CHIEFTAIN METALS INC

27 July 2012

Ian Sharpe
BC Ministry of Environment
Skeena Region
Bag 5000
Smithers BC V0J 2N0

Your Reference: 105719 (i)

Dear Ian,

RE: Notice of Non-Compliance and Warning

We write in response to your letter dated 24 July 2012.

Please find enclosed the *Chieftain Metals Inc. Interim Water Treatment Plant Mitigation and Restart Report.* This report provides a description of activities undertaken to date with regard to water treatment at the Tulsequah Chief Mine and describes the project timeline going forward.

Please do not hesitate to contact Joanne Thompson of our offices by email at joanne.thompson@chieftainmetals.com or telephone on (604) 671 1154 in the meantime should you have any questions.

Yours sincerely,

Joanne Thompson

for Keith Boyle
Chief Operating Officer
Chieftain Metals, Inc.

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Chieftain Metals Inc.
Tulsequah Chief Project Interim Water Treatment Plant
Mitigation and Re-Start Report

July 2012

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EXECUTIVE SUMMARY

Historic mining activities at the Tulsequah Chief Mine have left a legacy of acid mine drainage issues. Chieftain Metals Inc. (Chieftain) agreed to address these issues as part of the acquisition of the Tulsequah Project. An Interim Water Treatment Plant (IWTP) was constructed in Fall 2011 and commissioned in early 2012 to treat poor quality water prior to its discharge from site.

The IWTP has been operating since March 2012 and discharging treated effluent to the Tulsequah River. All plant discharges have met permit water quality conditions. However, reagent consumption rates, sludge production volumes and plant operating costs have far exceeded the engineered design parameters. The total cost of operation and support for the IWTP is in the order of $4.0M/year vs. an original estimate of $1.0M/year. The IWTP was designed as an interim measure to address the environmental legacy of historic mining activities, with the long-term acid mine drainage (AMD) solution being to develop, operate and ultimately close the mine in an environmentally responsible manner that addresses all AMD issues.

On 22 June 2012, Chieftain Metals curtailed operations at the Tulsequah Chief Interim Water Treatment Plan and entered into a period of non-compliance with the conditions of Waste Water Discharge Permit #105719.

Actions undertaken to date include:

- Immediate reduction of site workforce to meet revised operating expectations;
- Plant optimization studies and trial changes to the site operating system;
- Staged shut-down of plant operations;
- Surface Water Diversions; and
- Investigation of dilution and dispersion of AMD and an assessment of river impacts.

It is anticipated that Chieftain will issue a revised feasibility study in Q4 2012 and that financing will be dependent upon the findings of this study. As such, Chieftain expects to secure full project financing in the six to nine months following the issue of the updated Feasibility Study. Chieftain will re-start the water treatment plant upon securing project financing.

Chieftain proposes to continue environmental monitoring activities at the site on a monthly basis. This sampling regime will commence on 6 August 2012 and continue until such time as the IWTP resumes operations.

Chieftain wishes to maintain an open dialogue with regulators over the coming months as monitoring activities are undertaken and the plant returns to full operations.

1. INTRODUCTION

Historic mining activities at the Tulsequah Chief Mine have left a legacy of acid mine drainage issues. Chieftain Metals Inc. (Chieftain) agreed to address these issues as part of the acquisition of the Tulsequah Project. An Interim Water Treatment Plant (IWTP) was constructed in Fall 2011 and commissioned in early 2012 to treat poor quality water prior to its discharge from site.

Chieftain Metals Inc. has demonstrated its commitment to managing the environmental legacy of historical activities at the Tulsequah Chief Mine. Since purchasing the water treatment plant from Redfern's receivers in 2010, Chieftain has spent approximately $9 million to construct and operate the plant. During this time, Chieftain commissioned and operated the plant pursuant to its water quality discharge permit conditions, and discharged water quality results have met all permit requirements. However, the plant operation has not met expectations when compared to design, and Chieftain is currently reviewing all plant and site activities with a view to identifying and resolving the root causes of these issues. The mining industry as a whole is exposed to cost escalation elements and Chieftain is currently reviewing project economics to determine optimal design, construction and operating processes.

