one order of magnitude above CSR standards at Site

2C. Strictly speaking, soil pH is needed to determine the correct standard to apply to cadmium, copper and lead results and this parameter was not determined. However, it is likely that the standard would have been exceeded as the concentrations of these elements ranged from 2 to 340 times the lowest numerical standard.

It is of concern that the water sample collected from the Salmo River near the tailings was found to have concentrations of cadmium, iron, lead, manganese and zinc which exceeded BC Water Quality Guidelines for the protection of aquatic life and drinking water. Furthermore, these concentrations exceeded the background levels in Wildhorse Creek. This may provide evidence of degraded water quality and an impact of the tailings on the Salmo River. The Salmo River is a regionally significant fish bearing stream with resident bull trout (*Salvelinus confluentus*), rainbow trout (*Oncorhynchus mykiss*), mountain whitefish (*Prosopium williamsoni*), sucker (*Catastomus* spp.), dace (*Rhinichthys* spp.), northern pike minnow (*Ptycocheilus oregonensis*) and sculpin (*Cottus* spp.) fish populations. Bull trout have blue-listed status as a species of special concern (Cannings 1993). There may already be a conservation concern with respect to Salmo River bull trout due to the small size of the population (James Baxter, pers. comm.).

September 2000 Water Samples

The BC Water Quality Guidelines for the protection of aquatic life were exceeded for aluminium (dissolved), cadmium, cobalt, iron, lead, manganese and zinc in the water sample collected from the stagnant pond on the tailings (Table 3). Both total and dissolved cadmium levels were four orders of magnitude above the BC Water Quality Guidelines for protection of aquatic life (Table 3). Both total and dissolved aluminium, cobalt and zinc levels were two orders of magnitude above the guidelines (Table 3). For the other exceedances, metal levels ranged from at the same to one order of magnitude above guidelines at the pond. The MDL, where known, exceeded the Water Quality Guideline for antimony, arsenic, chromium, selenium and silver, therefore comparisons to the Water Quality Guideline cannot be made where the result is less than the MDL. Although it is the dissolved fraction which is generally considered to be bioavailable, the BC Water Quality Guidelines with the exception of aluminium are set for total metals. If the guidelines are met for all the metal present in a sample including particulate metal, then protection is conservatively assured. However, high dissolved levels of aluminium, cadmium, cobalt, iron, lead, manganese and zinc found in the sample do indicate that these metals are indeed bioavailable.

The pond sampled by MEM was observed to be coated by an oily film and copper and iron staining was noted to be prevalent around the pool (MEM 2002). The pool sample was acidic with a pH of 4.9. The BC Water Quality Guidelines for pH require that the pH be compared to a background measurement. No background sample was available; however comparisons to field measurements taken upstream of the tailings in August 2000 indicate that the pH of the pond is well below background. The pH of the pond is also lower than the 6.5 – 8.5 pH range considered to be protective of aquatic life. However, the impact of the acidity of the pond would be attenuated by the low sensitivity

of the Salmo River to acid inputs as indicated by the high calcium content. Metal toxicity is affected by pH as many insoluble substances can become bioavailable as pH drops. This may be supported by the high dissolved metals concentrations found in the pond sample. Sulphate concentration of the pond also exceeded the BC Water Quality Guidelines for the protection of aquatic life. Problems caused by sulphates are most often related to their ability to form strong acids which change the pH. Sulphate ions are also involved in complexing and precipitation reactions which affect the solubility of metals. As well, the water hardness ($Ca^{2+}Mg3^{+}$ calculated) of the pond is classified as very hard, and generally the harder the water, the lower the toxicity of other metals to aquatic life.

There was good agreement among the water samples collected from the ponds on the tailings in August and September 2000. The September water sample had higher hardness than the August WLAP sample. Generally, the harder the water, the lower the toxicity of metals such as lead, cadmium and zinc. However, the BC Water Quality Guidelines are adjusted for hardness for these elements. Cadmium, cobalt, iron, manganese and zinc were found in concentrations which exceeded the guidelines in both samples. The sample collected in September generally had higher levels of these elements which may be due to evaporation as suggested by the MEM report (MEM 2002).

November 2001 Soil Samples

Antimony, arsenic, cadmium, lead, selenium, silver and zinc exceeded the CSR numerical soil standards applicable to Urban Park/Residential land in the soil sample collected from both the surface (0 – 10 cm depth) and at a 15 – 25 cm depth of the grey-blue coloured tailings deposit (Site 1; Table 4). The sample taken at the 0 – 10 cm depth was found to be very acidic with a pH of 1.91. Additionally, the applicable CSR numerical soil standards were exceeded for cobalt and copper in the grey-blue sample taken at a 15 – 25 cm depth which was also very acidic with a pH of 2.48. Levels of arsenic, cadmium, copper, selenium and zinc were higher in the 15 – 25 cm sample than the 0 – 10 cm sample. Levels of antimony, lead and silver were higher in the 0 -10 cm sample. Note that these results are based on a single sample and therefore give no indication of variability of metal concentration in the tailings. Levels of arsenic, cadmium, lead and zinc were two orders of magnitude above CSR standards (Table 4). For the other exceedances, metal levels ranged up to one order of magnitude above CSR standards.

Arsenic, cadmium, lead and zinc exceeded the CSR numerical soil standards in the sample collected at a 100 cm depth on the exposed bank of the rust coloured deposit. Levels of cadmium were two orders of magnitude above CSR standards (Table 4). For the other exceedances, metal levels ranged up to one order of magnitude above CSR standards.

Arsenic, cadmium, chromium, lead and zinc exceeded the applicable CSR numerical soil standards in the soil sample collected from both the surface (0 -10 cm depth) and at a 15 – 25 cm depth of the grey coloured, sandy tailings deposit. Arsenic, cadmium, chromium,

lead and zinc exceeded the applicable CSR numerical soil standards in the samples collected both at 0 – 10 cm depth and 15 – 25 cm depth. Levels of arsenic, chromium and lead were higher in the 15 – 25 cm depth sample than the 0 – 25 cm depth sample. Levels of cadmium and zinc were higher in the surface sample. Levels of cadmium were two orders of magnitude above CSR standards (Table 4). For the other exceedances, metal levels ranged up to one order of magnitude above CSR standards.

SWR Leachate Quality Standards were exceeded for cadmium in samples collected from both a 0 – 10 cm depth and a 15 – 25 cm depth from the grey-blue coloured tailings deposit. Levels of cadmium were one order of magnitude above Leachate standards (Table 5). SWR Leachate Quality Standards were exceeded for lead and cadmium in the sample collected at a 100 cm depth on the exposed bank of the rust coloured deposit. Cadmium levels were one order of magnitude while lead levels were of the same order of magnitude, above Leachate standards (Table 5). SWR Leachate Quality Standards were exceeded for cadmium in samples collected from both a 0 – 10 cm depth and a 15 – 25 cm depth from the grey coloured, sandy tailings deposit. Cadmium levels were one order of magnitude above Leachate standards (Table 5).

Based on the Leachate Quality Standards of the SWR and Transportation of Dangerous Goods Class 9.2 provisions, the tailings qualify as special waste. Based on regulatory terminology, the tailings are considered 'leachable toxic waste'. Despite provisions of Section 13 of the CSR, the site would be deemed to contain a special waste.

There was good agreement among results of soil samples collected in August 2000 and November 2001. The grey-blue coloured oxidised deposit has levels of arsenic, cadmium, lead, silver and zinc above CSR numerical soil standards. Antimony, chromium and selenium levels in the tailings may also exceed soil standards. The rust coloured mineral deposit has levels of arsenic, lead and zinc above CSR numerical soil standards. Antimony, copper, silver, cadmium and tin concentrations in the tailings may also exceed soil standards. The sandy grey tailings material had levels of arsenic, cadmium, chromium, lead and zinc above CSR numerical soil standards. Of particular concern are the elements cadmium and lead in the tailings which exceed SWR Leachate Quality Standards and are present and bioavailable in the dissolved fraction.

