C/015/032 Incoming

#5067

GENWAL™ RESOURCES, INC.

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

Utah Division of Oil, Gas & Mining
Utah Coal Program
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, UT 84114-5801

January 13, 2015

Attn: Daron Haddock
Permit Supervisor

Re: Crandall Canyon Mines, C/015/032
C15-003 Midterm Review Task ID# 55011

Dear Mr. Haddock,

Attached you will find the application addressing the deficiencies regarding the Midterm review of Crandall Canyon Mine.

Following this letter, you will find the C1 and C2 forms, a summary of deficiencies and detailed actions taken to correct them, and 2 copies of each of the following: edited pages, red line strike out, and maps.

If you have any questions, or need any additional information regarding this submittal, please contact me directly at 435-888-4026.

Sincerely,

Karin Odendahl-Madsen
Engineering Technician
UtahAmerican Energy, Inc.

APPLICATION FOR PERMIT PROCESSING

Permit Change X	New Permit ☐	Renewal ☐	Transfer ☐	Exploration ☐	Bond Release ☐	Permit Number: ACT/015/032
Title of Proposal: C15-003 Midterm Review, Task ID# 55011						Mine: Crandall Canyon Mine
						Permittee: Genwal Resources, Inc.

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*

☐ Yes	☐ No	1. Change in the size of the Permit Area? ____ acres Disturbed Area? ____ acres ☐ increase ☐ decrease.
☐ Yes	☐ No	2. Is the application submitted as a result of a Division Order? DO #
☐ Yes	☐ No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes	☐ No	4. Does application include operations in hydrologic basins other than as currently approved?
☐ Yes	☐ No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes	☐ No	6. Does the application require or include public notice/publication?
☐ Yes	☐ No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes	☐ No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes	☐ No	9. Is the application submitted as a result of a Violation? NOV #
☐ Yes	☐ No	10. Is the application submitted as a result of other laws or regulations or policies? Explain:
☐ Yes	☐ No	11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes	☐ No	12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2?)
☐ Yes	☐ No	13. Does the application require or include collection and reporting of any baseline information?
☐ Yes	☐ No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes	☐ No	15. Does application require or include soil removal, storage or placement?
☐ Yes	☐ No	16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes	☐ No	17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes	☐ No	18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes	☐ No	19. Does the application require or include certified designs, maps, or calculations?
☐ Yes	☐ No	20. Does the application require or include subsidence control or monitoring?
☐ Yes	☐ No	21. Have reclamation costs for bonding been provided for?
☐ Yes	☐ No	22. Does application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes	☐ No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

X Attach 2 complete copies of the application and maps.

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, undertakings, and obligations, herein.

Karin Madsen - Engineering Tech - 1-12-16
Signed - Name - Position - Date

Subscribed and sworn to before me this 12th day of January, 19 2016

Notary Public

My Commission Expires: March 27, 19 2017
Attest: STATE OF Utah
COUNTY OF Carbon } ss:

LINDA KERNS
NOTARY PUBLIC • STATE of UTAH
COMMISSION # 663615
COMM. EXP. 03/27/2017

Received by Oil, Gas & Mining

RECEIVED
JAN 19 2016
DIV. OF OIL, GAS & MINING
DIV. OF OIL, GAS & MINING

ASSIGNED TRACKING NUMBER

Application for Permit Processing
Detailed Schedule of Changes to the MRP

C15-003 Midterm Review	Permit Number: ACT/015/032
	Mine: Crandall Canyon Mine
	Permittee: Genwal Resources, Inc.

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit application. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise the existing mining and reclamation plan. **Include page, section and drawing numbers as part of the description.**

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☐ REPLACE	☐ REMOVE	Replace Chapter 1
☐ ADD	☐ REPLACE	☐ REMOVE	Deficiency stated that the 1st 5 pages of chapter 1 were out of date. These pages are not in the currently approved MRP, please delete from DOGM's copy of MRP and follow the complete Chapter 1 that is included in this submittal.
☐ ADD	☐ REPLACE	☐ REMOVE	Replace entire Appendix 5-20 Bonding information.
☐ ADD	☐ REPLACE	☐ REMOVE	Replace Appendix 1-11
☐ ADD	☐ REPLACE	☐ REMOVE	Replace entire Appendix 7-66. Text edits pages 7, 8, 19, 20, and 21. Page numbering changed due to these changes.
☐ ADD	☐ REPLACE	☐ REMOVE	Appendix 7-65, text edits page 8. And add last page to Attachment 11
☐ ADD	☐ REPLACE	☐ REMOVE	Replace Chapter 5
☐ ADD	☐ REPLACE	☐ REMOVE	Chapter 7 pages 7-xii-a, 7-54
☐ ADD	☐ REPLACE	☐ REMOVE	Plates 1-1, 1-2, 2-3, 2-6, 3-1a, 3-1b, 3-1c, 3-2, 4-1, 4-2, 4-3, 4-4, 5-2 (H), 5-2 (BC), 5-3a, 5-5, 6-1, 7-12, 7-14, 7-15, 7-18
☐ ADD	☐ REPLACE	☐ REMOVE	Appendix 7-65, Attachment 11 add page to the back of the section showing estimated costs are similar to initial calculations.
☐ ADD	☐ REPLACE	☐ REMOVE	Chapter 7 page 7-40
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
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☐ ADD	☐ REPLACE	☐ REMOVE	

Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

The current mining and reclamation plan does not meet the state of Utah R645 requirements for identification of Interests. The permittee must revise the first page of Chapter 1. It identifies IPA as a joint owner of the Crandall Canyon Mine. As the first five pages are clearly out of date, the permittee may choose to delete them as the information is located elsewhere in the current MRP.

Introductory pages that are located in the DOGM copy of the MRP are not in our copy of the MRP and are out dated. DOGM needs to remove these introductory pages from their copy to eliminate the information that is out of date.

The current MRP does not meet the state of Utah R645 requirements for Violation information. The permittee must revise/update the violation information in appendix 1-11. It appears that the violation information in the appendix was last updated in November of 2009.

The violation information has been updated to include all current violations at the property.

The Current Crandall Canyon Mining and reclamation plan does not meet R645 requirements for right of entry information. The permittee must revise/update the lease information in the MRP . The lease information provided in the Crandall Mining and Reclamation plan needs to be revised to reflect the current leases held by the permittee. Section 114 Right of Entry information, beginning on page 1-5 as well as the first page of Chapter 1 need to be revised/updated. In addition, all maps, figures and plates that depict lease boundaries must be updated.

Section 114 in Chapter 1 as well as page 1 in Chapter 1 has been edited to reflect most current information. All maps, figures and plates have been also been revised.

The current MRP does not meet R645 requirements for legal description. The Permittee must update the legal description beginning on page 1-7 of the MRP the current legal description contains leases that have been relinquished by the Permittee. A sch, the permittee must revise the legal description. The legal description at a minimum must include all disturbed areas. If the permittee chooses to, the legal description can also include dthose leases that are currently held by the permittee, however the state of utah rules only require that the legal description include areas for which the division of oil gas and mining hold a reclamation bond. All plates and figures will also need to be revised to reflect the current permit area.

Legal description as well as all maps have been revised to reflect the most current lease information.

The current MRP does not address the changes in the mine boundary due to lease relinquishments. The permittee needs to update the appropriate drawings in chapter 5 to reflect current lease areas.

Plates in chapter 5 have been updated to reflect the current lease relinquishments.

The minimum requirements of R645 are met in the current MRP as the permittee presented a clear subsidence plan for protected are, however, subsidence monitoring requirements have been met as of 2014 and annual subsidence monitoring should be removed from the MRP. Section 5.25.14 of chapter 5 of the MRP states the annual requirement of vertical and horizontal positions of all monitoring points and pins directly over and within the 20 degree angle of draw to the mined area surveyed by aerial photography for that specific year. The subsidence monitoring that subsidence is substantially complete. Plate 5-5 and 5-5(2) detail the coordinates for all subsidence monitoring locations, including monitoring points over areas where the lease has been relinquished. The Permittee has submitted updated annual subsidence information since 2004 for the south Crandall mine and since 2012 for the east mountain reclaimed slide area. As of the 2014 subsidence monitoring report, all monitoring points have not recorded any subsidence greater than six inches since 2012. The permittee should amend the MRP to include demonstration of subsidence is substantially complete, and will no longer be monitored.

Monitoring requirements have been met as of December 2015, and no subsidence over 1 foot has occurred in the last 5 years.. Mining was idled after the 2007 accident, and mining is anticipated to resume after the market improves. Once mining has resumed, subsidence monitoring will resume as well. Maps have been revised.

Please provide the following current information.

1) Operation and reclamation of the Burma pond is described in chapter 7 appendices D, appendix 7-66. Chapter 2 of App. 7-66 states that after soil salvage at the Burma pond is completed a final assessment of the volume will be updated in the MRP and a final report will be prepared and submitted to the division. The work was completed in 2012. The as-built information could not be found within the MRP or in recent annual reports. Please provide the as-built report.

As Built Map is included in the submittal as Plate 5-3. Soil salvage information is included on that map.

2)Chapter 5 of App 7-66 item 2 states that the accumulated depth of sludge will be monitored and reported in the annual report and that grab samples of the dried material will be taken every 5 years or with 7.5 inches of solid waste deposited. This information could not be found in recent annual reports. Please provide the required reporting and analyses.

