

a

C/015/032 Incoming

#3605

R



P.O. Box 910, East Carbon, Utah 84520 794 North "C" Canyon Rd, East Carbon, Utah 84520  
Telephone (435) 888-4000 Fax (435) 888-4002

Daron Haddock  
Permit Supervisor  
Utah Division of Oil, Gas and Mining  
P.O. Box 145801  
1594 West North Temple, Suite 1210  
Salt Lake City, Utah 84114-5801

September 13, 2010

Re: Crandall Canyon Mines, C/015/032  
Response to Division Order DO10A, Item 2  
Change to the MRP to Include Mine-Water Discharge Monitoring  
Submittal of Clean Copies, Task #3605

Dear Mr. Haddock:

Enclosed are six (6 ea.) clean copies of change to the Crandall Canyon Mine MRP to include additional monitoring of the mine-water discharge. This submittal is made in response to Division Order DO10A, Item II, and Task #3605

If you have any questions or comments regarding this submittal please contact me at 435 888-4017.

Sincerely,

A handwritten signature in black ink, appearing to read "David Shaver", written over a horizontal line.

David Shaver  
Resident Agent

RECEIVED  
SEP 16 2010  
DIV. OF OIL, GAS & MINING

## APPLICATION FOR PERMIT PROCESSING

<input type="checkbox"/> Permit Change	<input type="checkbox"/> New Permit	<input type="checkbox"/> Renewal	<input type="checkbox"/> Transfer	<input type="checkbox"/> Exploration	<input type="checkbox"/> Bond Release	Permit Number: <b>015/032</b>
Title of Proposal <b>Change to include additional monitoring of mine-water discharge., submitted in response to Division Order DO10A, Item II</b>						Mine: <b>Crandall Canyon Mines</b>
<b>Submittal of clean copies, Task #3605</b>						Permittee: <b>GENWAL Resources, Inc.</b>

Description, include reason for application and timing required to implement.

Instructions: If you answer yes to any of the first 8 questions (gray), submit the application to the Salt Lake Office. Otherwise, you may submit it to your reclamation specialist.

<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	1. Change in the size of the Permit Area? _____ acres Disturbed Area? _____ acres <input type="checkbox"/> increase <input type="checkbox"/> decrease.
<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2. Is the application submitted as a result of a Division Order?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	4. Does application include operations in hydrologic basins other than as currently approved?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	6. Does the application require or include public notice/publication?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	9. Is the application submitted as a result of a Violation?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	10. Is the application submitted as a result of other laws or regulations or policies? Explain:
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	11. Does the application affect the surface landowner or change the post mining land use?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	12. Does the application require or include underground design or mine sequence and timing?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	13. Does the application require or include collection and reporting of any baseline information?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	15. Does application require or include soil removal, storage or placement?
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<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	18. Does the application require or include water monitoring, sediment or drainage control measures?
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<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	21. Have reclamation costs for bonding been provided for?
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<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

Attach 3 complete copies of the application.

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, understandings, and obligations, herein. (R645-301-123)

Signed - Name - Position - Date

Subscribed and sworn to before me this 8<sup>th</sup> day of Sept. 2010

My Commission Expires  
Attest: STATE OF  
COUNTY OF

Notary Public

3.27.13



Notary Public  
**LINDA KERNS**  
Commission #578211  
My Commission Expires  
March 27, 2013  
State of Utah

Received by **Oil, Gas & Mining**

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**SEP 16 2010**

**DIV. OF OIL, GAS & MINING**

ASSIGNED TRACKING NUMBER



**GENWAL RESOURCES, INC  
CRANDALL CANYON MINES  
C/015/032**

**CHANGE TO  
INCLUDE ADDITIONAL  
MONITORING OF MINE-WATER  
DISCHARGE**

**THIS SUBMITTAL IS IN RESPONSE TO  
DIVISION ORDER DO10A, ITEM II**

**SUBMITTAL OF CLEAN COPIES  
TASK #3605**

**SUBMITTED: SEPTEMBER 13, 2010**



P.O. Box 910, East Carbon, Utah 84520 794 North "C" Canyon Rd, East Carbon, Utah 84520  
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Signed - Name - Position - Date  
*[Signature]* \_\_\_\_\_ **8/8/10**

Subscribed and sworn to before me this 8<sup>th</sup> day of Sept. 2010.