On 22 June 2012, Chieftain Metals curtailed operations at the Tulsequah Chief Interim Water Treatment Plan and entered into a period of non-compliance with the conditions of Waste Water Discharge Permit #105719. Chieftain will resume water treatment activities upon completion of project financing.

This report provides a description of activities undertaken to date with regard to water treatment at the Tulsequah Chief Mine and describes the project timeline going forward.

2. PROJECT DESCRIPTION

The Tulsequah Chief Project covers two previously producing underground mines, the Tulsequah Chief and Big Bull deposits, and is currently in an advanced stage of development. Chieftain's principal focus is to develop an underground mine at the Tulsequah Chief Deposit. Mine construction is slated to commence in 2013, following the issue of an updated economic feasibility study review.

The Interim Water Treatment Plant is located proximate to the Tulsequah Chief 5200 Portal and adjacent to the Tulsequah River. Figure 1 provides the project location and a site plan for the Tulsequah Chief Mine and Interim Water Treatment Plant.

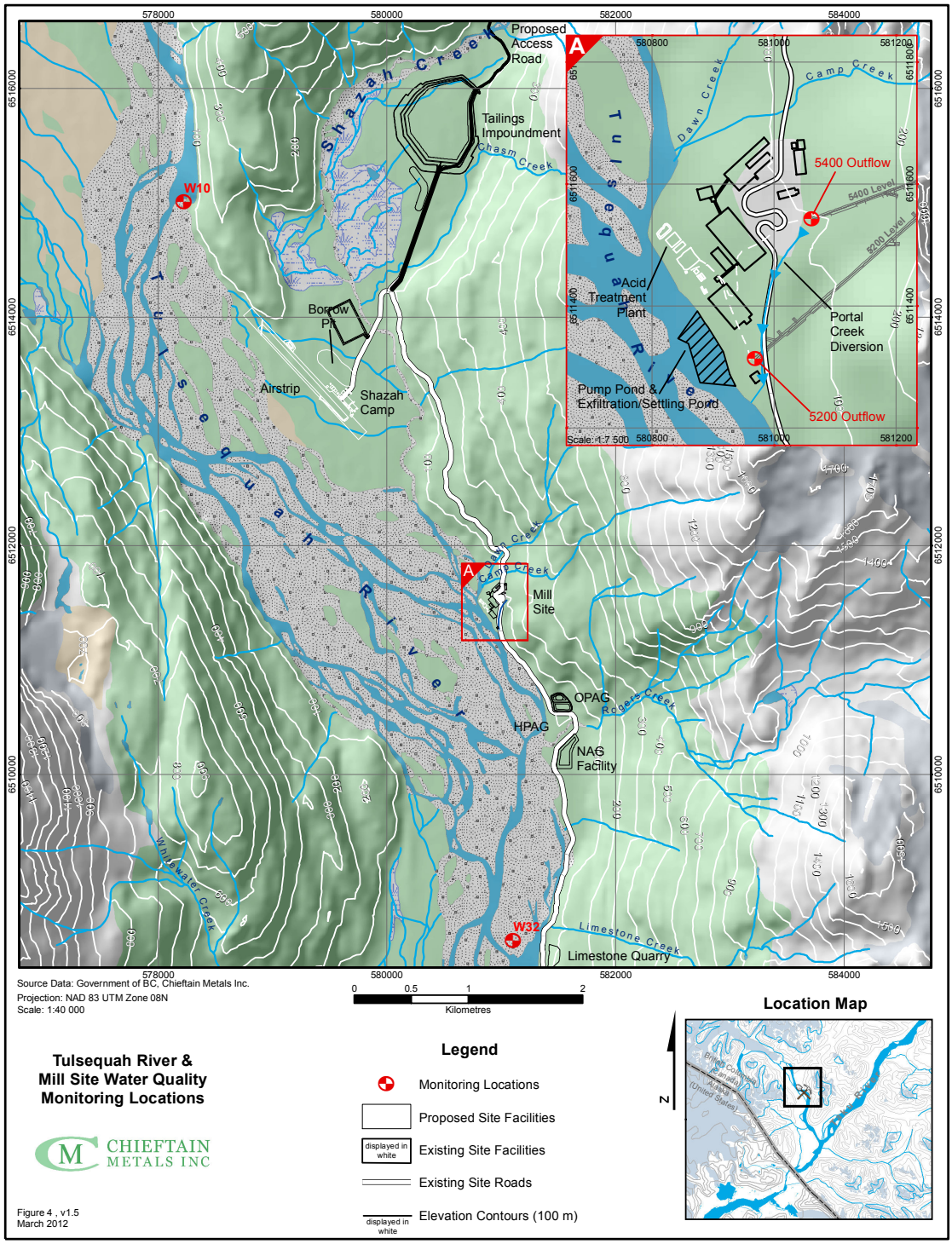


Figure 1 - Tulsequah Chief Site Plan

3. PERMIT SUMMARY

Historic mining activities at the Tulsequah Chief Mine have caused significant acid mine drainage legacy issues, and it was a condition of Chieftain's acquisition of the Tulsequah Chief that these

issues be managed and that AMD flows into the Tulsequah River be contained and treated before release into the receiving environment. To meet this requirement, the Tulsequah Chief Interim Water Treatment Plant (IWTP) was constructed in Fall 2011 and commissioned from November 2011 to February 2012. The British Columbia Ministry of Environment issued Waste Water Discharge Permit #105719 under the provisions of the *Environmental Management Act* on 4 April 2012. This permit authorised Chieftain Metals Inc. (Chieftain) to discharge treated water to the Tulsequah River, subject to conditions described in the permit. Table 1 provides the water quality limits for authorised discharges from the Tulsequah Chief Mine.

