LONG TERM POST-RECLAMATION MANAGEMENT OF THE PINCHI LAKE MINE

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ABSTRACT

The Pinchi Lake Mine was owned and operated by Cominco Ltd. (a predecessor of Teck Metals Ltd.) from 1940 to 1944, and between 1968 and 1975. The property is located approximately 25 km northwest of Fort St James, British Columbia. Between 2010 and 2012, the Pinchi Lake mine underwent decommissioning and reclamation. This paper discusses Teck's commitment to post-reclamation management of the site. The site has waste rock dumps, a tailings impoundment area and dam, a creek diversion, an industrial landfill, residual mercury in soils. A post-reclamation risk management plan has been developed and is currently under regulatory review. The plan includes monitoring for; geotechnical stability (creek diversion, waste rock dumps, tailings dam, calcine waste dump, and tailings impoundment cover), surface and ground water quality, re-vegetation progress, and mercury uptake by aquatic and terrestrial receptors. To support the long term implementation of the monitoring plans, an environmental management system is being established. The mine site will continue to be owned and managed by Teck and the site will continue to have controlled access.

Key words Long term monitoring, Risk management, Risk Assessment, Pinchi Mine, Closure Plan

INTRODUCTION

The Pinchi Lake Mine (Pinchi Mine) produced mercury from cinnabar ore and is located on the north shore of Pinchi Lake, approximately 25 km northwest of Fort St James, British Columbia. The mine site is located on property privately owned and operated by predecessor companies of Teck Metals Ltd. (Teck). The mine was initially operated during the 1940s but was closed in 1944 and all structures were subsequently demolished. It was then redeveloped with new structures and operated again from 1968 to 1975, at which time the facility was placed on care and maintenance.

Between 2010 and 2012, the Pinchi Mine underwent decommissioning and reclamation of all the mine facilities as outlined in the "Pinchi Lake Decommissioning and Reclamation Plan" (Marsland Environmental Associates, 2009), hereafter referred to as the 'Closure Plan'. The Closure Plan was developed on the basis that the site has waste rock dumps, a tailings impoundment area and dam, a creek diversion, an industrial landfill, and residual metals in soils. To ensure that the remaining infrastructure and environmental conditions remain stable and to meet the Closure Plan objectives, Teck has committed to developing a post-reclamation risk management plan which includes short- and long-term monitoring. Teck plans to retain the land and risk manage the site in the long term as industrial land.

This paper is one of four papers prepared on the work and studies associated with the closure activities at the Pinchi Lake Mine. The other papers include "Decommissioning and Remediation of the Pinchi Lake Mine" (Donald et al, 2013), "Use of Ecological Risk Assessment to Guide Remediation at the Teck Pinchi Lake Mine (Allard et al., 2013), "Pinchi Mine Closure – Demolition Debris Disposal" (Marsland et al., 2013).

DEVELOPMENT OF THE DECOMMISSIONING AND RECLAMATION PLAN

The post closure scenario for the Pinchi Mine Closure Plan was developed on the basis that the site would be retained by Teck as industrial land, as such the on-site human receptors is limited to industrial workers (including on-site caretakers) and occasional visitors. The primary objectives of the decommissioning and reclamation of the site as stated in the "Pinchi Lake Decommissioning and Reclamation Plan", (Marsland Environmental Associates, 2009) are to ensure that:

1. The site is physically stable to ensure the migration of mercury and other potential contaminants of concern do not pose unacceptable risks to either the aquatic or terrestrial environments;
2. Through the use of risk management and physical protection measures, the site does not present unacceptable risks to either human health or safety or to wildlife populations utilizing the site;
3. Site reclamation complements adjacent wildlife habitat so that the entire area will continue to support viable wildlife populations; and
4. The Traditional Use of the areas surrounding the Pinchi Mine site by First Nations are safe and can be facilitated, consistent with ensuring public safety and adherence to the Mines Act requirements.

