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Investigation of Pebble Prospect Reclaimed Drill Sites

Figure 1: Drill discharge to tundra. (from ADNR Inspection Report, July 26-27, 2007)

The Pebble ore deposit was intensively explored between 2004 and 2012. Active exploration has not occurred in the past four years. The site has 1,355 drill holes ranging from shallow geotechnical holes to exploration holes up to 6,000 feet deep, all located on State-owned land. Drilling targeted copper sulfide mineralization, and "rock flour" cuttings with copper and sulfide can create acidic soil with high copper concentrations when disposed on the landscape. Additionally, drill holes that are not properly reclaimed could generate acid downhole and allow groundwater to carry metals to the surface.

The Pebble Limited Partnership operates under a Miscellaneous Land Use Permit from the Alaska Department of Natural Resources, in part to continue reclamation work. In November 2015, the United Tribes of Bristol Bay and others petitioned ADNR to investigate the status of reclamation, including drill holes that had not been properly plugged, unsuccessful revegetation efforts, and the continuing presence and impact of drilling waste.

Artesian drill holes

Artesian sites are producing water, neutral in pH, but elevated in metals. Artesian flow is occurring at locations with the drill casing both absent and present. ADNR listed six artesian sites for PLP to address but did not collect samples to determine what type of water was being discharged. CSP2 sampled one of the six artesian sites ADNR visited and found it to be discharging aluminum, manganese, sulfate, sodium, calcium, and magnesium in high concentrations, but was low in copper (Figure 2). Of five artesian sites CSP2 had tested, two were very high in copper, iron, and at least six other metals, with copper being well into the range of being toxic to aquatic life.

Drill cuttings have also flushed from open drill casings frequently cut off just above the ground surface.

Figure 2: Artesian flow at DDH 9475, drilled in 2009.

These were all acidic, and high in copper and molybdenum. If these are continuing to flush periodically, either the holes were not cemented, or the cement has failed. As wells age, it will be important to know if this problem is observed at more sites.

Artesian conditions may vary daily and are not always dramatic. For example, one site that was flushing material up around a casing and into a wetland – and testing found petroleum elevated in the wetland sediment – was not noted as artesian when ADNR visited. A site ADNR described as artesian was not flowing when CSP2 visited a week later

Some sites that clearly have been artesian have temporary fixes. It is not clear why temporary fixes have been applied instead of removing the drill casing, as required by ADNR. At least two of these sites, repaired in 2015, were visited by ADNR and approved as "good condition", with aerial photographs provided. Photographs on the ground (CSP2) indicate that sites are not permanently stable.

Drill Waste

Remnants of direct discharge from drilling are still evident on the landscape as oxidized or grey fine-grained material accompanied by dead brush and tundra (Figure 3). Exploration drilling targeted sulfide ore with copper, gold, and molybdenum, and sampling by CSP2 determined sites with remaining drill waste discharge to be very high in copper and molybdenum. Some samples were acidic, and may be continuing to impact vegetation.

Figure 3: Dead vegetation and acidic drill cuttings (light-colored material in foreground) remain years after the hole was drilled. Soil was over 100 times higher in copper and molybdenum than background. The nearest hole (DDH 6355) was drilled in 2006.

Five areas with discharge were located. The nearest sites to these discharges were drilled in 2004, 2006, 2007, and 2012, indicating that the waste may have been impacting vegetation and soil for anywhere from 4 to 12 years.

Incomplete Reclamation

Approximately 25% of the sites visited had steel drill casings extending above the surface. These drill casings can pose a risk to snow machine operators

Figure 4: Steel drill casing at reclaimed drill site DDH 11540, drilled in 2011.

when fully or partially covered with snow. The Multiple Land Use Permit that ADNR issued to allow Pebble mine exploration on State land requires specific reclamation actions, including cutting abandoned drill casings off below ground surface, filling drill holes with a minimum of 10 feet of cement, removing equipment and buildings, and submitting an annual reclamation statement.

There were many sites that had open drill casings (Figure 4), and sites where drill casings had been removed but artesian water appeared to flow from the old drill hole. Mobilizing equipment to properly remove these drill casings and close the holes will be very expensive due to the remoteness of the location.

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Summary

A CSP2 team inspected 107 wellsites in August, 2016. Of the sites visited, 34% had no issues, 41% had environmental issues, and 25% had minor issues such as open casings, frost-jacked casings, casings with plugs and valves, or no site identification. Our study determined that 71 of 107 sites inspected were not fully reclaimed. Evidence of impacts was documented through photos, pH and conductivity field meters, and laboratory analysis. Impacts observed in the field were largely dead vegetation, artesian flows, and the presence of open, apparently abandoned, drill casings

In July, 2016, ADNR inspected 141 sites, including 34 identified by PLP as sites that needed monitoring or repair work. At 23 drill sites that CSP2 and ADNR both inspected, within a week of each other, ADNR identified problems at 3 and CSP2 determined that at least 8 of the 23 had problems.

Conclusions

It is evident that these are significant ongoing reclamation and maintenance issues. Drill sites that have not been in use for years continue to have artesian flows or possibly flush drill cuttings; many sites require revegetation. ADNR decided that none of the 134 drill sites they inspected in 2016 posed an environmental or compliance risk. CSP2 identified several areas where drill holes may be having current and continuing impacts in the area, and where there were impacts from discharge during drilling that have not yet recovered, some after over a decade.

To fully understand and address the extent of all environmental impacts a detailed inspection, detailed reclamation plans with funding, and follow up monitoring is needed. It is clear that with the existing issues, and Pebble's unstable financial state, the full environmental impacts cannot be understood nor addressed, and the full financial risks to the State will not be known until a more detailed inspection has been done.

From the Executive Director

Dave Chambers is the Executive Director of CSP2

The summer field work in Bristol Bay last August was fulfilling both professionally and personally. Professionally, I have been suggesting to regulators for years that caution needs to be taken with drill cuttings that contain sulfide minerals, because if they are left on the surface where exposed to air and precipitation, acid drainage could result. The response has been 'Well, there's nothing in the literature about it.' Because it is still legal in most states to dump drill cutting directly on the surface (as is done when you might drill a water well for your home), this is something that has continued to concern me. Kendra and I are in the process of shopping a paper to be published in a journal so that the excuse about 'nothing in the literature' will no longer ring true. On a personal basis it was the first time in a number of years that I have had the resources to actually go to the field and collect data. It was nice to be a field hand again.

Bob and Dave in Bristol Bay

On a more somber note, I must note the passing of one of the conservation communities few technical experts. Bob Moran, Ph.D., was the victim of an automobile accident in Ireland. Bob, a geo-hydrologist, recently focused on working in Latin America and on marine tailings disposal issues in the Asia Pacific, but also contributed to the efforts on many North American projects like the Pebble mine, as well as proposed, operating, and closed mines in Colorado, New Mexico, Wisconsin, and many other states.

Bob was a friend to all of various technical experts working with the NGO community worldwide, and he will be sorely missed on both a professional and personal basis.

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