As per the requirements, sludge is only to be sampled after 5 years, or when accumulated depth of sediment reaches 7.5 inches. Construction of Burma Pond was completed on Thursday, January 9th, 2013. It is not scheduled to be sampled until January 2018, unless the sediment reaches 7.5 inches. In 2014, the pond evaporated enough to reveal an accumulated depth of approximately 3.5 inches of sediment. In 2015, the pond did not evaporate enough to show a total accumulation of sediment. When sediment surveys are done on the ponds, it is the surveyor's estimate of what the sediment is while suspended in water, therefore the accumulated

level is unknown at this time. It is my estimation that sediment levels will be close to 7.5 inches in the summer of 2016, and the sediment will be sampled then.

3) Provide a reporting of the depth of placement and compaction of sludge. Include sampling information if lacement depth met the reqirements of item 2.

See Above

The Permittee must remove monitoring wells MW-1 MW-2 MW-6 MW-6a MW-7 MW-8 and DH-1 from the water monitoring plan. These in-mine wells are located in a lease that is no longer held by the permittee.

Note added to bottom of monitoring location table stating that the monitoring up the underground wells are no longer monitored due to the sealing off of the portals after the accident in 2007. Information regarding the wells has been retained for historical reference, as per Amanda Daniel's recommendation.

R645-301-731.121 Update Appendix 7-66 of the MRP to include the actual operations taking place at the Burma Pond, specifically hauling of sludge/water from the water treatment system, instead of estimated operations.

Calculations were done and current operational amounts are not significantly different from what is currently in the MRP. Appendix 7-65 Attachment 11. An additional page has been created and added as the last page of this attachment showing our current calculations.

R645-301-731-121It is unclear how much solid material is accumulating at the Burma Pond. The submitted quarterly impoundment inspections indicate that between 2013 and 2014 there wa no change in the accumulated material levels. Appendix 7-66 estimates that 1.5 inches of material will be deposited each year (with hauling rates that are much lower than what is actually taking place). This accumulation rate, as well as the estimated life of the Burma Pond should be updated to reflect what is currently taking place.

Changes made to Appendix 7-66.

The minimum requirements of R645-301-540 are not met within the current MRP as there is a missing reference to the operations and reclamation of the Burma Evaporation Pond and treatment plant. Appendix 5-22A is the stand alone reclamation plan for the eadt mountain emergency drillpads and access roads and is referenced in chapter 5 section 5.40 so that relevant information can be located. The MRP chapter 5 section 5-40 is missing information detailing the operation and reclamation of Burma pond and treatment plant to service the mine discharge can be found in appendix 7-65 and 7-66. The permittee will amend this section to include the

relevant directions to additional reclamation plans associated with the Crandall mining operations.

Chapter 5 section 5.40 text has been changed to update the relevant directions to additional reclamation plans associated with the operations.

R645-301-540 The minimum requirements are not met within the MRP as the Burma Pond and treatment plant is reaching the end of it's bonding agreement. The MRP within chapter 7 appendix 7-66 details several various operations and reclamation scenarios as described in items one through seven on page 8 of appendix 7-66. Operations within the Burma pond appendix 7-66 need to be updated as detailed in hydrology deficiencies (above)

EIS completed updated bonding calculations. They are included in Appendix 5-20.

R645-301-553 Minimum requirements not met within the MRP due to outdated information present in Appendix 7-65 and 7-66 backfilling cost. During reclamation the subsoils or backfill material will be laid in 12-18'' lifts and compacted through repeated travel of heavy equipment. In areas with slopes of less than 30% the subsoil will be ripped to a depth of 18" prior to topsoil placement. In areas having an average slope of more than 30%the subsoil will be ripped to a depth over 12". The East mountain area has been fully back graded and remains stable as detailed in the 2014 annual report. The Burma Pond and treatment plant final reclamation needs to be updated to reflect updated operations and life expectancy as addressed in hydro deficiencies (above). The water treatment area does not contemplate the volume required to backfill the current treatment pond shown on plate 5-3 (PJ Updated this map already) to achieve AOC shown on plate 5-17. Volumes of the loadout area need to be updated.

See updated hydro plan in Appendix 7-66

Please provide documentation (narrative and map) of the interim reclamation measures taken on disturbed areas which are not required for continuing operations, along with control of noxious weeds in accordance with article 10.2 of SITLA lease 1708 (Appendix 1-16, chapter 5 item 6 page 9 and item 9 on page 10).
To ensure permit renewal is processed in a timely manner please revise the timing of the evaluation described in appendix 7-66 chapter 5 item 5 and 6, page 8 to the midterm permit review and please provide said evaluation in response to this review.

Change made to chapter 5 page 33

The application does not meet the minimum requirements as the permittee did not submit detailed bond information. The division requires an evaluation of the reclamation cost estimate

during each midterm permit review. This cost estimate is then escalated for 5 years or until the next midterm review. In accordance with the requirements it is the permittees responsibility to provide detailed estimated cost sheets to support the reclamation cost estimate.

The permittee must update the unit cost data used in the 2011 midterm permit review reclamation cost estimate to 2015 unit costs using RS Means. All comutation sheets for demolition earthwork and reveg must be updated and submitted to the division so the division can determine the required bond amount needed through 2020.

The total reclamation cost for the Crandall mine must be escalated from 2015 to 2020 using an escalation factor of 1.2%. This escalated cost is rounded to the nearest $1,000 to determine the amount of required bond which must be posted with the Division by the Permitee.

In addition to the line item update the permittee must update relevant Burma Pond and water treatment cost quantities to show the updated operations detailed as the current MRP operations and bonded amounts do not mach the current site maintenance activities.

Bonding information was completed and is in Appendix 5-20

Appendix 1-11

Violation Information

Updated through December 31st 2015

Crandall Canyon Mine Permit Number 015/032 MSHA ID# 42-01715

Date Issued	Violation #	Issuing Agency	Reason	Status	Action Taken
8-19-04	4-49-4-1	DOGM	Parking in Forest	Term	Moved Vehicle
9-13-04	4-49-5-1	DOGM	Non Coal Waste	Term	Moved Waste
9-8-05	5-49-2-1	DOGM	Annual Subsidence	Term	
10-4-06	10001	DOGM	Plugged Culvert	Term	Un Plugged
9-6-07	10014	DOGM	No sed pond inspection	Term	Inspected
9-10-07	10015	DOGM	Plugged Culvert	Term	Unplugged
1-14-08	10017	DOGM	Gravity Flow From Portals	Term	Stopped Flow
1-14-08	10016	DOGM	Minewater Stored in Pond	Term	Re-Routed Water
2-6-08	10019	DOGM	Failure to Renew Permit	Term	Submitted Renewal
5-28-08	10021	DOGM	Plugged Culverts	Term	Unplugged
5-28-08	10022	DOGM	Failure to Maintain Silt Fence	Term	Cleaned Fences
8-10-09	10044	DOGM	No Macroinvertebrate Study		
8-10-08	10043	DOGM	High Iron Discharge into Crandall Creek		
10-29-09	10046	DOGM	Failure to Clean Sed Pond		
8-25-10	10065	DOGM	Failure to Maintain Sed	Term	Cleaned Pond
2-15-11	10073	DOGM	Failure to Comply to MRP	Term	
12-3-12	10099	DOGM	Failure to Collect Water	Term	Collected
12-3-12	10100	DOGM	Failure to Replace Equip	Term	Replaced
3-18-13	10105	DOGM	Failure to Maintain Adequate Sed Pond Storage	Vacated	

Mine Data Retrieval System
as developed by PEIR

Mine Citations, Orders, and Safeguards

Current Mine Information

Mine ID:	**4202356**
Operator:	**Genwal Resources Inc**
Opr. Begin Date:	**3/3/2003**
Mine Name:	**Princess Mine**
Current Controller:	**Robert E Murray**
Controller Start Date:	**8/9/2006**
Mine Status:	NonProducing
Status Date:	9/11/2013
Mined Material:	Coal (Bituminous)
Type of Mine:	Underground
Location:	Emery County, UT
State:	UT

Operator History for Mine ID: **4202356**

Operator Name	Begin Date	End Date
Genwal Resources Inc	3/3/2003	

How do I use this information? *Click Here*

PLEASE NOTE: The information provided by the Mine Data Retrieval System (MDRS) is based on data gathered from various MSHA systems. As there may be a lag time in data being entered into those systems, there will also be a lag in the reflection of that data on the MDRS.

Assessment data is not available prior to 1/1/1995.

Citations, Orders, and Safeguards

The current operator Genwal Resources Inc has been the operator since 3/3/2003

Indicates violations pending hearings, appeals, and/or other actions.
Indicates violations that have not yet been assessed.
These are non-assessable.

— Assessment Process Overview

Note: Vacated Citations are not included in any reports on the MDRS.

