

SUMMARY DOCUMENT
WHARF RESOURCES (USA) INC.
MINE PERMIT APPLICATION
WHARF EXPANSION PROJECT

Pursuant to ARSD 74:29:01:10, the Department of Environment and Natural Resources, in consultation with Wharf Resources, has prepared a summary document for the mine permit application for the Wharf Expansion Project. The application is for an expansion of the Wharf Mine.

Applicant: Wharf Resources (USA), Inc.
10928 Wharf Road
Lead, South Dakota 57754

Type of Mining: Large scale heap leach operation for gold and silver

Legal Description: Portions of Sections 1, 2, 3, and 12; T4N-R2E; Sections 6 and 7; T4N-R3E; and Sections 33 and 36; T5N-R2E

General Location: Approximately four miles west of Lead, Lawrence County, South Dakota

Local Contact: Bill Shand, General Manager, Wharf Resources

Background:

Wharf Resources operates the Wharf Mine (Annie Creek, Foley Ridge, and Trojan Mines) and Golden Reward Mine, a surface gold mine and heap leaching operation approximately 4 miles west of Lead, South Dakota, in the Bald Mountain Mining District. Wharf has been operating under South Dakota Life of Mine Permit No. 356 since December 1982. In 1986, Wharf was granted two additional Life of Mine Permit Nos. 434 and 435, which expanded the operation. In 1998, Wharf was granted a fourth Life of Mine Permit No. 464 for another expansion of the operation. This application is for the Wharf Expansion Project which involves surface mining for gold in an area immediately to the south and east of Wharf's current mining operation, including a portion of the reclaimed Golden Reward Mine. The Golden Reward Mine, Permit No. 450, was transferred to Wharf in November 2010.

On February 18, 2011, the Minerals and Mining Program of the Department of Environment and Natural Resources received an application from Wharf Resources for the Wharf Expansion Project. With Wharf's submission of supplemental information, the department notified Wharf on July 18, 2011 that the application was procedurally complete.

Operating Plan:

General. The Wharf Expansion Project would be an open pit, truck and front end loader operation similar to the existing Wharf Mine. The proposed project would involve open pit mining and

disposal of overburden primarily to the south of the existing Wharf Mine and west of the Golden Reward Mine. A portion of the reclaimed Golden Reward Mine would be redisturbed during the project. There would be three new mine pits mined in four phases: the Green Mountain, the Golden Reward (Harmony and Liberty), and the Portland Ridgeline Pits. A new haul road will be constructed between the Wharf and Golden Reward Mines. In addition, a new road, parking lot, and warehouse would be planned for the expansion area to the north of the Wharf Processing area. The project involves 528 acres, of which a total of 298 acres would be directly affected by mining activities and 230 acres would be undisturbed. Total production is estimated at 175,554,000 tons of material which includes 25,580,000 tons of ore and 149,974,000 tons of overburden and non-mineralized rock. Estimated life of the mining project is approximately 8 years ending in the year 2020. Ore extracted from the project would be trucked to the existing, permitted Wharf Mine heap leaching facility for processing. No new leach pads or ponds are proposed.

Green Mountain Pit. The Green Mountain Pit would affect about 154.09 acres of land and involve about 13,985,000 tons of ore and 59,673,000 tons of overburden and rock. This pit will be mined during Phases 1, 2, and 3 of the project. During Phase 1, the southwest side of Green Mountain will be mined to an elevation of 6100 feet in 2012. Waste rock from this part of the pit will be used for backfill in the American Eagle Pit. During Phase 2, mining will continue northward in 2013 and 2014 toward the current Trojan Pit to an elevation of 6100 feet. A small section of Bald Mountain will also be mined during this phase to an elevation of 6100 feet on the west flank and 6160 feet on the north side of the mountain. Waste rock from this part of the pit will be used to backfill mined out areas of the Green Mountain Pit. During Phase 3, mining activities will be nearing completion in the northern portion of the pit with a final pit elevation of 5940 feet. The remaining portions of the pit will be backfilled with waste rock from the Portland Ridgeline during Phase 4 to final contours. The entire pit will be backfilled.

