



# STATE OF NEVADA

Department of Conservation & Natural Resources

DIVISION OF ENVIRONMENTAL PROTECTION

Kenny C. Guinn, Governor

Allen Biaggi, Director

Leo M. Drozdoff, P.E., Administrator

January 13, 2006

## NOTICE OF DECISION

### WATER POLLUTION CONTROL PERMIT NUMBER NEV2005101 New Permit

#### **Borealis Mining Company Borealis Mine**

The Nevada Division of Environmental Protection has decided to approve issuance of Water Pollution Control Permit NEV2005101, to Borealis Mining Company for the Borealis Mine. This permit authorizes the construction, operation, and closure of the approved facilities in Mineral County. The Division has been provided with sufficient information, in accordance with Nevada Administrative Code (NAC) 445A.350 through NAC 445A.447, to assure the Division that the groundwater quality will not be degraded by this operation, and that public safety and health will be protected.

This new permit will become effective January 28, 2006. The final determination of the Administrator may be appealed to the State Environmental Commission pursuant to Nevada Revised Statute (NRS) 445A.605 and NAC 445A.407. All requests for appeals must be filed by 5:00 PM, January 23, 2006, on Form 3, with the State Environmental Commission, 901 S. Stewart Street, Room 4001, Carson City, Nevada 89701-5249. For more information, contact Rob Kuczynski directly at (775) 687-9441, toll free in Nevada at (800) 992-0900, extension 4670, or visit the Division website at: <http://ndep.nv.gov/bmrr/bmrr01.htm>.

Two comment letters were received during the public comment period. The first letter, dated December 12, 2005, was received from Robert D. Williams, Field Supervisor, U.S. Fish and Wildlife Service (FWS). The second letter, dated December 29, 2005 was received from Tom Myers, Ph.D., Hydrologic Consultant for Great Basin Mine Watch.

Division responses to the received comments are attached to this Notice of Decision.

#### **U.S. Fish and Wildlife Service (FWS) Comments:**

FWS Comment: "We are concerned that migratory birds may drink acidic waters from the ephemeral pond in the [East Ridge/Goldview] pit, which may also contain elevated concentrations of various metals and trace elements. We [FWS] recommend that if water remains in the pond for periods exceeding one month....a sample of water be collected from the pond and be analyzed for Profile I constituents."

NDEP RESPONSE: *Comments noted. NDEP has revised the permit to clarify that monitoring for Profile I constituents and lake elevation will be performed on a quarterly basis when water is present.*

FWS Comment: “We are concerned that acidic seeps or runoff may occur from the waste rock dumps and could be utilized as a source of drinking water for migratory birds. We recommend that inspections be made...at least twice monthly, especially during wet months and following major precipitation events. [If] pH of the water is less than 5, a sample of water should be collected from the pond and be analyzed for Profile I constituents.”

NDEP RESPONSE: *Comments noted. NDEP has revised the permit to incorporate weekly observations of the toe of the waste rock dumps. If any seepage is observed from the toe of the dumps, it must be collected and sampled for Profile I constituents.*

*In addition, the Borealis Mining Company has recently submitted a permit application with the Nevada Department of Wildlife (NDOW) for the Borealis Mine. Once issued, it is expected to provide another level of oversight (monitoring and compliance inspections) with respect to wildlife concerns.*

### **Great Basin Mine Watch (GBMW) General Comments:**

GBMW divided their review into five sections (*Introduction, Hydrogeology, East Ridge Pit Lake, Waste Rock, Background Data and Monitoring Plan*) followed by a sixth section (*Recommendations*) listing seven specific recommendations to NDEP and Borealis Mining Company (Borealis). **Provided below are NDEP’s responses to comments relating to or relevant to a specific recommendation.**

It should be noted that several of the GBMW recommendations have already been addressed by the updated information in the Interim Supplemental Report (Knight Piesold, 2005b) or will be implemented in ongoing hydrogeological characterization activities in conjunction with the permitted mineral exploration.