To meet these objectives, a risk assessment/risk management strategy and long-term monitoring was adopted as outlined in Figure 1. Confirmation of success at fulfilling these objectives will be based on the following which ultimately defines the scope for the post reclamation risk management plan:

1. Periodic monitoring of mercury concentrations in fish utilizing Pinchi Lake;
2. Documented use of the site by the targeted wildlife species;
3. Monitoring of vegetation growth (i.e. species, density, etc.);
4. Monitoring of metal concentrations (mercury in particular) in various plant and animal tissues (e.g., grasses, berries, leaves, ground and flying insects, small mammals);
5. Monitoring of mine and tailings pond effluent to ensure satisfactory effluent quality;
6. Geotechnical inspections to monitor the physical stability of structures such as the tailings dam and capped waste materials; and
7. Retaining a site caretaker, who will maintain fencing and signage, controlling access to significantly disturbed areas of the site ensuring public safety.

The development of the Closure Plan and the risk assessment/risk management strategy greatly benefited from input by members of the Pinchi Mine Technical Working Group (TWG), which is composed of members/advisors of the Tl'azt'en Nation and the Nak'azdli Band and Teck. One additional objective identified by the TWG in the Closure Plan included the development of a trail for use by First Nations to

replace the traditional trail that used to go through the site. The new trail was located, designed, and constructed by First Nations with Teck's funding in 2008 and connects with other traditional trails that have already been re-established under the direction of the John Prince Research Forest area management staff. This objective has been completed and as such is not considered part of the post-reclamation risk management plan. Another objective is to improve the fish habitat within the Ed Creek diversion channel which is currently ongoing.

