**Province of British Columbia**
**MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES**
Report of Inspector of Mines
Reclamation and Permitting
**(Issued pursuant to Section 15 of the *Mines Act*)**

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| **Inspection No.:** | **80236** | | | |
| **File:** | **18070-02-09** | | | |
| **Mine No.:** | **0100291** | | | |
| **Permit No.:** | **M-18** | | | |
| **Emp/Cont:** | **0** | **/** | **0** | |
| **Orders H&S:** | **0** | **RECL** | **3** | |
| **Stop Work:** | **0** | | | |

| | |
|---|---|
| Mine Name: | Cassiar |
| Location: | Northwest of Jade City |
| Owner | Ernie Hatzl |
| Company: | Cassiar Jade Contracting Inc. |
| Address: | PO Box 332<br>Watson Lake, YT, Y04 1C0 |
| Workers Contacted: | Ernie Hatzl (Mine Manager), Jason Kearns (Assistant Manager) |
| Type of Mining: | Surface Industrial Mineral |
| Date of | September 20th, 2017 |
| Accompanying Inspectors: | Victoria Stevens |
| Copies to | Al Hoffman, Diane Howe, Kim Bellefontaine, Lowell Constable, Jennifer McConnachie, Doug Flynn, Howard Davies |

**Written response is required from the Mine Manager within 15 days of receiving the report. In this document, Code means Health, Safety and Reclamation Code for Mines in British Columbia.**

**Inspection Report**

## Introduction

An inspection of Cassiar Mine property was conducted on September 20th, 2017 by Liz Murphy (Reclamation Inspector) and Victoria Stevens (Reclamation Specialist) with the Ministry of Energy, Mines and Petroleum Resources (EMPR). Jason Kearns (Assistant Manager) toured the inspectors around the site and Ernie Hatzl (Mine Manager) attended the pre and post-inspection meetings. The weather was sunny and partially overcast with no wind.

## Purpose of the Inspection

The purpose of the inspection was to assess the status of the site from an environmental and reclamation compliance perspective and review the reclamation activities currently being implemented on site.

The following report provides a general understanding of the site based on permit amendment applications, previous Annual Reclamation Reports submitted to the EMPR, and the observations and discussion that

occurred on-site and during the inspection related to requirements laid out in the M-18 permit, the *Health, Safety and Reclamation Code for Mines in BC*, and established best practices in environmental management and mine reclamation.

As per the on-site worker health and safety procedure in place, the inspectors wore fitted ventilators and Tyvek suits in addition to standard personal protective equipment required on mine sites.

An overview inspection map is provided on the last page of this report.

**Preamble/Background**

There is an active jade mining operation on the property that operates from May through September. The jade operation removes jade from old waste rock dumps using excavators. This reclamation inspection was focused on aspects of the old asbestos mine and did not include high elevation dumps or open pit area near the top of the mountain where the jade operation is located.

The Cassiar Mine property is located approximately 150 kilometers south of Watson Lake, YT and 120 km north of Dease Lake, BC, approximately 12 kilometers northwest of Jade City, at the former townsite of Cassiar, BC. The M-18 permit was originally issued to the Cassiar asbestos mining operation in the early 1950s and the asbestos mine operated from 1952 until 1992, initially underground and later as an open pit surface mine.

The permit is currently held by Cassiar Jade Contracting Inc, and authorizes surface jade mining of old waste piles from the asbestos mine. Jade mining was permitted in December 1991 and the operation has had a number of owners; it was acquired by the current permittee in 2002. The permit includes the requirement to reclaim the footprint of the asbestos mining operation.

The current permittee holds a comprehensive understanding of the reclamation works to be completed for the site but has yet to document these plans. Annual Reclamation Reports were submitted to EMPR in 2002, 2007 and 2008 but this reporting requirement has not been met since that time. The company has not provided an explanation to clarify the rationale for disregarding this permit and Code requirement for the last 9 years.