Notary Public  
*[Signature]*  
 My Commission Expires 3-27-13  
 STATE OF UTAH  
 COUNTY OF Carbon



Received by Oil, Gas & Mining  
**RECEIVED**  
**SEP 16 2010**  
 DIV. OF OIL, GAS & MINING

ASSIGNED TRACKING NUMBER



TABLE 7-4

Abbreviated Groundwater Analysis List

**Field Measurements:**

Water level or flow  
pH  
Specific conductance (umhos/cm)  
Temperature (°C)

**Laboratory Measurements:**

Total dissolved solids  
Total hardness (as CaCO<sub>3</sub>)  
Total Alkalinity  
Bicarbonate (as HCO<sub>3</sub>)  
Carbonate (as CO<sub>3</sub>)  
Calcium (as Ca)  
Chloride (as Cl)

Dissolved iron (as Fe)  
Total Iron (as Fe)  
Magnesium (as Mg)  
Total Manganese (as Mn)  
Potassium (as K)  
Sodium (as Na)  
Sulfate (as SO<sub>4</sub>)

TABLE 7-4(A)

Mine-Water Discharge Analysis List

**Field Measurements:**

Ferrous iron  
pH  
Dissolved oxygen  
Conductivity  
Temperature  
Flow

**Laboratory Measurements:**

Calcium (dissolved)  
Potassium (dissolved)  
Sodium (dissolved)  
Magnesium (dissolved)  
Silica  
Chloride  
Hot acidity by Standard Method 2310B4(a)  
Aluminum (total and dissolved)  
Iron (total and dissolved)  
Manganese (total and dissolved)  
Sulfate  
Alkalinity (total, carbonate, and bicarbonate)  
TDS  
Suspended solids

Note: All Mine-Water Discharge monitoring data will be submitted to the Division monthly. Water chemistry and field measurements data will be submitted electronically using the Division's water monitoring database EDI system. Mine-water discharge rate data will be provided in a spreadsheet format.

TABLE 7-5

Extended Groundwater Analysis List

**Field Measurements:**

Water level or flow  
 pH  
 Specific conductance (umhos/cm)  
 Temperature (°C)

**Laboratory Measurements:**

Total dissolved solids	Selenium (as Se)(Dissolved)
Total hardness (as CaCO <sub>3</sub> )	Sodium (as Na)(Dissolved)
Total Alkalinity	Sulfate (as SO <sub>4</sub> )
Acidity	Zinc (as Zn)
Aluminum (as Al)	
Arsenic (as As)	
Barium (as Ba)	
Bicarbonate (as HCO <sub>3</sub> )	
Baron (as B)	
Carbonate (as CO <sub>3</sub> )	
Cadmium (as Cd)(Dissolved)	
Calcium (as Ca)(Dissolved)	
Chloride (as Cl)	
Copper (as (Cu)(Dissolved)	
Dissolved Iron (as Fe)	
Total Iron (as Fe)	
Lead (as Pb)(Dissolved)	
Magnesium (as Mg)(Dissolved)	
Dissolved Manganese	
Total Manganese (as Mn)	
Molybdenum (as Mo)(Dissolved)	
Nitrogen-Ammonia (as NH <sub>3</sub> )	
Nitrite (as NO <sub>2</sub> )	
Nitrate (as NO <sub>3</sub> )	
Potassium (as K)(Dissolved)	
Phosphate (as PO <sub>4</sub> )	

All samples are preserved as soon as practicable after collection. Samples are collected and analyzed according to the methodology in the current edition of "Standard Methods for the Examination of Water and Wastewater" or the methodology in 40 CFR Parts 136 and 434.