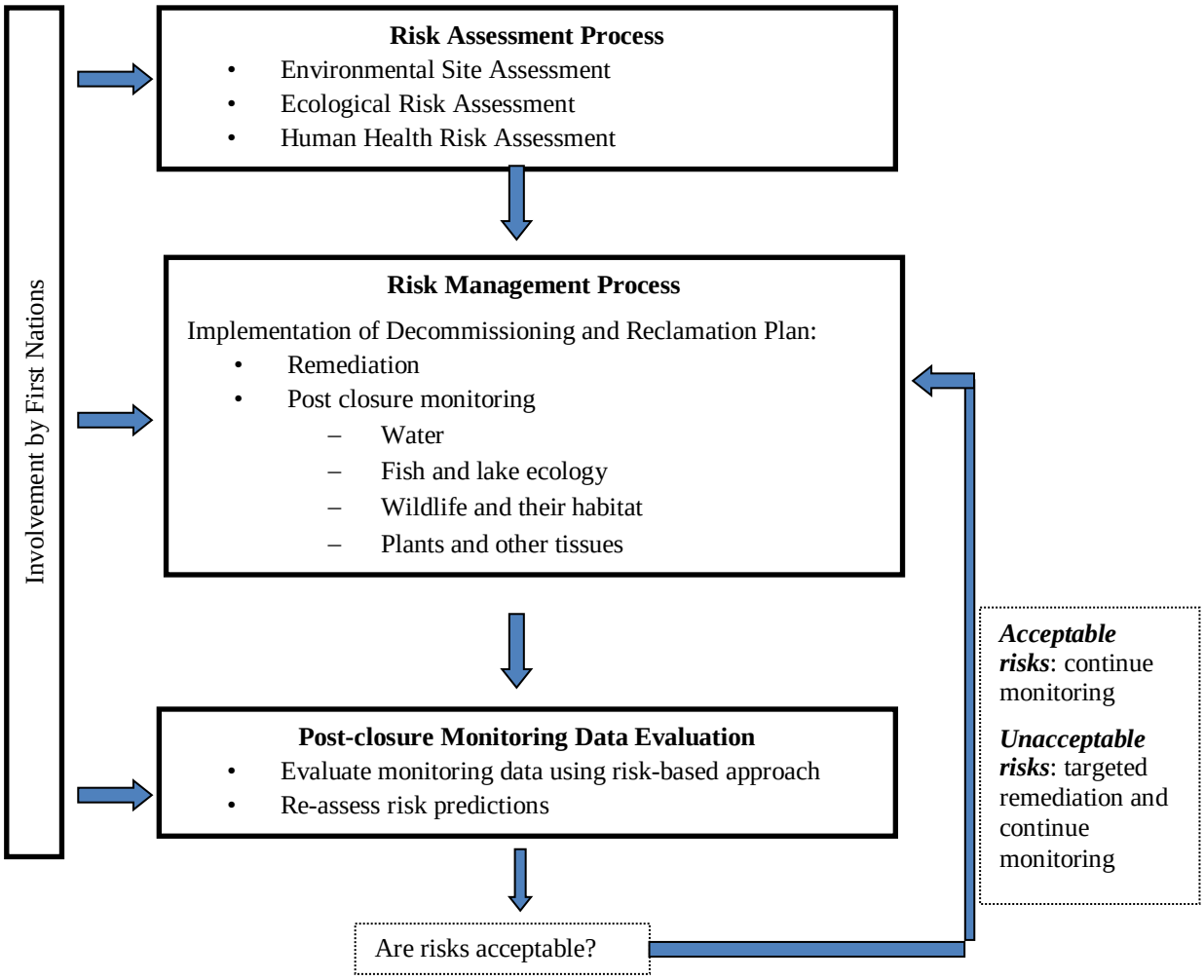

Figure 1: Risk Assessment / Risk Assessment Strategy

Ecological Risk Assessment and Risk Management Strategy

Since 1996, the Pinchi Mine site had undergone numerous terrestrial and aquatic scientific studies. These studies provide a basis for understanding the spatial extent and magnitude of environmental contamination (primarily by mercury but also by other metals such as antimony and arsenic) as well as potential impacts to the ecology of Pinchi Lake, upland portions of the mine site, and surrounding lands.

The extensive site characterization was used to complete a human health and ecological risk assessment at the site (Azimuth, 2009; Wilson Scientific, 2010). The results from the studies were used to make risk management decisions for the site, particularly to identify measures for mitigating risk. These measures were used to develop the Closure Plan to either physically remove the source of contamination (e.g.,

excavation and disposal) or remove the "pathway" between the source and the receptor (i.e., capping soils and managing contaminants in place). In both cases, humans and/or biota do not come into contact with the contaminants and risk is substantially reduced or eliminated. If managing contaminants in place, then long-term monitoring is required to monitor the stability or mobility of the contaminants (Marsland Environmental Associates, 2009).

As part of the closure strategy, post-closure monitoring will be conducted in the short- and long-term. The monitoring results will be evaluated, through "mini risk assessments". Issues identified will be evaluated through more detailed investigation and if necessary, mitigative action will be taken to ensure that the levels of risk to humans and the environment remain low.

REGULATORY PROCESS

The Closure Plan approved by the Ministry of Energy and Mines in 2010 included an outline of a short and post-reclamation monitoring plan. However, the Closure Plan approval and amending Permit M-5 did require the development of a post-reclamation monitoring plan for both core and non-core areas. The plan is to be developed with the various government agencies including the Ministry of Environment (Environmental Protection, Environmental Stewardship, and Water Stewardship Divisions, and Land Remediation Section) and the Ministry of Energy and Mines.

The post-reclamation monitoring plan will become part of the overall Pinchi Mine Closure Management Manual. The Closure Management Manual will describe and document the operational surveillance and monitoring requirements to track important changes that could affect long-term mitigation performance, monitoring and maintenance requirements.

The draft post-reclamation monitoring plan was issued to the regulator agencies in July 2012 and is currently under review.

Concurrent to the development and review of the post-reclamation monitoring plan, Teck is submitting an amendment to the Ministry of Environment water discharge permit PE-224. The original permit was issued for an active mine site with discharge from operations and will be amended to reflect current conditions for an inactive mine site with discharge from the tailings impoundment area and underground workings at the 750 Level Portal. As such, the Ministry of Environment will be reviewing the permit amendment application, including a technical assessment report, and the post-reclamation monitoring plan together.

Ultimately the post-reclamation monitoring plan will be implemented under the reclamation permit M-5 and where applicable the Ministry of Environment discharge permit PE-224-P.

THE POST-RECLAMATION MONITORING AND RISK MONITORING PLAN

The Post-Reclamation Monitoring and Risk Management Plan aims to collect the data needed to meet the specific objectives of the following studies:

1. Ecological Risk Assessment;

2. Environmental Site Assessment;
3. Human Health Risk Assessment;
4. Re-vegetation Plan; and
5. Geotechnical Monitoring.

Naturally, there is some overlap in the media sampled, their sampling locations and the parameters sampled. The following sections describe how the post-closure monitoring will be achieved to meet the goals of each of the above.