Violator	Contractor ID	Citation/Order No.	Case No.	Date Issued	Final Order Date	Section of Act	Date Terminated	Citation/ Order	S & S	Standard	Proposed Penalty ($)	Citation/Order Status	Current Penalty ($)	Amount Paid To Date ($)
Genwal Resources Inc		8483653	000378841	3/11/2015	10/13/2015	104(a)	3/11/2015	C	Y	77.1103 (a)	176.00	Closed	176.00	176.00
Genwal Resources Inc		8483654	000378841	3/11/2015	5/20/2015	104(a)	3/11/2015	C	N	47.41(a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8483652	000378841	3/11/2015	5/20/2015	104(a)	3/11/2015	C	N	77.205(b)	100.00	Closed	100.00	100.00

Genwal Resources Inc		8462715	000369590	10/16/2014	1/28/2015	104(a)	10/27/2014	C	N	77.1103 (d)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8462574	000350878	4/2/2014	1/5/2015	104(a)	4/8/2014	C	Y	77.207	392.00	Closed	392.00	392.00
Genwal Resources Inc		8462575	000350878	4/2/2014	6/18/2014	104(a)	4/2/2014	C	N	47.41(a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8462576	000350878	4/2/2014	1/5/2015	104(a)	4/2/2014	C	Y	77.205(a)	392.00	Closed	192.00	192.00
Genwal Resources Inc		8462884	000348068	3/10/2014	5/21/2014	104(a)	3/10/2014	C	N	47.51(b)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8462644	000338984	10/29/2013	1/22/2014	104(g)(1)	10/29/2013	O	N	48.31(a)	112.00	Closed	112.00	112.00
Genwal Resources Inc		8462642	000338984	10/29/2013	1/22/2014	104(a)	10/29/2013	C	N	48.31(b)	117.00	Closed	117.00	117.00
Genwal Resources Inc		8462556	000329832	6/26/2013	9/19/2013	104(a)	7/15/2013	C	N		100.00	Closed	100.00	100.00
Genwal Resources Inc		8461957	000321723	3/25/2013	6/20/2013	104(a)	3/25/2013	C	Y	77.1710 (h)	334.00	Closed	334.00	334.00
Genwal Resources Inc		8482347	000321723	3/21/2013	6/20/2013	104(a)	3/21/2013	C	Y	77.1006 (a)	334.00	Closed	334.00	334.00
Genwal Resources Inc		8482346	000321723	3/21/2013	6/20/2013	104(a)	3/21/2013	C	Y	77.1005 (a)	334.00	Closed	334.00	334.00
Genwal Resources Inc		8482344		3/18/2013		103(k)	7/30/2013	O	N/A		Non-Assessable			
Genwal Resources Inc		8461952	000319007	3/15/2013	5/23/2013	104(a)	3/15/2013	C	Y	77.205(a)	263.00	Closed	263.00	263.00
Genwal Resources Inc		8462374	000316158	2/6/2013	4/18/2013	104(a)	2/7/2013	C	Y	77.502	585.00	Closed	585.00	585.00
Genwal Resources Inc		8462371	000316158	2/6/2013	4/18/2013	104(a)	2/6/2013	C	Y	77.205(a)	585.00	Closed	585.00	585.00
Genwal Resources Inc		8462372	000316158	2/6/2013	4/18/2013	104(a)	2/7/2013	C	Y	77.1710 (h)	585.00	Closed	585.00	585.00
Genwal Resources Inc		8462373	000316158	2/6/2013	4/18/2013	104(a)	2/6/2013	C	N	77.1110	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461942	000314025	1/2/2013	3/21/2013	104(a)	1/23/2013	C	N	75.372(b)(8)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461837	000314025	12/19/2012	3/21/2013	104(a)	12/19/2012	C	N	75.360(g)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461838	000314025	12/19/2012	3/21/2013	104(a)	12/19/2012	C	N	75.364(h)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461836	000314025	12/18/2012	3/21/2013	104(a)	12/18/2012	C	N	48.31(a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		7290071	000306554	10/12/2012	12/20/2012	104(a)	11/8/2012	C	N	49.50(a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8465312	000297870	6/28/2012	9/20/2012	104(a)	7/26/2012	C	N	75.372(a)(1)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461914	000297870	6/22/2012	9/20/2012	104(a)	6/22/2012	C	N	77.1109 (e)(1)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461913	000297870	6/22/2012	9/20/2012	104(a)	6/27/2012	C	N	77.1605 (a)	117.00	Closed	117.00	117.00

Genwal Resources Inc		8461912	000297870	6/22/2012	9/20/2012	104(a)	6/22/2012	C	N	77.1110	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461658	000269460	9/1/2011	11/17/2011	104(a)	9/1/2011	C	N	77.1103 (a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461239	000246753	1/7/2011	3/24/2011	104(a)	1/7/2011	C	N	77.800-2	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461223	000238359	10/7/2010	12/22/2010	104(a)	10/7/2010	C	Y	77.400(a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461220	000238359	10/7/2010	12/22/2010	104(a)	10/12/2010	C	N	77.400(a)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461221	000238359	10/7/2010	12/22/2010	104(a)	10/12/2010	C	N	75.1711-3	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461222	000238359	10/7/2010	12/22/2010	104(a)	10/12/2010	C	N	77.1110	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461041	000228952	6/22/2010	9/23/2010	104(a)	6/23/2010	C	N	77.509(c)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461043	000228952	6/22/2010	9/23/2010	104(a)	6/23/2010	C	N	77.1103 (b)	100.00	Closed	100.00	100.00
Genwal Resources Inc		8461040	000228952	6/22/2010	9/23/2010	104(a)	6/23/2010	C	N	77.502	100.00	Closed	100.00	100.00
Scamp Excavation Inc	2GQ	8461042	000229722	6/22/2010	10/3/2010	104(a)	6/23/2010	C	N	77.1110	100.00	Closed	100.00	100.00
Scamp Excavation Inc	2GQ	4769959	000217445	3/8/2010	7/11/2011	104(a)	3/9/2010	C	Y	77.410(a) (1)	162.00	Closed	130.00	130.00
Valley Transport and Supply Company	Z427	8460961	000217446	3/8/2010	10/15/2011	104(a)	3/8/2010	C	Y	77.410(a) (1)	108.00	Closed	108.00	108.00
Valley Transport and Supply Company	Z427	4769960	000217446	3/8/2010	10/15/2011	104(g) (1)	3/8/2010	O	Y	48.31(a)	270.00	Closed	112.00	112.00
Valley Transport and Supply Company	Z427	8460963	000217446	3/8/2010	10/15/2011	104(a)	3/8/2010	C	Y	77.1607 (n)	108.00	Closed	108.00	108.00
Valley Transport and Supply Company	Z427	8460962	000217446	3/8/2010	10/15/2011	104(a)	3/8/2010	C	N	77.1110	100.00	Closed	100.00	100.00
Scamp Excavation Inc	2GQ	8467865	000209127	12/2/2009	2/25/2010	104(a)	12/2/2009	C	N	77.404(a)	100.00	Closed	100.00	100.00
Scamp Excavation Inc	2GQ	8467866	000209127	12/2/2009	2/25/2010	104(a)	12/2/2009	C	N	77.1104	100.00	Closed	100.00	100.00
Genwal Resources Inc		8467867	000211447	12/2/2009	3/25/2010	104(a)	12/2/2009	C	N	77.704-8 (a)(1)	100.00	Closed	100.00	100.00

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CHAPTER 1

LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION (R645-301-100)

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CHAPTER 1

LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

R945-301-112 IDENTIFICATION OF INTERESTS

112.100 **GENWAL Resources, Inc. is a corporation organized and existing under the laws of Utah and qualified to do business in Utah.**

112.200 **The applicant, GENWAL Resources, Inc. will also be the operator.**

GENWAL Resources, Inc.
P.O. Box 910
East Carbon, Utah 84520
(435) 888-4000
David Hibbs - President

112.220 **The resident agent of the applicant, GENWAL Resources, Inc., is:**

Karin Madsen
GENWAL Resources, Inc.
P.0. Box 910
East Carbon, Utah 84520
(435) 888-4000

112.230 **GENWAL Resources, Inc. will pay the abandoned mine land reclamation fee.**

112.300 thru 112.330 Ownership and Control - See Appendix 1-9.

GENWAL Resources, Inc. is the permittee and operator of the Crandall Canyon and the South Crandall Mines. GENWAL Resources, Inc. is a wholly owned subsidiary of ANDALEX Resources, Inc. GENWAL Resources, Inc. is a Utah corporation licensed to do business in the State of Utah. ANDALEX Resources, Inc, is a wholly owned subsidiary of UtahAmerican Energy Inc., which in turn is a wholly owned subsidiary of Murray Energy Corporation.

112.340 See Appendix 1-12

112.350 See Appendix 1-12

112.410 See Appendix 1-12

112.420 See Appendix 1-9

112.500 Surface Owners:

U.S. Forest Service
Manti-La Sal National Forest
599 West Price River Drive
Price, Utah 84501

School and Institutional Trust
Lands Administration
355 West North Temple, Suite 400
Salt Lake City, Utah 84180-1204

GENWAL Resources Inc.
P.O. Box 1077
Price, Utah 84501

Subsurface Owners:

Bureau of Land Management
Utah State Office
136 East South Temple
Salt Lake City, Utah 84111

School and Institutional Trust
Lands Administration
355 West North Temple, Suite 400
Salt Lake City, Utah 84180-1204

GENWAL Resources Inc.
P.O. Box 1077
Price, Utah 84501

112.600 Contiguous Surface Owners:

U.S. Forest Service
Manti-La Sal National Forest
599 West Price River Drive
Price, Utah 84501

School and Institutional Trust
Lands Administration
355 West North Temple, Suite 400
Salt Lake City, Utah 84180-1204

Dick Nielson
c/o Kris Ligon
4819 Mandell Street
Houston, Texas 77006

Contiguous Sub-Surface Owners:

Bureau of Land Management
Utah State Office
136 East South Temple
Salt Lake City, Utah 84111

School and Institutional Trust
Lands Administration
355 West North Temple, Suite 400
Salt Lake City, Utah 84180-1204
Dick Nielson
c/o Kris Ligon
4819 Mandell Street
Houston, Texas 77006

112.700 See Appendix 1-12

112.800 N/A

113 Violation Information:

113.100 The applicant or any subsidiary, affiliate or persons controlled by or under common control with the applicant has not had a federal or state permit to conduct coal mining and reclamation operations suspended or revoked in the five years preceding the date of submission of the application.