A Reclamation Inspection was conducted on July 25, 2016 by an EMPR contractor and the Inspection Report was issued on April 11, 2017. The current status of the 2016 Reclamation Inspection Report orders was

assessed during the 2017 reclamation inspection. The status of compliance specific to the 2016 orders is listed at the end of this report.

At the pre-inspection meeting of September 20th, 2017, the Mine Manager explained that the orders in the 2016 Reclamation Inspection Report have not yet been addressed in part because the report was received in the spring of 2017 when personnel were focused on responding to EMPR Health and Safety Orders received on June 2nd 2017 and requiring safe operating procedures, worker training, personal protective equipment, asbestos exposure monitoring strategy and the requirements and provisions for worker decontamination. These orders were met on August 4th 2017 and the jade operation commenced operations in early August. The work season of 2017 was short and reclamation was not the focus.

One wildlife siting occurred during the inspection; a sheep was observed on the shotcrete slope above Portal 1465. It was explained that sheep are commonly observed on the mine site and that caribou are often seen near the jade operation at higher elevations.

**General Reclamation**

To date, reclamation activities have included extensive demolition, equipment and scrap metal salvage and disposal, tram line removal, recontouring, seeding (broadcast by hand and helicopter) and direct placement of intact forest floor "islands" as a trial of native plant colonization.

The reclamation inspections conducted in 2016 and 2017 observed considerable progress of reclamation activities on the ground; in particular, clean up, demolition and scrap removal. However, reporting of on-going reclamation activities remains outstanding and is required. See repeat order 1.

It was discussed at both the pre- and post-inspection meetings that there are plans to contact a qualified environmental consulting professional, who can potentially assist mine personnel in meeting the reporting requirements of the Code, including the outstanding orders from the 2016 Reclamation Inspection Report.

It was explained that there are several areas on site that have been recontoured in preparation for seeding but that some of these sites may need more site preparation because equipment operators had created a flat, compact surface. It was stated that past seeding results observed indicate that rough and loose or humpy site preparation established vegetation much sooner than flat preparation.

**Inspection Observations**

The following areas were inspected

- Pit Access Road
- Tramline Building
- Concrete Plant
- 1465 Portal and Waste Dumps
- Tramline Corridor
- Boneyard
- Truck Wash
- Mill Site
- Tailings Pile
- Cassiar Town Site

***Pit Access Road***

The Pit Access Road was travelled from the Mill Site to the 1465 Portal. The ditches appear to have been well constructed and there were no signs of erosion or areas requiring maintenance or upgrades.

***Concrete Plant***

The concrete plant has been demolished and removed from site. The concrete pad remains and the general area has been used for a jade sort and storage yard in the past; scattered jade was observed (Photo 1). An area of pallets and bagged asbestos in poor condition is also located in the vicinity (Photo 2). It was discussed that there are plans to remove the bags and materials and recontour the area. It was discussed that reclamation of this area will require implementation of appropriate health and safety procedures for workers handling the asbestos.

*Photo 1. Foundation of concrete plant. Note scattered jade.*

*Photo 2. Open bags of asbestos and pallets*

***1465 Portal***

The 2016 Inspection Report notes that the 1465 portal has been "closed using iron bars and the placement of large boulders to prevent access; the face of the portal area has been treated with shotcrete". Since then, loose material has been placed in front of the boulders to fully block access to the portal. Further permanent works may be required to completely secure the portal opening and could be combined with resloping the steep bank faces surrounding the portal.

There was no water flowing from the portal at the time of inspection and it was explained that the underground is a spiral decline so any water would flow to the bottom of the underground not out of the portal. It was stated that there is no known outlet of mine water.

A tin clad building containing the mine air heaters remains upslope of the portal. A buyer is being sought for the propane underground mine air heating system equipment.

A sheep was on the shockcrete above the portal at the time of the inspection (Photo 3).

***Tramline Building***

The 5 storey high Tramline building was used as a loading point for ore onto the tram cars. The hopper was located on the 1465 Portal area and a conveyor took the ore to the load out facility. The building has been completely demolished and the footprint has been recontoured in preparation for revegetation (Photo 4 and 7).