Ecological Risk Assessment

The Pinchi Mine Ecological Risk Assessment (ERA) (Azimuth Consulting Group, 2009) was developed based on pre-reclamation exposure conditions to guide the development of the Closure Plan. Remediation activities completed at the site were designed to decrease contaminant exposure at the majority of areas; a few discrete areas were deemed to have acceptable risks and were not remediated, thus there is an element of residual risk. Ongoing monitoring is required to address this uncertainty and to ensure that predictions regarding reductions in risk remain accurate over time. Therefore, contaminant exposure (e.g., environmental concentrations of contaminants of potential concern, presence of new or modified exposure pathways) will be re-assessed periodically.

Accordingly, the purpose of the Pinchi Mine post-closure ERA monitoring program is to provide a framework to collect and evaluate future monitoring data (including surface water, vegetation, other biota, receiving environment testing). Depending on findings, additional assessment or action may be required to ensure long-term environmental protection. This approach is consistent with the risk assessment/risk management strategy outlined in the Closure Plan.

To support post closure monitoring, a detailed matrix was developed by Azimuth (Azimuth Consulting Group, 2012a) for monitoring the on-site surface water/sediment quality monitoring, terrestrial monitoring, and aquatic monitoring.

Surface Water Quality Monitoring

The objective of the surface water quality monitoring plan is to monitor water chemistry and toxicity for various sources on the mine site that drain into Pinchi Lake. This information will be used to quantify ongoing contaminant loadings from the site to Pinchi Lake as well as predicting any related effects to aquatic life. The two sources of effluent discharge identified include the tailings impoundment area and the 750 level portal (Photo 1). Surface water samples will also be collected at upstream and downstream locations along Ed Creek adjacent to the tailings impoundment. It is anticipated that this task will be conducted twice a year (spring and fall) on an annual basis in the short term (i.e., for the first three years after remediation) and then gradually reduce in frequency (e.g., annually and then every two years) once stability of conditions has been confirmed. Water quality will be assessed through a combination of chemistry and toxicity analyses. The frequency and scope of the water quality monitoring will be re-evaluated as needed. Rising trends and exceedances of trigger levels would lead to additional investigation and if required, mitigative actions. Trigger levels were developed by Marsland Environmental Associates based on historic water quality data sets and have been identified for most parameters that approach or exceed BC Receiving Water Quality Guidelines (BC WQG) for the Protection of Aquatic Life (Marsland Environmental Associates, 2012). Triggers were selected generally based on percentile value (i.e., P80, P90 or P95) of the entire historic database and then compared with the recent data trend to ensure they were reasonable given the more recent (i.e., post-1997) data. Trigger values for both field pH and conductivity were established as these are easily measured in the field and may provide a rapid indication of whether significant changes are occurring in water quality. If a trigger value is exceeded, then the location is to be re-sampled as promptly as possible and the data re-evaluated.

Photo 1: 750 Level portal discharge

Terrestrial Monitoring

The capping of metals contaminated soil at the mill site, south of mill site, and tailings impoundment area will decrease contaminant exposure for wildlife using the property. As such, the objective of the terrestrial monitoring is to confirm that the contaminant pathway has been broken and exposure has been reduced or eliminated in these areas. Concentrations of metals in soils and various biota tissues will be monitored periodically to confirm risk predictions. The terrestrial monitoring is associated with the re-vegetation monitoring. As such the first monitoring event is to measure re-vegetation success and will not be undertaken until three years after seeding. Three years provides sufficient time after seeding to allow ecological communities to become established and newly restored habitat.

Monitoring of soil and vegetation chemistry subsequent to planting in 2012 is planned on 10-year cycles, pending results of each monitoring event. Ten years is the minimum amount of time required for root

systems to develop sufficiently to potentially grow deep enough to penetrate through the cap layer and into contaminated soils. Thus terrestrial media including soils, vegetation, ground and flying insects and possibly small mammals will be collected from discrete areas in 2022. Sampling will be conducted in the remediated/capped areas.

Sampling will also be conducted in a subset of non-remediated areas including west mine, old mill and gate area. The purpose is to compare future conditions with historic data to document residual risk and natural recovery of soils. Environmental media will be sampled for appropriate parameters including TOC (soils), metals, mercury and methyl mercury.

The distribution and type of vegetation across the Pinchi Mine site has a strong influence on how wildlife species forage and are exposed to metals. In the ERA, a wildlife habitat assessment documented current conditions. To ensure that post closure conditions are adequately evaluated (i.e., particularly for newly restored habitats), periodic monitoring of wildlife habitats will be conducted in parallel with soil/tissue sampling.