Contaminant Effects

The main contaminants of concern are cadmium and lead, and to a lesser extent, arsenic, zinc, chromium and silver. The toxic effects of these heavy metals on aquatic organisms and humans are well documented (CCME 1999; Nagpal 1999; Warrington 1996; CCREM 1987). Benthic organisms are exposed to both particulate and dissolved forms of metals in interstitial and overlying waters, as well as sediment bound metals through surface contact and ingestion of sediment (CCME 1999). Biological effects include decreased benthic invertebrate abundance, increased mortality and behavioural changes. In terms of human exposure, the Yankee Girl tailings appear to be used for recreation and therefore pose a risk to humans of inhalation and dermal exposure to contaminants.

Cadmium is a non-essential trace element that can be toxic to aquatic organisms at elevated concentrations. Cadmium tends to be removed rapidly from solution and accumulate in bottom sediments. However, changes in environmental conditions such as lowering of pH may allow cadmium to be mobilized. It is unclear whether cadmium undergoes biomagnification in aquatic food webs; however the Canadian Water Quality Guidelines indicate that the protection of fish and aquatic life is the most sensitive water use with respect to cadmium (CCME 1999). In humans, critical organs that may be affected by exposure to cadmium include the kidney and liver (Krenkel 1975).

The protection of fish and aquatic life is the most sensitive water use with respect to water-borne lead. Chronic toxicity thresholds of dissolved lead have been estimated at 12.3 and 18.9 ug/L for water fleas (*Daphnia* spp.) and rainbow trout, respectively (CCREM 1987). In humans, critical organs that may be affected by exposure to lead include the central and peripheral nervous system, haematopoietic system and kidney (Krenkel 1975). Chromium is an essential trace element that can be toxic to aquatic biota at elevated concentrations. Chromium may bioaccumulate in aquatic plants, although bioaccumulation has not been demonstrated in fish (CCME 1999).

Zinc is found naturally in many rock-forming minerals and is an essential element in the diet. Zinc is most toxic to microscopic organisms in the aquatic environments (Nagpal 1999). Dissolved forms of zinc are believed to be the most readily bioavailable, and therefore, considered as most toxic. It has been shown that zinc in water is a better predictor of fish tissue contamination than zinc in either sediment or invertebrates (*i.e.*, food source) (Nagpal 1999). Arsenic is a metalloid that is considered nonessential to living organisms. Microorganisms in the sediments can transform inorganic arsenic into an organic form which may bioaccumulate in aquatic organisms (CCME 1999). Silver is one of the most toxic of the heavy metals to freshwater micro-organisms or the larval forms of aquatic animals (Warrington 1996). Invertebrates and embryos of fish are also generally more sensitive to silver than juvenile and adult fish (Warrington 1996).

Human Health Concerns

There are currently three active water licenses on the Salmo River downstream of the tailings site (License No. C028928; C029765; C047187), and the Salmo River itself is used for recreational activities such as swimming and rafting. Kootenay Boundary Health Services is currently assisting known downstream water users in assessing their water quality in comparison with Canadian Drinking Water Guidelines. An alternate and uninvolved source of drinking water is used for the community of Ymir, and there is no indication that food is grown at the Yankee Girl tailings site. The Salmo River fishery has been designated as a catch and release fishery only for bull trout, however currently the rainbow trout quota is 2 per day (none under 30 cm) for the period from June 15th to October 31st (2002-2003 Freshwater Fishing Regulations Synopsis 2002). Dermal absorption of these contaminants is likely to be very low. The most likely route to metals exposure through direct contact with the tailings would be by ingestion of dirt and dust.

Although metal concentrations in the breathing zone of cyclists and motor bikers may be elevated during dry weather, these exposures would likely take place in relatively small numbers over the year. As well windblown dust is unlikely to carry any significant concentration of contaminants offsite on an ongoing basis. (Dr. Nelson Ames, pers. comm.).

Conclusion and Recommendations

There are three primary concerns evident from the limited site investigation of the Yankee Girl tailings. These are the high metal contaminant levels in the tailings, their leachable nature and the evidence that metals concentrations in the Salmo River adjacent to the tailings are elevated as compared to the BC Water Quality Guidelines and a reference site. This limited preliminary information indicates a potential for the Yankee Girl tailings to impact the aquatic ecosystem of the Salmo River, downstream water users, recreational users of the site and the community of Ymir. Further water sampling at several locations adjacent to and downstream of the tailings is required to confirm and quantify the tailings impact on the river. In addition to site characterization sampling, consideration should be given to public consultation, site security and if necessary, options for funding further site characterization/impact assessment, monitoring and site remediation.

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Tables

Table 1 Analytical results of water samples collected from Wildhorse Creek, from the Salmo River near the Yankee Girl tailings and from a pond on the tailings, by MWLAP on August 9 2000.

PARAMETER	**WATER SAMPLES**			**MDL**	**UNITS**	**BC Water Quality Guidelines (Criteria)**	
	Site 1 Salmo River near Tailings	Site 2 Pond on Tailings	Site3 Ymir Creek (control)			Aquatic Life (mg/L)	Drinking Water (mg/L)
General							
Cyanide, Total	<0.03	<0.03	<0.03	0.03	mg/L		0.2
Specific Conductance	225	439	95	2	uS/cm		
Hardness, calc.	133.4	193.6	43.3		mg $CaC0_3$		
Chloride	0.5	1.1	0.3	0.1	mg/L		
Fluoride	0.09	0.26	0.06	0.01	mg/L	0.2 hardness < 50 mg/L; 0.3 hardness ≥ 50 mg/L	1.5
Sulphate	59	203	6.6	3	mg/L	100	500
Bromide	<0.05	<0.05	<0.05	0.05	mg/L		
Nitrate	0.005	<0.002	0.019	0.002	mg/L	40	10
Nitrite	<0.005	<0.005	<0.005	0.005	mg/L	0.06	1
Phosphorus	<0.05	<0.05	<0.05	0.05	mg/L		0.01
ICP Total Metals							
Aluminum	1.60	0.06	<0.06	**0.06**	mg/L	0.1 (Dissolved; pH dependent)	0.2 (Dissolved)
Antimony	<0.06	<0.06	<0.06	**0.06**	mg/L	0.02 (WG)	0.006
Arsenic	<0.06	<0.06	<0.06	**0.06**	mg/L	0.005 (WG)	0.025
Barium	0.064	0.042	0.012	0.001	mg/L	5 (WG)	1
Berylium	<0.001	0.001	<0.001	0.001	mg/L	0.0053 (WG)	
Boron	0.08	0.01	<0.01	0.01	mg/L	5 (WG)	5
Cadmium	0.016	0.086	<0.006	**0.006**	mg/L	0.000042 hardness 133.4 mg/L; 0.000058 hardness 193.6mg/L; 0.000016 hardness 43.3 mg/L (WG)	0.005
Calcium	42.3	60.8	14.5	0.1	mg/L		
Chromium	0.010	<0.006	0.011	**0.006**	mg/L	0.001 (WG)	0.05
Cobalt	<0.006	0.011	0.015	**0.006**	mg/L	0.0009 (WG)	
Copper	<0.006	<0.006	<0.006	**0.006**	mg/L	0.002 hardness < 50 mg/L; 0.00004 ≥ 50 mg/L	1 (aesthetic)
Iron	32.300	1.810	0.017	0.006	mg/L	0.3 (WG)	0.3 (aesthetic)

Table 1 continued.