This area is one of the sites (discussed above) which may receive additional site preparation to create a more natural topography and promote microsite development. It was stated that at a minimum the area will be ripped prior to seeding.

*Photo 3. 1465 Portal. Note sheep on shockcrete.*

*Photo 4. North end of former Tramline Building site from the 1465 Portal*

***Waste Dumps***

It is noted that the waste dumps above 1440 masl are exempt from land use and productivity objectives (currently referred to as end land use objectives) as per the February 19, 1992 *Mines Act* Permit M-18, Section 9. Waste Dumps, Subsection (b) (restated in the January 1, 1994 amendment). All other reclamation standards outlined in the Code apply, including long-term erosion control, long-term stability, water quality, etc.

It was observed that undisturbed landforms in the vicinity of the mine resemble the landscape created by the waste dumps at higher elevations.

The waste dumps and disturbed landscape below the dump areas range from sparsely vegetated to completely void of vegetative cover at higher elevations (Photo 5). Although the slopes were only observed from the bottom, they did not appear to be ravelling or failing. There was a small slump observed above 1465 Portal (Photo 6). Site personnel explained that plans were being designed and will be implemented to divert surface water in the area to avoid future failures. The slump was observed from the 1465 Portal area only.

*Photo 5. Waste Dumps above 1465 Portal.*

*Photo 6. Slump above 1465 Portal*

During operations of the asbestos mine, a slide originating on the mine side of the valley south of the waste dumps took out the tramline below and deposited considerable material on the west side of the valley (Photo 7). The slide material was not seeded or planted and appears to be revegetating naturally.

***Tramline***

The 1.7 km tramline was used to transport ore from the top of the mountain near the former open pit to the mill at the bottom of the valley. The support structures for the cable tramline were extensive structures placed at interval for the full extent of the line. Demolition of the tramline has been completed and included removal of the cable line, tram cars and all supporting infrastructure including recontouring support footprints. From a vantage point near 1465 Portal looking down at the lower elevations of the linear corridor, it was noted that the most of the former tramline appears to have established vegetation from natural ingress except for areas that have been recently recontoured. An access road adjacent to the tramline that was in place for maintenance, is still visible, and may require decompaction if revegetation objectives are not met through natural successional processes.

Berms of loose ore material were observed at points along the former tramline (Photo 8). It was explained that the berms occur at certain points along the length of the line and were created by ore spilling from the tram cars. A decision about how these berms will be reclaimed has not been made.

The tramline corridor will require future monitoring of vegetation success. Vegetation monitoring plans are required to be submitted as part of the Updated Reclamation and Closure Plan. See repeat order 2.

There are 3 remaining telephone poles that supported a telephone system between the lower mill site and the tram car loading area. The phone line and all easily accessible poles have been removed. It was explained that the three remaining poles are considered inaccessible.

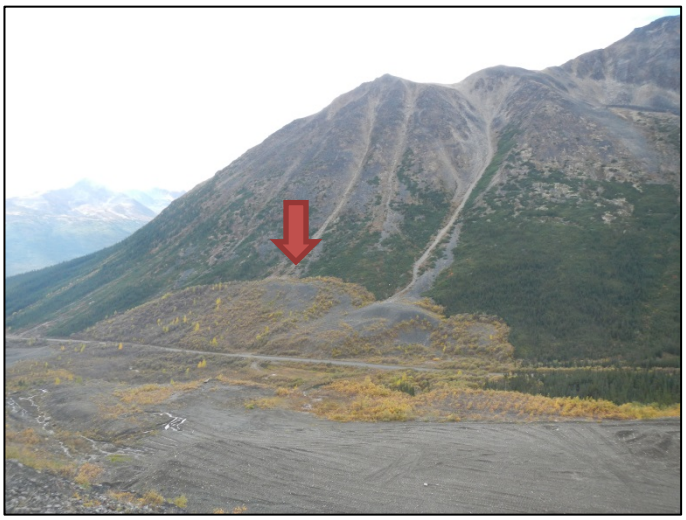

*Photo 7. Slide run out area at arrow showing vegetation establishment. South end of graded Tramline Building site in foreground.*

*Photo 8. Berm of spilled ore along tramline.*

***Boneyard***

The Boneyard clearing is north of the mill site on both sides of the access road. It was explained that extensive scrap removal efforts were made in 2013 to 2014 and included a total of 350 B-train truckloads of scrap metal removed from site. Once all the scrap was removed from the west side of the Boneyard, a 1 to 2.5 m thick lift of previously stockpiled overburden material was placed over the area in the fall of 2016. The overburden used as cover had been stockpiled from stripping activities that occurred during original development of the Boneyard site.