113.120 The applicant etc. has not forfeited any performance bond or similar security.

113.200 Not applicable

113.300 A listing of violations received by the applicant in connection with any coal mining and reclamation operation during the three year period preceding the application date is provided in Appendix 1-11. MSHA numbers for the operations can be found in Appendix 1-12. There have been no unabated violations or cessation orders issued to any affiliated companies during the previous three years.

113.400 N/A

114 RIGHT OF ENTRY INFORMATION

114.100 Applicant bases its legal right to enter and begin underground mining activities in the permit area upon the following:

- Federal Coal Lease U-54762, issued to GENWAL on December 1, 1986, is currently owned by Andalex and IPA. Andalex has undivided 100% interest as tenants in common of all leases previously under GENWAL's sole ownership (Andalex Resources, Inc has now assumed all leases or portions of the leases previously held by NEICO through the purchase and transfer of those rights to GENWAL Resources, Inc. effective 1/11/95).

- Federal coal lease UTU-78953 (also known as the South Crandall tract) was acquired in June 2003. (Refer to Appendix 1-13)

- A 40 acre parcel of the SITLA Millfork Lease was subleased from PacifiCorp in February, 2004. (Refer to Appendix 1-14). On July 11, 2011 the SITLA Milfork Lease (ML-48258) reverted to the United States Department of the Interior and became Federal Lease UTU-88554, still leased by Pacificorp. The same 40 acre parcel was subleased from Pacificorp. In September 2011, Andalex filed for an assignment of this parcel as a separate lease. Effective January 1, 2013 this 40 acre parcel was assigned Federal Lease number UTU-88990, with Andalex Resources holding 100% undivided interest.

- In December, 2004 the BLM issued a decision to approve Federal Lease UTU-68082, to include an additional 120 acres . (Refer to Appendix 15-A.) The approval became effective in the early part of 2005 (Refer to Appendix 1-15).

The present Owner (Andalex) base their legal right to enter and continue underground mining activities in the permit area upon the following documents and the NEICO/Andalex sales contract:

Federal Coal Lease Assignments

Federal Coal Lease U-54762 was issued to Genwal Coal Co. on December 1, 1986 and was assigned to the previous Joint Owners (NEICO and IPA) on July 11, 1991. NEICO's interest was assigned to ANDALEX on January 11, 1995. GENWAL Resources relinquished this coal lease as of April 1, 2011. See Plate 1-2.

Federal Coal Lease SL-62648, was assigned to the previous Joint Owners (NEICO and IPA) on July 11, 1991. NEICO's interest was assigned to ANDALEX on January 11, 1995. GENWAL Resources relinquished this coal lease as of April 1, 2011. See Plate 1-2. The Special Use Permit for the Sediment Pond is still in effect.

Federal Coal Lease UTU-68082, was assigned to the previous Joint Owners (NEICO and IPA) in March, 1994. NEICO's interest was assigned to ANDALEX on January 11, 1995. GENWAL Resources relinquished this coal lease as of April 1, 2011. See Plate 1-2.

State Coal Lease Assignments

Utah State Coal Lease ML-21568, was assigned to the previous Joint Owners (NEICO and IPA) on July 11, 1991. NEICO's interest was assigned to ANDALEX on January 11, 1995. GENWAL Resources relinquished this coal lease as of December 19, 2011. See Plate 1-2.

Utah State Coal Lease ML-21569, was assigned to the previous Joint Owners (NEICO and IPA) on July 11, 1991. NEICO's interest was assigned to ANDALEX on January 11, 1995. GENWAL Resources relinquished this coal lease as of December 19, 2011. See Plate 1-2.

Copies of the Assignments are included in Appendix 1-1.

Forest Service Special Use Permit Assignments

Special Use Permit, 1.5 acres, 150 x 400 ft adjacent to the eastern boundary of GENWAL's Federal Coal Lease SL-062648 for construction of the Sediment Pond. (See Appendix 1-3)

Special Use Permit, .10 acres located in Section 6, SW quarter NE quarter T16S R7E SLBM for the Trailhead parking and snow storage. (See Appendix 1-3).

Special Use Permit, 1.4 acres for stockpiles 1, 2, 3 and 4 dated 8/17/87 (See Appendix 1-3)

Road Use Permit Assignment for F.S. No. 50248 road issued May 21, 1981 by the United States Forest Service (Appendix 1-2).

It should be noted that throughout this Mining and Reclamation Plan the combined area of Federal Lease UTU-78953 and UTU-88990 are collectively referred to as the South Crandall lease area, the South Crandall tract, the South Crandall mining area, and similar such terms.

Emergency Drillholes and Access Roads

On August 6, 2007, the active mine workings in Main West barrier pillar section collapsed trapping six miners underground. In an emergency attempt to rescue these men a number of boreholes were drilled from the surface of East Mountain down to the underground workings (see Plate 1-1). Due to the emergency nature of this rescue operation all surface construction for the drillpads and access roads was done under the emergency provisions of the

various surface management regulations. The Forest Service, BLM, SITLA and the Division all granted verbal authority to proceed in a cooperative effort to not hinder the rescue attempts. Due to the emergency nature of the operation no formal rights-of-entry were granted for the areas of surface disturbance. On August 30, MSHA officially called off the rescue effort. Reclamation of drill pads and access roads began shortly thereafter. Refer to Appendix 5-22(A) for the addendum to the reclamation plan for the East Mountain drillpads and access roads. This plan includes a more complete description of activities and land management issues involving this rescue attempt.

SITLA Special Use Lease #1708, Burma Evaporation Basin

This Special Use Lease is located in lower Huntington Canyon, and is the site of the Burma evaporation pond. Refer to Plate 1-1A for location. Refer to Appendix 1-16 for right-of-entry information. Refer to Appendix 7-66 for details of the evaporation basin facility.

PERMIT LEGAL DESCRIPTION

The permit area is located and described as follows:

PARCEL	ACREAGE	LEGAL DESCRIPTION
FEDERAL LEASE U-78953	880.00	T 16 S, R 7 E Section 4: W½SW¼ S½SW¼NW¼ Section 5: SE¼ S½SE¼NE¼ Section 8: E½ NE¼NW¼ S½NW¼ Section 9: NW¼
FEE SURFACE AND COAL (Dellenback)	160.00	T 16 S, R 7 E Section 5: SW¼
FEDERAL LEASE UTU-88990	40.0	T 16 S, R 7 E Section 8: NW¼NW¼

FOREST SERVICE SPECIAL USE AREAS:

(all in T 16 S, R 7 E)

SEDIMENT POND (7/28/83) SW¼SW¼SE¼NW¼,	1.5	Section 5: located within
TOPSOIL PILE #1 (8/17/87) SE¼SE¼SE¼NW¼,	0.2	Section 5: located within
TOPSOIL PILE #2 (8/17/87) SW¼NW¼SE¼NE¼,	0.2	Section 5: located within
TOPSOIL PILE #3 (8/17/87) NW¼NW¼SE¼NW¼,	0.5	Section 4: located within
TOPSOIL PILE #4 (8/17/87) SW¼SW¼NE¼NW¼	0.5	Section 4: located within
SITLA SPECIAL USE LEASE* (Burma Evaporation Basin)	7.32	T 17 S, R 8 E Section 5: located within Lot 6
TOTAL PERMIT AREA	**1090.22**	

* For complete legal description of Burma Pond, refer to Appendix 1-16

The right to continue underground mining operations will apply to the property attached hereto as Appendix 1-1.

The surface facility area and permit area is not within 300 feet of any occupied dwelling and is not subject to the prohibitions or limitations of the State and/or Federal Regulations.

GENWAL DISTURBED ACREAGE

AREA	LOCATION	ACRES	PARCEL
Minesite	NW1/4 of Sec 5 (1)	7.778*	Federal Lease UTU-54762
Minesite	SW1/4 of Sec 5 (1)	6.086	Dellenbach Fee
Topsoil Pile #1	NW1/4 of Sec 5 (1)	0.2	FS Special Use Permit

Topsoil Pile #2	NE1/4 of Sec 5 (1)	0.2	FS Special Use Permit
Topsoil Pile #3	NW1/4 of Sec 4 (1)	0.5	FS Special Use Permit
Topsoil Pile #4	NE1/4 of Sec 4 (1)	0.5	FS Special Use Permit
Rescue Drillholes	SE1/4 of Sec 35 (2)	2.27	Federal Lease UTU-68082
Rescue Drillholes	NE1/4 of Sec 2 (3)	5.64	State Lease ML-21568
SITLA Rescue Road	E1/2 of Sec 2 (3)	3.98	State Lease ML-21568
Burma Evaporation Basin	Lot 6 of Sec 5 (4)	7.32	SITLA Special Use Lease 1708
TOTAL		**34.47**	

Notes: (1) T16S, R7E
(2) T15S, R6E
(3) T16S, R6E
(4) T17S, R8E

* Includes all areas within "permitted" disturbed area. Not all acreage is presently disturbed. See Figure 8C.

