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July 23rd Inspection of the Greens Creek Mine

This report covers the July 23, 2014 inspection of the Greens Creek Mine. The inspection team consisted of David Wilfong from the Alaska Department of Natural Resources (ADNR) and Curtis Caton from the United States Forest Service (USFS). The team was accompanied by Mitch Brooks from the Hecla Greens Creek Mining Company Environmental Department for the entire duration of the inspection. The team was transported to the mine via a USFS chartered Ward Air De Havilland Beaver, and back to Juneau International Airport float pond on a Cessna 185 floatplane. This inspection was focused on the mine's Best Management Practices (BMP) and covered the Beach, the Tailings Disposal Facility, 920, Site 23, D Pond and Site E on the B Road "side". The team also traveled on the A Road to Pit 7.

As the team drove past the Tailings Disposal Facility (TDF), we stopped quickly near the East Ridge Expansion to photograph some monitoring stations that were placed in the still growing pile (Figure 1). The monitoring equipment consists of vibrating wire piezometers and suction lysimeters. An approximately 10' X 10' pile of refuse was being burned near the southeast end of the pile. Mitch stated that the burning was allowed under a permit issued by the Alaska Department of Environmental Conservation (ADEC).

Figure 1 Monitoring site in the TSF

During the ensuing trip up the B Road, several Brown Bears were spotted grazing on the seeded areas near the road. All disturbed areas stripped of vegetation are protected from erosion by reseeding the disturbance. This concurrent reclamation practice provides excellent nutrition for the region's wildlife. It was also noted that the Alaska Department of Fish and Game was on the site doing their annual biomonitoring work.

Figure 2 Added freeboard to the integrated secondary containment.

Upon arrival at the 920 area, the inspectors stopped near the mill and looked inside one of the new 20 foot "Sea Vans" built with integral secondary containment. Several of the containers were ordered by Hecla to ensure that chemicals and hydrocarbons are properly stored. When the new containers arrived, it was found that the volume held by the secondary containment was insufficient to allow for the storage of the large totes used in the mill facility. This design flaw was rectified by the addition of a short bar of metal welded across the front of the container by Hecla's millwrights (Figure 2). The modified containers will now hold a large volume of liquid should a primary container be punctured and the fluid leak out. The arrival and retrofitting of these containers supply a long-awaited remedy for the lack of secondary containment that has been noted in previous inspections.

Figure 3 Sediment on the bridge leading to/from the portal.

The primary objective of this inspection was to review the BMP's in place throughout the mine site. Many of these practices include controlling erosion, run on, and runoff of water within the mine's disturbance footprint. For that reason, the inspectors moved around the perimeter of the mine. The truck was parked at the north end of the bridge leading to the portal, and the inspectors got out and moved on foot toward the mine opening. A large amount of sediment had accumulated on the bridge deck (Figure 3). The tall splash guards installed above the guard rails on each side of the bridge are designed to prevent ore that is tracked out of the mine from being splashed into Greens Creek. The underside of the bridge was

Figure 4 The underside of the bridge crossing Greens Creek.

Figure 5 Road rock storage area.

clean (Figure 4), and it appeared that the splash guards were working as designed to prevent sediment from entering the creek.

After crossing the bridge, the inspectors noted an area to the left of the portal which is used to store crushed rock that has been imported from off-site (Figure 5). The imported rock is more durable than rock that can be found near the mine site, and is used to build long-lasting underground roads in the mine. The storage area was lined with ecology blocks stacked two high, and some of the rock had spilled over the side and partway down the embankment to Greens Creek.

Figure 6 The 920 Portal.

Walking around the entrance to the portal (Figure 6), there appeared to be piles of loose rock on the ground at the base of the high walls. Mitch stated that a scaling bar is used to periodically dislodge loose rocks from the wall to prevent safety hazards, and a scaling bar was found nearby showing that it may have been done recently. Additional wire mesh covering the highwall may alleviate the need for this maintenance, but frequent scaling of the loose rock will prevent any safety issues. Walking up the road towards the 1350 adit, it was noted that runoff traveling down the access road had begun to develop a preferential flow path down the embankment and into Greens Creek (Figure 7). A safety berm runs along the north edge of the seasonal access road, but there was an approximately 4 foot wide gap between the

Figure 7 A preferential flow path into Greens Creek.

dirt safety berm, and a vertical wall at the edge of a concrete pad (figure 8). The water flowing down the access road is considered diversion water. The water on the concrete pad is considered contact water, and is collected in a sump near the portal and pumped through a pipe (seen in Figure 4) beneath the bridge to "A Pond"[1] where it is pumped to Pond 23, and then to a treatment plant.