At the time of the inspection, the overburden had not been seeded but small “islands” of intact forest floor supporting native species such as willows, grasses, mosses, forbs and brush had been placed randomly to encourage establishment of natural ground cover (Photo 9). The plots of native ground (approximately 1.5m X 2m) are sourced from an adjacent old camp area. The process involves a front end loader, which scoops the vegetation and soil and transports each scoop individually to the destination. The method attempts to maintain the integrity of the vegetation in an upright and undisturbed position, and keeps the roots intact with the growth medium, for direct placement. The plots on the overburden lift were placed last fall and the vegetation had

survived the winter and leafed out this season. Monitoring results of this method of direct placement should be included in Annual Reclamation Reports. See repeat order 1.

It was explained that the area directly adjacent to the overburden cover had revegetated naturally over the past 3 to 4 years (Photo 10) and that the overburden would be left to do the same. It was discussed that vegetation cover on the overburden would be monitored for the next few years and seeding would occur if natural ingress did not occur as expected. The area of the Boneyard where natural ingress has occurred since 2014 appeared to have considerable coverage of native species including sedges and shrubs. A single common tansy plant was identified as well as some scentless chamomile near the road.

*Photo 9. Direct placement of native vegetation on overburden cover of former Boneyard.*

*Photo 10. Natural vegetation established over 3-4 years. Berm of overburden placed last year in foreground.*

The Boneyard area on the east side of the access road contains some scrap, including several tram cars, wooden cable spools and a drill. It was discussed that plans are underway for these items to be removed from site.

***Truck Wash***

The truck wash is a simple water tank supported pump and spray facility located south of the Boneyard. A much larger equipment wash facility was in place at this location during operation of the asbestos mine. It was explained that some of the original washing infrastructure (pipes and a gravel area constructed to promote sedimentation) has recently been reactivated and is currently in use as part of the implementation of the current health and safety procedures for the jade operation. Photo 11 shows the truck wash area with the tank and pump, drainage ditch and extensive gravel area beyond where the water drains.

***Mill Site***

The extensive area around the former mill is referred to as the Mill Site. The original mill was a 6 storey wooden building built in the 1950s and destroyed by a fire in the late 1980s. At the time of the fire, the asbestos mine was processing tailings from high grade ore mined in the 1950s in an attempt to extend mine life. When the mill burned, the company decided not to rebuild. They shut the mine down and most of the town's occupants had moved by the early 1990s.

Historic photos show that extensive demolition has occurred on the Mill Site. A few buildings remain; the largest is the Dry Rock Storage, which is an A frame building where ore was placed in separate compartments via conveyor and left to dry prior to bagging for transport. The drying compartments are constructed of old Bailey bridges sourced from a Highway 37 upgrade project. The top of the Dry Rock Storage building is visible in photo 12 which was taken from the top of the tailings pile. It was explained that this type of drying facility is still used in other areas around the world and that a potential buyer may still be found.