#### 1. GBMW Comments—Hydrogeology:

- “The difference in water levels among the wells discussed (WX-11, -12, and -14 compared with WX-6, -10, and WW-1) is not sufficient to indicate a compartment.”(Page 2, second paragraph, fourth sentence);
- “Knight Piesold (2005b, page 17, 18), repeats this analysis but provides no significant new evidence of compartmentalization other than in the Freedom Flats pit.” (Page 2, second paragraph, last sentence);
- “Knight Piesold (2005b) also mentions additional boreholes from 1981, PS-11, -12, -13 and -14, that were drilled into bedrock about 1 mile west of the mine site.” (Page 2, third paragraph, first and second sentences);
- “Knight Piesold (2005 a and b) does not provide data or analysis indicating the saturated soil beneath the pit lake is not connected to the regional groundwater.” (Page 2, fifth paragraph, first sentence);
- “This indicates that the zone of saturation observed in the pit and standpipe may be part of the same aquifer observed in WX-7 or WX-8.” (Page 2, fifth paragraph, last sentence);
- “Recharge through the pit bottom may have added a mound to the water table that is not perched. Analyses to date have been inconclusive in this regard.” (Page 2, sixth paragraph, third and fourth sentences);
- “There has also been no analysis of whether the new mining will extend below the existing regional groundwater table (see discussion above regarding the unlikelihood that the observed saturated is perched).” (Page 3, third paragraph, fourth sentence); and
- “The NDEP should require the applicant to determine the extent of saturation and connectivity to the groundwater under the pit lake in the East Ridge Pit.” [GBMW Recommendation #1]

***NDEP RESPONSE:** Data provided by Knight Piesold (Knight Piesold, 2005a and Knight Piesold, 2005b) and available for public review verifies the fact that the bedrock groundwater system is compartmentalized in the mineralized zone and that movement of groundwater to and from the mineralized zone compartments is limited. The extent of the compartmentalization in the vicinity of the Freedom Flats pit cannot at this time be positively determined. For example, the difference in groundwater elevations at locations WX-12 and WW-1 (6,850 versus 6,930 ft amsl), indicates the presence of a boundary or compartment. However, at location WX-6, the water levels across the indicated boundary show little difference, indicating very little compartmentalization if any.*

*Geologic cross-sections (Figures 2.13, 2.14, 2.7, and 2.8, Knight Piesold, 2005b) support the existence of a hydrogeologic boundary that coincides with the mineralized zone boundary, particularly in the area between the East Ridge pit and WX-7/WX-8. From southwest to northeast the cross-sections perpendicular to the mineralized zone boundary are, respectively, G-G', H-H', A-A', and B-B' (Figures 2.13, 2.14, 2.7, and 2.8, Knight Piesold, 2005b). These cross-sections all indicate a zone of low-permeability, argillically-altered bedrock that may restrict groundwater flow.*

*With respect to the geologic formations assigned to 1981 boreholes PS-11, -12, -13 and -14, about 1 mile west of the mine site, the Interim Report (Section 2.4.3.1, Knight Piesold, 2005b) states that the new cross-section (G-G') verifies the existence of the Coal Valley Formation in bedrock. The Interim Report also clarified (Section 2.5.2, Knight Piesold, 2005b) that formation assignments in that area were probably incorrect in the initial WPCP report. This clarification should have been repeated in the section where the PS boreholes were described in the Interim Report.*

*In addition, Knight Piesold has since performed additional studies with respect to the zone of saturation observed in the East Ridge Pit. In their Interim Report (Knight Piesold, 2005b) states that it could not be established whether the surface water in the East Ridge pit was perched, however a connection to groundwater produced from fractures as deep as 100 to 150 ft bgs in the silicic bedrock was demonstrated. This conclusion is based on witnessing the drilling of the boring, collection of airlift samples (e.g., Table 2.2, Knight Piesold, 2005b), and communication with the driller about airlift flow rates and the behavior of the drill rig.*

*NDEP concurs that the connectivity of groundwater beneath the East Ridge pit to locations further downhill/down gradient requires further investigation. Additional data are presently being collected in conjunction with the mineral exploration activities, both within the pit and downhill in the area of Deep Ore Flats.*

*An analysis of the extent of anticipated mining below the water table in the East Ridge pit was presented in Section 4.2.4 of the Interim Report (Knight Piesold, 2005b). The floor of the ultimate proposed pit is expected to be as much as 50 feet below the current groundwater table. The closure plan has been updated to provide that open pits excavated below the local water table will be partially backfilled to prevent pit-lakes from forming, assuming that pre-mining water levels return following mining.*

## 2. GBMW Comments-- East Ridge Pit Lake Water Quality:

- “There have been no investigations of whether water quality has harmed avian health.” (Page 3, second paragraph, final sentence); and
- “The existing pit lake should be studied to determine whether it is a threat to avian health in violation of Nevada regulations.” [GBMW Recommendation #2]