PARAMETER	WATER SAMPLES			MDL	UNITS	BC Water Quality Guidelines (Criteria)	
	Site 1 Salmo River near Tailings	Site 2 Pond on Tailings	Site3 Ymir Creek (control)			Aquatic Life (mg/L)	Drinking Water (mg/L)
Lead	0.15	<0.06	<0.06	**0.06**	mg/L	0.118 hardness 133.4 mg/L; 0.189 hardness 193.4 mg/L; 0.028 hardness 43.3 mg/L	0.01
Magnesium	6.7	10.1	1.7	0.1	mg/L		100 (taste threshold)
Manganese	0.447	0.488	<0.001	0.001	mg/L	0.1 - 1.0 (WG)	0.05 (aesthetic)
Molybdenum	<0.01	<0.01	<0.01	0.01	mg/L	2	0.25
Nickel	<0.02	0.03	<0.02	**0.02**	mg/L	0.025 hardness 0-60 mg/L; 0.110 hardnesss 120-180 mg/L; 0.150 hardness >180 mg/L(WG)	
Phosphorus	0.5	<0.1	<0.1	0.1	mg/L		
Potassium	1.8	2.1	0.6	0.1	mg/L		
Selenium	<0.06	<0.06	<0.06	**0.06**	mg/L	0.001 (WG)	0.01
Silicon	7.56	5.39	3.50	0.06	mg/L		
Silver	<0.01	<0.01	<0.01	**0.01**	mg/L	0.0001	
Sodium	1.0	2.1	0.9	0.1	mg/L		200 (aesthetic)
Strontium	0.223	0.333	0.096	0.001	mg/L		
Sulfur	26.3	70.6	2.41	0.06	mg/L		
Tin	<0.06	<0.06	<0.06	0.06	mg/L		
Titanium	0.092	<0.002	0.003	0.002	mg/L	0.1 (WG)	
Vanadium	<0.01	<0.01	<0.01	0.01	mg/L		
Zinc	1.990	3.540	0.015	0.002	mg/L	0.07 hardness 133.4 mg/L; 0.11 hardness 193.4 mg/L; 0.03 hardness 43.3 mg/L	5 (aesthetic)

MDL above WQ criteria
WG = Working Water Quality Guideline

Table 2 Analytical results of soil samples collected from three different looking residues on the Yankee Girl tailings by MWLAP on August 9 2000.

PARAMETER	**SEDIMENT SAMPLES**			**MDL**	**UNITS**	**CSR NUMERICAL SOIL STANDARDS**	
	Site 2A Iron colour deposit	Site 2B Bluish deposit	Site 2C Mineral looking deposit			Generic Numerical Soil Standard (Urban Park/Residential)	Matrix Numerical Soil Standards (Urban Park/Residential)
General							
Cyanide, Total	0.8	26.2	2.7	0.5	ug/g		
ICP Total Metals							
Aluminum	8700	24000	7330	8	ug/g		
Antimony	<8	81	195	8	ug/g	20 ug/g	
Arsenic	1680	1030	1950	8	ug/g		35 ug/g[1]
Barium	116.0	286.0	101.0	0.2	ug/g	500 ug/g	
Berylium	0.5	0.9	0.5	0.2	ug/g	4 ug/g	
Boron	238	133	594	2	ug/g		
Cadmium	<0.8	14.8*	<0.8	0.8	ug/g		1.5 ug/g[3] pH<6.0; 8 ug/g[3] pH6.5-7.0; 3 or 35 ug/g[1]
Calcium	694	2000	388	20	ug/g		
Chromium	59.2	65.7	29.6	0.8	ug/g		60 ug/g[3]
Cobalt	<0.8	1.6	36.0	0.8	ug/g		
Copper	17.0	125.0	187*	0.8	ug/g		90 ug/g[3] pH<5.0; 150 ug/g[2]
Iron	120000.0	59200.0	323000.0	0.8	ug/g		
Lead	1120*	51100*	13000*	8	ug/g		150 ug/g[3] pH<5.5; 500 ug/g[1]
Magnesium	1060	2010	503	20	ug/g		
Manganese	<0.2	30.2	<0.2	0.2	ug/g		
Molybdenum	<2	<2	<2	2	ug/g	10 ug/g	
Nickel	<3	4	77	3	ug/g	100 ug/g	
Phosphorus	562	548	<20	20	ug/g		
Potassium	5210	13300	4020	20	ug/g		
Selenium	<8	<8	<8	8	ug/g	3 ug/g	
Silicon	522	352	283	8	ug/g		
Silver	<2	124	39	2	ug/g	20 ug/g	
Sodium	239	585	45	20	ug/g		

Table 2 continued.

PARAMETER	SEDIMENT SAMPLES			MDL	UNITS	CSR NUMERICAL SOIL STANDARDS	
	Site 2A Iron colour deposit	Site 2B Bluish deposit	Site 2C Mineral looking deposit			Generic Numerical Soil Standard (Urban Park/Residential)	Matrix Numerical Soil Standards (Urban Park/Residential)
Strontium	113.0	132.0	32.7	0.2	ug/g		
Sulfur	11000	27300	36200	8	ug/g		
Tin	35	21	60	8	ug/g	50 ug/g	
Titanium	148.0	766.0	72.0	0.3	ug/g		
Vanadium	64	74	74	2	ug/g	200 ug/g	
Zinc	2880.0	1390.0	1070.0	0.3	ug/g		150 ug/g[3] pH<6.0; 450 ug/g[2]
Mercury	0.025	0.920	0.660	0.016	ug/g		

[1]Human Health Protection - Intake of contaminated soil

[2]Environmental Protection - Toxicity to soil invertebrates and plants

[3]Environmental Protection - Groundwater flow to surface water used by aquatic life

* Need soil pH

Table 3 Analytical results of a water sample collected from a stagnant pond on the Yankee Girl tailings by MEM on September 13 2000.

PARAMETER	**WATER SAMPLE** Pond on Tailings		**MDL**	**UNITS**	**BC Water Quality Guidelines (Criteria)** Aquatic Life (mg/L)	Drinking Water (mg/L)
General						
pH	4.92		0.03	mg/L		6.5 - 8.5 (aesthetic)
Sulphate	410		2	uS/cm	100 mg/L	≤ 500 mg/L (aesthetic)
Hardness, calc.	349			mg $CaC0_3$		
ICP Metals	***Dissolved***	***Total***				
Aluminum	2.6	2.8		mg/L	0.022 (Dissolved)	0.2 (Dissolved)
Antimony	<0.2	<0.2	**0.2**	mg/L	0.02 (WG)	0.006
Arsenic	<0.2	<0.2	**0.2**	mg/L	0.005 (WG)	0.025
Barium	0.04	0.04		mg/L	5 (WG)	1
Berylium	<0.005	<0.005	0.005	mg/L	0.0053 (WG)	
Bismuth	<0.1	<0.1	0.1			
Boron	<0.1	<0.1	0.1	mg/L	5 (WG)	5
Cadmium	0.82	0.87		mg/L	0.00009 hardness 348.7 mg/L (WG)	0.005
Calcium	106	108		mg/L	> 8 low sensitivity to acid inputs	
Chromium	<0.01	<0.01	**0.01**	mg/L	0.001 (WG)	0.05
Cobalt	0.02	0.02		mg/L	0.0009 (WG)	
Copper	0.02	0.02		mg/L	0.035 hardness 348.7 mg/L	1 (aesthetic)
Iron	0.73	6.43		mg/L	0.3 (WG)	0.3 (aesthetic)
Lead	0.41	0.49		mg/L	0.4 hardness 348.7 mg/L	0.01
Lithium	0.01	0.01				
Magnesium	19	19.2		mg/L		100 (taste threshold)
Manganese	2.14	2.18		mg/L	0.1 - 1.0 (WG)	0.05 (aesthetic)
Molybdenum	<0.03	<0.03	0.03	mg/L	2	0.25
Nickel	<0.05	<0.05	0.05	mg/L	0.150 hardness >180 mg/L(WG)	
Phosphorus	<0.3	<0.3	0.3	mg/L		
Potassium	<2	2	2	mg/L		
Selenium	<0.2	<0.2	**0.2**	mg/L	0.001 (WG)	0.01
Silicon	8.3	8.5		mg/L		

Table 3 continued.