Golden Reward Pit. The Golden Reward Pit consists of portions of the reclaimed Harmony and Liberty Pits that were mined by Golden Reward in the 1980's and 1990's. The pit would affect about 124.50 acres of land and involve about 4,200,000 tons of ore and 14,759,000 tons of overburden and rock. An additional 3,800,000 tons of rock used for pit backfill during final reclamation of the mine will also be removed. This pit will be mined during Phase 3 of the project. To limit impacts to the Terry Peak ski area immediately to the west of the proposed mine area, mining will occur during the ski area's off season from early April through mid to late November. Mining in this pit will begin in 2014 and go through 2016. The Harmony highwall will be the first area mined. The existing highwall will be removed and will be backfilled with waste rock from the Liberty Pit area to blend in with the existing ski runs. In 2015, the Liberty Pit highwall will be laid back so that the current highwall would be removed and contoured to blend in with the existing ski runs. Waste rock from this area would be used to backfill the pit area at the base of the highwall. The final elevation of the pit would be 5720 feet.

Portland Ridgeline Pit. The Portland Ridgeline Pit would affect about 164.16 acres of land and involve about 7,395,000 tons of ore and 49,092,000 tons of overburden and rock. An additional 21,500,000 tons of rock and 2,000,000 tons of spent ore used for backfill of the reclaimed Portland Pit will also be removed. The pit would be immediately adjacent to the existing Deep Portland and American Eagle Pits. This pit would be mined during Phase 4 of the project. Mining in this area would begin in 2017 and continue through 2019. The final elevations of the pit vary from 6300 feet

in the Flossie area in the southwest corner of the pit to 6000 feet in the remaining portions of the pit. Most of the pit will be backfilled with spent ore from the leach pad except for two sections of exposed highwall along the southern portion of the pit (one section 400 feet long by 30 feet high and one section 500 feet long by 20 feet high).

Haul Road. The haul road connecting Golden Reward to Wharf in Nevada Gulch would disturb about 33.47 acres. The haul road would be constructed during Phase 2 of the project in 2013 and 2014. Mine traffic on the haul road will pass through a tunnel underneath a relocated portion of State Highway 473. The majority of the new haul road will be located on previously disturbed lands at Wharf. Some reclaimed lands at Golden Reward will be redisturbed by haul road construction.

Topsoil. Topsoil will be salvaged from disturbed areas when practical. Approximately 215,947 cubic yards of topsoil and subsoil can be salvaged from the disturbed portions of the Expansion Area. Achieving 4 inches of topsoil over 298 disturbed acres of pit, road, and rock facility would require 155,418 cubic yards, leaving a surplus of 60,529 cubic yards. The current mine area will require approximately 281,650 cubic yards of soil for 4-inch coverage, and there is currently 344,365 cubic yards stockpiled. Another 31,191 cubic yards can be salvaged from the redisturbed Portland Pit, leaving a current surplus of 93,906 cubic yards. The total soil surplus from the existing Wharf operation and the Expansion Project is approximately 154,436 cubic yards. The surplus soil would be used to increase coverage depth as available. As Wharf is planning concurrent reclamation, topsoil would be applied throughout the life of the project, generally as soon as pit backfills and waste facilities are completed.

Other Facilities. Just north of the Process area in Section 33; T5N-R2E, Wharf is proposing to construct a warehouse, parking lot, and a new access road to the Process area. A total of 19.54 acres would be disturbed in this area.

Reclamation:

Reclamation Goal. The proposed postmining land use for the expansion area is a mixture of rangeland (woodland grazing), recreation, home sites, and industrial or commercial development.

General Reclamation Plans. Wharf plans to conduct concurrent reclamation during the project. Overburden and non-mineralized rock material excavated from the mine pits would be used to backfill most of the previously mined areas. After processing, neutralized spent ore from the expansion area would be deposited in the mined out portions of the Portland Ridgeline and Green Mountain Pits.