Table 1. Water Quality Limits for Authorized Discharges

Parameter	Limit
Dissolved Aluminum (D-Al)	0.5 mg/L
Dissolved Arsenic (D-As)	0.05 mg/L
Dissolved Copper (D-Cu)	0.05 mg/L
Dissolved Lead (D-Pb)	0.05 mg/L
Dissolved Zinc (D-Zn)	0.2 mg/L
Total Suspended Solids (TSS)	30.0 mg/L
pH	6.0 to 9.5 pH units

4. INTERIM WATER TREATMENT PLANT OPERATIONS REVIEW

The IWTP has been operating since March 2012 and discharging treated effluent to the Tulsequah River. All plant discharges have met permit water quality conditions. However, reagent consumption rates, sludge production volumes and plant operating costs have far exceeded the engineered design parameters. The total cost of operation and support for the IWTP is in the order of $4.0M/year vs. an original estimate of $1.0M/year. It is in light of these issues that Chieftain has by necessity conducted a comprehensive review of the operation and management of the IWTP. The IWTP was designed as an interim measure to address the environmental legacy of historic mining activities, with the long-term acid mine drainage (AMD) solution being to develop, operate and ultimately close the mine in an environmentally responsible manner that addresses all AMD issues.

Reagent Consumption

Actual reagent consumption rates of 0.2kg of ferric chloride and 0.07 kg of lime per cubic metre of effluent have significantly exceeded design, which forecast reagent consumption rates of 0.03 and 0.016 kg/m^3 respectively. Alterations made to the water treatment process significantly improved reagent consumption rates over the last month of operation, but these changes still yielded results far in excess of forecast.

Effluent Volumes

The 2012 Permit Application submitted by Chieftain to the Ministry of Environment contemplated an average treatment volume of 40m^3/hr, or 960m^3/day. Daily treatment volumes averaged 53m^3/hr or 1,270m^3/day, 35% greater than anticipated. This is primarily due to the timing of the permitted operations, during the spring snowmelt period.