*Photo 11. Truck wash.*

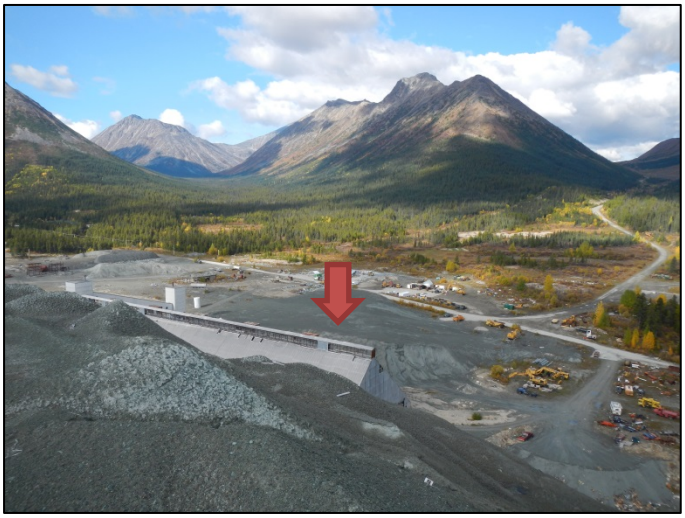

*Photo 12. Mill area overview looking north. Arrow is top of dry rock storage building.*

The other remaining large building that is planned for demolition next is the Bag House. It was explained that the building housed large bag filters for mill outflow air venting. The filter bags were designed to trap asbestos fibers as the mill air exhaust moved through the facility.

Direct placement of plots of native ground was observed near the tramline terminus building. The approach ramp has been recontoured and seeded (Photo 13).

Natural ingress of black cottonwood and pine was observed adjacent to the warehouse foundation (Photo 14).

*Photo 13. Tramline terminus building and directly placed native ground and vegetation plots*

*Photo 14. Natural ingress near warehouse foundation.*

The Dry building also remains and is now used by an exploration company for storing core. The building is in good shape and will be demolished once it is no longer required for storage.

The progress of demolition on the Mill Site was documented in the 2016 Reclamation Inspection Report and little has changed since then. It was explained that demolition activities have not occurred in the 2017 season because scrap salvage crews were not permitted on site until the new procedures for health and safety were in place.

Discussions on site indicated that the company has plans for strategic demolition of buildings, and activities are expected to commence next season.

Cassiar's remote location may pose challenges for selling mine components and scrap metal because transporting materials to market is often not economical. For much of the scrap removal, the mine has employed the services of a scrap metal salvage company (Scrappy Larry's) located directly adjacent to the mine access gate.

A considerable amount of cement was observed to be used in construction of infrastructure. It was explained that because the mine had an on-site cement plant, cement was used extensively in early construction of both the mine and Cassiar town site.

It was discussed that covering all the foundations may be a challenge because debris was historically buried on site and digging to source overburden cover material for cement foundations may uncover decades-old buried debris.

***Tailings Pile***

The largest of the tailings piles is located between the Mill Site and access road. Estimates discussed on site were that the pile is 17 million imperial tons of tailings at a composition of approximately 20% magnesium, >1% asbestos. The large tailings pile is more accurately described as a tailings mountain. It was explained that the pile is frozen approximately 1-2 m from the surface, so resloping the pile could potentially create melting and safety issues for equipment on the pile.

Approximately five weeks prior to the inspection, the top eastern end of the pile was heli-seeded using a grass mix with a high percentage of red fescue. Grass has sprouted and one patch was observed to have germinated at a visibly dense rate (Photo 15); however, the density is low across the majority of the seeded area. It was stated that success of the seeding will be monitored over the next few growing seasons.

The method of direct placement of native ground "islands" has also been used on the upper portions of the tailings and some of these areas have been in place for multiple years. At the time of inspection, the plots were supporting native vegetation, including willow and pine (Photo 16). EMPR looks forward to receiving the monitoring results of this method in subsequent Annual Reclamation Reports.