PARAMETER	WATER SAMPLES Pond on Tailings		MDL	UNITS	BC Water Quality Guidelines (Criteria)	
					Aquatic Life (mg/L)	Drinking Water (mg/L)
Silver	<0.01	<0.01	**0.01**	mg/L	0.0001	
Sodium	2	3		mg/L		200 (aesthetic)
Strontium	0.51	0.52		mg/L		
Sulfur	<0.2	<0.2	0.2	mg/L		
Tin	<0.03	<0.03	0.03	mg/L		
Titanium	<0.01	<0.01	0.01	mg/L	0.1 (WG)	
Vanadium	<0.03	<0.03	0.03	mg/L		
Zinc	25.1	25.8		mg/L	0.227 (WG)	5 (aesthetic)

MDL above WQ criteria
WG = Working Water Quality Guideline

Table 4 Analytical results of soil samples collected from three different looking residues of the Yankee Girl tailings by MWLAP on November 1 2001.

PARAMETER	**SITES SAMPLED**					**MDL**	**UNITS**	**CSR NUMERICAL SOIL STANDARDS**	
	Site 1 (grey/blue deposit) Surface	Site 1 (grey/blue deposit) Depth	Site 2 (rusty deposit)	Site 3 (grey sandy deposit) Surface	Site 3 (grey sandy deposit) Depth			Generic Numerical Soil Standard (Urban Park/Residential)	Matrix Numerical Soil Standards (Urban Park/Residential)
	0-10 cm depth (composite)	15-25 cm depth (composite)	~100 cm depth on exposed bank (composite)	0-10 cm depth (composite)	15-25 cm depth (composite)				
General									
pH sediment	1.91	2.48	4.48	6.68	7.21	0.01	pH Units		
Cyanide, Total	20.8	36.0	7.3	1.3	<0.5	0.5	ug/g (wet)		
Cyanide, WAD	1.9	0.9	1.1	<0.5	0.7	0.5	ug/g (wet)	10 ug/g	
ICP Total Metals									
Aluminum	25420	14470	13780	11070	13640	8	ug/g (dry)		
Antimony	72	46	<8	<8	13	8	ug/g (dry)	20 ug/g	
Arsenic	<8	2089	605	289	315	8	ug/g (dry)		35 ug/g[1]
Barium	267.2	107.6	68.9	75.4	86.2	0.2	ug/g (dry)	500 ug/g	
Berylium	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	ug/g (dry)	4 ug/g	
Boron	<2	<2	<2	<2	<2	2	ug/g (dry)		
Cadmium	58.5	629.5	134.0	197.6	189.1	0.8	ug/g (dry)		1.5 ug/g[3] pH<6.0; 8 ug/g[3] pH 6.5-<7.0; 3 or 35 ug/g[1]
Calcium	3267	4095	5564	23590	26900	20	ug/g (dry)		
Chromium	55.0	41.7	51.9	65.1	128.1	0.8	ug/g (dry)		60 ug/g[3]
Cobalt	5.4	55.7	1.2	3.1	3.7	0.8	ug/g (dry)		
Copper	81.6	317.5	86.4	14.5	25.3	0.8	ug/g (dry)		90 ug/g[3] pH<5.0; 150 ug/g[2]
Iron	46130.0	93350.0	92980.0	35040.0	45860.0	0.8	ug/g (dry)		
Lead	64910	32710	345	2759	4223	80	ug/g (dry)		150 ug/g[3] pH<5.5; 500 ug/g[1]
Magnesium	1773	7593	10050	12160	18480	20	ug/g (dry)		
Manganese	19.0	21.3	245.4	2022.0	2306.0	0.2	ug/g (dry)		
Molybdenum	5	5	3	<2	<2	2	ug/g (dry)	10 ug/g	
Nickel	5	40	14	5	5	3	ug/g (dry)	100 ug/g	

Table 4 continued.

PARAMETER	**SITES SAMPLED**					**MDL**	**UNITS**	**CSR NUMERICAL SOIL STANDARDS**	
	Site 1 (grey/blue deposit) Surface 0-10 cm depth (composite)	Site 1 (grey/blue deposit) Depth 15-25 cm depth (composite)	Site 2 (rusty deposit) ~100 cm depth on exposed bank (composite)	Site 3 (grey sandy deposit) Surface 0-10 cm depth (composite)	Site 3 (grey sandy deposit) Depth 15-25 cm depth (composite)			Generic Numerical Soil Standard (Urban Park/Residential)	Matrix Numerical Soil Standards (Urban Park/Residential)
ICP Total Metals									
Phosphorus	153	4061	4035	896	848	20	ug/g (dry)		
Potassium	13500	6756	1696	4956	5600	20	ug/g (dry)		
Selenium	14	19	<8	<8	<8	8	ug/g (dry)	3 ug/g	
Silicon	742	552	1533	1041	1055	8	ug/g (dry)		
Silver	258	139	<2	7	12	2	ug/g (dry)	20 ug/g	
Sodium	157	<20	32	<20	<20	20	ug/g (dry)		
Strontium	266.9	127.5	64.5	203.3	255.5	0.2	ug/g (dry)		
Sulfur	51100	274900	6126	3618	2033	8	ug/g (dry)		
Tin	10	14	12	9	9	8	ug/g (dry)	50 ug/g	
Titanium	265.2	105.3	1039.0	218.2	256.7	0.3	ug/g (dry)		
Vanadium	61	32	64	34	57	2	ug/g (dry)	200 ug/g	
Zinc	1934.0	21620.0	4166.0	8039.0	6474.0	0.3	ug/g (dry)		150 ug/g[3] pH<6.0; 450 ug/g[2]
ICPMS Total Metals									
Antimony	71.200	46.237	1.840	6.467	12.512	0.005	ug/g (dry)	20 ug/g	
Arsenic	713.0	2325.0	555.0	295.0	336.0	0.1	ug/g (dry)		35 ug/g[1]
Barium	253.52	108.57	67.08	71.94	83.59	0.02	ug/g (dry)	500 ug/g	
Berylium	0.985	0.363	0.124	0.687	0.727	0.002	ug/g (dry)	4 ug/g	
Bismuth	32.80	30.80	0.80	1.40	2.12	0.02	ug/g (dry)		
Cadmium	53.00	583.00	123.00	181.00	175.00	0.01	ug/g (dry)		1.5 ug/g[3] pH<6.0; 8 ug/g[3] pH 6.5-<7.0; 3 or 35 ug/g[1]
Chromium	52.9	42.2	49.5	61.2	119	0.2	ug/g (dry)		60 ug/g[3]
Cobalt	6.384	66.000	6.689	3.720	4.405	0.005	ug/g (dry)	50 ug/g	
Copper	76.95	307.89	78.23	16.16	24.29	0.05	ug/g (dry)		90 ug/g[3] pH<5.0; 150 ug/g[2]

Table 4 continued.