Figure 8 Gap in the berm near the concrete pad.

After walking back across the bridge, the inspectors walked up the haul road toward the mill facility. Running along the side of the road is a drainage ditch that carries contact water to a sump where it is pumped to A Pond. The ditch contains several check dams that allow water to create small pools and drop heavier sediment particles out before it reaches A Pond. These small settling basins had reached their capacity and were no longer functioning as designed (Figure 9). Moving up the haul road toward the ore pad, a small amount of erosion and slope movement could be seen on the uphill side of the road (Figure 10). When asked whether or not the slope had been seeded with grass, Mitch indicated that it likely had not been. Despite the fact that it had not been artificially seeded, a large amount of moss had volunteered to grow on the slope, and was doing a fairly good job of holding the slope together. Evergreen trees (also volunteers) could be seen growing along the slope, further stabilizing it. As can be seen in Figure 10, parts of the lower slope show signs of movement. Upon closer

Figure 9 Settling pond full of sediment.

Figure 10 Slope next to the Haul Road showing signs of movement.

[1] Not to be confused with a pond, A Pond (could be called Pond A) is a primary collection point for contact water at the 920 Area.

investigation, it was found that the soil along the eroded area was formed by a majority of coarse grains. This may indicate that the fine-grained soil had been washed away during heavy rain events. At this time, there appeared to be no concern for the stability of the slope. However, revegetation the slope with the approved reclamation seed mix may reduce the possibility of further erosion.

Figure 11 Vegetation and debris in a diversion ditch.

The team moved further up the haul road to the ore pad, and then to the mill back slope. This area contains Potentially Acid Generating (PAG) wasterock from the mine. The back slope was well vegetated and appeared stable. Runoff from the slope flows into a lined ditch that runs along the north side of the ore pad and warehouse building. The water in the ditch flows west, and eventually makes its way to A Pond. There was some debris including wood and plastic, along with a moderate amount of vegetation in the diversion ditch (Figure 11). This debris may cause the water in the ditch to run slowly and lead to drainage problems. The containers with integrated secondary containment were put to good use behind the warehouse. Chemicals and petroleum products were properly stored in these containers.

Figure 12 Spill site near the mill.

Figure 13 "A Pond" under construction.

A Pond was under repair during the inspection. The liner was being removed, and preparations to reline the pond were underway (Figure 13). Water that normally would have flowed to A Pond was being stored in a degrit basin and pumped to Pond 23, then to Pond 7 at the TDF. Soil was being excavated from an area near the mill building after a failed fitting led to a

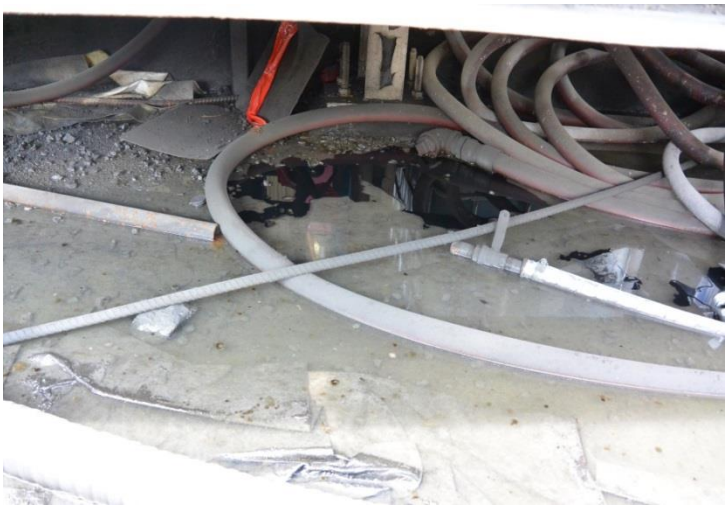


Figure 14 Oil floating on water in secondary containment.

moderate sized hydraulic oil spill (Figure 12). Current excavation been temporarily halted because crews had inadvertently removed soil from under some building support footings. The remainder of the contaminated soil was to be excavated as soon as an engineer had looked at the support footings. At other oil storage tanks, water had accumulated in the secondary containment basins. Oil could be seen floating on top of the water inside the basins (Figure 14). At the time of the inspection, there was no danger of the secondary containment overflowing into the environment.

Figure 15 Piles of wasterock at Site 23.