Sludge Production

Sludge production rates at the water treatment plant outstripped capacity to manage and transport the sludge. Plant operating parameters produced a fluffy, low-density, low percentage solids content sludge. The original design contemplated sludge production at a rate of 1m^3 sludge per 720m^3 treated water. In the time period from 1 March 2012 to 31 May 2012, sludge was being produced at an average rate of 1m^3 sludge per 52.8m^3 treated water, or 1,200% of design output. Sludge management issues were driving all activities on site and additional personnel were required to manage the sludge output. This placed unsustainable pressure on site resources, and operating costs exceeded design by in excess of 300%. The bulk of these costs were for IWTP support, including the requirement for additional manpower to remove sludge from the plant and the camp and logistical crew required to support a larger than anticipated workforce. This by extension is placed untenable pressure on operation and corporate finances, and overstretched the site workforce.

Continued sludge production at this rate cannot be sustained, in particular through the winter months where constant road maintenance will be required to facilitate hauling sludge 6km from the IWTP to the Airstrip Sludge Storage Pit. There have been no safety incidents to date, but the combination of sub-optimal plant operation, the condition of the site fleet and the relative inexperience of operators provide significant cause for concern. Employee safety is of primary concern at this time and the current state of plant operations necessitates a substantive change in site activities to address these issues.

5. COST REVIEW

Chieftain's corporate cashflow has been severely stressed by excessive costs incurred in addition to delays in permitting, updating of the project feasibility study and, as a result, project financing. Chieftain is a single asset company and project viability is dependent upon careful fiscal management. To this end, planned activities will specifically include a first-principles review of the plant engineering and process, a comprehensive safety audit and development and implementation of safe and efficient practices for management of Interim Water Treatment Plant. Table 1 provides a comparison between forecast, actual and projected operating costs.

Table 2 - IWTP Operating Cost Comparison Table

Area	Item	2009 Forecast		2012 Forecast		CMI Proposal	
		Daily	Monthly	Daily	Monthly	Daily	Monthly
Staffing	**On site**	2	2	8	8	4	4
Sludge Produced	**(av. Daily volume m^3)**	1	31	15	450	2-6	60-180
		Monthly	**Annual**	**Monthly**	**Annual**	**Monthly**	**Annual**
	TOTAL	$89,756	$1,077,069	$362,734	$4,352,808	$185,000	$2,220,000

6. ACTIONS UNDERTAKEN TO DATE

Actions undertaken to date include:

- A comprehensive review of IWTP process inputs and outputs;
- A sludge removal campaign;
- Options assessment and internal consultation program;
- Revision of site operating plans and forecasts; and
- Commencement of a mitigation and site optimization program.

These activities have been completed and, while insufficient data is available at this time to draw conclusions, revisions to the plant process have yielded promising improvements to the process. It is anticipated that these improvements will continue to be seen through testing and refining the process during re-commissioning.

7. OPTIONS ASSESSMENT

Prior to any decision being made with regard to IWTP operations, four options were evaluated. These were:

1. Status Quo (Unchanged operations and practises);
2. Operation with a reduced workforce;
3. Treatment of only the most impacted water (i.e., 5200 outflows); and
4. Curtailment of operations for plant optimization.

For all options, the objective was to be able to operate the IWTP and manage the greater than planned volume of sludge in a safe and effective manner year round with the current equipment fleet, provided funding for such operations has been secured. The intention of any change in site practices will be to protect employee safety, increase plant efficiency, manage overheads and reduce costs to meet revised expectations while all permit conditions are met. In all cases, the curtailment of activities would be on a temporary basis while project financing was secured. Chieftain has pursued Option 4 – Curtailment of operations, and the plant will be restarted as soon as process optimisation is complete and project funding is secured.

8. MITIGATION ACTIVITIES

Chieftain has undertaken a number of options to mitigate environmental effects of the temporary curtailment of activities at the IWTP. This section discusses the mitigation options that were outlined in a letter sent 6 June 2012 to Wade Comin of Environment Canada and provides a progress update on each.

1. Immediate reduction of site workforce to meet revised operating expectations

Chieftain has retrenched the majority of its workforce and has transitioned to a site operating model of 2 employees on site at any time. This is in line with design expectations and is anticipated to continue after full-time water treatment activities resume. The workforce will comprise one manager or his delegate and one water treatment plant operator/general maintenance hand.

