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# State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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January 7, 2000

TO: Pam Grubaugh-Littig, Permit Supervisor

THRU: Daron Haddock, Permit Supervisor

FROM: Sharon Falvey, Senior Reclamation Hydrologist

RE: Phase II Bond Release, Received October 18, 1999, Western States Minerals, J.B. King Mine, ACT/015/002-99B, Internal File

## SUMMARY:


Western States Minerals Corporation (WSWC) submitted a request for Phase II and Phase III bond release. This request was determined incomplete with regard to Phase II bond release as was outlined in the J.B. King September 21, 1999 Technical Analysis (TA). Subsequently, WSWC submitted information in a letter format with attached documents to respond to the September 21, 1999 TA. The bond release information was not presented in a complete package allowing the public to easily access related information. Additionally, the information was not submitted in a format where Phase II bond release was addressed separately from Phase III bond release.

The Division has attempted to make up for the inadequacies of the submittal by providing supporting information to allow WSWC to obtain bond release. A water quality sample was collected in the field following the second review completed on November 8, 1999. Information provided in this document may be used for the decision making process regarding Phase II bond release.


## TECHNICAL ANALYSIS:

## HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-880.320.

**Analysis:**

**Sedimentation Pond**

The following R645-301 regulations apply to permanent sedimentation ponds:

1) **733.220.** A permanent impoundment of water may be created, if authorized by the Division in the approved permit based upon the following demonstration:

Approval to retain the pond was previously granted. There were references to some of the regulatory requirements in the1995 reclamation plan; however, all requirements were not clearly addressed and this resulted in deficiencies outlined in the September TA. The following sections summarize WSWC's response and are followed by the Divisions analysis:

2) **733.221.** The size and configuration of such impoundment will be adequate for its intended purposes;

The pond has 4H:1V slopes around the perimeter to allow for wildlife and livestock access. The capacity was stated by the applicant to be sufficient to handle a large herd of cattle.

The Division considers the pond configuration adequate for the intended purpose: 4H:1V slopes do provide access for livestock and wildlife. Although the capacity was stated to be sufficient to handle a large herd of cattle, no numbers were provided describing what the animal water consumption requirements are, or how many cattle or wildlife are expected to utilize the area at one time.

The Division considers the size adequate for the intended use for the following reasons: 1) rainfall occurs infrequently and, 2) the pond has not been known to discharge. Therefore, it can be determined that the pond holds the maximum available water following a precipitation event. This determination is based on documentation in inspection reports.

3) **733.222.** The quality of impounded water will be suitable on a permanent basis for its intended use and, after reclamation, will meet applicable Utah and federal water quality standards, and discharges from the impoundment will meet applicable effluent limitations and will not degrade the quality of receiving water below applicable Utah and federal water quality standards;

The letter submitted by WSMC suggests information submitted in a memorandum, dated Sept.10, 1992, demonstrates the long term water quality expected at the pond.

The information provided in the 1992 analysis assesses fill and refuse properties at the site using the Meteoric Water Mobility Procedure. The method uses a single pass column leach process, using de-ionized water over a 24 hour period. (Note: the procedure may not be suitable for obtaining extracts from finely divided soils such as clayey soil, sludge, and mill tailings). This method characterizes fill but, does not necessarily characterize water quality. Since water is not known to discharge from the pond and the site is located where evaporation rates are high, a potential for increased TDS, Alkalinity, pH, salts, boron and selenium 13 created for the pond water. The Division can not make a finding on based on the information provided by the applicant.

A water sample was collected by the Division on November 10, 1999 when the water elevation was low. Water was previously observed in the pond during an August 26, 1999 inspection. The sample results are compared with the state water quality criteria and livestock water quality criteria in Appendix A. Additional discussions regarding the results are found in this TA under the section heading **Water quality standards and effluent limitations.** These data show the water quality sample meets state standards.

The sedimentation pond captures a majority of the sediment from the site and is not known to have discharged during the reclamation period; therefore, the requirement that discharges from the impoundment will meet applicable effluent limitations and will not degrade the quality of receiving water below applicable Utah and federal water quality standards is considered to be met.

3) **733.223.** The water level will be sufficiently stable and be capable of supporting the intended use;

According to the response memo, the highest probability for capturing water is during late summer and early fall is supported by the data.

The response memo indicates the data supports the observations, but no data is referenced or provided; therefore, the Division summarized information documenting the pond water availability in Table 1. Information was gathered from inspection reports and quarterly impoundment inspections conducted from 1991 through 1999.