No wasterock was placed at Site 23 during the inspection, and the bulldozer that is normally present pushing piles was also absent. There were small piles of waste rock waiting to be spread out and shaped into the pile (Figure 15). PAG material mixed with overburden excavated from the 1350 Level was waiting in lined containment to be transferred to the TSF for co-disposal. Hecla decided to keep the material from the 1350 separate from the rest of the Wasterock at site 23 as the 1350 material is further along in its oxidation process. Staining was apparent around the base of the 1350 rock pile inside the liner, but it was difficult to tell whether the orange stains were due to organic iron bacteria, or acid generation/metals leaching. The in situ settling basins at Site 23 were also full, and not performing as designed (Figure 16). The team walked along the drainage path that carries water from Site 23 down to Pond 23, and then walked across the B Road to the pipe outlet that delivers water to D Pond. D Pond is overgrown with vegetation. Much of the vegetation had been pressed flat,

Figure 16 Settling basin full of sediment at Site 23

and the large bear tracks leading to and from the area suggests that local bears are using the pond to cool off. The quality of the water is generally good, and the use of it by wildlife is not a concern to the animal's health.

The team left, and traveled to Site E. This area is the site of a historic wasterock dump. The PAG wasterock is being excavated and disposed of in the tailings pile as space allows. Walking around the perimeter, a disturbance in a straw waddle was found (Figure 17). It appeared as though a bear may have peeled the waddle back in the search for insects, grubs, and other edibles.

Figure 17 Permeable mesh pulled back by bears.

The team left the area, and made the short journey back to the Tailings Disposal Facility. Tailings were actively being placed in the northwest area of the drystack pile. After leaving the TDF, Pit 7 off of the A Road was visited. Beavers had been hard at work damming up the culvert under the access road in an attempt to raise the water level in the adjacent swamp (Figure 18). It appears as though their efforts had been successful as woody debris was seen on the road where water levels may have risen and flowed across it during a recent large rainfall event. At this time, it is unclear whether or not the beavers will require a permit to construct and operate a dam.

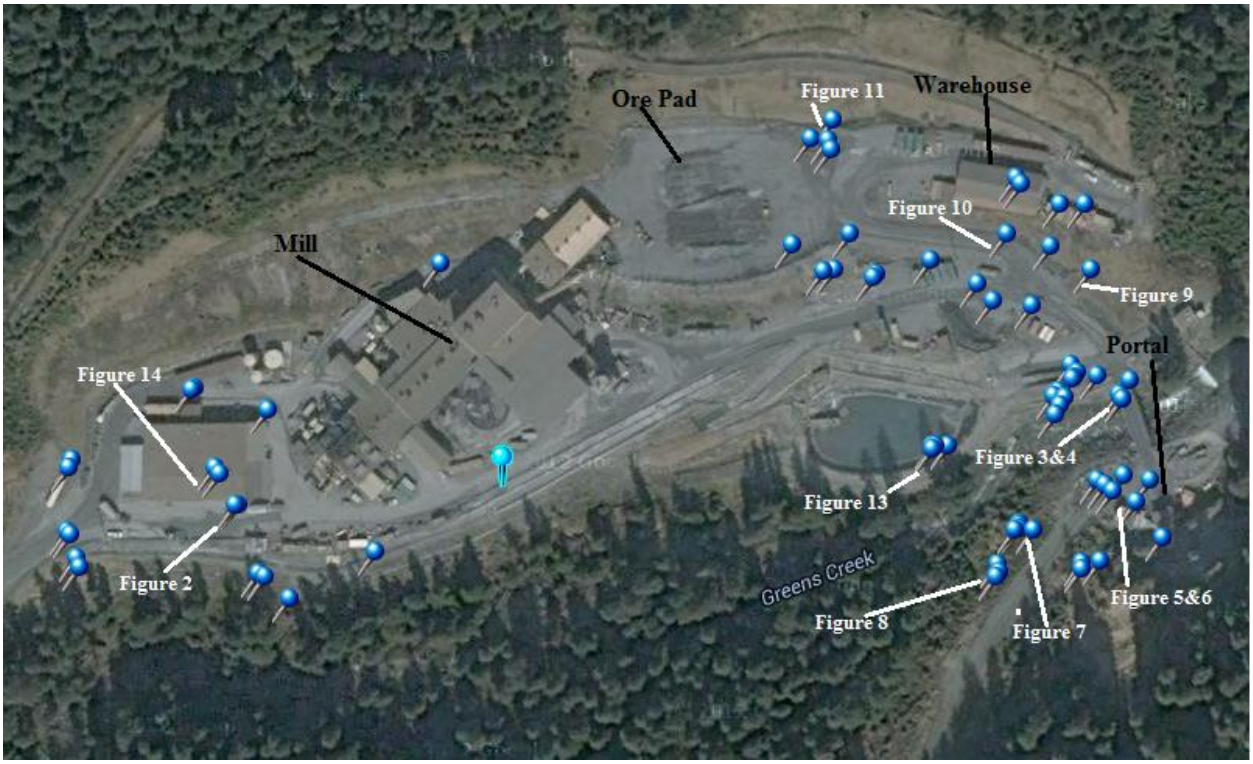
Figure 18 Debris placed at a culvert inlet by beavers.