Comprehensive Aquatic Monitoring

Extensive aquatic studies have been undertaken at the site since 1995. The results have shown that there is an overall healthy aquatic environment, there is a reduction of fish tissue mercury concentrations, and that the mine site is no longer a significant source of total and methyl mercury to Pinchi Lake, due to natural covering of lake sediment by low mercury material (Azimuth Consulting Group, 2008). However, there is a possibility of changing conditions that would indirectly result in higher mercury tissue concentrations in lake trout and other fish. Consequently, post-closure monitoring is considered necessary to ensure that any changes or trends are identified. The aquatic studies would be a comprehensive sampling event which would include sampling lake trout and whitefish in Pinchi Lake and two surrounding lakes, Tezzeron Lake and Stuart Lake. The program would include a full suite of lake ecology components including limnology, water chemistry, sediment chemistry, zooplankton and benthic invertebrate community structure and mercury concentrations. In addition, a variety of fish species will be sampled for multiple endpoints including gonad weight, liver weight, fecundity and egg size. The study is proposed to occur in 10-year cycles.

A technical report will be issued for each post-closure monitoring component to confirm that the assumptions made in the ERA remain valid, to confirm that conditions have improved, or to determine whether other changes have occurred. If conditions change adversely (e.g., water quality is impaired, or contaminant uptake in biota increases), then the technical reports will include a re-assessment of the "new" data, discuss implications for risk predictions, and provide recommendations as appropriate. Specifically, it is proposed to issue a "mini risk assessment" that, if risks were found to be unacceptable (i.e., increased from previous studies or an increasing trend), would serve to trigger management action(s). This will allow all relevant exposure information (e.g., updated tissue concentrations, modified habitat characteristics, new wildlife receptors) to be integrated for determining a risk-based threshold for action.

An ecological risk assessor will be involved in preparing and reviewing the above technical reports. Findings and recommendations will be provided to the Technical Working Group as well as relevant regulatory agencies.

To ensure that the data is collected consistently in the long-term, a *Post-closure ERA Monitoring Manual: Standard Operating Procedures* document was prepared by Azimuth (Azimuth Consulting Group, 2012b) and will ultimately be included in the Closure Management Manual. The manual describes the step-by-step procedures to monitor a wide variety of environmental media, both aquatic and terrestrial. The document is meant to read like a 'cook-book' style monitoring manual that will serve as the basis for the long-term monitoring of the site and can be executed by any experienced biologist. The monitoring manual also includes field Standard Operating Procedures (SOPs) that provide step-by-step instructions for the collection of ERA post-closure samples. Establishing the SOPs for the program ensures that sampling is standardized from sampling event to sampling event, year to year.

Environmental Site Assessment Monitoring

Environmental site assessment activities, including soil and groundwater monitoring, were initiated prior to closure to determine the extent of metals and hydrocarbon contamination. The information was used to provide data for the ecological and human health risk assessments and to assist with the development of the Closure Plan. Additional soil investigations and remedial activities were conducted concurrently with the site decommissioning and closure activities. The results will be incorporated into the soils database for the site and used by the risk assessors during scheduled monitoring activities and 'mini' risk assessments of candidate areas to ensure that adequate data are available to address areas with potential residual risk.

Based on the soil remedial results and activities, there are residual metals and hydrocarbon contaminants at the site (SNC Lavalin Environment, In Prep). To assess the potential impacts to groundwater and to gain a better understanding of the hydrogeological conditions additional monitoring wells were installed in 2012. The wells were located in areas down gradient and cross gradient of known areas of contamination and to provide a "fence" of wells between areas of known contamination and the receiving environment. The presence at site of a low permeability till layer prevents rapid groundwater movement. Since the network of monitoring wells was recently installed the current data set has limited seasonal data. As such, in order to gain a better understanding on concentration trends and in order to establish frequency and timing of groundwater sampling events, the initial groundwater sampling is being conducted every four months including spring (before freshet), summer, and fall. Pending the results, the data will be re-evaluated to determine if the sampling frequency should be reduced to annual sampling (i.e., if the data show the highest results occur during a particular season and/or if a decreasing concentration trend is observed). Currently, it is planned that sampling will be reduced to annual events in 2014 and will continue for three years (through 2016) at which time the data will be re-evaluated to determine if concentrations have stabilized or are reducing. During the evaluation of the data specific triggers for further action will be established. After 2016, it is planned that groundwater sampling will be further reduced to every two years, similar to the surface water monitoring program. Eventually, the frequency of the sentinel wells sampling will be reduced to every 5 years.