On a quarterly basis an inventory will be conducted of the active portion of the mine to identify the location and geologic occurrence of mine inflows that exceed three gallons per minute. In consultation with DOGM, certain of these inflows (if they occur) will be selected for continued monitoring. Previously, only one such inflow existed, flowing from the roof of the mine from an exploratory hole (DH-1) that was vertically drilled from within the permit area at the location shown on Plate 3-2 (listed as "DRILL HOLE"). Flow from this hole was originally controlled with a valve. However, the overlying perched aquifer no longer produces a flow sufficient to monitor.

After selection of the inflow points to be monitored, data will be collected on a quarterly basis and analyzed according to Table 7-4. Samples collected during the low-flow period (normally the fourth quarter) will be analyzed according to Table 7-5 in the years 1990, 1995, 2000, and at 5-year intervals thereafter. Monitoring and sampling of the selected mine inflow points will continue, according to this schedule, in safely accessible portions of the mine.

Water rights apparently have been filed for two additional springs in the area surrounding the lease areas (93-1407 and 93-1408 on Plate 7-14). As noted in Section 7.24.1 the source at 93-1407 was not discovered until the fall of 1990. Until this time it was surmised to exist as only a seep (similar to 93-1408 (SP-47)). Since its discovery GENWAL has committed to monitoring and sampling SP-1407 (SP-47a) in the groundwater monitoring plan submitted with the Right-of-Way application. Source 93-1408 existed as a seep in June but was dry in October, 1985. Hence, it was decided not to monitor 93-1408 on a long-term basis since it does not flow at a sufficient rate to permit sample collection. SP-47 was observed to be dry in October, 1989 and in June of 1990.

GENWAL installed monitoring wells near the mine portal (MW-1), and in the East Mains near their junction with the North Mains (MW-2) (Plate 7-13). Monitoring well MW-3 is located in an area sealed in 1979, and is now inaccessible. Monitoring wells MW-4 and MW-5 were installed in January 1992. These locations were chosen in areas where access will be maintained as long as possible.

Each underground monitoring well was drilled using air-rotary techniques (see Appendix 7-46 for completion diagrams). MW-1 was drilled to a total depth of 375 feet (Figure 7-1). As 6 5/8-inch diameter steel casing was cemented within a 10-inch diameter hole to a depth of 100 feet. A 6-inch diameter open hole completion exists from 100 to 375 feet. MW-2 was drilled to a total depth of 134 feet. Four-inch casing was set to 5 feet. A 3-inch open hole completion exists from 5 to 134 feet. Drilling of a larger diameter hole at greater depth was precluded by the inability of a larger drill rig to mobilize underground.

Monitoring well MW-4 was drilled to a depth of 111.5 feet. The hole has a 5" casing set to a depth of 4 feet, and a 1.5 inch PVC casing for the remainder, with a slot screen in the bottom 10 feet. MW-5 was drilled to a depth of 116.8 feet. It has a 5" casing to a depth of 4 feet, and a 2 inch PVC casing for the remainder, with a slot screen in the bottom 40 feet.

After drilling, each hole was surged with air to remove fines that had accumulated in the holes. Surging continued until the water discharging from the holes was visibly clear. A cap was placed over the surface casing to allow closure of each well when not in use.

Construction and initial sampling of the underground monitoring wells was completed in June, 1989 and June, 1992. Lithologic/completion logs of the wells have been submitted to DOGM along with the results of analyses of the first samples collected from the wells. An interpretation of the hydrogeology of the Star Point Sandstone beneath the mine appears in Section 7.24.1.

Water-level measurements and water-quality samples will be collected from the monitoring wells on a quarterly basis following completion during the first two years following completion of the in-mine wells and in the years 1990, 1995, 2000 and in 5-year intervals thereafter. During the operational period of the mine, water-quality samples collected from all wells will be analyzed according to the list provided in Table 7-4. Monitoring will continue according to this schedule in accessible wells until two years after the completion of surface reclamation activities.

Each monitoring well will be pumped prior to sampling to purge it of stagnant water standing in the hole. In the case of M-1, purging will be accomplished using a submersible pump. A bailer will be used for purging and sampling MW-2, MW-4 and MW-5. In each case, purging will continue until at least 3 times the volume of water standing in the well has been pumped. Samples will be collected directly from the discharge line of the pump. Samples will be preserved and stored in accordance with U.S. Environmental Protection Agency guidelines.