Action Items:[2]

- Repair the berm along the 1350 access road so that sediment from the 1350 access road does not enter Greens Creek. Several diversions have been installed to lower the flow of water to the gap in the berm. This successfully stopped the flow of sediment .
- Clean out all debris and sediment, to the extent feasible, in all drainage and diversion ditches.
- Excavate the oil-contaminated soil near the mill building. The soil has been excavated and properly disposed of.
- Drain the water from secondary containment basins. Draining the water from secondary containment in an ongoing maintenance procedure.
- Clear the debris from the culvert under the Pit 7 access road. The debris was cleared.

Additional Photo Points[3]

Each blue pin is a point at which a photo was taken.



[2] Green text indicates work that had been performed at the time of the writing of this report.
[3] Points on the map are approximate. Please contact the ADNR at 907-465-3404 for copies of the photos.

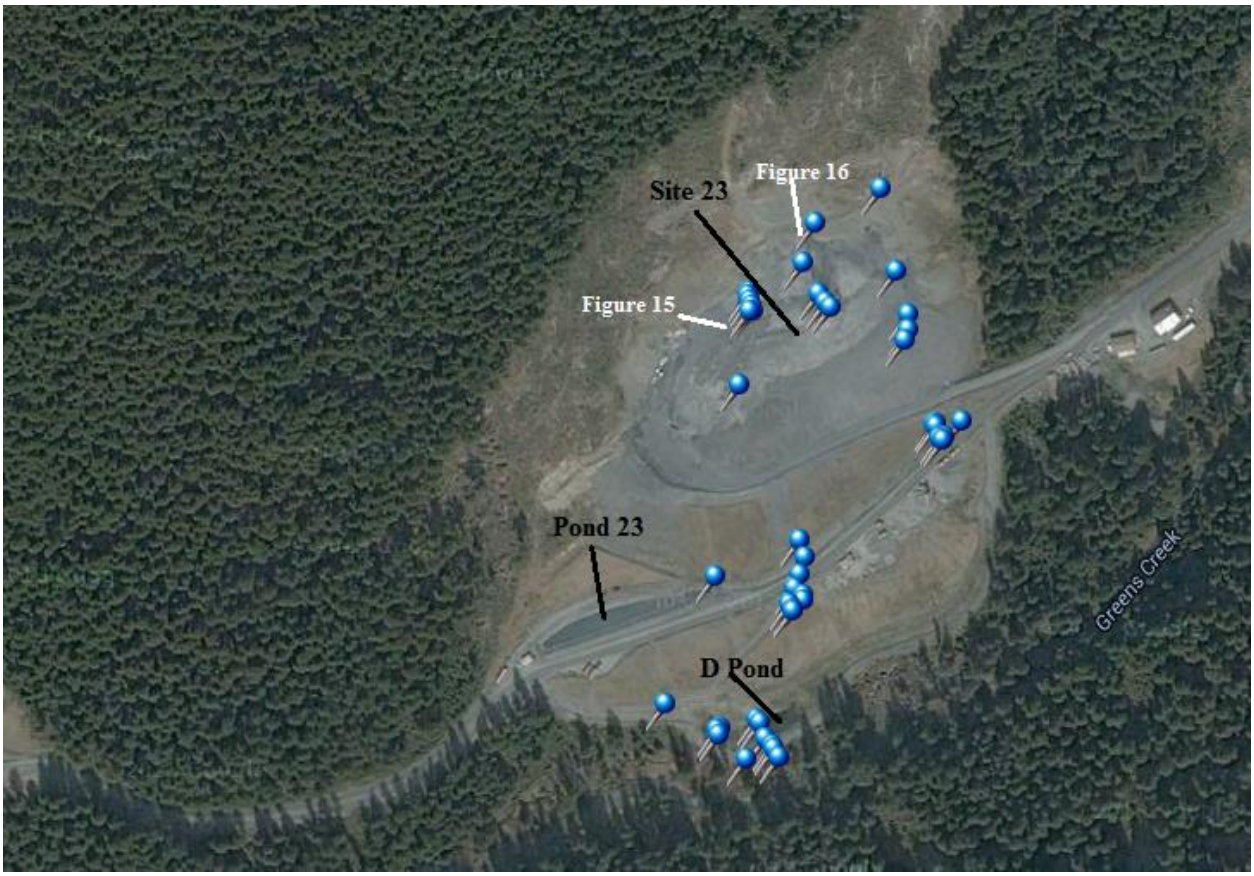


Figure 16
Site 23
Figure 15
Pond 23
Greens Creek
D Pond


Figure 17

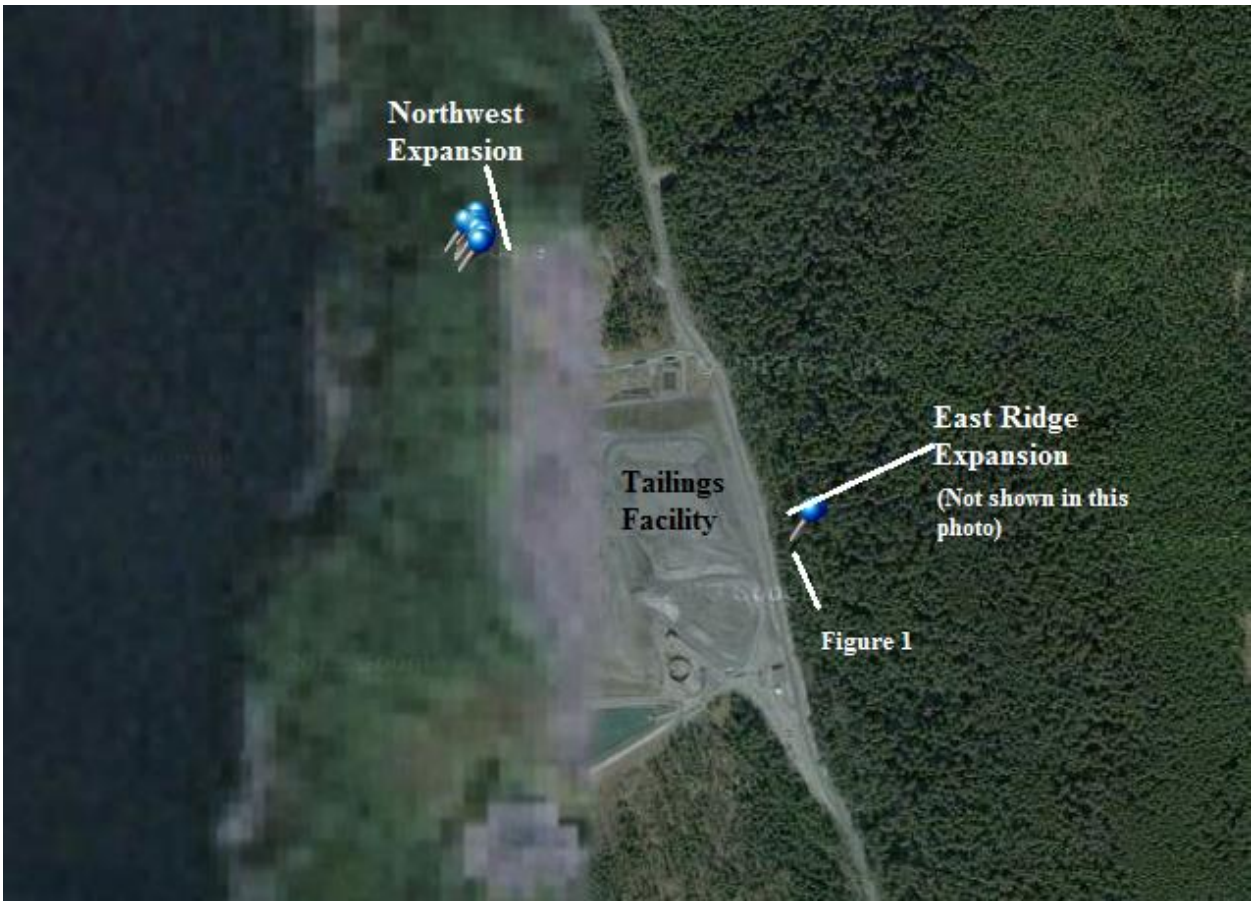


Figure 1

The Alaska Department of Natural Resources would like to thank the United States Forest Service for providing transportation to and from the Hecla Greens Creek Mine, and Mitch Brooks and Hecla Mining Company for providing a safe and informative inspection.