Reclamation Costs. In its mine permit application, Wharf estimated the total reclamation and postclosure costs for the current Wharf Mine and proposed expansion area to be \$23,125,124. These costs include nitrate treatment and leach pad neutralization. Wharf's current bonds include a \$15,554,622 reclamation bond and a \$9,887,777 postclosure bond. The reclamation and postclosure bonds for the current mine and the expansion area will be independently calculated by the department. These calculations will include long term nitrate treatment costs and are therefore

expected to be higher. A phased bond approach for the reclamation bond is proposed, which would be recalculated on an annual basis.

Environmental Concerns:

Acid Rock Drainage (ARD):

Overview. An environmental concern associated with the proposed project is the potential for acid rock drainage. Based on past acid rock drainage (ARD) protocol developed for the Clinton Expansion and subsequent amendment and technical revision, Wharf performed acid base accounting (ABA) testing. Samples were collected on approximately 100 foot by 100 foot grid with spacing dependent upon the rock unit. A greater spacing was used within the upper and middle Deadwood sediments and porphyry units, and closer spacing was on the lower Deadwood.

Mitigation for ARD conditions would include avoiding sulfide zones and blending of buffering rock with any mined or exposed acid generating rock. Based on the high buffering capacity of Cambrian Deadwood formation rocks, the low volume of potentially acid-generating rock, and proper blending of buffering rock, acid generation should not occur in rock depositories or backfilled pits. By avoiding sulfide zones, and with proper mitigation (buffering) of exposed sulfide rocks, low permeability capping systems for the rock depository and the pit areas would not be necessary to protect water quality. The current mining operation has similar geology and mineralogy (also mining the Deadwood formation and Tertiary porphyries) to that of the expansion areas. It has operated for nearly 30 years without encountering significant acid producing conditions. Also, the historic mines in the proposed permit area, which date back to the late 1800's, have not been a source of significant acid mine drainage.

Precambrian Rock Units. The ABA results indicated that portions of the Precambrian rock units may be capable of acid generation. Even though Wharf does not plan to mine Precambrian rock, some potentially acid producing Precambrian rock may be exposed on pit floors and highwalls. Sulfide zones already identified would be further delineated during the mining process. Sulfide rocks exposed in the pit highwalls and floors would be backfilled with rock having suitable buffering capacity and all caution will be made not to expose any Precambrian rock.

Flossie Area. ABA test results for the Flossie area on the west end of the Portland Ridgeline Pit indicate that there is a potential for ARD, however, no ARD was generated by mining the adjacent Maria Pit, which has similar geology. The samples for the Flossie area indicate an ARD potential in the upper and intermediate Cambrian Deadwood rock units and in the Tertiary monzonite porphyry. More in depth analysis of this area will be completed plus additional geochemical testing may be required prior to disturbance of the Flossie area which will better define the ARD potential of this area. The Flossie area is not planned to be mined until 2018.

Green Mountain Pit. ABA test results for the Green Mountain Pit indicate that there is a potential for ARD on the western flank of Bald Mountain. Potential for ARD in this area was found in the Precambrian units, upper and intermediate Deadwood rock units and in the monzonite porphyry, though no Precambrian rock is planned to be disturbed. Within the intermediate and upper Deadwood rock units and Monzonite Porphyry small isolated potential ARD pods have been

identified and will require following the ARD protocol of blending the material with sufficient neutralizing material. Additional geochemical testing may be required to better define the ARD potential of this area.

Golden Reward Pit. Mining of the East and West Liberty Pits under Permit No. 450 encountered sulfide-rich graphitic phyllite in the Precambrian rock. During backfilling and reclamation of the Liberty Pits (circa 1996 - 2002), department inspectors identified a number of small acid seeps in both the East Liberty Pit and West Liberty Pit. The source of these acidic seeps involved both reactive backfill material and pyrite-rich graphitic phyllite exposed in various areas of the pit highwall. The seeps in the East Liberty Pit were mitigated by backfilling with rock with buffering capacity. The source of the seeps in the West Liberty Pit was acid generating rock backfilled in the north half of the pit. In 1999, Golden Reward installed a PVC liner over this acid generating backfill. However, drainage from the West Liberty Pit area still apparently impacts the bedrock ground water system in Nevada Gulch, including monitoring well SM01A, immediately to the north of the pit.