Groundwater monitoring data collected from the area will be submitted to DOGM on a quarterly basis. On an annual basis, a report will be submitted to DOGM summarizing all data collected during the year and containing an analysis of the mine water balance, accounting for mine inflows, outflows, consumptive uses, and sump storage (a copy of the annual report will also be given directly to the Price office of the U.S. Forest Service).

After the completion of mining activities and during the post-mining/reclamation period, water-level and quality samples will be collected annually from the designated springs and MW-1 until the termination of bonding. In-mine wells will be inaccessible following reclamation. Samples will be collected during the latter portion of the summer to represent low-flow conditions. Samples thus collected will be analyzed for the parameters listed in Table 7-4. A report will be submitted to DOGM on an annual basis summarizing the results and assessing mining impacts and system recovery since mining ceased.

#### **7.31.22 Surface Water Monitoring Plan**

Two 36-inch Parshall flumes were installed in July 1985 on Crandall Creek (one upstream from the surface facilities and one downstream (see Plate 7-16)). A 12-inch Parshall flume has been installed in Blind Canyon to monitor possible effects of mining in State Lease ML-21569. These flumes are equipped with Stevens Type-F water-level recorders to allow the collection of continuous flow data. Charts will be changed and the flumes inspected on a monthly basis. Flume location and stream monitoring stations are shown on Plate 7-16.

Water quality samples will be collected from the flume locations quarterly, and analyzed according to the list contained in Table 7-8. In the years 1990, 1995, 2000 and every fifth year thereafter the samples collected during the low-flow period (normally fourth quarter) will be analyzed according to Table 7-9. All samples will be analyzed for total and dissolved constituents according to the indicated lists. Sampling and analysis will be conducted quarterly until the surface areas are reclaimed, at which time sampling will be conducted semiannually until the surety bond is released. For perennial streams, those samples will be collected during high-flow (normally second quarter) and low-flow (normally fourth quarter) periods. Discharges from the sedimentation pond will be analyzed in accordance with the UPDES permit for the facility.

Stream flow observations made during drilling operations as well as seep and spring surveys suggest that large portions of the south fork of Horse Creek, and both the north and south forks of Crandall Creek have only ephemeral and intermittent flows within State Leases ML-21568 and ML-21569 and portions of UTU-68082. Plate 7-16 shows the points of transition between perennial and intermittent flow for Horse Creek, Blind Creek, the north and south forks of Crandall Creek, and Indian Creek. Blind Creek has been determined to be intermittent.

Stream channel monitoring stations have been established along both the north and south forks of Crandall Creek, and the south branch of Horse Creek to determine what stream reaches exhibit perennial flow. Stream flow and water temperature were measured twice monthly from May through July, and monthly during the remainder of 1991 when the area was accessible. Stream monitoring results are found in Appendix 7-23. Stream monitoring was again done on September 28, 1992. These results are also contained in Appendix 7-23. Stream monitoring ceased at the end of 1992.

To provide for proper monitoring of Indian Creek (in Upper Joe's Valley) a 36-inch Parshall flume was installed. This flume is equipped with a Stevens Type-F water-level recorder to allow the collection of continuous flow data. Charts will be changed and the flumes inspected on a monthly basis. The location of this flume is depicted on Plate 7-16. Because of its higher elevation and limited access this flume is typically operational from June 1 through November 1 of any given year. If seasonal variations and access allow, this station will be operated for longer periods.

Water quality samples will be collected from the Indian Creek flume location quarterly (weather permitting), and analyzed according to the list contained in Table 7-8. In the years 1995, 2000 and every fifth year thereafter the samples collected during the low-flow period (normally fourth quarter) will be analyzed according to Table 7-9. All samples will be analyzed for total and dissolved constituents according to the indicated lists. When flumes or other monitoring devices are no longer required, they will be removed and the affected areas will be restored.