PARAMETER	**SITES SAMPLED**					**MDL**	**UNITS**	**CSR NUMERICAL SOIL STANDARDS**	
	Site 1 (grey/blue deposit) Surface	Site 1 (grey/blue deposit) Depth	Site 2 (rusty deposit)	Site 3 (grey sandy deposit) Surface	Site 3 (grey sandy deposit) Depth			Generic Numerical Soil Standard (Urban Park/Residential)	Matrix Numerical Soil Standards (Urban Park/Residential)
	0-10 cm depth (composite)	15-25 cm depth (composite)	~100 cm depth on exposed bank (composite)	0-10 cm depth (composite)	15-25 cm depth (composite)				
ICPMS Total Metals									
Lead	55710.00	30062.00	370.82	2246.00	3445.00	0.01	ug/g (dry)		150 ug/g[3] pH<5.5; 500 ug/g[1]
Lithium	3.76	2.09	9.56	4.68	7.22	0.05	ug/g (dry)		
Manganese	16.337	18.421	209.928	1535.000	1628.000	0.005	ug/g (dry)		
Molybdenum	4.89	7.01	4.38	0.79	1.00	0.05	ug/g (dry)	10 ug/g	
Nickel	5.54	39.98	15.5	5.63	5.65	0.05	ug/g (dry)	100 ug/g	
Selenium	7.1	19.4	2.3	1.4	1.5	0.2	ug/g (dry)	3 ug/g	
Silver	111.00	62.50	1.17	4.82	7.71	0.02	ug/g (dry)	20 ug/g	
Strontium	216.261	103.040	54.676	155.949	186.065	0.005	ug/g (dry)		
Thallium	0.542	0.344	0.079	0.147	0.177	0.002	ug/g (dry)		
Tin	3.76	4.14	4.12	0.44	0.70	0.05	ug/g (dry)	50 ug/g	
Uranium	0.371	0.509	1.053	1.035	1.230	0.002	ug/g (dry)		
Vanadium	58.54	29.97	59.85	31.80	50.88	0.05	ug/g (dry)	200 ug/g	
Zinc	1734.0	18817.0	3814.0	6883.0	5861.0	0.1	ug/g (dry)		150 ug/g[3] pH<6.0; 450 ug/g[2]
Mercury	1.350	0.352	0.051	0.054	0.069	0.008	ug/g (dry)		

[1]Human Health Protection - Intake of contaminated soil

[2]Environmental Protection - Toxicity to soil invertebrates and plants

[3]Environmental Protection - Groundwater flow to surface water used by aquatic life

Table 5 Special Waste Extraction Procedure results of soil samples collected from three different looking residues of the Yankee Girl tailings by MWLAP on November 1 2001.

PARAMETER	**SITES SAMPLED**					**MDL**	**UNITS**	**SPECIAL WASTE REGULATION**
Special Waste Extraction Procedure	Site 1 (grey/blue deposit) Surface 0-10 cm depth (composite)	Site 1 (grey/blue deposit) Depth 15-25 cm depth (composite)	Site 2 (rusty deposit) ~100 cm depth on exposed bank (composite)	Site 3 (grey sandy deposit) Surface 0-10 cm depth (composite)	Site 3 (grey sandy deposit) Depth 15-25 cm depth (composite)			Leachate Quality Standards
General								
Cyanide, Total	0.05	0.04	0.03	<0.03	0.04	0.03	mg/L	
Cyanide, WAD	0.04	0.03	<0.03	<0.03	<0.03	0.03	mg/L	
Hardness, CaMg diss.	361.9	354.7	576.5	25.5	576.5	0.4	mg CaC03/L	
Hardness, Total diss.	786.6	1112.7	802.4	33.0	857.4	0.4	mg CaC03/L	
ICP Dissolved								
Aluminum	12.64	11.33	<0.05	<0.05	<0.05	0.05	mg/L	
Barium	<0.001	<0.001	0.376	0.037	0.150	0.001	mg/L	100 mg/L
Calcium	138.7	133.3	160.3	8.9	209.8	0.1	mg/L	
Copper	0.491	1.276	0.046	<0.005	<0.005	0.005	mg/L	100 mg/L
Iron	157.400	153.100	0.519	<0.005	0.064	0.005	mg/L	
Lead	2.62	2.42	11.80	<0.05	1.89	0.05	mg/L	5.0 mg/L
Magnesium	3.8	5.3	42.8	0.8	12.8	0.1	mg/L	
Manganese	0.385	0.553	19.600	0.202	5.617	0.001	mg/L	
Phosphorus	0.2	<0.1	<0.1	<0.1	<0.1	0.1	mg/L	
Potassium	<0.1	1.7	1.5	0.5	0.5	0.1	mg/L	
Silicon	0.65	<0.05	6.48	2.61	24.80	0.05	mg/L	
Sodium	<0.1	<0.1	<0.1	0.3	<0.1	0.1	mg/L	
Strontium	0.136	0.122	1.102	0.054	0.865	0.001	mg/L	
Sulfur	374.00	390.00	2.16	12.03	0.63	0.05	mg/L	
Titanium	0.016	<0.002	<0.002	<0.002	0.010	0.002	mg/L	
Zinc	60.630	285.550	118.850	4.531	175.450	0.002	mg/L	500.0 mg/L

Table 5 continued.

PARAMETER	**SITES SAMPLED**					**MDL**	**UNITS**	**SPECIAL WASTE REGULATION**
Special Waste Extraction Procedure	Site 1 (grey/blue deposit) Surface 0-10 cm depth (composite)	Site 1 (grey/blue deposit) Depth 15-25 cm depth (composite)	Site 2 (rusty deposit) ~100 cm depth on exposed bank (composite)	Site 3 (grey sandy deposit) Surface 0-10 cm depth (composite)	Site 3 (grey sandy deposit) Depth 15-25 cm depth (composite)			Leachate Quality Standards
ICPMS Dissolved								
Alumium	11302.0	11024.0	5.7	33.1	1.4	0.2	ug/L	
Antimony	25.268	43.239	0.029	0.022	0.148	0.005	ug/L	
Arsenic	754.0	2593.0	2.4	1.4	3.9	0.1	ug/L	5000 ug/L
Barium	2.96	1.18	341.94	46.28	141.03	0.02	ug/L	100000 ug/L
Berylium	0.833	0.858	0.290	0.009	0.213	0.002	ug/L	
Bismuth	0.06	0.04	<0.02	<0.02	<0.02	0.02	ug/L	
Boron	3	<2	13	<2	15	2	ug/L	500000 ug/L
Cadmium	1944.00	6606.00	6357.00	780.00	5340.00	0.01	ug/L	500 ug/L
Chromium	84.6	161.2	<0.2	<0.2	<0.2	0.2	ug/L	5000 ug/L
Cobalt	59.108	289.849	29.436	7.991	4.642	0.005	ug/L	
Copper	462.16	1224.00	56.44	1.60	14.27	0.05	ug/L	100000 ug/L
Lead	2573.00	2555.00	8965.00	0.82	1273.00	0.01	ug/L	5000 ug/L
Lithium	9.26	9.85	0.89	2.43	0.37	0.05	ug/L	
Magnesium	3749.52	5682.57	39178.00	1180.62	10934.00	0.05	ug/L	
Manganese	357.300	562.000	14800.000	246.073	4840.000	0.005	ug/L	
Molybdenum	0.61	0.44	<0.05	<0.05	0.05	0.05	ug/L	
Nickel	42.54	116.68	20.04	11.05	14.63	0.05	ug/L	
Selenium	10.9	<0.2	<0.2	<0.2	<0.2	0.2	ug/L	1000 ug/L
Silver	27.22	0.17	0.07	<0.02	0.11	0.02	ug/L	5000 ug/L
Strontium	128.407	124.756	876.000	68.750	642.000	0.005	ug/L	
Thallium	0.035	0.430	0.017	<0.002	<0.002	0.002	ug/L	
Tin	0.06	<0.01	<0.01	<0.01	<0.01	0.01	ug/L	
Uranium	1.495	4.119	0.167	0.012	0.120	0.002	ug/L	10000 ug/L
Vanadium	14.66	29.87	0.92	<0.05	0.73	0.05	ug/L	

Table 5 continued.