Sulfate levels in SM01A are on an upward trend, with recent concentrations exceeding 1,900 mg/l. Ambient (i.e., pre-mining) levels of sulfate in SM01A were around 40 mg/l. Wharf Resources hired a consulting hydrogeologist, ERM, to study the relationship between flow through the West Liberty Pit and impacts in SM01A. The results of a recent tracer test indicate ground water in the vicinity of the current West Liberty Pit's west highwall is influencing water quality in SM01A.

During the mining and reclamation phases, Wharf plans to mitigate the west highwall of the West Liberty Pit. The mitigation plans will be based on final mining depths and backfilling effort.

ABA test results for the Harmony area indicate that there is a small potential for ARD in the monzonite porphyry unit. Additional testing may be needed to more adequately define the ARD potential of this area, and the special handling procedure will be followed to assure proper mitigation

Nitrate:

Overview. Wharf has a problem with nitrates in ground water which is created from the breakdown of residual cyanide in the process area and spent ore impoundments and from blasting residues in ammonium nitrate fuel oil explosives found in waste rock depositories. Since the 1990's, Wharf has tried several processes for nitrate destruction. The most successful effort involved biological treatment with denitrifying bacteria. This included the construction of the Ross Valley Biological Treatment Plant and in situ ground water treatment by injecting bacteria and nutrients into nitrate impacted ground water. Biological treatment, however, also has had problems, including the discharge of black biomass sludge to Annie Creek and Biological Oxygen Demand (BOD) issues in the discharge water. These discharges impacted aquatic life in Annie Creek.

Wharf Process Area. Since the mid-1990's, nitrate impacts have occurred in the ground water underlying the process ponds and leach pads. Since 1995, nitrate concentrations in most Process

Area monitoring wells have occasionally or frequently exceeded the state ground water standard of 10 mg/l. Between 1995 and 2007, the approximate average nitrate concentration in monitoring wells HDH-11 and MW-44 was 13 mg/l and 9 mg/l, respectively.

In 2008, Wharf performed a number of mitigative measures in an effort to control Process Area nitrate impacts. In addition to replacing process area piping and relining process ditches, Wharf performed in situ biotreatment which involved injecting denitrifying bacteria and nutrients into a number of Process Area wells. A third component of the 2008 mitigation project involved installing six new multi-level monitoring wells in order to better define the lateral and stratigraphic extent of Process Area impacts. While the 2008 in situ biotreatment successfully lowered nitrate within the immediate vicinity of each injection/monitoring well, sampling results from the new multi-level monitoring wells indicate the Process Area nitrate problem remained. Average nitrate concentrations in the new multi-level monitoring wells vary widely, especially depending upon the sampling horizon.

In 2009, Wharf developed a biological treatment system that has been successful in removing nitrates from process waters. Wharf's "Blue Water" denitrification plant went on-line in October 2009 and there has been no Biological Oxygen Demand (BOD) or biomass issue with Annie Creek to date. This treatment system is expected to, over the next few years, substantially reduce the nitrate levels in off-loaded spent ore.

In 2010, Wharf performed a dye tracer test of the Process Area to identify sources of process solution leakage. Wharf identified leakage sources in the leach pad dams, process ponds, and leak detection galleries. As a result, Wharf repaired or relined the leach pad dams, process ponds, and leak detection galleries. It also installed eight new injection wells along the southwest fringe of the process ponds. Wharf also submitted a biotreatment plan for the process area which the department has reviewed and approved. As part of the plan, Wharf will begin injection of biotreatment solution in the eight injection wells in August, 2011.

Through in situ treatment, and possibly through continuous production of well HDH-8A, Wharf has managed to contain nitrate impacts within the immediate vicinity of the Process Area. Nitrate concentrations in downgradient monitoring wells have never exceeded the nitrate ground water standard.