No retreat mining will be conducted within the designated stream channel buffer zones. Horse Canyon is located hydraulically upgradient and north of the UTU-68082 (LBA No. 9) north boundary line. Current mine plans show that because of limited coal height that neither development mining or retreat mining will occur beneath Horse Canyon and the stream channel

buffer zones. Since mining has already occurred under Blind Canyon, Crandall Canyon, and beneath the upper reaches of the left fork (South Fork) tributary of Horse Canyon, any adverse effects to the respective streams should manifest as reduced stream flow and a continuous high volume inflow into the mine workings. If it is found that stream flows in Blind Canyon and Crandall Canyon have been impacted by mining, then a decision to monitor Horse Canyon on a continuous basis will be made.

In conjunction with the South Crandall Lease (UTU-78953) and the SITLA/PacifiCorp sublease GENWAL will monitor four creeks. The monitoring plan for the South Crandall Lease is described below. Monitoring site locations are shown on Plate 7-18. The monitoring protocols for each of the monitored creeks are presented in Table 7-10.

Little Bear Canyon Creek will be monitored quarterly for Table 7-8 parameters including flow and field water-quality parameters. The creek will be monitored approximately 100 feet above the confluence with Huntington Creek (Plate 7-18). Based on the range of discharge anticipated at the creek (see Appendix 7-58) discharge measurements at Little Bear Canyon Creek will likely be performed using a 90° v-notch weir or a portable 3-inch Parshall flume.

The ephemeral drainage in SW 1/4 of Section 4 T16S R7E will be monitored quarterly for Table 7-8 parameters including flow and field water-quality parameters. No discharge was observed in this drainage during drought conditions in 2003. If flow occurs in this drainage, the discharge will be measured using appropriate portable discharge measuring devices.

Monitoring station IBC-1 monitors the drainage located along the border of Sections 5 and 6, T16S, R7E. This drainage will be monitored quarterly for Table 7-8 parameters including flow and field water-quality parameters. Discharge in this drainage has been meager (Appendix 7-58) and discharge will likely be measured using a stopwatch and a calibrated bucket. The potential for impacts to this drainage are considered remote because only a small region in the extreme northwestern portion of the South Crandall Lease area is drained by this drainage. However, to verify that no impacts to this drainage occur, and to document the effects of climatic variability on stream discharge in the region, this creek will be monitored.

The creek in Section 5 T16S, R7E will be monitored quarterly for Table 7-8 parameters including flow and field water-quality measurements. This creek drains most of the northeastern portion of the South Crandall Lease area, where the initial mining in the lease area will occur. Additionally, the upper forks of this drainage will be monitored for flow and field water-quality measurements will be performed. Flow at each of the monitoring sites on this drainage has been meager. Thus, flow measurements will likely be performed using a stopwatch and a calibrated bucket.

In conjunction with mining in the U-68082 lease modification area GENWAL will monitor surface flow in Shingle Canyon (aka No Name Canyon), for flow and field parameters quarterly. This site is located immediately down stream from the confluence of the right and left forks of the canyon, and is shown on Plate 7-18.

TABLE 7-8

Abbreviated Surface Water Analysis List

Field Measurements:

Water level or flow  
pH  
Specific conductance (umhos/cm)  
Temperature (°C)  
Dissolved oxygen (ppm)

Laboratory Measurements:

Total dissolved solids  
Total suspended solids  
Total settleable solids  
Total hardness (as CaCO<sub>3</sub>)  
Total Alkalinity  
Bicarbonate (as HCO<sub>3</sub>)

Carbonate (as CO<sub>3</sub>)  
Calcium (as Ca)  
Chloride (as Cl)  
Dissolved Iron (as Fe)  
Total Iron as (Fe)  
Magnesium (as Mg)

Dissolved Manganese  
Total Manganese (as Mn)  
Potassium (as K)  
Sodium (as Na)  
Sulfate (as SO<sub>4</sub>)  
Oil and Grease  
Cation - Anion balance

TABLE 7-9

Extended Surface Water Analysis List  
(Baseline Parameters)

Field Measurements:

Flow  
pH  
Specific conductance (umhos/cm)  
Temperature (°C)  
Dissolved oxygen (ppm)