***NDEP RESPONSE:** As part of the Echo Bay Mines closure plan (2000), an ecological risk assessment was performed at the Borealis site that included evaluating threat to avian species (SRK, 2000). The risk assessment concluded that the water in the East Ridge pit did not pose a credible risk to terrestrial and avian life that would be likely to inhabit the Borealis Mine site, and specifically, the East Ridge pit. **The NDEP-BMRR Closure Branch concurred with these findings.***

*The pond in the East Ridge pit is an existing condition. All historic closure and reclamation obligations appear to have been accomplished at the Borealis Mine. Records indicate that the bond posted by Echo Bay Mines been fully released by the Forest Service. Bond release is normally viewed as prima facie evidence that the closure and reclamation obligations at the site have been fully and adequately addressed.*

3. GBMW Comments--East Ridge Pit Lake Backfilling:

- “Leakage of the water to the regional groundwater could significantly degrade the groundwater.” (Page 3, first paragraph, second to last sentence);
- “There has not been an analysis of seepage through the backfill or the recharge rate to groundwater associated with surface water accumulating in the pit.” (Page 3, third paragraph, fourth sentence);
- “Finally, there has been no analysis of the effect of the potential seepage through the backfilled pit will have on groundwater.” (Page 3, third paragraph, final sentence); and
- “Because the East Ridge Pit will be re-mined and then backfilled, there should be an analysis of the seepage through this backfill. This should include groundwater modeling, unsaturated if necessary, and an analysis of contaminant transport.” [GBMW Recommendation #3]

***NDEP RESPONSE:** The closure plan has been updated to provide for partial backfill to prevent a pit-lake from forming. As described in Section 5.2 of the Interim Report (Knight Piesold, 2005b), the plan is to place unaltered bedrock or oxide rock from pit walls into pit bottoms. If additional fill materials are required, excavated waste rock from other mining operations on the site may be used, and/or adjacent reclaimed disposal facilities may be excavated. A requirement of the closure plan is to grade the pit backfills to be free draining. Because the pit pond is an existing condition, elimination of the pond during closure and reducing the amount of surface water infiltration will likely lead to an improvement to the existing situation.*

4. GBMW Comments--East Ridge Pit Lake and Background Data and Monitoring Plan:

- “There are no monitoring wells to verify the water quality downgradient of this pit (Knight Piesold, 2005a, Figure 5.7).” (Page 3, first paragraph, last sentence);
- “It is necessary to have at least two monitoring wells downgradient and one upgradient of this pit. The wells should be dual completion, if there is a significant alluvial layer, in the bedrock and alluvium.” (Page 5, fifth paragraph, fifth and sixth sentences); and
- “There should be monitoring wells installed up and down gradient of the pit lake to determine the current extent of contamination. The extent of the wells should be based on the results of the contaminant transport analysis.” [GBMW Recommendation #4]

***NDEP RESPONSE:** As mentioned earlier, the connectivity of groundwater beneath the East Ridge pit to locations further downhill/downgradient is under investigation. Before locating monitoring wells, groundwater must be characterized. To date, there is no data to indicate the existence of groundwater southwest of the East Ridge pit along the mineralized zone trend. The exception is a single water sample BMC reported at an elevation of 5,560 ft amsl (i.e., more than 1,400 ft bgs) in the vicinity of Freedom Flats (p. 20, Section 2.4.3.2, Knight Piesold, 2005b).*

The ongoing groundwater investigation includes placing 2-inch diameter PVC casing in boreholes to determine whether they remain dry, and therefore establish data that groundwater is absent at a particular elevation. This is similar to what was done at boring GGC-18 as described in the Interim Report (p. 19, Knight Piesold, 2005b). After necessary data *is collected* concerning the occurrence or absence of groundwater, it will be determined whether it is appropriate to locate a monitoring well, or wells immediately downgradient of the East Ridge pit. If groundwater cannot be located, it may not be feasible to drill *monitoring* wells. The overall amounts of water flow in the mineralized zone are currently estimated as low (16 gallons per minute, pp. 37-38, Section 4.3.1, Knight Piesold, 2005b).

It is also possible that groundwater *or perched meteoric water*, similar to that at East Ridge pit may be present beneath the Borealis, Deep Ore Flats, and Freedom Flats pits. The deep bedrock monitoring well (MW-179) downgradient of the Freedom Flats Pit *will be utilized for* monitoring the possible cumulative impact of the project along the mineralized zone.