Based on the information presented in Table 1, the Division considers the pond adequate for the intended purpose: the pond provides a source of water for livestock and wildlife. Water is available intermittently during the period where livestock and large ungulates graze the area (heavy use is from November through March). In a drought or low precipitation year the pond may be dry, and at other times during the winter months the water may be frozen. In this arid region where few water sources are observed in the immediate vicinity, this impoundment will have periods where it fulfills the intended postmining land use.

4) **880.320.** The applicant needs to provide for sound future maintenance by the operator or the landowner with the Division.

**"A document was presented by fax to the Division on September 13, 1999."** This letter did not make it clear that the land owner, School and Institutional Trust Lands Administration, would provide for sound future maintenance.

In the response letter, received by the Division on October 18, 1999, Western States Minerals Corp. indicated that Jim Cooper, SITLA was contacted and he will communicate directly with DOGM. Similar to the previous letter, no clear statement indicating the state would provide for sound future maintenance is presented. It is recommended that the Division send a letter to SITLA indicating we understand the letter to indicate it is their intent to conduct sound future maintenance on the pond. When adequate documentation is provided to the Division, this component of the regulatory requirements will be considered satisfied.

**Diversions**

The following R645-301 regulations applies to diversions:

1) **R634-301-742.313. Removal of all Temporary Sediment Control Measures and Diversions.**

The north perimeter ditch routed to the sedimentation pond needs to be removed, regraded, roughened, and seeded before the bond can be released.

The response memo indicates the ditch will be regraded pocked and seeded. Once the applicant achieves regrading this regulatory requirement can be considered complete. In addition, there is a section of silt fence that should be removed.

Table 1. Pond Water Observations

| Year | Water observations | Comment |
|---|---|---|
| 1991 | July 31<br>September 10<br>December 24 | Some water noted- pond previously noted dry.<br>First observation of water by this inspector.<br>Estimated 2 feet of water in pond inspection. |
| 1992 | February 5<br>March 27<br>April 21<br>August 20<br>October 6<br>December 24 | Water noted- pond dry in inspection report 1/22.<br>Water noted 2 feet estimated depth.<br>Water noted- some water; pond dry by 6/26.<br>Water noted- pond dry in inspection report on 7/9/92.<br>Water noted- 1 foot estimated depth in pond inspection.<br>Water noted- 0.03 foot depth water noted in pond inspection. |
| 1993 | | No water noted for year. |
| 1994 | August 3<br><br>October 15 | Trace of water noted in pond inspection- noted dry in 6/9 and 9/22 inspection report.<br>Water noted- pond dry in inspection report 11/15. |
| 1995 | | No water noted for year. |
| 1996 | September 9<br>October 9<br>November 29<br>December 4 | Water noted - pond full. Pond dry in inspection report 7/9.<br>Water noted.<br>Water noted - 2.5 feet in pond inspection.<br>Water noted - pond 1/4 full in inspection report. |
| 1997 | January 30<br>February 13<br>March 18<br>September 25<br>October 29<br>November 12<br>December 29 | Water noted - inspection report.<br>Water noted - pond 1/4 to 1/3 full in inspection report.<br>Water noted - near dry in 4/24 and dry 5/12 inspection report.<br>Water noted - pond ½ full (water from undisturbed area entered pond).<br>Water noted - inspection report.<br>Water noted - inspection report.<br>Water noted - ice in pond (97 pond inspections not found). |
| 1998 | January 15<br>March 13<br><br>September 23<br>October 21<br>December 22 | Water noted - 3 inches frozen per pond inspection.<br>Water noted - Ice and water 0.5 ft pond inspection. Pond dry in inspection 4/29.<br>Pond full. Pond dry in previous inspection 8/20.<br>Water noted - ½ full per inspection report.<br>Water noted - frozen per inspection report. |
| 1999 | February 24<br>March 23<br>April 27<br>August 26<br>October 10 | Water noted partially full thin ice.<br>Water noted partially full - not frozen.<br>Pond drying out. Pond dry 6/25.<br>Water noted - Pond estimated to be ½ full. Pond dry 7/16.<br>Pond 1/3 full according to pond inspection. |

**Water quality standards and effluent limitations.**

The following R645-301 regulations applies to water quality standards and effluent limitations:

Lands to be released shall not contribute suspended solids or runoff outside the permit area in excess of the requirements set by UCA 40-10-17(j).