Spent Ore Impoundments. The disposal of neutralized spent ore into the Portland Ridgeline and Green Mountain Pits may increase the risk of nitrate and residual cyanide contamination in ground and surface waters in the Cleopatra and Deadwood Creek drainages. If necessary, spent ore may need to be placed in lined impoundments with runoff treated by biological means, possibly requiring the construction of satellite treatment plants.

Backfilled Pits and Waste Rock Facilities. There is also a risk of nitrate contamination from rock placed in backfilled pits and waste rock facilities. This could have effects on ground and surface waters in several watersheds, including the False Bottom Creek, Deadwood Creek, Cleopatra, Nevada Gulch, Fantail, and Annie Creek drainages. Wharf has already taken steps in its current mining operation to reduce the amount of nitrate generated by blasting by changing blasting practices.

If necessary, nitrate in runoff from overburden and rock piles can be treated by the biological treatment plant or satellite plants.

Cyanide:

Although cyanide in spent ore is neutralized prior to off-loading from the leach pads, residual cyanide is present in Wharf spent ore. Cyanide compliance at Wharf is based on the weak acid dissociable (WAD) test method, as it does not measure strongly bonded, non-toxic cyanide metal complexes. EPA and the state acute surface water standard for cyanide is 0.022 mg/L as measured by the WAD cyanide method. The residual cyanide left in Wharf's spent ore is mainly in the form of the non-toxic, strongly bonded cyanide metal complexes.

Also, residual cyanide in discharge water has caused some issues in the past with Wharf's Surface Water Discharge permit. A Notice of Violation was issued on December 12, 1997 for violations of the total cyanide limit in Annie Creek and Ross Valley. After the notice of violation was issued, the permit was modified so that all surface water compliance points were required to meet an acute limit of 0.022 mg/L WAD cyanide with no total cyanide requirement. Compliance point 005, located below the confluence of Annie Creek with Lost Camp Creek, has an additional requirement with a 30-day average limit for WAD cyanide of 0.0052 mg/L.

For the past several years, Wharf has occasionally exceeded the WAD cyanide standard in its discharges to Annie Creek. To address these exceedences, Wharf submitted a technical revision in late 2010 to construct a carbon water treatment plant for the removal of residual cyanide in Wharf's discharge water. The carbon plant has been constructed near the Ross Valley Biological Plant and will remove residual WAD cyanide from the waste water discharge stream. The new Carbon Plant was put on line in July 2011.

There has also been a direct discharge of cyanide solutions from the Process area into surface waters. In August 1995, Wharf discharged inadequately treated cyanide solution into Ross Valley and subsequently into Annie Creek. The discharge caused several violations of mining and water pollution control laws. Wharf has subsequently taken many mitigative steps to prevent the reoccurrence of a direct discharge of process solutions.

Arsenic:

In 2008, coincident with the in situ biotreatment of Process Area ground water, concentrations of arsenic in Process Area ground water dramatically increased. Background arsenic concentrations associated with the Pahasapa limestone aquifer underlying the Process Area are very low to negligible. Prior to 2008, most process area wells only rarely yielded water with detectible concentrations of arsenic. In 2008, arsenic levels in MW-44, MW-47, HDH-11 and HDH-12 all increased to well above the 0.01 mg/l ground water standard. In general, as of 2011, arsenic levels in these wells appear to be stabilizing and/or decreasing. However, arsenic concentrations in MW-47, HDH-11 and HDH-12 still exceed the 0.01 mg/l standard. Initial levels of arsenic in the new multi-level wells were also unexpectedly high. However, recent arsenic concentrations in all multi-level wells appear to be following a decreasing/stabilizing trend, although levels of arsenic in MW-58.4, MW-53.1, and MW-57.2 still exceed the ground water quality standard.