PARAMETER	**SITES SAMPLED**					**MDL**	**UNITS**	**SPECIAL WASTE REGULATION**
Special Waste Extraction Procedure	Site 1 (grey/blue deposit) Surface	Site 1 (grey/blue deposit) Depth	Site 2 (rusty deposit)	Site 3 (grey sandy deposit) Surface	Site 3 (grey sandy deposit) Depth			Leachate Quality Standards
	0-10 cm depth (composite)	15-25 cm depth (composite)	~100 cm depth on exposed bank (composite)	0-10 cm depth (composite)	15-25 cm depth (composite)			
Zinc	58654.0	241900.0	105900.0	5955.0	151300.0	0.1	ug/L	500000 ug/L
Mercury Diss.	<0.05	0.13	<0.05	<0.05	<0.05	0.05	ug/L	100 ug/L

Figures

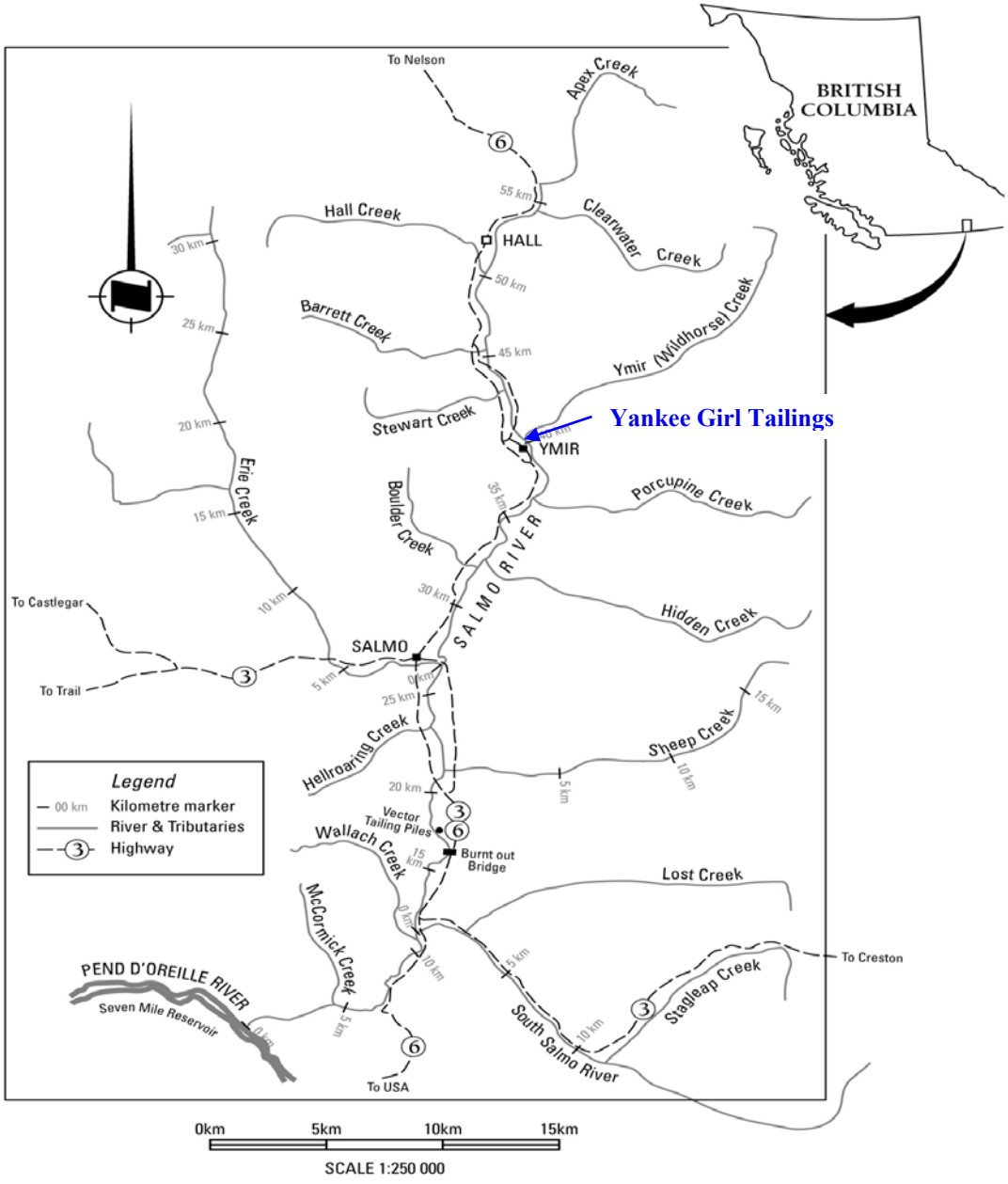

Figure 1 Map of the Salmo River Watershed. Yankee Girl tailings located on the east bank of the Salmo River at Ymir (Wildhorse Creek). (Courtesy: James Baxter and the Salmo Watershed Streamkeepers Society).

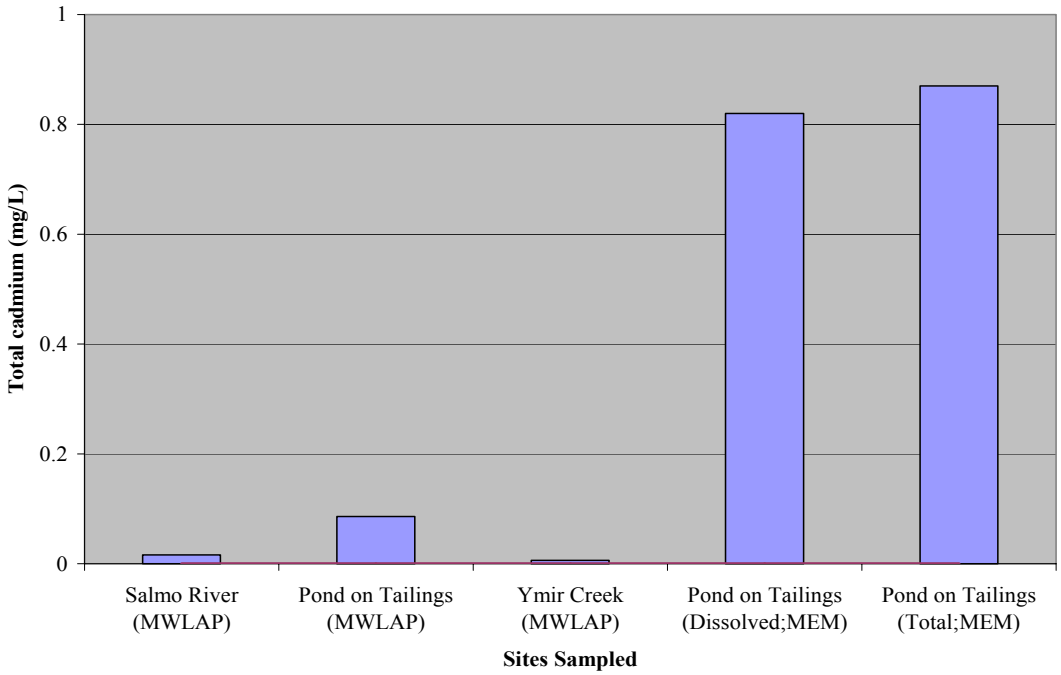

Figure 2 Total cadmium (mg/L) in water samples collected from the Salmo River near the Yankee Girl tailings, a pond on the tailings and Wildhorse (Ymir) Creek by MWLAP on August 9 2000 and from a pond on the tailings by the Ministry of Energy and Mines on September 13 2000.