For which the applicable parts state:

**(j) Minimize the disturbances to the prevailing hydrologic balance at the mine site and associated offsite areas and to the quality and quantity of water in surface and groundwater systems both during and after surface coal mining operations by:**

**(I) Avoiding acid or toxic mine drainage.**

**(ii)(A) Conducting surface coal mining operations so as to prevent to the extent possible using the best technology currently available, additional contributions of suspended solids to stream -flow or runoff outside the permit are, but in no event shall contributions be in excess of requirements set by applicable state or federal law:**

*Acid and Toxic Drainage*

The July 1995 permit amendment provides analysis of substitute topsoil materials at the site and suggests that after mixing through erosion processes the site will not produce acid and toxic forming material. The site does contain boron and selenium levels which are above the standards presented in the guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, State of Utah Department of Oil Gas and Mining, April 1988, by James Leatherwood and Dan Duce. See discussions under **Topsoil and Subsoil** in this Bond Release analysis.

*Additional Contributions of Suspended Solids*

Reclamation at the J. B. King Mine was conducted in 1985-86 and this site is one of the first sites reclaimed in Utah under the SCMRA program. Regrading at the site was completed by placing the fill against the highwall with a convex land form. The deepest fill is located in areas where adjacent undisturbed lands with high runoff rates transport water through the site. Climatic changes impose periods of drought and high intensity short duration thunderstorms on this site. Unfortunately, this results in a land-form and environment predisposed to erosion, especially along the drainages.

The erosion from the reclaimed area is primarily retained on site. The sedimentation pond captures the sediment and is not known to have discharged during the reclamation period; therefore, the requirements to minimize additional contributions of suspended solids to stream-flow, or runoff, outside the permit area is met at this site. In addition, Rock mulch and biosolids were added to the refuse pile to decrease erosion in 1995. This activity has increased vegetation success and uses best technology currently available to reduce onsite erosion.

The applicant submitted and compared annual sediment volumes deposited in the pond with the sheet and rill erosion rates estimated using RUSLE. The sediment deposition in the pond doubled beyond the average annual estimated sediment deposition for 1997 and 1998. The increased sediment volume was attributed to high intensity storms.

An Erosion Monitoring Program was set up for the reclaimed J.B. King Mine in 1995 to monitor erosion for Bond release purposes. Information was collected on-site and off-site along erosion monitoring transects and precipitation was recorded with an on-site recording rain gauge. The response to precipitation events and recovery from erosive events at the reclaimed site was proposed to be used to determine whether the erosive rate at the site is acceptable for the post mining land use.

A photographic record was also obtained on the site for each transect. Data was collected twice for the first two years after installation. The applicant installed a recording rain gauge and collected data precipitation data. The rain gauge was provided to determine the rill and gully erosion rate changes influenced from the intensity and duration of precipitation events. The applicant has not provided a summary of this data.

*Surface Water*

The Division assessed results from the sample collected on November 11, 1999 and compared the analysis with the state standards and the standards for use which are presented in Appendix A The following paragraph summarizes the results.

All parameters were within the limits set by the state. Selenium was re-analyzed because the initial analysis did not provide the minimum detection limit of 0.05; the state's selenium standard for Class 4 water. Field conductivity was 1470 (umhos/cm) and the Total Dissolved Solids (TDS) identified from the Lab analysis was 853 mg/l which equates to between 1551 to 1218 umhos/cm using the standard TDS to E.C. ratio (0.55 to 0.7).

The sample was obtained on November 11, 1999 approximately a month after a precipitation event, recorded to be 0.15 inches on September 25, and followed buy a trace of precipitation on October 12 (obtained from the JB King weather station data). An earlier sample obtained by the Division on October 10, 1999 resulted in a pH of 8 and an E.C. of 1270 umhos/cm. The ions in solution seem unusually low for a closed basin in a semi-desert setting. However, the cold temperatures during sample periods can influence the water quality. Because this site contains gypsum, sulfate is probably present in the pond water. Sodium sulfate is strongly influenced by temperature and the cool temperatures can result in mirablite precipitate. Following freezing or reduced temperatures, it is likely that mineral precipitation reduces the ions in solution.

Large ungulate and cattle use is predominate from November through March when average minimum temperatures range from 10.2 to 17.0 $^{0}$F and average maximum temperatures range from 35.9 to 40.8 $^{0}$F (data from Emery 15 SW, Utah, Station No. 422488, period of record

7/79-6/86). Because the period of use occurs during colder temperatures the water quality should be similar to the sample obtained by the Division; although, the TDS and ions in solution may increase considerably under warmer temperatures.