115 STATUS OF UNSUITABILITY CLAIMS

All available information concludes that the proposed permit area is not within an area designated as unsuitable for underground mining activities (refer to Appendix 1-7). The map required to be maintained by the regulatory authority under 764.25(b), does not indicate this permit area as unsuitable for underground mining. The regulatory authority has also stated that this area is not under study for designation in an administrative proceeding. The permit area is located in the Wasatch Plateau as described in the following, "Known Recoverable Coal Resource Area", as indicated in the San Rafael Planning Area Management

Framework Plan, published in July 1979, by the United States Department of Interior, Bureau of Land Management. Pages 43 and 44 of that publication, copies of which are included with this application and found at the end of this chapter as Appendix 1-6, indicate that none of the acreage in the KRCRA was determined to be unsuitable for underground mining. In addition, the Land Management Plan, Ferron-Price Planning Unit, Manti-La Sal National Forest, published in May 1979, by the United States Department of Agriculture, Forest Service, Intermountain Region. The Forest Service has stated that this permit area, which is included in the Section A3 minable coal area of this publication, will not be considered unsuitable for leasing or mining. Page 149 of the document is included with this application as Appendix 1-7.

The applicant was notified of a public hearing scheduled for June 2, 1981, at 3:00 p.m. in Huntington, Utah, at the Senior Citizens Center. An officer of GENWAL was present at the hearing. The public hearing dealt with the proposed mining activities of the Crandall Canyon Mine within 100 feet of a public road (Forest Service Development). The USFS has issued a Special Use Permit for the Crandall Canyon Mine and accepts that the operation will occur within 100 feet of the Forest Service Development road.

The surface facility area and permit area is not within 300 feet from any occupied dwelling and is not subject to the prohibitions or limitations of State and/or Federal Regulations.

The area to be included in the Incidental Boundary Change (IBC) is immediately adjacent to the current permit area. Since mining in the IBC will be primarily first mining (longwall setup entries and barrier pillars), no surface impacts are expected to occur. Protection of the resources in this IBC are provided under the Mining and Reclamation Permit as well as state and federal.

116 PERMIT TERMS

The applicant requests a permit term of five years from the date of approval, however mining activities will continue longer than five years if the coal becomes available and feasible to mine. The starting and termination dates in one year increments is shown on Plate 5-2. The horizontal extent of the underground mine workings is also shown. GENWAL will commit to comply with all applicable standards during times of temporary and permanent cessation of operations. Further discussion may be found in Chapter 5, Engineering.

117 INSURANCE, PROOF OF PUBLICATION

117.100 Insurance

A Certificate of Liability Insurance is included in Appendix 1-10.

117.200 Proof of Publication

A copy of the newspaper advertisement of the application for a renewal of Crandall Canyon Mine permit was included in the permit package, as required under R645-300-121.100. Also, a copy of the newpaper advertisement for the permit amendment to install a culvert in Crandall Canyon has been included. See Appendix 1-8 for both copies.

118 FILING FEE

This permit application to conduct coal mining and reclamation operations pursuant to the State Program was accompanied by a fee of $5.00.

120 APPLICATION FORMAT AND CONTENTS

This application is structured based on the R645 regulations of the Division of Oil, Gas, and Mining. The chapter divisions in the application are based on the different sections of the R645 regulations. Each section of the application is based on the corresponding sections of the GENERAL CONTENTS of the R645 regulations.

123 VERIFICATION OF APPLICATION

I hereby certify that I am a responsible official (Resident Agent) of the applicant (Andalex for GENWAL Resources, Inc.) 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, undertakings, and obligations, herein

_____ **Signed - Name - Position - Date**

Subscribed and sworn to before me this__ day of_____, 20___

_____

Notary Public

My commission Expires: _____, 20___)

Attest: STATE OF _____) ss:

COUNTY OF _____)

CHAPTER 1

LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

R945-301-112——— IDENTIFICATION OF INTERESTS

112.100——— GENWAL Resources, Inc. is a corporation organized and existing under the laws of Utah and qualified to do business in Utah.

112.200——— The applicant, GENWAL Resources, Inc. will also be the operator.

———G E N W A L Resources, Inc.
P.O. Box 910
East Carbon, Utah 84520
(435) 888-4000
David Hibbs - President

112.220——— The resident agent of the applicant, GENWAL Resources, Inc., is:

~~David Hibbs~~Karin Madsen
GENWAL Resources, Inc.
P.0. Box 910
East Carbon, Utah 84520
(435) 888-4000

112.230——— GENWAL Resources, Inc. will pay the abandoned mine land reclamation fee.

112.300 thru 112.330——_Ownership and Control - See Appendix 1-9.

GENWAL Resources, Inc. is the permittee and operator of the Crandall Canyon and the South Crandall Mines. GENWAL Resources, Inc. is a wholly owned subsidiary of ANDALEX Resources, Inc. GENWAL Resources, Inc. is a Utah corporation licensed to do business in the State of Utah. ANDALEX Resources, Inc, is a wholly owned subsidiary of UtahAmerican Energy Inc., which in turn is a wholly owned subsidiary of Murray Energy Corporation.

112.340 See Appendix 1-12

112.350 See Appendix 1-12

112.410 See Appendix 1-12

112.420 See Appendix 1-9

112.500 Surface Owners:

U.S. Forest Service
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599 West Price River Drive
Price, Utah 84501

School and Institutional Trust
Lands Administration
355 West North Temple, Suite 400
Salt Lake City, Utah 84180-1204

GENWAL Resources Inc.
P.O. Box 1077
Price, Utah 84501

Subsurface Owners:

Bureau of Land Management
Utah State Office
136 East South Temple
Salt Lake City, Utah 84111

School and Institutional Trust
Lands Administration
355 West North Temple, Suite 400
Salt Lake City, Utah 84180-1204

114 RIGHT OF ENTRY INFORMATION

114.100 Applicant bases its legal right to enter and begin underground mining activities in the permit area upon the following:

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- Federal coal lease UTU-78953 (also known as the South Crandall tract) was acquired in June 2003. (Refer to Appendix 1-13)

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The present ~~Joint~~ Owners (Andalex ~~and IPA~~) base their legal right to enter and continue underground mining activities in the permit area upon the following documents and the NEICO/Andalex sales contract:

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Utah State Coal Lease ML-21569, was assigned to the previous Joint Owners (NEICO and IPA) on July 11, 1991. NEICO's interest was assigned to ANDALEX on January 11, 1995. GENWAL Resources relinquished this coal lease as of December 19, 2011. See Plate 1-2.

Copies of the Assignments are included in Appendix 1-1.

Forest Service Special Use Permit Assignments

Special Use Permit, 1.5 acres, 150 x 400 ft adjacent to the eastern boundary of GENWAL's Federal Coal Lease SL-062648 for construction of the Sediment Pond. (See Appendix 1-3)

Special Use Permit, .10 acres located in Section 6, SW quarter NE quarter T16S R7E SLBM for the Trailhead parking and snow storage. (See Appendix 1-3).

Special Use Permit, 1.4 acres for stockpiles 1, 2, 3 and 4 dated 8/17/87 (See Appendix 1-3)

Road Use Permit Assignment for F.S. No. 50248 road issued May 21, 1981 by the United States Forest Service (Appendix 1-2).

It should be noted that throughout this Mining and Reclamation Plan the combined area of Federal Lease UTU-78953 and ~~the SITLA/PacifiCorp sublease~~UTU-88990 are collectively referred to as the South Crandall lease area, the South Crandall tract, the South Crandall mining area, and similar such terms.

Emergency Drillholes and Access Roads

On August 6, 2007, the active mine workings in Main West barrier pillar section collapsed trapping six miners underground. In an emergency attempt to rescue these men a number of boreholes were drilled from the surface of East Mountain down to the underground workings (see Plate 1-1). Due to the emergency nature of this rescue operation all surface

construction for the drillpads and access roads was done under the emergency provisions of the various surface management regulations. The Forest Service, BLM, SITLA and the Division all granted verbal authority to proceed in a cooperative effort to not hinder the rescue attempts. Due to the emergency nature of the operation no formal rights-of-entry were granted for the areas of surface disturbance. On August 30, MSHA officially called off the rescue effort. Reclamation of drill pads and access roads began shortly thereafter. Refer to Appendix 5-22(A) for the addendum to the reclamation plan for the East Mountain drillpads and access roads. This plan includes a more complete description of activities and land management issues involving this rescue attempt.

SITLA Special Use Lease #1708, Burma Evaporation Basin

This Special Use Lease is located in lower Huntington Canyon, and is the site of the Burma evaporation pond. Refer to Plate 1-1A for location. Refer to Appendix 1-16 for right-of-entry information. Refer to Appendix 7-66 for details of the evaporation basin facility.