*Photo 15. Recent heli seeding results on tailings*

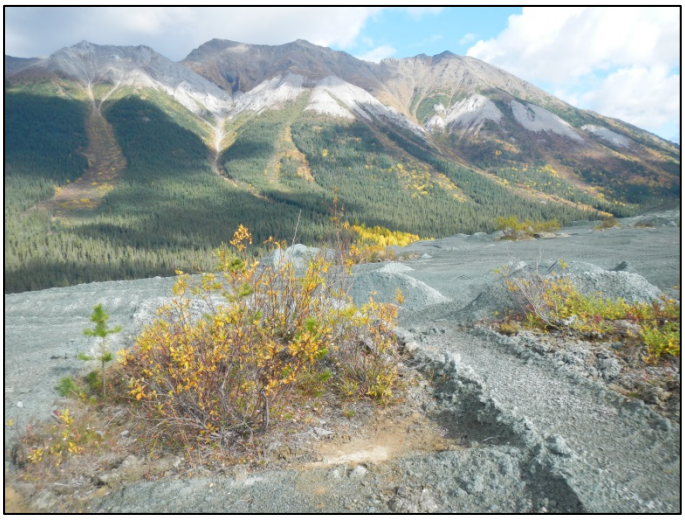

*Photo 16. Native ground direct placement plots on top of tailings.*

Tailings were observed to be a composite of mulch-like fibers and silty material that clumps together to give the appearance of a bumpy surface. It was discussed during the post inspection meeting that the outer slope of the Tailings Pile may already have suitable sites for seed capture due to the natural weathering process of the material. It was explained that seeding of the slopes has been conducted in past years with limited success.

There is an area that supports vegetation on the eastern end of the pile where the older tailings are located (Photo 17). It was explained that an overburden cover was likely applied at this location prior to hydro seeding and hand seeding applications (thought to have been completed in the late 1970s).

In limited areas on the top of the tailings, small plantations of lodgepole pine and Englemann Spruce have been trialed. As noted in the 2016 Reclamation Inspection Report, the seedlings are showing signs of stress and stunted growth, but most have survived so far and some plantations are believed to be 10 years old (Photo 18). It was discussed that natural growth rates in this area are also likely to be slow.

*Photo 17. Revegetation on older slopes of the Tailings Pile*

*Photo 18. Pine seedlings on tailings.*

Although the majority of the Tailings Pile is not vegetated (Photo 19), there was no sign of dust deposition on the surface of the pile. It was discussed that the area is generally very wet during the summer and the tailings do not dry out sufficiently to generate dust.

One area of erosion was noted from the top of the pile. The slump occurred near the access road a few years ago and there is a fan of material beyond the toe of the pile.

***Cassiar Town Site***

A driving tour through the former town site was conducted. Natural ingress of native vegetation including pine, black cottonwood and numerous native shrub species was observed (Photo 20). No planting has occurred on the town site; however some footprint disturbances, such as that of the church, will receive an application of seed. The paved road is still in place for access, but most of the cement sidewalks have been ripped up. It was discussed at the pre-inspection meeting that several collapsing sewage tanks have been removed from the site.

The church, which was adjacent to the current camp facility, was burned in the fall of 2016 because the subfloor was rotting and it was deemed unsafe.

The hockey arena has been dismantled and only the concrete foundation remains. It was stated that cement pads will be covered and seeded. The location of the source for cover material was not known at the time of inspection.

*Photo 19. Typical view of tailings pile slope. Note surface texture in foreground.*

*Photo 20. Cassiar town site revegetation.*

**Soil Management**

There are no known soil stockpiles on site. The Updated Reclamation and Closure Plan required in repeat order 2 is to propose strategies that will be used to address cover requirements.

**Invasive Plant Management**

It was discussed that guide outfitters in the area have transported horses through the site in the past and that weeds were not noticed prior to the horses. It was also discussed that herbicide application occurred last year

for Mountain Bluet in the Cassiar town site. The herbicide program was conducted by the North West Invasive Plant Council and signs indicating weed treatment were observed.

No treatment occurred on site this year, as the new procedure for additional personal protective equipment was not in place. An Invasive Plant Management Plan was ordered in the 2016 Reclamation Inspection Report. See repeat order 3 for details.

**Orders**

The status of the orders from the 2016 reclamation inspection has been assessed as part of this inspection through review of information received and observations made at site. For tracking purposes, the 2016 inspection order is re-stated with the 2017 assessment provided directly below it. All orders require response and follow up immediately.

1. **2016 Inspection Order :** Pursuant to Section 2. (Annual Reclamation Report) of Permit M-18 and 10.4.4(a) of the Code, the Manager shall submit a current Annual Reclamation Report for 2016 by **May 31, 2017** and annually on March 31st thereafter as required by the Code.