Probable explanations for arsenic increases in Process Area ground water involve a failure to follow biotreatment protocol during the 2008 treatment, and the construction of the multi-level wells. In 2008, Wharf inadvertently used water from the bottom of a pond at the Ross Valley Biological Plant as a as their injection solution. While no sample results have been provided to the department, Wharf has verbally reported that this inoculum contained elevated concentrations of arsenic. Quality control procedures under Wharf's new biotreatment plan are designed to preclude such inadvertent arsenic impacts. A portion of the elevated arsenic levels in the new multi-level wells apparently stems from the well tubing. These wells utilize small-diameter plastic tubes to extract samples from different stratigraphic horizons. According to a product description, the inside of these tubes is treated with arsenic as an antimicrobial agent (multi-level wells are apparently often utilized for microbial sampling). In this case the tubing would have contaminated the sample with arsenic but not the aquifer.

Threatened and Endangered Species:

No threatened and endangered vertebrate species were documented in the Wharf expansion area during baseline surveys conducted in 2009 and 2010. No records exist with historical accounts of the nearby Golden Reward and Wharf Mine annual monitoring programs. No candidate, petitioned or proposed threatened and endangered vertebrate species were recorded during the baseline surveys or annual monitoring. The US Fish and Wildlife Service identified one federally listed vertebrate species, the whooping crane, which could occur in Lawrence County. Seven avian species (Cooper's hawks, sharp-shinned hawks, broad-winged hawks, northern saw-whet owl, American three-toed woodpeckers, brown creepers, Cassin's finches) and one reptile species (smooth green snake) that are included on the South Dakota Natural Heritage list were observed in the Wharf expansion area during baseline surveys. Where possible, Wharf Resources would be required to avoid these sensitive species.

No federally listed plants were found during baseline surveys conducted during 2010. The presence of two SD Natural Heritage species, white-veined wintergreen and mountain huckleberry was confirmed during the surveys mostly in the Terry Peak ski area. However, these communities will not be affected during the mining operation. No other SD Heritage species were found. The only South Dakota plant currently listed as either federally threatened or endangered is the western prairie fringed orchid. However, it does not occur in the area.

Other Environmental Concerns:

Other concerns associated with the proposed permit are more general to the mining industry as a whole, and are listed as follows:

1. There is the potential that storm events could cause erosion at the site, and sedimentation in nearby drainages. Sedimentation and erosion controls would need to be installed and maintained throughout the life of the mine.
2. Additional dust may be generated from the proposed operation, both from blasting and truck traffic. There are many residences (Terry Valley) and the Terry Peak ski area near the mine

area, so air quality impacts are a concern. Dust from truck traffic can be mitigated by proper watering of haul roads.

Other Concerns:

Aesthetics. Due to the proximity of the proposed area to Terry Peak ski area to the south of Wharf and on the west flank of Golden Reward, there are concerns regarding aesthetics. Wharf will push back the Foley Ridge ridge line and cross over the Green Mountain ridge line, Golden Reward will be mining near the base of the Red Chair, and haul road will pass by the base of the Blue Chair, the mine operation will be very apparent. . Aesthetics would be improved by backfilling and reclaiming as soon as possible those lands that can be viewed from Terry Peak.

Noise. Noise from the operation could impact nearby residences and the Terry Peak ski area. Also, as Wharf plans to stay to the north of the Foley Ridge ridge line, this ridge would serve as a noise screen.

Current Status – July 27, 2011:

On July 18, 2011, the application was determined to be procedurally complete. The department and the other review agencies are presently conducting a technical review of the application. Wharf has concurred with a 45-day extension of the time to review the mine permit application prior to the hearing. A hearing is tentatively set for November, 2011. The department's recommendation will be tentatively issued in October 2011.

Copies of the mine permit application are available for public inspection at the Lawrence County Register of Deeds Office, Lawrence County Courthouse, Deadwood, South Dakota, on the department's web page at <http://denr.sd.gov/des/mm/wharfminepermitapppage.aspx>, or at the Minerals and Mining Program, Department of Environment and Resources, 523 East Capitol, Pierre, South Dakota.

For more information, contact the Minerals and Mining Program, Joe Foss Building, 523 East Capitol, Pierre, South Dakota, or call (605) 773-4201.