PERMIT LEGAL DESCRIPTION

The permit area is located and described as follows:

PARCEL DESCRIPTION	PARCEL	ACREAGE	LEGAL DESCRIPTION
FEDERAL LEASE U-68082		2979.49	T 15 S, R 6 E
			Section 25: S ½
			Section 26: S ½
			Section 35: ALL
			T 15 S, R 7 E
			Section 30: Lots 7-12
			SE ¼
			Section 31: Lots 1-12
			NE ¼
			N½SE¼
			SW¼SE¼
			T 16 S, R 6 E
			Section 1: Lots 1-12
			SW¼
			T 16 S, R 7 E
			Section 6: Lots 2-4
			SW¼NE¼
MODIFICATION TO U-68082		120.00	T15S, R7E
			Section 32: W½NW¼
			NW¼SW¼

~~FEDERAL LEASE U-54762 256.49 T 15 S, R 7 E~~

~~Section 31: SE¼SE¼~~
~~Section 32: S½SW¼~~
~~SW¼SE¼~~

~~T 16 S, R 7 E~~

~~Section 5: Lots 2, 3, and 8~~

~~FEDERAL LEASE SL-062648 161.17 T 16 S, R 7 E~~

~~Section 5: Lots 5 and 6~~
~~Section 6: Lot 1~~
~~SE¼NE¼~~

~~FEDERAL LEASE U-78953 880.00 T 16 S, R 7 E~~

~~Section 4: W½SW¼~~
~~S½SW¼NW¼~~
~~Section 5: SE¼~~
~~S½SE¼NE¼~~
~~Section 8: E½~~
~~NE¼NW¼~~
~~S½NW¼~~
~~Section 9: NW¼~~

~~STATE LEASE ML-21568 997.69 T 16 S, R 6 E~~

~~Section 2: ALL~~

~~STATE LEASE ML-21569 640.00 T 15 S, R 6 E~~

~~Section 36: ALL~~U-78953
880.00
T 16 S, R 7 E

Section 4: W½SW¼
S½SW¼NW¼
Section 5: SE¼
S½SE¼NE¼
Section 8: E½

NE¼NW¼

S½NW¼

Section 9: NW¼

FEE SURFACE AND ~~COAL~~	COAL	160.~~00~~	~~T~~00	T 16 S, R 7 E

(~~Dellenbach~~)

Section ~~5:~~ ~~SW¼~~

~~BLM RIGHT OF WAY UTU-77975 50.00 T 16 S, R 6 E~~
~~(underground mining rights)~~

~~Section 3: E½E½SE¼NE¼~~
~~E½E½NE¼SE¼~~
~~E½SE¼SE¼~~
~~Section 10: NE¼NE¼NE¼~~

~~SITLA/PACIFICORP SUBLEASE 40.0 T 16 S, R 7 E~~

~~Section 8: NW¼NW¼~~

Dellenback)
Section 5: SW¼

FEDERAL LEASE UTU-88990 40.0 T 16 S, R 7 E

Section 8: NW¼NW¼

FOREST SERVICE SPECIAL USE AREAS:
(all in T 16 S, R 7 E)

~~SEDIMENT~~ SEDIMENT POND (7/28/83) ~~1~~ 1.5 ~~Section~~ 5 Section 5: located within SW¼SW¼SE¼NW¼,

~~TOPSOIL~~ TOPSOIL PILE #1 (8/17/87) ~~0~~ 0.2 ~~Section~~ 2 Se

				ction 5: located within SE¼SE¼SE¼NW¼,
~~TOPSOIL~~	TOPSOIL PILE #2 (8/17/87)	~~0~~	0.2	~~Section~~ 2 Section 5: located within SW¼NW¼SE¼NE¼,
~~TOPSOIL~~	TOPSOIL PILE #3 (8/17/87)	~~0~~	0.5	~~Section~~ 5 Section 4: located within NW¼NW¼SE¼NW¼,
~~TOPSOIL~~	TOPSOIL PILE #4 (8/17/87)	~~0~~	0.5	~~Section~~ 5 Section 4: located within SW¼SW¼N

				E¼N W¼
SITLA SPECIAL USE ~~LEASE*~~		~~7~~LEASE*	7.~~32~~	~~T~~32 T 17 S, R 8 E,
	(Burma Evaporation Basin)			~~Section~~ Sectio n 5: located within Lot 6
TOTAL PERMIT ~~AREA~~		~~6795~~AREA		1090.~~06~~22

* For complete legal description of Burma Pond, refer to Appendix 1-16

117 INSURANCE, PROOF OF PUBLICATION

117.100 Insurance

A Certificate of Liability Insurance ~~with Andalex and IPA~~ is included in Appendix 1-10.

117.200 Proof of Publication

A copy of the newspaper advertisement of the application for a renewal of Crandall Canyon Mine permit was included in the permit package, as required under R645-300-121.100. Also, a copy of the newpaper advertisement for the permit amendment to install a culvert in Crandall Canyon has been included. See Appendix 1-8 for both copies.

118 FILING FEE

This permit application to conduct coal mining and reclamation operations pursuant to the State Program was accompanied by a fee of $5.00.

120 APPLICATION FORMAT AND CONTENTS

This application is structured based on the R645 regulations of the Division of Oil, Gas, and Mining. The chapter divisions in the application are based on the different sections of the R645 regulations. Each section of the application is based on the corresponding sections of the GENERAL CONTENTS of the R645 regulations.

CHAPTER 5

ENGINEERING
(R645-301-500)

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CHAPTER 5

LIST OF APPENDICES

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5-24	R2P2 (Resource Recovery and Protection Plan) Approval Letter (South Crandall Federal Lease UTU-78953)
5-24A	R2P2 (Resource Recovery and Protection Plan) Approval Letter (120 Acre Modification, Federal Lease UTU-68082)
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5-28	Slope Stability Analysis Report, RB&G Engineering
5-29	Burma Evaporation Pond

CHAPTER 5

ENGINEERING

5.10 Introduction

This chapter will present the Operation Plan, Reclamation Plan, Design criteria, and Performance standards which will affect the mining operations of the Crandall Canyon Mine. The facilities and structures have been and/or will be designed in such a way to minimize the potential impacts of mining operations at the mine site.

5.11 General Requirements

The methods, calculations, maps, plans, and cross-sections pertinent to the operations of the Crandall Canyon Mine Facilities and subsequent reclamation operations are presented in the following sections. These designs are required to comply with the design within the R645-301-500 regulations.

5.12 Certification

All maps, cross-sections, designs, and plans, as required will be prepared by or under the direction of and certified by a professional engineer or land surveyor.

5.13 Compliance with MSHA Regulations and MSHA Approvals

As required by MSHA, the surface of the mine site is inspected on a quarterly basis, as mandated by law, and on spot inspections as deemed necessary by the governing agency. All mine openings are inspected on a quarterly basis and/or more often if deemed necessary by MSHA. GENWAL will comply with the requirements of both DOGM and MSHA regarding these facilities.

5.14 Inspections

All engineering inspections, except those described under R645-301-514.330, will be conducted by a registered professional engineer or other qualified professional specialist under the direction of the professional engineer.

The existing sedimentation pond will be inspected by a professional engineer or a qualified person under the supervision of a professional engineer on an annual basis. The inspection report, see Figure 5-1, will be certified by the professional engineer and be provided to the Division as part of the annual report.

Quarterly inspections will be performed by a qualified person for appearance of structural weakness and other hazardous conditions, as specified in R645-301-330.

CERTIFICATION REPORT

On _____,199_, an inspection of GENWAL Resources sedimentation pond number 1 revealed the following:

A. The pond has been constructed and maintained in accordance with the approved plan.

B. The pond's embankment appeared sound with no signs of instability or hazardous conditions.

C. The water evaluation was _____ feet. The water depth was _____ feet.

D. The existing storage capacity is _____ acre-feet which is greater than/less than 3.988 acre-feet required by the Mining and Reclamation plan.

E. The pond is inspected quarterly for signs of structural weakness or problems.

F. Comments and Remarks _____

_____

_____

_____

_____

_____

I have performed the above inspection on this pond to comply with R645-301-514 and do hereby certify the inspection to be a true and accurate representation of the pond at this time.

_____
Signature

_____
Date

Figure 5-1. Certification Report Form.

SEDIMENTATION POND INSPECTION REPORT *

DATE	TIME	DECANT LEVEL	DISCHARGE	CONTROL DEVICE	DIKE	INSPECTED BY

* Note any appearances of instability, structural weakness, and other hazardous conditions; and change in piezometer readings.

Figure 5-2. Sedimentation Pond Inspection Report Form.

The Sedimentation Pond Inspection Report Form is used to record information from each inspection and is located at the mine site.

5.15 Reporting and Emergency Procedures

5.15.10 Reporting a Slope Failure

At any time a slope failure occurs which may have a potential adverse effect on public, property, health, safety, or the environment, GENWAL will notify the Division promptly of the problem and of any remedial measures planned to correct the problem. If any examination or inspection of the sedimentation pond discloses that a potential hazard exists, the Division will be notified by the fastest available means of the hazards and of the remedial measures to correct such hazards. GENWAL will comply with any remedial measures requested by the Division and agreed upon by the operator.

5.15.20 Impoundment Hazards

If any examination or inspection discloses that a potential hazard exists, GENWAL will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action. If adequate procedures cannot be formulated or implemented, the Division will be notified immediately.

5.15.30 Temporary Cessation

In the event of a temporary cessation of mining operations, as defined by the Division, GENWAL will notify the Division as soon as possible. GENWAL will effectively support and maintain all surface access openings to the underground operations, and secure surface facilities in areas in which there would be no current operations but operations would resume under an approved permit.