2. Staged shut-down of plant operations

A planned and orderly shutdown of plant activities has occurred and the plant has now been placed in care and maintenance until such time as project funding is secured. Two employees are on site at all times to undertake routine maintenance of site water diversion works and the project site.

3. Undertake plant optimization studies and trial changes to the site operating system

These activities have commenced, and early results are promising. Chieftain has undertaken a comprehensive process review and has identified those parts of the water treatment process requiring further investigation and testing. Optimization studies will be actively pursued over the coming months, and an intensive testing process will be undertaken when the plant is re-commissioned.

4. Apply for a permit amendment to allow deposition of sludge into the proposed Pyrite Pond area at Paddy's Flat

An integral part of the IWTP re-start strategy is permitting an alternative sludge disposal site closer to the Plant. A suitable facility was constructed in 2011 at Paddy's Flats, 1km from the IWTP, and Chieftain intends to apply for a permit to re-designate this facility for sludge deposition. This will reduce haul times during periods of high sludge production, remove the need for road maintenance between the IWTP and the Airstrip Sludge Storage Pit and relieve the pressure placed on employees and equipment by hauling from the IWTP to the Airstrip Sludge Pit. Monitoring wells are already present at this location and baseline data are available. It is anticipated that the Airstrip Sludge Pond will continue to be used during summer, when sludge hauling capacity is available. Chieftain will commence this permitting process in Q4 2012.

5. Surface Water Diversions

A meeting was held between Chieftain and Jeanien Carmody-Fallows of the BC Ministry of Environment on 11 June 2012. During this meeting, Ms Carmody-Fallows stated that she wished to see surface water diversions facilitating a longer residence time for impacted water on site prior to discharge to the Tulsequah River. Based on historical monitoring data and on verbal advice received from BC Ministry of Environment, removal of suspended sediments from site

water will significantly reduce the total metals load to the Tulsequah River. These works have been undertaken, and all mine water has been diverted to the Exfiltration Pond to allow settling and filtration of solids prior to release to the receiving environment. In short, the diversions undertaken to date are:

- Diversion of 5200 Portal drainage to the Exfiltration Pond;
- Diversion of 5400 Portal drainage to the Exfiltration Pond;
- Re-routing of Neutral Mine Water (previously discharged directly to the receiving environment) to the Exfiltration Pond to provide dilution of impacted water prior to discharge.

Figure 2 illustrates the current surface water diversion configuration.