Laboratory Measurements:

Total dissolved solids	
Oil and Grease	Nitrate (as NO <sub>3</sub> )
Cation - Anion balance	Potassium (as K)(Dissolved)
Total suspended solids	Phosphate (as PO <sub>4</sub> )
Total settleable solids	Selenium (as Se)(Dissolved)
Total hardness (as CaCO <sub>3</sub> )	Sodium (as Na)(Dissolved)
Total Alkalinity	
Acidity as (CaCO <sub>3</sub> )	Sulfate (as SO <sub>4</sub> )
Aluminum (as Al)	Zinc (as Zn)(Dissolved)
Arsenic (as As)	
Bicarbonate (as HCO <sub>3</sub> )	
Boron (as B)	
Carbonate (as CO <sub>3</sub> )	
Cadmium (as Cd)	
Calcium (as Ca)	
Chloride (as Cl)	
Copper (as Cu)(Dissolved)	
Dissolved iron (as F)	
Total iron as (Fe)	
Lead (as Pb)(Dissolved)	
Magnesium (as Mg)(Dissolved)	
Dissolved Manganese	
Total Manganese (as Mn)	
Molybdenum (as Mo)(Dissolved)	
Nitrogen-Ammonia (as NH <sub>3</sub> )	
Nitrite (as NO <sub>2</sub> )	

**Table 7-10 Water Monitoring Program**

**Ground Water**

**Springs**

1	SP-30	No Side Lower Crandall	Flow and field parameters quarterly
2	SP-36	No Side Lower Crandall	Flow, field parameters, and Table 7-4 parameters quarterly
3	SP-58	Forks of Crandall Crk.	Flow, field parameters, and Table 7-4 parameters quarterly
4	SP2-24	Top of East Mountain	Flow, field parameters, and Table 7-4 parameters quarterly
5	SP2-9	Top of East Mountain	Flow, field parameters, and Table 7-4 parameters quarterly
6	SP47A	Pt No of Crandall Mine	Flow and field parameters quarterly
7	SP1-3	Top of East Mountain	Flow and field parameters quarterly
8	SP1-19	Top of East Mountain	Flow and field parameters quarterly
9	SP1-22	Top of East Mountain	Flow and field parameters quarterly
10	SP1-33	Upper Joe's Valley	Flow, field parameters, and Table 7-4 parameters quarterly
11	SP1-47	Upper Joe's Valley	Flow and field parameters quarterly
12	SP2-1	Upper Joe's Valley	Flow and field parameters quarterly
13	SP1-9	Top of East Mountain	Flow, field parameters, and Table 7-4 parameters quarterly
14	SP1-24	Top of East Mountain	Flow and field parameters quarterly
15	LB-5A	Little Bear Canyon	Flow, field parameters, and Table 7-4 parameters quarterly
16	LB-7	Little Bear Canyon	Flow, field parameters quarterly
17	LB-7A	Little Bear Canyon	Flow, field parameters quarterly
18	LB-7B	Little Bear Canyon	Flow, field parameters quarterly
19	LB-7C	Little Bear Canyon	Flow, field parameters quarterly
20	LB-12	Little Bear Canyon	Flow, field parameters quarterly
21	SP-79	Huntington Canyon trib.	Flow, field parameters, and Table 7-4 parameters quarterly
22	Little Bear Spring		Flow, field parameters, and Table 7-4 parameters quarterly
23	SP-18	Shingle Canyon	Flow, field parameters quarterly.
24	SP-22	Shingle Canyon	Flow, filed parameters quarterly.