*Ground Water*

No groundwater monitoring was conducted at the site for reclamation purposes. Information selected from the Cumulative Hydrologic Impact Assessment (CHIA), (dated August 9, 1985 ), describes ground water at the site as follows:

1) "The only identifiable ground-water resource within the CIA [Cumulative Impact Area] is the aquifer located approximately 200 feet below the Ferron "I" seam. Mining did not intercept sufficient water to warrant discharge, and exploration drilling did not encounter subsurface water, a natural system of recharge form the surface above the workings is not thought to be existent. Accordingly, a mining induced dewatering impact is determined to have a low probability."

2) "Subsidence related to mining has the greatest potential for impacting groundwater resources in the CIA."

3) "The [subsidence] surface tension fractures may readily divert surface runoff into the subsurface and thereby increase the natural system of recharge. However, this potential impact is considered temporary since the operator has committed to sealing all open tension fractures prior to bond release."

Although the applicant was not successful in eliminating subsidence cracks, it is unlikely that significant impacts to ground water and surface water has or will occur. The reason it is unlikely that significant impacts to ground water and surface water has or will occur are based on information in the CHIA and site observations as follows:

a. The average annual rainfall rates is 12 inches (1985 CHIA, J.B. King Mine).
b. Visual signs of subsidence have not indicated large volumes of water flow to the cracks (see last page of photos in the December 1,1999 bond release inspection report).
c. The mine elevation is approximately 200 feet above the nearest aquifer according to the CHIA.
d. No springs occur within the CIA, and no water rights were noted as having a potential to be impacted in the CHIA document.

Based on the available information Pollution of surface and subsurface water is not expected to occur, and the probability of future occurrence is not expected to vary greatly from the natural undisturbed area.

**Findings**:

The application does not meet the minimum requirements in accordance with the R645 requirements for Phase II bond release; therefore the following needs to be provided in the bond release application:

**R645-301-761.** The north perimeter ditch routed to the sedimentation pond needs to be removed, regraded, roughened, and seeded before receiving bond release; however, based on their commitment approval for bond release can be granted.

**R645-301- 880.320.** When the documentation for sound future maintenance at the site is determined by the Division to be adequate, bond release can be approved.

**RECOMMENDATIONS:**

Management should make the findings for Bond Release based on information presented in this document. The Bond Release could be granted but should not be released until the elements stated in the findings section of this document are completed.

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# Appendix A: State Water Quality Criteria and Livestock Toxicity

APPENDIX A

**NUMERIC CRITERIA FOR CLASS 4 WATERS DOMESTIC, RECREATION, AND AGRICULTURAL USES**

| PARAMETER | CRITERIA | SAMPLE 11/10/99 |
|---|---|---|
| **PHYSICAL** | | |
| pH (RANGE) | 6.5-9.0 | Lab 8.97 |
| | | Field 8.96 |
| **BACTERIOLOGICAL** | | |
| (30-DAY GEOMETRIC | | |
| MEAN) (NO.)/100 ML) (7) | | |
| Max. Total Coliforms ** | 5000 | Not analyzed |
| Max. Fecal Coliforms** | 200 | Not analyzed |
| **METALS (DISSOLVED, MAXIMUM MG/L) (2)** | | |
| Arsenic | 0.1 | < 0.03 |
| Cadmium | 0.01 | < 0.002 |
| Chromium | 0.10 | < 0.01 |
| Copper | 0.20 | < 0.005 |
| Lead | 0.1 | < 0.03 |
| Selenium | 0.05 | 0.014 |
| **INORGANICS (MAXIMUM MG/L)** | | |
| Boron * | 0.75 | < 0.3 |
| Total Dissolved | | |
| Solids (4) | 1200 | Lab 853 |
| Electric Conductivity | | Field 1,4700 (umhos/cm) |

Nitrate ***(included based on recommended MCLs for livestock)

| | | |
|---|---|---|
| 100 mg/l of nitrate-nitrogen plus nitrite-nitrogen | nitrate-nitrogen | < 0.04 |
| | nitrite-nitrogen | 0.42 |

FOOTNOTES:

* Although Boron is a state water quality standard the post mining land use of grazing and wildlife would not be impacted by increased levels in this parameter. (High nitrates interfere with the analysis and should be obtained in conjunction with Boron analysis if high nitrates are suspected to be present).

** Although this is a state standard for Class 4 waters it is primarily applicable to irrigation water used on crops for human consumption.

(2) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by atomic absorption or inductively coupled plasma (ICP) spectrophotometry.