*Finally, it should be noted that NDEP does not have any policy or requirement to locate at least two monitoring wells downgradient and one upgradient of a pit pit.*

##### 5. GBMW Comments—Waste Rock and Background Data and Monitoring Plan:

- “If the poor quality of existing groundwater results from seepage through undisturbed soils, it is likely that seepage through the disturbances to be caused by this mining activity will increase the loading from the seepage.” (Page 3, last paragraph continuing onto page 4, last sentence);
- “Borealis should collect baseline data before mining commences.” (Page 4, fourth paragraph, last sentence);
- “Borealis does not intend to re-mine the existing heaps. ... It would behoove Borealis to drill some boreholes and complete water sampling, perhaps on a one-time basis, near any heaps they do not intend to mine.” (Page 4, fifth paragraph, first three sentences); and
- “Borealis should complete a groundwater quality reconnaissance around the existing heaps and waste rock dumps.” [GBMW Recommendation #5]

***NDEP RESPONSE:** All five existing heap leach pads are located on alluvium north of the mineralized zone. This area was characterized in 2004 with test pits, a seismic refraction survey, a drilling program, and completion of seven monitoring wells. The total depth of characterization was to about 140 feet bgs. Samples were taken for both geotechnical and geochemical analyses. As described in the Interim Report (Knight Piesold, 2005b), no groundwater has been observed in alluvium. Soil samples were collected and analyzed with MWMP extracts, and no hydro-geochemical impacts downgradient of the five existing heap leach pads have been identified. However, some impact to near surface soils around the former Plant Site area *was* identified (p. 7-25, Knight Piesold, 2005a). *These levels establish the background against which Borealis closure will be measured.**

With respect to “groundwater quality reconnaissance” around the existing waste rock facilities, it should be noted that these facilities are located in the mineralized zone on bedrock or thin alluvium overlying bedrock. *While Borealis has not to date* located any groundwater to sample downgradient of the existing waste rock facilities, the occurrence of groundwater in the mineralized zone *remains* under investigation.

6. GBMW Comments—Background Data and Monitoring Plan:

- “Several aspects of this proposed project require monitoring to be certain it will not degrade waters of the state, but the monitoring proposed here is not even minimally sufficient.” (Page 4, seventh paragraph, first sentence);
- “This is an additional reason for using either multi-port samplers or well clusters with narrow screened intervals to sample specific levels.” (Page 5, third paragraph, last sentence);
- “This plan must add at least two wells to the monitoring plan downgradient of the proposed heap and developed in the bedrock. There should also be vadose zone monitoring under the cyanide heap.” (Page 5, fourth paragraph, final two sentences); and
- “The monitoring wells proposed in the section Background Data and Monitoring Plan should be designed and installed. The wells should have appropriate screening to avoid averaging problems and cross-contamination and provide for enhanced plume detection and plotting. Multi-port or dual completion wells should be used to establish vertical gradients and the vertical movement of contaminants.” [GBMW Recommendation #6]

***NDEP RESPONSE:** As described in Section 2.5.2 of the Interim Report (Knight Piesold, 2005b), a 300-foot deep downgradient monitoring well (MW-178S), and the location of an additional monitoring well approximately 600 feet deep (MW-179), await completion of additional hydrogeologic characterization in the bedrock-dominated area near the Borealis and Freedom Flats pits. Borealis has indicated that they will modify the design of the 300-foot deep single-screen downgradient monitoring well to a dual-completion well (MW-178S/MW-178D) to separately monitor the bedrock and the deepest alluvium above the bedrock contact. **Monitoring wells MW-178/MW-178D and MW-170 have been incorporated into WPCP NEV2005101 Section I.B., Schedule of Compliance (SOC) item 1.***

*Three shallow monitoring wells (PMW-1, PMW-2, and PMW-3) are proposed for monitoring immediately downgradient of the future heap leach pad. These wells are proposed to be sited after construction of the facility in order to obtain precise information on the nature and depth of anticipated permeable alluvium overlying lower-permeability, clay-rich alluvium. It is anticipated that these wells will be dry when installed and will provide early detection of **any** potential leaks from the pad liner systems.*