   This report shall include a detailed, accurate accounting of all mining related disturbances and reclamation activities that have occurred to the end of December 31, 2016 on all disturbances permitted under M-18. MEM's format requirements for the Annual Reclamation Report, including for shapefiles (digital spatial data) are located at the following link:
   http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/reclamation-and-closure/2017_03_27_annual_reclamation_report_requirements.pdf

   **2017 Follow Up Assessment:** The company is in non compliance with this order re-stated above.

2. 2016 Reclamation Order: Pursuant to Section 10.4.1 (Updated Plans) of the Code, the Manager shall, by **July 31, 2017**, develop and submit an updated Mine Plan and Reclamation Program to the Chief Inspector. The report shall detail the projected mining activities for the jade operation over the next 5 years and provide a detailed Reclamation and Closure Plan, with a detailed cost estimate to implement the plan based on third party rates, for all disturbances permitted under M-18. The plan should be developed to address areas of concern identified in this inspection report and to meet end land use objectives, permit requirements, and other reclamation standards outlined in the Code. In addition, the plan should include:

- ongoing monitoring and maintenance requirements to ensure compliance with health, safety, and reclamation standards,
- operating procedures that will be followed to ensure health and safety of workers and public, as well as environmental compliance for both the mining operation and the areas undergoing reclamation and closure activities,
- a human health and ecological risk assessment should be conducted at a level that will assist the Permittee in identifying operational management and reclamation practices that will be required to contain and mitigate the asbestos contamination that has been observed at this site; the results of this assessment should be used to inform the reclamation prescriptions,
- characterization of waste materials and potential sources of soil/overburden to determine suitability for reclamation,
- decommissioning of unnecessary water management structures,
- closure plans for any underground openings, including consideration for bats and bat habitat if bat use is detected,
- an assessment of the 1440-meter elevation to determine the areas of the mine that will be exempt from land use and productivity objectives in accordance with the condition in the M-18 permit,
- plans to address the reclamation standards (Code and permit conditions) that continue to apply to the high elevation areas,
- an evaluation of the areas that have been left to revegetate through natural processes to determine effectiveness of the established vegetation communities with respect to Code requirements,
- resloping of waste dumps and tailings piles, including a safety assessment of the asbestos tailings pile,
- plans for treatment of all compacted areas,
- plans for surface preparation to reduce erosion potential, especially on slopes and areas where a soil cover may be required,
- prescriptions for placement of soil/overburden (depth/suitability) and revegetation, and
- a schedule for completing the works.

**2017 Follow Up Assessment:** The company is in non compliance with this order re-stated above. The required updated Reclamation and Closure Plan has not been received by EMPR to date.

3. **2016 Reclamation Order**: Pursuant to Section 10.7.7 (Re-vegetation) of the Code and Section 2 (Duty to control noxious weeds) of the British Columbia Weed Control Act, the Manager shall prepare and implement an Invasive Plant Management Plan by **July 31, 2017**.

In order to develop this plan, it is recommended that Cassiar Jade have a qualified professional prepare an invasive plant management plan that is focussed on the operational treatment of mountain bluet and scentless chamomile, as well as other invasive plants that are identified. This plan should include a description of the distribution and amount of these invasive species that exist on the mine site and provide appropriate management actions that should be taken to address each of the species."

**2017 Follow Up Assessment:** The company is in non compliance with this order re-stated above. The required Invasive Plant Management Plan has not been received by EMPR to date.

**Conclusion**

The September 20th, 2017 reclamation inspection provided a good overview of the site infrastructure and reclamation work completed thus far, and an understanding of the remaining reclamation work required to move the site towards the goal of meeting Code requirements, permit conditions, and end land use objectives.

EMPR acknowledges the considerable reclamation work that has been completed on the ground at this site to date and looks forward to receiving the required Reclamation and Closure Plan tracking all reclamation work to date and providing an update of outstanding reclamation and closure works required. Please note that annual updates of reclamation activities completed in the future must be summarized and submitted in the Annual Reclamation Reports.