Before temporary cessation of coal mining and reclamation operations for a period of 30 days or more, or as soon as it is known that a temporary cessation will extend beyond 30 days, GENWAL will submit to the Division a notice of intention to cease or abandon operations. This notice will be as required by R645-301-515.321.

5.20 Operation Plan

This section presents the operations plan for the Crandall Canyon Mine.

5.21 General

This section presents a description of the plan for operation of the permit area, including descriptions of previously mined and presently mined areas, surface and subsurface facilities, land owner and right-of-way maps, permit area maps, and other feature maps which apply.

5.21.11 Previously Mined and Presently Mined Areas

Plates 5-1 and 5-2 show the location and extent of past and present underground mining operations.

5.21.12 Existing Surface and Subsurface Facilities and Features

The location of surface and subsurface man-made features within, passing through, or passing over the proposed permit area are combined on Plates 5-3, 7-5 and 7-5A. Other detailed plans are as shown on Plate 5-4 (In Mine Sump), Plate 2-2 (Top Soil Storage Piles), Plate 5-6 (Truck Loadout Facility), Plate 5-7 (Rock Dust Silo), Plate 5-8 (Electrical Substation), and Plates 7-4A and 7-6A (Sedimentation Pond Details and Cross-Sections).

The design and details for the USFS road within the permit area are shown on Plate 5-19, sheet 5 of 9 (Concrete Turnaround), sheet 6 of 9 (Layout of the USFS road), sheet 7 of 9 (Gabion Wall), sheet 8 of 9 (Rock Wall Details), and sheet 9 (Upper Parking Area).

5.21.13 Landowners and Right-of-Entry and Public Interest Maps

The landowners of record both surface and subsurface, included in or contiguous to the permit area are shown on Plate 1-1. The permit area on which GENWAL has the legal right to enter is shown on Plate 5-2.

Appendix 1-1, 1-2, 1-3, 1-4, 1-5 and 1-13 shows the legal right of the applicant to enter and conduct coal mining and reclamation operations, and the measures to be used to ensure that the interests of the public and landowners affected are protected under R645-103-234.

GENWAL has included the entire T 16 S, R 7 E, SW1/4 of section 5 in the permit area. GENWAL owns in fee (surface and coal) the entire SW1/4 of section 5, which was previously known as the Dellenbach property. GENWAL acquired the property from ARCO. Previously, only a small portion of the SW1/4 of section 5 had been included in the permit area. Expansion of the surface facility area requires the inclusion of this fee section within the permit area boundary.

GENWAL is requesting an Incidental Boundary Change in order to mine a long, narrow block of coal adjacent to projected longwall panels in Section 2, T. 16 S., R. 6 E. This block contains about 40,000 tons of federal coal that would not otherwise be mined. An Incidental Boundary Change would allow for maximum recovery of the coal reserves by allowing the longwall setup entires and panels to be moved westward but, in no case, would the longwall panels extend into the 22 degree angle projected downward from the surface expression of the Joe's Valley Fault. The amending the permit boundary would include approximately 50 acres in T 16 S, R 6 E as the Incidental Boundary Change area. Refer to Plates 1-1 and 5-2 for GENWAL's existing lease area and the Incidental Boundary Change Area. This addition would allow GENWAL to mine additional coal reserves located on the eastern edge of sections 3 and 10 from their proposed underground workings in section 2 thus optimizing the coal reserves in this area. This coal would not be mineable from the west due to the Joes's Valley fault, nor from the north or south because of limited access.

GENWAL will obtain a coal right-of-way (application has been submitted) from the BLM in order to extend the longwall panels up to the western boundary of section 2. By extending the longwall panels to the western edge of section 2, a total of approximately 300,000 additional tons could be mined in this area of the mine. The Incidental Boundary Change area would consist of first mining only. The right-of-way would accommodate the setup rooms and barrier pillars for the longwall panels allowing the panels to be extended to the western boundary of section 2. The legal description for the area included in the Incidental Boundary Change is as follows:

T. 16 S., R. 6 E.	Section 3	E1/2 E1/2 SE1/4 NE1/4	10 acres
		E1/2 E1/2 NE1/4 SE1/4	10 acres
		E1/2 SE1/4 SE1/4	20 acres
	Section 10	NE1/4 NE1/4 NE1/4	10 acres
		TOTAL	50 acres

Refer to Plate 5-2 for mine projections in the IBC area.

GENWAL acquired federal lease UTU-78953 (South Crandall tract) on June 2003 (refer to Appendix 5-24 for right of entry information.) Lease UTU-78953 is described as follows:

T. 16 S., R. 7 E.	Section 4	W1/2 SW1/4,	80.00 acres
		S1/2 SW1/4 NW1/4	20.00 acres
	Section 5	SE1/4	160.00 acres
		S1/2 SE1/4 NE1/4	20.00 acres
	Section 8	E1/2	320.00 acres
		NE1/4 NW1/4	40.00 acres
		S1/2 NW1/4	80.00 acres
	Section 9	NW1/4	160.00 acres
		TOTAL	880.00 acres

GENWAL Resources acquired the SITLA/PacifiCorp sublease in February 2004 (Refer to Appendix 1-14 for right-of-entry information.) This sublease is described as follows:

T. 16 S., R. 7 E.	Section 8	NW¼NW¼	40.00 acres

GENWAL Resources acquired the Nielson Fee Lease in April 2004 (Refer to Appendix 1-15 for right-of-entry information.) This sublease is described as follows:

T. 16 S., R. 7 E.	Section 8	SW¼	160.00 acres

It should be noted that throughout this Mining and Reclamation Plan the combined area (1080 acres) of Federal Lease UTU-78953, the SITLA/PacifiCorp sublease and the Nielson Fee Lease is collectively referred to as the South Crandall lease area, the South Crandall tract, the South Crandall mining area and other similar terms.

GENWAL Resources acquired the modification of Federal Lease U-68082 in February, 2005. (Refer to Appendix 1-15 for right of entry information.) This modification is described as follows:

T.15S., R. 7 E.	Section 32	W½NW¼	80.00 acres
		NW¼SW¼	40.00 acres
		Total	120.00 acres

The Forest Service and GENWAL have agreed to than arrangement whereby a certain portion of the trailhead parking lot can be utilized for GENWALl employee parking under the terms of the existing special use permit. To facilitate the flow of public traffic in and out of the trailhead, GENWAL will construct a barricaded exit from the trailhead out through the existing material storage area. This exit will be kept clear of materials, supplies, vehicles and all other potential obstructions so that the public will have unimpeded egress from the trailhead parking area at all times. Employee parking will be restricted to those designated areas as shown on the drawing in Appendix 5-26, so that a 30' wide area along the perimeter of the parking lot is maintained for public parking and run-around. Within this perimeter parking area no employee parking will be allowed. Signs will be installed to delineate the appropriate designated parking areas. Under the terms of the existing Forest Service special use permit GENWAL will continue to utilize the perimeter area of parking lot for snow storage during the winter months when the public no longer uses the trailhead.

To provide for better utilization of this area the trailhead will be expanded slightly, by less than 0.01 acres, by removing an irregular part of the bank at the upper end of the lot. (Refer to Appendix 5-26). Within this area of excavation topsoil will be salvaged and stockpiled in accordance with the approved reclamation plan. A minimum of 24" of topsoil/subsoil will be salvaged and stored at topsoil pile #4 located at the mouth of Crandall Canyon. A minimum of 32 cubic yards of topsoil material will be salvaged from this bank. Any additional material below the top 24" which, based on visual observation, appears to be suitable growth medium will also be salvaged. Once this additional topsoil material has been placed on the existing storage pile it will be re-vegetated as

required by the Forest Service special use permit. The newly created slope-bank at the trailhead will be re-seeded with a final-reclamation seed mix, exclusive of any clover and/or alfalfa.

5.21.14 Mine Maps and Permit Area Maps

Plate 1-1 shows leases of the existing permit area (including the South Crandall lease area and the U-68082 lease mod area) and defines the Incidental Boundary Change area. Plate 5-2 shows the boundaries of all areas affected by mining operations, including the proposed underground workings within the IBC area. Plate 5-3 shows the disturbed surface area within the permit area including the culvert expansion. The location and extent of potential subsidence is shown on Plate 6-2.

5.21.15 Land Surface Configuration Maps

Topographic maps used by GENWAL to depict surface contours within the permit area are represented on Plate 5-3.

5.21.16 Maps and Cross-Sections of the Features and Proposed Features

Maps produced by GENWAL show the facilities, disturbed area, disturbed area boundary, (Plate 5-3), explosive storage (there is no explosive storage on the surface), and point source discharges (Plate 7-5). These maps are located within this application.

5.21.17 Transportation Facilities Maps

This application describes each road and conveyor system to be constructed and used by the applicant as required by R645-301-527. Maps supporting this section include Plates 5-3, 5-6, 5-10, 5-19, 7-5, 7-5A, and 7-5C.

5.21.18 Support Facilities

Drawings showing support facilities are located on Plates 5-3, 5-6, 5-7, 5-8, 5-18, 7-5, 7-5A, and 7-5C.