*The additional monitoring well(s) to be located in the mineralized zone will likely be located where there is bedrock or thin alluvium overlying bedrock. NDEP concurs with the installation of dual-completion monitoring well(s) downgradient in the mineralized zone to separately monitor the bedrock and alluvium **where** alluvium is present.*

7. GBMW Comments and Recommendations—Waste Rock:

- “This is an unreferenced and unverified statement because there was no **acid mine drainage (AMD)** monitoring completed and therefore no data to support it. The dumps have been reclaimed which could have essentially “buried” any problems. There are no monitoring wells below or downgradient of the waste rock dumps to test whether AMD has occurred.” (Page 3, fourth paragraph, last three sentences);
- “The draft permit, I.D.6.5, indicates that if static testing indicates that if rock has the potential to be acid generating, kinetic tests should commence within 10 days. ... NDEP should require additional kinetic testing before granting the permit. It is not acceptable this to be a schedule of compliance item because the results could substantially alter the plans.” (Page 4, third paragraph, last four sentences); and
- “The waste rock should be analyzed more completely with kinetic tests to estimate more accurately whether AMD will occur before this permit is issued.” [GBMW Recommendation #7]

NDEP RESPONSE: Pursuant to the first comment, existing Borealis waste rock dumps are considered valuable site-specific indicators of future waste rock dump behavior with respect to the potential for *acid mine drainage (AMD) generation*. These dumps, in effect, represent sources of empirical data from long-term kinetic tests conducted under conditions that are more relevant to the site than can *typically* be achieved in the laboratory.

*Visual examination of these waste rock dumps serves as a credible indicator of potential AMD generation. The absence of clear visual indicators such as oxidative weathering and fluid flow/seepage would indicate that the potential for the generation and release of AMD is unlikely.*

*Not all Borealis dumps have been reclaimed or are in any way protected from direct exposure to the environment, or amended in any way to mitigate oxidation. The waste rock dump on the east side of the East Ridge Pit contains potentially AMD generating material but was not protected from exposure to the environment. This dump would therefore be more prone to the effects of oxidative weathering. However, there is no clear visual evidence of oxidative weathering, fluid flow and AMD generation. It should also be noted that in the Borealis Plan of Operations, future mining plans call for reclamation (e.g. cover and re-vegetation) to minimize meteoric water infiltration to any new dumps.*

*With respect to the pits, the East Ridge Pit and the associated ephemeral pit lake confirms that there is potential for some Borealis waste rock to create AMD. The East Ridge Pit highwall contains pyrite is fully exposed to direct precipitation and runoff, has been fractured by blasting. Acidic highwall runoff is actively being generated and the acidic, sulfate-enriched, metal-enriched water is accumulating in the pit “lake” and the associated local aquifer. Proposed mining of the East Ridge pit will remove the pit highwall and is unlikely to expose any material with greater AMD potential. Further, the closure plans for the Borealis pit are designed to limit future infiltration and eliminate “ideal “ AMD-generating situations such as currently exist at East Ridge pit.*

*Pursuant to WPCP NEV2005101, Section I.D.6, all new waste rock generated at the Borealis mine site must be characterized quarterly and the acid neutralization/acid generation potential (ANP/AGP) determined. Furthermore, Section I.D.6, Footnote (5) states: “When static testing characterization of material indicates that a rock type not previously recognized and managed as acid generating has the potential for acid generation as set forth in the Division’s guidance document “Waste Rock and Overburden Evaluation” (dated September 14, 1990), the Permittee shall notify the Division in writing and initiate kinetic testing on the potentially acid generating portions of this rock type within ten (10) days. If the kinetic test results indicate acid generation conditions exist, the Permittee shall submit in writing, within thirty (30) days, the methods proposed for providing containment of these materials and the anticipated impact this acid generation potential may have on final stabilization of all components affected as defined in NAC 445A.359.” This statement is consistent with other WPC permits issued by NDEP.*

#### *References:*

*Knight Piesold and Co. (2005a). Borealis Mining Company, Borealis Project, Water Pollution Control Permit, January 26 (Submitted to NDEP-BMRR under cover letter dated February 24, 2005).*

*Knight Piesold and Co (2005b). Borealis Project, Water Pollution Control Permit, Interim Supplemental Report, November.*

*Steffen Robertson and Kirsten, Inc (SRK, 2000). Additional Evaluations of the East Ridge Pit, Borealis Mine, May. (Submitted to NDEP under cover letter dated May 22, 2000).*



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