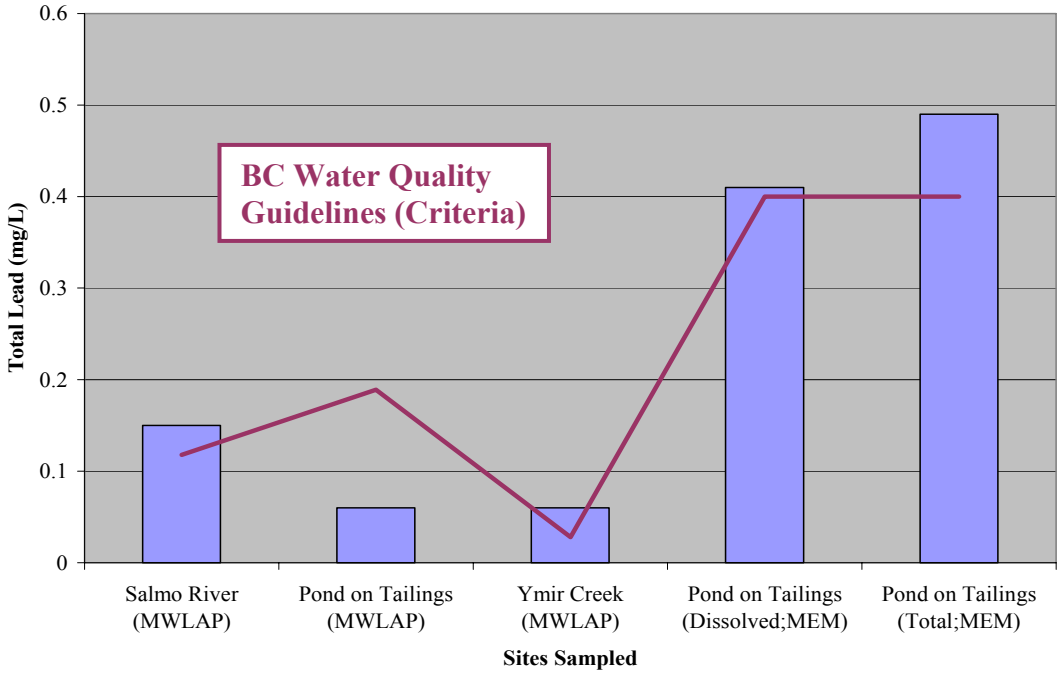

Figure 3 Total lead (mg/L) in water samples collected from the Salmo River near the Yankee Girl tailings, a pond on the tailings and Wildhorse (Ymir) Creek by the MWLAP on August 9 2000, and from a pond on the tailings by MEM on September 13 2000.

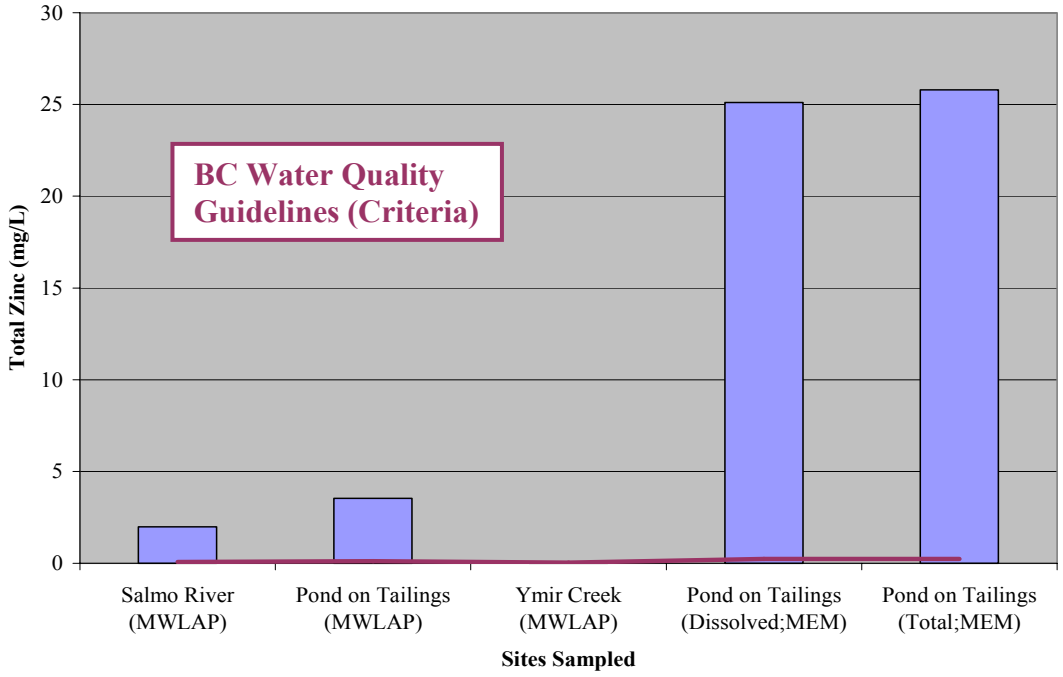

Figure 4 Total zinc (mg/L) in water samples collected from the Salmo River near the Yankee Girl tailings, a pond on the tailings and Wildhorse (Ymir) Creek by MWLAP on August 9 2000 and from a pond on the tailings by MEM on September 13 2000.

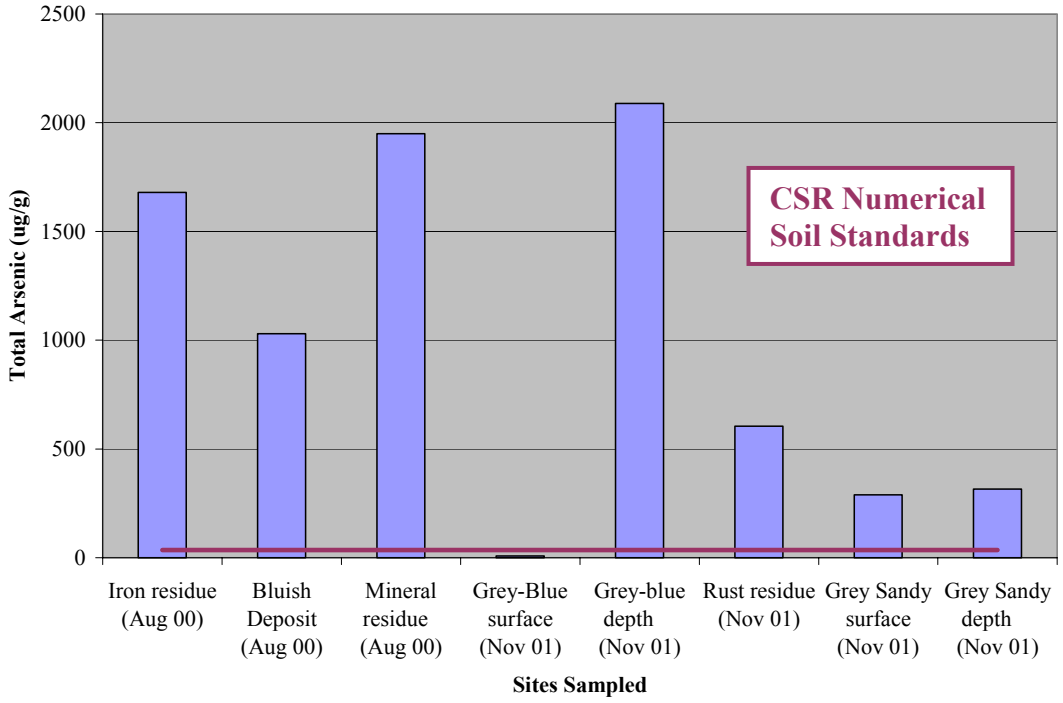

Figure 5 Total arsenic (ug/g) in soil samples collected from three different looking residues of the Yankee Girl tailings by MWLAP on August 9 2000 and November 1 2001.