**In-Mine Monitoring Wells \*\***

1	DH-1	Main North (Dry)	Flow, field parameters, and Table 7-4 parameters quarterly
2	DH-2	In Sealed Area	Flow, field parameters, and Table 7-4 parameters quarterly
3	MW-1	At Portals	Flow, field parameters, and Table 7-4 parameters quarterly
4	MW-2	At Mouth of Main East	Flow, field parameters, and Table 7-4 parameters quarterly
5	MW-3	In Sealed Area	Flow, field parameters, and Table 7-4 parameters quarterly
6	MW-4	In Sealed Area	Flow, field parameters, and Table 7-4 parameters quarterly
7	MW-5	Destroyed	Flow, field parameters, and Table 7-4 parameters quarterly
8	MW-6	Main South (DEEP)	Flow, field parameters, and Table 7-4 parameters quarterly
9	MW-6a	Main South (No of Dike)	Flow, field parameters, and Table 7-4 parameters quarterly
10	MW-7	Main West	Flow, field parameters, and Table 7-4 parameters quarterly
11	MW-8	Main South (So of Dike)	Flow, field parameters, and Table 7-4 parameters quarterly

## **Surface Water**

### **Streams**

1 Upper Flume Crandall Creek	Flow, field parameters, and Table 7-8 parameters quarterly
2 Lower Flume Crandall Creek	Flow, field parameters, and Table 7-8 parameters quarterly
3 Horse Canyon Creek	Flow, field parameters, and Table 7-8 parameters quarterly
4 Blind Canyon Creek	Flow, field parameters, and Table 7-8 parameters quarterly
5 Indian Creek	Flow, field parameters, and Table 7-8 parameters quarterly
6 IBC-1	Flow, field parameters, and Table 7-8 parameters quarterly
7 Section 4 Creek	Flow, field parameters, and Table 7-8 parameters quarterly
8 Section 5 Creek (lower)	Flow, field parameters, and Table 7-8 parameters quarterly
9 Section 5 Creek (Upper Right Fork)	Flow and field parameters quarterly
10 Section 5 Creek (Upper Left Fork)	Flow and field parameters quarterly
11 Little Bear Creek	Flow, field parameters, and Table 7-8 parameters quarterly
12 Shingle Creek	Flow, Field parameters quarterly.

### **UPDES**

1 001 – Sed Pond Discharge	Flow, field parameters, and UPDES parameters per occurrence
2 002 – Mine Water Discharge	Flow, field parameters, and UPDES parameters monthly

### **Mine Discharge**

Flow, field parameters and Table 7-4(A) parameters monthly

\*\* Note: Monitoring of all In-Mine Monitoring wells has been discontinued since the mine was sealed up following the 2007 collapse of the mine.

Note: See Plate 7-18 for Locations

the treated water ends up reporting to the Crandall Canyon drainage (by way of the main bypass culvert) at the existing approved UPDES outfall point.

There is every reason to believe that water will permanently discharge from the Crandall Mine portals. The iron level of the mine water historically was very low, and began rising only after the water began to build up and impound within the mine workings following the mine collapse of 2007. It is now the consensus that the elevated iron concentration will be a permanent situation, and that the reclamation plan must provide for a permanent means of treating the discharge water so as to meet UPDES requirements, even subsequent to final reclamation. To address this situation, the company commits to revising the reclamation plan in the near future. Additional baseline data will be incorporated into this revised reclamation plan. This data will include: 1) flow quantities from the seep in the sandstone ledge above the treatment facility, 2) historical data concerning the iron concentration levels in the mine discharge water, and 3) performance data demonstrating the effectiveness of the existing treatment system methodology, i.e., oxidation/settling, as opposed to other treatment methods such as reverse-osmosis, fine-element filtration, chemical coagulants/flocculants, etc

As part of the revised reclamation plan, the company commits to conducting the following monitoring and collection of additional information on the chemistry and flow of the mine-water discharge:

- a. Measurement of the discharge rate from the sealed portals; either continuously (e.g., using a data logger) or at a minimum, daily.
- b. Monthly whole water chemical analysis and field measurements of the untreated mine discharge as specified on Table 7-4(A).

#### **7.42.22 Sedimentation Pond**

##### **Design**

The sedimentation pond located in Crandall Canyon has been redesigned to control the additional storm runoff from the pad extension and from the designated undisturbed drainage areas above the pad extension associated with the proposed culvert expansion. The topography and watershed boundaries are shown on Plate 7-5 and 7-5C. Cross sections of the pond design are shown on Plate 7-3.