(4) Total dissolved solids (TDS) limits may be adjusted if such adjustment does not impair the designated beneficial use of the receiving water.

(7) Exceedences of bacteriological numeric criteria from nonhuman nonpoint.

*** Not a state standard for class 4 water.

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The following information was collected at various Internet sites to determine potential for Toxicity to Livestock. Because wildlife toxicity information will require additional time to obtain the livestock levels will be used as cursory information to get a general idea of acceptable levels for the postmining land use.

**Salinity levels for different classes of livestock are:**

| | |
|---|---|
| Low | Less than 1000 milligrams per liter (mg/l). Excellent for all classes of livestock. (Less than 1500 umhos/cm specific conductance- Montana State University). |
| Very Satisfactory | 1000-2999 mg/l. All classes of livestock. Temporary, mild diarrhea in livestock may be noticed in animals not accustomed to this level of salinity. (1500-5000 umhos/cm specific conductance- Montana State University). |
| Satisfactory | 3000-4999 mg/l. Satisfactory for livestock; Livestock not used to saline water may refuse it or have temporary diarrhea.<br>5000 - 8000 umhos/cm specific conductance. Montana State University. |
| Marginal | 5000-6999 mg/l. Marginal for beef cattle, sheep, and horses; should not be used for pregnant or lactating animals. (8000- 11000 umhos/cm specific conductance). |
| Considerable Risk | 7000-10,000 mg/l. Considerable risk for pregnant or lactating cows, horses, sheep, or immature animals of any class. Avoid use for all animals if possible; however, older animals may subsist on water of this quality under certain conditions.(11000-16000 umhos/cm specific conductance. |

**Elements and Compounds**

Note: Maximum Contaminant Level (MCL), in mg/l, indicates the uppermost limit at which water should be considered safe to use. (This is probably considered to apply for a specified time period and may be considered the major water source but, this needs to be researched further).

| | | |
|---|---|---|
| Selenium | MCL 0.05 mg/l | Too much selenium can cause "blind staggers" or "bob-tailed disease," leading to loss of mane and tail in horses, switch of cattle. Animals may recover if removed quickly from the contaminated source |
| Fluoride | No MCL | A limit of 2.0 mg/l is recommended. Fluoride interacts with copper in dietary minerals. Excessive levels can cause loss of tooth enamel, resulting in rapid, uneven wear. Secondary effects disturb metabolism, causing semi-starvation conditions. |
| Arsenic | MCL 0.02 mg/l. | Arsenic is stored by the body and can reach chronic toxicity |

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| | | |
|---|---|---|
| | | levels, causing death. |
| Copper | MCL 0.5 mg/l. | In combination with phosphorus, copper plays a role in bone development. Ruminants are more susceptible to copper toxicity. Problems can occur when dietary molybdenum is either excessive or deficient. |
| Nitrate | No MCL | High nitrate levels may indicate high levels of biological pathogens (bacteria that can cause gastrointestinal disease). Recommended MCLs are 100 mg/l of nitrate-nitrogen plus nitrite-nitrogen, or 10 mg/l of nitrite-nitrogen alone. Excessive nitrate/nitrite intake can lead to problems in fetal development. |
| Cadmium | MCL 0.05 mg/l | Cadmium is considered very toxic. In young animals, increased dietary intake of cadmium can cause anemia. Reproductive problems related to cadmium have been observed in most livestock classes. |
| Boron | MCL 5.0 mg/l | Little scientific information on livestock boron intake is available. Slower growth rate is known to be one of the effects of too much boron in livestock water. Higher levels (150-300 ppm) can cause inflammation and edema in the legs of cattle, causing subsequent weight loss. |
| Chromium | MCL 1.0 mg/l | Carbohydrate metabolism in animals requires dietary chromium. Chromium toxicity from diet has been studied very little and is not considered a serious problem. Symptoms of elevated chromium intake varies among classes of animals, but primarily appear as skin and soft tissue problems. |
| Lead | MCL 0.1 mg/l | Pregnant goats will abort fetuses as a result of moderate levels of lead intake. |
| Mercury | MCL 0.01 mg/l | Mercury is not essential to animal nutrition and is not readily absorbed. Mercury can cause acute poisoning, much the same as arsenic. In cattle and sheep, dietary intake of 0.2 mg/kg mercury will cause un-coordination, unsteady gait, and eventual death. |
| Zinc | MCL 25 mg/l | Required for normal growth and development of all animals: 40-100 ppm zinc in the diet are normal. |