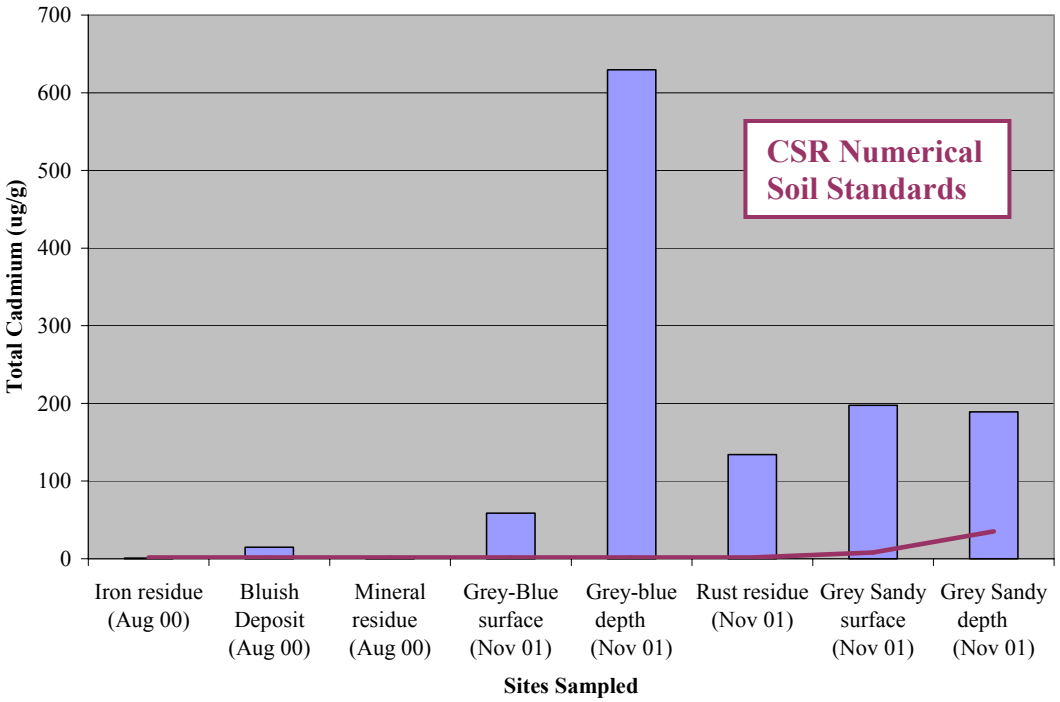

Figure 6 Total cadmium (ug/g) in soil samples collected from three different looking residues of the Yankee Girl tailings by MWLAP on August 9 2000 and November 1 2001.

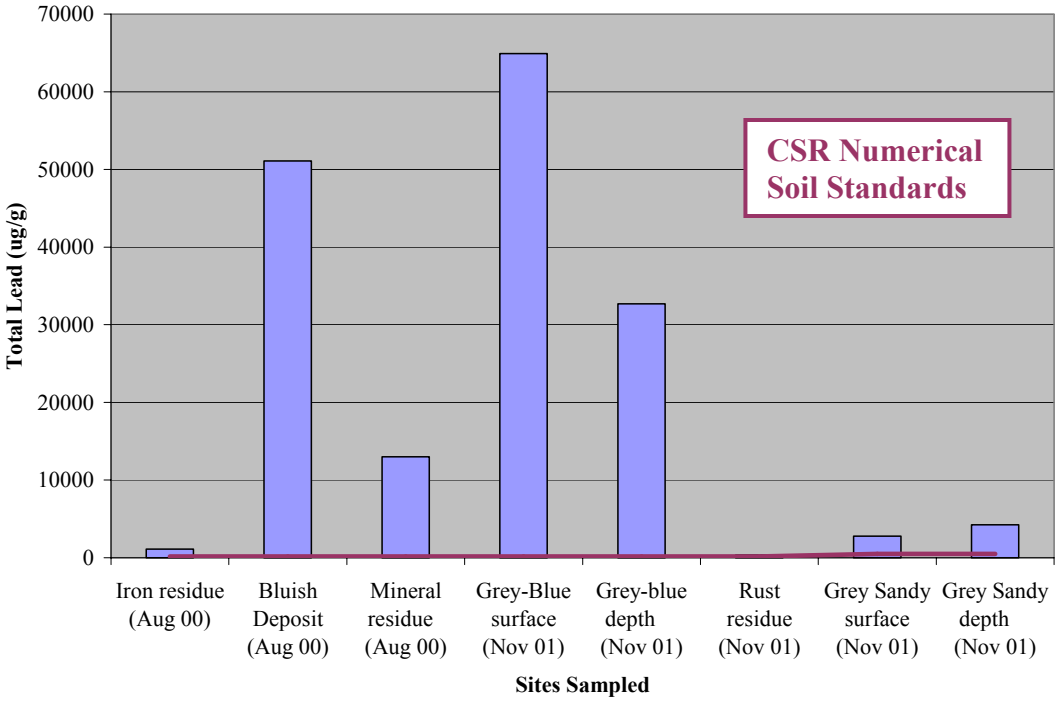

Figure 7 Total lead (ug/g) in soil samples collected from three different looking residues of the Yankee Girl tailings by MWLAP on August 9 2000 and November 1 2001.

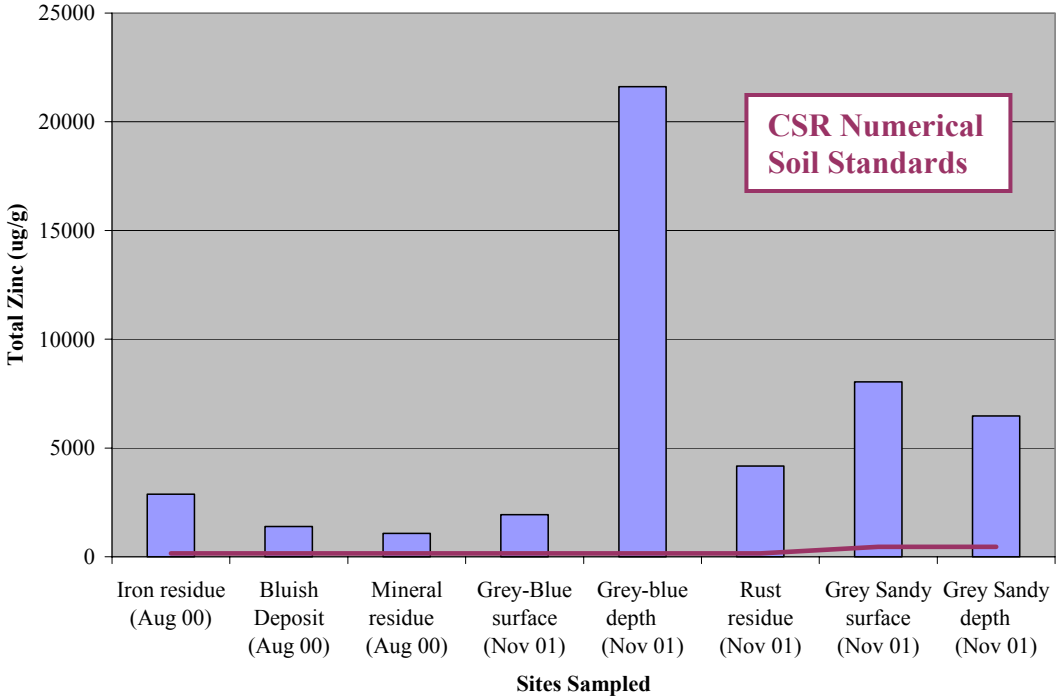

Figure 8 Total zinc (ug/g) in soil samples collected from three different looking residues of the Yankee Girl tailings by MWLAP on August 9 2000 and November 1 2001.

Plates

Plate 1 Yankee Girl Tailings facing downstream from main tailings pile, August 2000.

Plate 2 Yankee Girl tailings forming east bank of Salmo River, August 2000.
Grey, blue-grey and rust-coloured residues seen in photo (facing upstream).

Plate 3 Pond on Yankee Girl tailings, August 2000.

Plate 4 Extent of Yankee Girl tailings, August 2000.

Plate 5 Yankee Girl tailings forming east bank of Salmo River, November 2001. Blue-grey and rust-coloured residues seen in photo (facing downstream).

Plate 6 Yankee Girl tailings facing downstream, November 2001.

Plate 7 Yankee Girl tailings showing grey, sandy residues, November 2001.

Plate 8 Yankee Girl tailings showing rust-coloured or mineral deposit, November 2001.