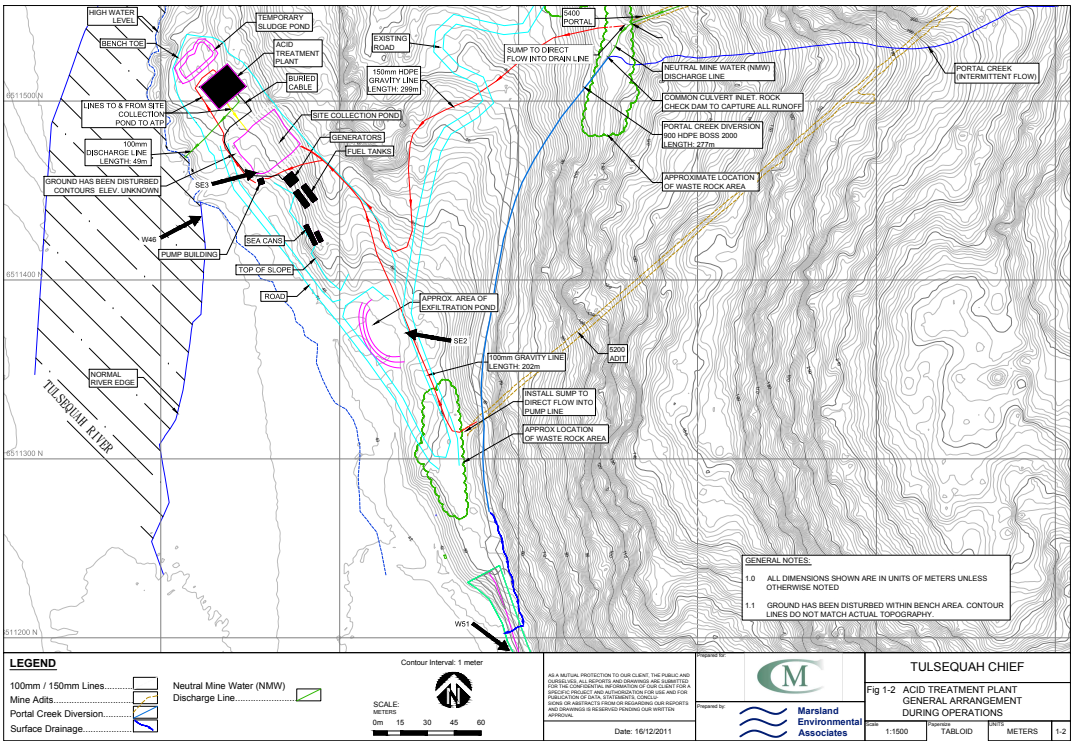


Figure 2 - Tulsequah Chief IWTP Plan

6. Dilution and Dispersion

In 1994, a study of the dilution effects of the Tulsequah River on acid water from the Tulsequah Chief was undertaken by Rescan in support of the original Tulsequah Chief Environmental Assessment. Scientists measured dilution downstream of the mine site at a point 500 m downstream of the Mine (upstream of Rogers Creek) and found open water dilution to be 78-fold in Sept 1994 and as much as 370-fold for sulphate during higher flows. Dissolved copper and zinc were somewhat non-conservative and exhibited higher dilution ratios. Conversely, in the winter when there was no river flow with only limited groundwater inflow, dilution was as

low as 2.7. However, this period of limited dilution coincides with periods of no fish access, due to the absence of any surface water flows.

Two subsequent studies, published in 2001 and 2003, by the BC Environmental Assessment Office and BC Ministry of Environment, both found that mass loadings were non-conservative in the Tulsequah River, i.e., that both concentration and mass loading decreased going downstream. The 2003 study reported on sampling conducted during a jokulhaup and found anomalously increased total metal concentrations relative to dissolved concentrations and proposed that colloidal metal particles were flushing out of the river sediments during the flood event. All research was undertaken when impacted water was discharging directly to the Tulsequah River and, although both studies were more focused on cumulative loadings and potential effects on the Taku River as it enters Alaska and so do not provide much information on "near-field" dilution, the findings suggest that any effects caused by impacted water discharging from the Tulsequah Chief Mine are temporary and extremely localised.

In 2011, Alaska Fish and Game undertook a study on resident Dolly Varden collected 1 km downstream of the mine and found no significant effects on fish tissue metal content. Some parameters were higher upstream of the mine, others were lower and Cd was highest in fish collected in the Taku River at the Alaskan border. Those parameters which were higher downstream of the Tulsequah mine were lower than the concentrations measured in Dolly Varden collected above the Greens Creek Mine in Alaska.

In June 2012, Chieftain collected samples of untreated site runoff and the treatment plant discharge as part of its monthly monitoring program. Samples were also collected upstream of the mine (W10), immediately below the treatment plant discharge (W46), 150m downstream of the mine site (W51) and at a location further downstream (below Rogers Creek) (W32). Inspection of the Zn and sulphate data shows that there was almost no measurable effect on the Tulsequah within 150m of the mine site. Table 3 summarizes the analytical results. Where multiple samples were collected, the range of values is reported.