Human Health Risk Assessment

To determine if there are acceptable risks to human health in the post-closure scenario (i.e., industrial land use), Wilson Scientific Consulting Inc. (Wilson Scientific) completed a Human Health Risk Assessment (HHRA) of the chemical exposure that could potentially occur where contaminants remain on site at the Pinchi Mine site and in its vicinity. The HHRA (Wilson Scientific, 2010) has evaluated whether or not current environmental conditions would pose acceptable health risks to persons using the site and/or vicinity.

For the results of the HHRA to remain valid, it will be necessary for the site to be properly managed into the future. Preliminary conclusions made in the HHRA relied on assumptions regarding post closure conditions at the site and some of these assumptions will need to be re-visited periodically to ensure that human health remains protected. The following management recommendations will help to ensure that conditions at the site remain acceptable:

- Monitoring the aquatic and terrestrial environmental conditions to determine if the data is consistent with previously collected data. If collected soil, water and biological data (e.g. mercury concentrations in fish tissues for human consumption) are consistent with the existing environmental dataset (i.e., conditions are found to have remained stable and environmental concentrations are not increasing), no further action will be warranted from a HHRA perspective and site monitoring can continue without input by a human health risk assessor. If collected data indicates elevated concentrations (or trends towards elevated conditions), a review of the HHRA assumptions and conditions will be undertaken. In particular, a revision to recommended maximum fish consumption rates might be made.
- Animal tissues and wild plants will be monitored on an as-required basis. If environmental concentrations are found to appreciably increase in the future (see above), it will be necessary to re-visit the conclusions on the health risks associated with consumption of various foods and contact with the environment. Under such a scenario, it may be necessary to either collect and/or model the concentrations of chemicals in the various animals (e.g., fish, moose) and plants (e.g., berries, leaves, roots).
- Land occupancy will be monitored. The HHRA was developed under the assumption that the mine site will continue to be used for industrial purposes. Important land use elements to monitor include:
    - Persons living at the site as caretakers should be adults.
    - Occasional authorized visitors that include young children should be restricted to spending their time at only the residential area.
    - Activities that involve excavation, removal or moving of impacted materials will require health and safety measures to ensure protection of involved persons.
    - Trespassing will continue to be discouraged.
    - Occasional adult site visitors will be on site, under supervision of the caretaker or another Teck representative.
- Going forward, Teck representatives will continue to observe site usage patterns. If a change in site use is considered, Teck would need to review the HHRA to determine if such activities are considered to be acceptable from a health perspective.

- Communication of results on food consumption. Despite the beneficial effects of consumption of many wild-harvested foods, it appears that many people may be avoiding such foods in the vicinity of Pinchi Lake. On the other hand, consumption of some foods (namely certain fish species such as lake trout and burbot) should be restricted (particularly the consumption of large (old) fish). Consequently, it is recommended that these results be communicated to interested parties such as the communities and health agencies. In addition, it may be necessary to revise the consumption recommendations if appreciably different monitoring results are obtained in the future (and communicate any such changes to the communities/health agencies).

Implementation of the above risk management measures will be important for the human health risk estimates to be considered valid. If conditions appreciably change resulting in increased exposures, First Nations representatives, local groups and governmental agencies will be immediately notified and the appropriate mitigation measures will be undertaken to reduce risks to acceptable levels.

Re-vegetation Monitoring

The objective for the long-term vegetation monitoring program is to have a self-sustaining plant community of acceptable species that will become established and thrive over the long-term. Pryzm Environmental (Pryzm Environmental, 2012) has developed a specific set of field sample methods and standards to determine if the objective of the vegetation program is being met. The information generated through the vegetation monitoring program will also be used to ensure that the site reclamation complements the adjacent wildlife habitat which is one of the primary objectives of the Closure Plan.