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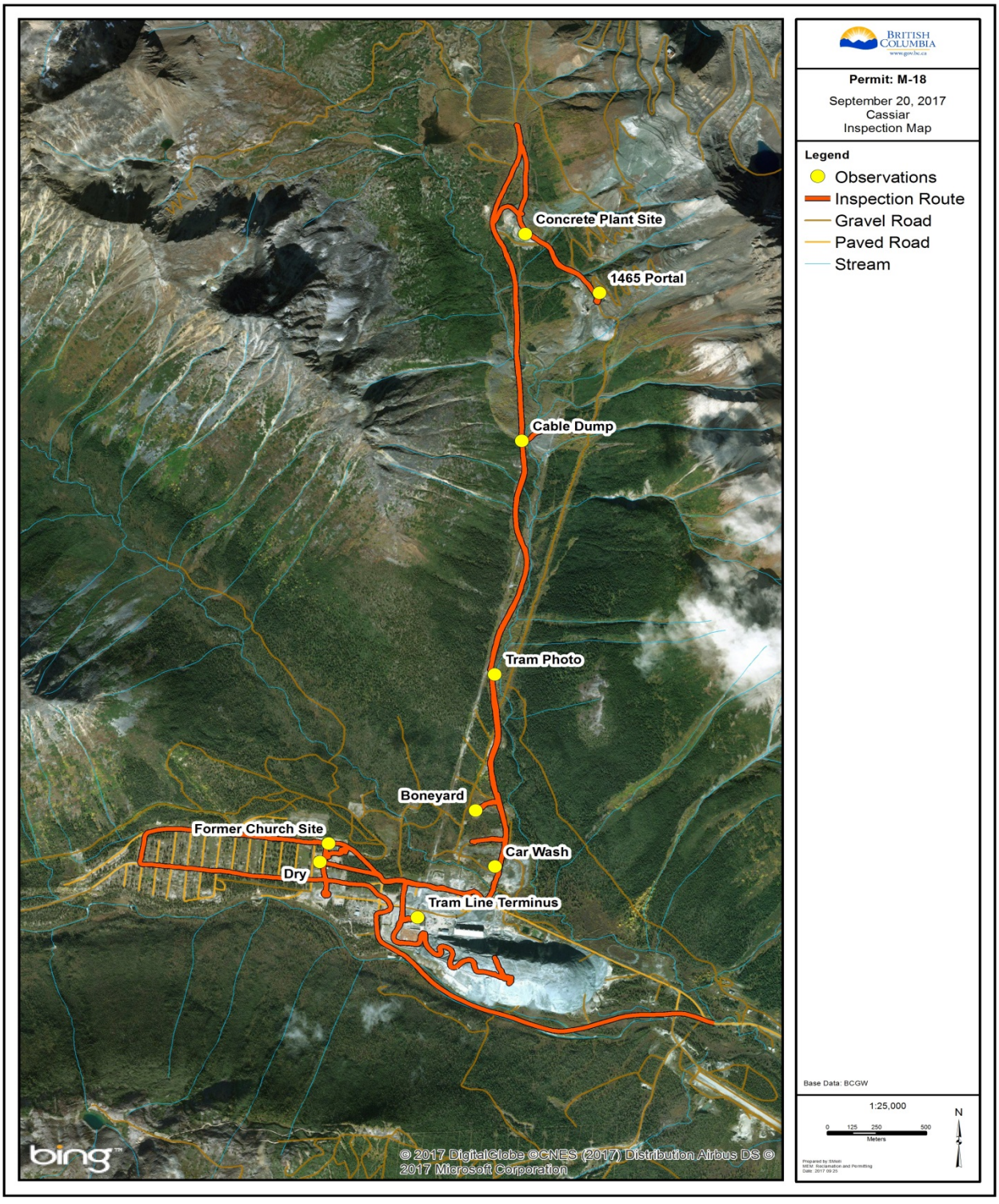
Liz Murphy, P.Ag Dated: October 2nd 2017

Inspector of Mines, Reclamation

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Dated: October 2nd 2017