Table 3 - Tulsequah Chief Monitoring Results, June 2012

Sample Location	Zn (µg/L)	SO_4 (mg/L)
Permit Limit	200	
W10 – Tulsequah River – upstream of Airstrip	<5	15
IWTP Discharge	44-100	444-484
W46 – Initial mixing zone of IWTP discharge in Tulsequah River	<5-32	15-23
SE2 – Surface runoff in Exfiltration Pond	19,100	279
W51 – Tulsequah River 150m below Mine	6.9	15
W32 – Far-field location 4km downstream in Tulsequah River	<5	7.8-12

If on-site dilution was the required course of action, to ensure compliance with the SSWQO of 32 ug/L for Zn in the river by diluting the portal discharge (ATP Feed or SE3) at 40-80 mg/L Zn (average 50 mg/L) and a flow of 12 L/s, by using river water at 5 ug/L, the dilution would require 22.2 m3/s of flow. If we wanted to use Camp Creek or NMW flow, we'd need even more water, since the background concentration in those is higher than 5 ug/L. This calculation suggests that as long as the site drainage is mixing with the river (i.e., during the open water season), there would be adequate dilution (May-October). During the winter, site drainage is isolated from the river flow and hence there will be no effect on river water quality.

The modelling for the proposed buried diffuser indicated that groundwater dilution alone provides a 10-fold dilution within 600m of the discharge. One might hypothesize then, that an incremental dilution of 2.2 m3/s would be required to achieve the SSWQO if mixing with surface water were to begin at that point. The 7Q2 flow in the Tulsequah is estimated to be 3.1 m3/s, so in an average year, there would be no adverse effect even if all the discharge were to mix with the river after mixing with groundwater. However, the diffuser groundwater model also indicated that it would take upwards of 100 days to reach steady-state conditions in the groundwater, 600 m downstream. In this case, only a portion of the winter discharge would reach the river surface flow before spring thaw.

9. PROJECT SCHEDULE

It is anticipated that Chieftain will issue a revised feasibility study in Q4 2012 and that financing will be dependent upon the findings of this study. As such, Chieftain expects to secure full project financing in 6-9 months following the issue of the updated Feasibility Study. Table 4 provides the anticipated schedule for Chieftain's activities.

Table 4 - Anticipated Project Schedule

	2012			2013	
Activity	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**
Reduce Workforce					
Plant Shutdown					
Plant Optimization Study					
Permit Application					
Feasibility Study Issued					
Project Financing Secured					
Resume full IWTP operation					

10. MONITORING & SURVEILLANCE

Chieftain proposes to continue environmental monitoring activities at the site on a monthly basis. This sampling regime will commence on 6 August 2012 and continue until such time as the IWTP resumes operations.

11. FOLLOW-UP ACTIONS

Chieftain wishes to maintain an open dialogue with regulators over the coming months as IWTP optimization activities are undertaken and the plant returns to full operations.