Sample sites and numbers of samples were chosen to provide a cross section of the plant communities that have been established at the mine site for a variety of site conditions over time. The monitoring for seeded vegetation includes germination success, species composition, and biomass, whereas the monitoring for planted seedlings includes survival and height growth. The schedule and monitoring level is a combination of reconnaissance level and detailed data recording and follow up statistical analysis for reporting purposes. Vegetation sampling to determine if metals uptake is a concern will be completed in conjunction with soil sampling as detailed in the ecological risk assessment.

Geotechnical and geophysical monitoring

The objective of the geotechnical and geophysical monitoring at the site is to ensure the "physical stability" of the site. The site currently has a number of engineered structures that require regular monitoring and are based on hazard classifications completed by Klohn Crippen Berger (Klohn Crippen Berger, 2012). The hazard classifications included a review of the economic and cultural losses, and environmental losses. The overall classification for the tailings storage facility (TSF) is considered 'Significant' (based on the 2007 Canadian Dam Association guidance). Significant is the second lowest classification for dams which implies that the downstream consequences of failure are expected to be relatively minor. The overall classifications for four of the five waste dumps are considered 'Very Low' and the 500-level waste dump is considered 'Low'.

The facilities that require regular geotechnical and geophysical inspections include:

- The decommissioned TSF, closure spillway and soil cover;
- Former lagoon/calcine dump areas;
- Waste rock dumps;
- Ed Creek diversion channel;
- West zone pit cover cap; and
- Other areas of the site primarily for erosion control.
- The type and frequency of geotechnical inspections for the site include:
    - Routine site surveillance inspections to be conducted by a knowledgeable and trained person familiar with the site semi-annually/annually (depending on the structure);
    - Formal visual inspections for all facilities, to be completed by an appropriate company representative or company engineering consultant annually;
    - Formal visual inspections to be completed by a professional geotechnical engineer. Inspection of the TSF will be completed initially on an annual basis (for five years). After 5 years annual inspection may be done by an appropriate company representative, supplemented by inspections every 5 years by a professional geotechnical engineer. The geotechnical engineer will produce a formal inspection report.

Dam safety review will be completed on a periodic basis (once every 10 years) by a professional geotechnical engineer to verify that the dam is still stable and that no new risks have been identified. A formal review report would be prepared.

If any of the structures show evidence of instability or require maintenance work, the frequency of inspections would be increased in accordance with the geotechnical consultant's recommendations. In addition, inspections and monitoring will occur immediately following large hydrologic or seismic events.

ADAPTIVE MANAGEMENT AND ENVIRONMENTAL MANAGEMENT SYSTEM

A key component of the post-reclamation monitoring plan for all aspects is the concept of 'Adaptive Management'. That is the need for and scope of a monitoring program re-evaluation. For instance, if chemical exposure is shown to increase, monitoring frequency may be increased. Conversely, if chemical exposure is reduced, monitoring frequency may be decreased. With respect to the ERA components, a report will be prepared to interpret the findings in the context of the ERA predictions and assumptions. The decision to reduce or increase monitoring will be determined based on the findings of that report.

To ensure that the post-reclamation monitoring events and permit conditions are being completed, Teck has inserted all the tasks in an Environmental Management System called SiteLine. SiteLine is a web-based software application developed by Teck primarily for use at operating facilities to help personnel understand, meet and manage environment, health, safety and community (EHSC) requirements. SiteLine will be used by the Pinchi mine site supervisor and future supervisors as a management and compliance tool. The program provides a clear line of sight from an EHSC requirement to the person who must take action to fulfill the requirement; tracks the completion of EHSC tasks and corrective

actions; and escalates and communicates overdue assignments, including corrective actions, to help ensure Teck is meeting commitments.

CONCLUSIONS

The Pinchi Mine site has undergone decommissioning and reclamation using a risk management approach. As the site contains a tailings impoundment facility and dam, an industrial landfill, and residual soil and groundwater contamination, monitoring is required to ensure that risks are managed. Currently, an on-site caretaker is also part of the risk management plan to manage site security. The frequency and type of post closure monitoring is higher in the short term, however even in the long term, Teck is required to maintain and manage the stability of the property. Currently, the post closure monitoring costs are expected to be approximately $400K/year. For a 100 year budget, that is currently $15.3M. Based on Teck's Dormant Properties group and other mines' experiences, a closed mine is not static and must be actively managed for the long term.

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