12. REFERENCES

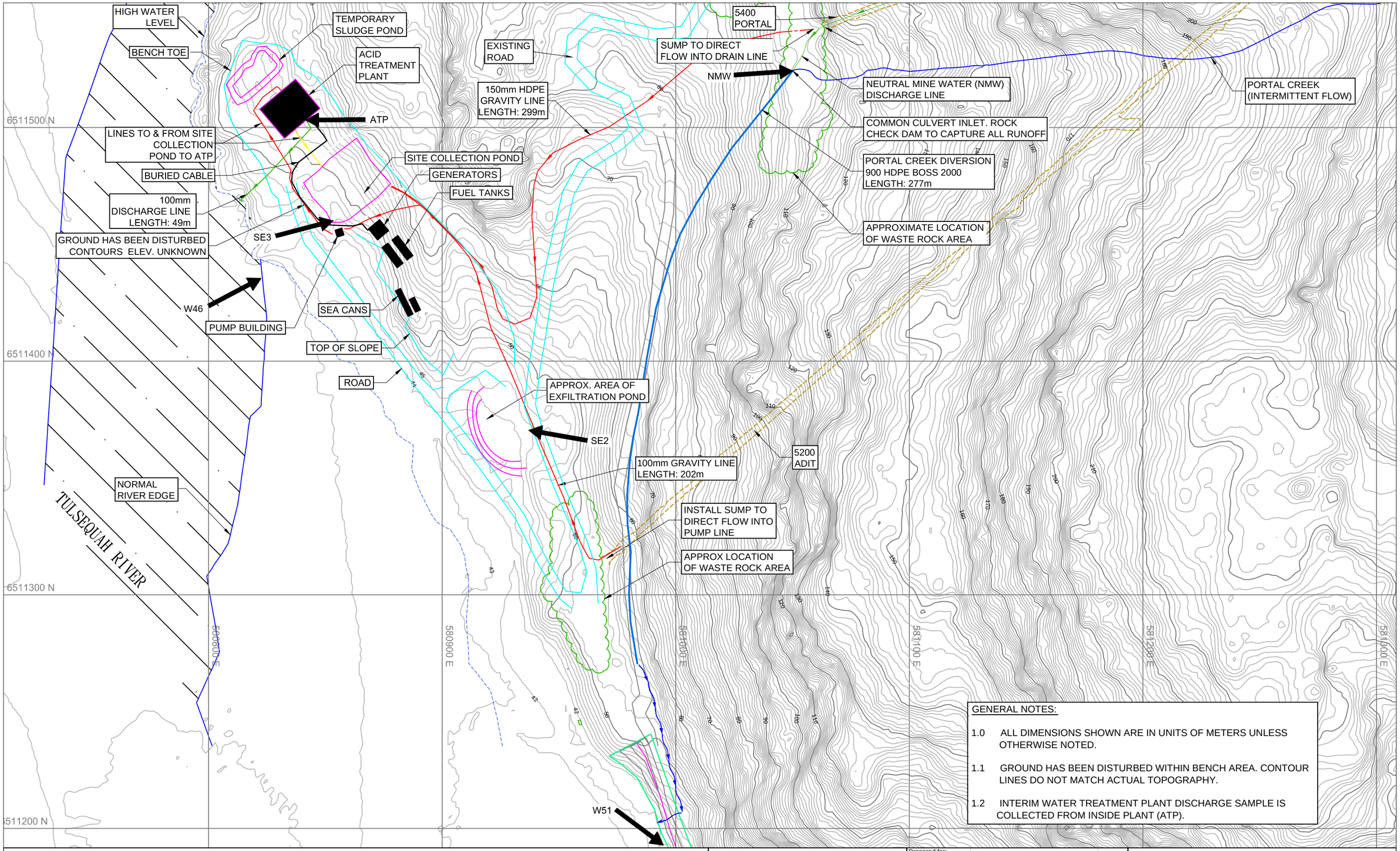
Rescan Environmental Services Ltd. (1994) *Tulsequah Chief Project Report*

Mehling Environmental Management Inc. (2001*) Tulsequah Chief Project Updated Cumulative Water Quality Effects Assessment* for the Environmental Assessment Office

Lough, J. and Sharpe, I. (2003) *Tulsequah and Taku Rivers Mass Balance Water Quality Report* for the BC Ministry of Water Land and Air Protection – Environmental Protection Division

Hitselberger, J.P. (2012) *Tulsequah Chief Acid Mine Drainage: Whole Body Metals Concentrations in Dolly Varden Char* for the Alaskan Department of Fish and Game, Habitat Division

AECOM (2008) *Preliminary Diffuser Plume Assessment for Redfern Resources Ltd.*



GENERAL NOTES:

1.0 ALL DIMENSIONS SHOWN ARE IN UNITS OF METERS UNLESS OTHERWISE NOTED.

1.1 GROUND HAS BEEN DISTURBED WITHIN BENCH AREA. CONTOUR LINES DO NOT MATCH ACTUAL TOPOGRAPHY.

1.2 INTERIM WATER TREATMENT PLANT DISCHARGE SAMPLE IS COLLECTED FROM INSIDE PLANT (ATP).

LEGEND

100mm / 150mm Lines.....
Mine Adits.....
Portal Creek Diversion.....
Surface Drainage.....
Neutral Mine Water (NMW) Discharge Line.....

Contour Interval: 1 meter

SCALE: METERS
0m 15 30 45 60

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND FOR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL

Date: 16/12/2011

Prepared for:

Prepared by: Marsland Environmental Associates

TULSEQUAH CHIEF

Fig 3 ACID TREATMENT PLANT GENERAL ARRANGEMENT DURING OPERATIONS

Scale	Papersize	UNITS	
1:1500	TABLOID	METERS	1-2