5.21.20 Signs and Markers

Signs and Markers are posted, maintained, and removed by the operator; will be of uniform design that can be easily seen and read, be made of durable material, and conform to local laws and regulations, and be maintained during all activities to which they pertain. Identification signs will be placed, maintained, and marked in accordance with R645-301-243.

5.21.24 Mine and Permit Identification Signs

Mine and permit identification signs will be displayed in accordance with R645-301-521.240 through R645-301-521.244.

5.21.25 Perimeter Markers

The perimeter of all areas affected by surface operations or facilities are or will be clearly marked.

5.21.26 Buffer Zone Markers

Signs which have been or will be erected for buffer Zones as required by R645-301-731.600 will be clearly marked.

5.21.27 Topsoil Markers

Markers have been and will be erected to mark where topsoil or other vegetation-supporting material is stockpiled as required under R645-301-234.

5.22 Coal Recovery

The Bureau of Land Management (BLM) and the Utah State Division of Natural Resources govern the conservation and royalty payments of the coal located within GENWAL's proposed permit boundary. Mining plans must be approved by the BLM before mining can occur within the new area. A Resource Recovery Protection Plan (R2P2) is currently on file with the BLM and all federal coal will be mined in accordance with the R2P2 to ensure the diligent development and extraction of all minable coal. (See Appendix 5-24 and Appendix 5-24A)

The lower Blackhawk Formation of the Wasatch Plateau is known to contain two minable seams in this general area. These two seams are locally referred to as the Hiawatha and Blind Canyon (lower and upper coal respectively) seams. Drilling which began in March of 1985, and has since concluded, revealed that the upper seam is not of minable thickness in previous Lease Area. In the South Crandall lease area both seams are minable. In the U-68082 lease mod area only the Hiawatha seam is minable.

In the State lease (M-21568) GENWAL has committed to drilling 150 foot "up-holes" every half-mile in the mains prior to second mining. Installation of the 150 foot up-holes will allow for location and evaluation of the overlying seams for coal production. Mine development plans for the upper seam will be developed and submitted for approval if the horizontal extent and mining conditions make mining the upper seam economically feasible. The BLM has determined the upper seam is not minable and during 1985, approval was given by both the BLM and the Division to commence pillaring of the lower seam.

GENWAL will mine from rock to rock in areas where coal is less than 8' thick and geologic conditions allow. However, in areas where the top is poorly consolidated (i.e. shale partings are present with laminae of carboniferous materials with slickensides) and the roof is not self-supporting, coal top may be left. In addition, on development only, in areas where the coal is more

than 8' thick, coal top or bottom may be left. Within the physical limitations of the mining equipment retreat coal will be mined rock-to-rock in order to maximize resource recovery.

GENWAL has found that in areas of the mine, cutting coal higher than 8' on development results in excess rib sloughage, exposing miners to unnecessary dangers. GENWAL has found that width to height (w/h) ratios lower than 5.6 results in large slabs (2' - 3' thick and 8' high) separating from pillars and sliding or rotating into the entry. These slabs cause an immediate safety hazard to personnel working or traveling in the area and may be classified as accumulations by MSHA. Cleaning up the slabs results in more slabs sloughing which reduces the size of the pillar and results in entries that are wider than legally allowed. For these reasons, GENWAL may not cut higher than 8' on development. Although maximum recovery is an important design criteria, other considerations must be looked at in the final analysis in the extraction of coal. These factors consider the insurance of protection of personnel and the environment. Coal reserves will not be recovered in the following areas:

1. Areas where the coal thickness is less than 5'. Mining below this height is not feasible under current economic conditions.

2. Solid coal barriers will be left to protect main entries from mined out panels and to guarantee stability of the main entries for the life of the mine.

3. Solid coal barriers will be left between particular panels for roof and floor protection.

4. When extreme hazardous conditions exist, and personnel safety is compromised, coal extraction could then be terminated in that area of concern.

5. Coal will only partially be recovered in areas under existing perennial streams within the specified angle of draw with the consent of the Forest Service and approval by the Division. Expected recovery at GENWAL is predicted to be 80% in panels and 60% overall.

6. In areas of development in coal height of 8' or greater, top and/or bottom coal may be left.

7. In panels where the coal height exceeds the effective mining height of the mining equipment, including longwall equipment, either top or bottom coal will be left.

Mining in the South Crandall lease area will be done in accordance with the approved Resource Recover and Protection Plan (R2P2) (See Appendix 5-24). This plan was recommended for approval by the BLM on Nov. 12, 2004. This plan states that full extraction mining (i.e. longwall mining) is not authorized in panels BC-4 and HIA-5 in areas with less than 600' overburden unless it can be determined that these areas can be mined without adverse impacts to the Little Bear Canyon

municipal watershed. Final approval of full extraction mining in these panes will be addressed as a modification to the approved R2P2. Multiple seam mining beyond spring site LB-7 in Little Bear Canyon is contingent upon a monitoring plan approved by the Division in concurrence with the Forest Service at least two years prior to mining in that area.

Maps 5-2 (BC) and 5-2 (H) and Appendix 7-63 show the areas with less than 600' cover affected by this R2P2 condition. These maps show which areas are planned for longwall mining and which areas are planned to be mined with continuous miner units.

According to stipulation #17 of Federal Lease UTU-78953 (see App. 1-13) the Castle Valley Special Service District water treatment plant (constructed as water replacement for Little Bear Spring) must be operational prior to mining in the following areas:

- Mill Fork Graben - Area within 1,000 feet of the southeast corner of the lease in Section 8 (corner of Sections 8, 9, 17, and 16 in T, 16 S., R. 7 E., SLM).

- North of Little Bear Spring (possible water-bearing fracture system) - Area within 1,000 feet of the southern boundary of the lease in Section 9, T. 16 S., R. 7 E., SLM).

It should be noted that under the currently approved R2P2 there is no mining being proposed in either of these areas. The water treatment plant is scheduled for completion in January 2005.

5.23 Mining Methods

GENWAL will use both Room and Pillar and longwall mining methods for coal production. Projected mine development is depicted on Plate 5-2. In general, room and pillar development mining will be accomplished using continuous mining methods. Retreat mining will use longwall mining and room and pillar methods. The mine plan has been developed to maximize coal recovery in an economical manner.

Second (recovery) mining by continuous miner will occur in those areas which are not longwall mined (Plate 5-2) and will be done in accordance with the approved MSHA roof control plan. Specifically, in areas where long-wall panels cannot be installed due to the presence of stream buffer protection zones or in perimeter areas with irregular boundaries, room and pillar methods will be utilized to maximize coal recovery and still maintain regard for environmental and safety concerns listed in Section 5.22 above. All pillars in the mine, with the exception of barrier pillars or other pillars needed to protect the outcrop, will be fully extracted. However, safety or economic reasons may dictate some pillars or partial pillars remain in place. Pillars used to protect mains, submains, and fire breaks will be left until final retreat or when they serve no useful purpose.

Mining in the Incidental Boundary Change area will consist primarily of longwall gateroads, setup rooms and barrier pillars. (No room and pillar mining will be conducted in the Incidental Boundary Change Area or adjacent areas.) First mining will be done with continuous miners. The longwall entries will be extended to the west but in no case will they extend past the 22 degree angle of draw projected from the surface expression of the Joes's Valley Fault. No pillars will be removed during mining in the Incidental Boundary Change area and consequently, no subsidence will occur. No surface disturbance or breakouts will occur within the Incidental Boundary Change area. Refer to Plate 5-2.

When mining in the longwall gate entry nears the fault (between 200-300 feet away) an underground drill will be used to drill west toward the fault to determine its location. The drill will drill horizontally toward the fault up to 50 feet ahead of the entry face. If the fault is not encountered, the continuous miner will advance about 30-40 feet toward the fault, leaving at least 10 feet of coal between the entry and the end of the hole. The drill will again drill ahead. This sequence will continue until either water or fault gouge is encountered in the hole or the entry has been developed to its maximum extent (providing no fault was detected). If the fault is encountered prior to reaching the bleeder entries, then mining will stop and the bleeder entries will be relocated. At least 10 feet of solid coal will be left between the face of the entry and the fault. GENWAL will notify the Forest Service and DOGM if substantial water is produced from the drill holes or the fault. Any appreciable outflow from the fault will be monitored.

At least one horizontal hole will be drilled in the headgate and tailgate of each panel. Should water be encountered by the drill hole, the hole would be evaluated. If flow is low to moderate and the flow rate diminishs, drilling would be re-initiated. However, if the flow is high (greater than

50 gallons per minute) and the end of the hole close to the fault, the hole would immediately be plugged and entry development would stop at least 10 feet from the end of the hole.

Although large amounts of water and high pressure have not been previously encountered by mining near the fault, an emergency plan to handle water inundation from the fault has been developed. The plan consists of the following actions:

1. Pull equipment back from face
2. Erect two Kennedy stoppings at least 2 feet apart
3. Place appropriate sized de-water pipe w/valve at bottom of stoppings
4. Pump quick drying cement into the space between the stopping
5. After minimum drying time, close water valve

5.23.10 Mining Operation

The mine was developed in an area of old works in the Hiawatha seam. Coal was produced from this operation during the period of 1940 through 1955 and was sold locally for domestic use. Certain sections of the old-mine were reopened so that water sumps, ventilation, and coal haulage facilities were re-established. Plate 5-2 illustrates the manner in which the old workings were modified and repaired in order to bring them into compliance with current regulations and the overall mining plans of GENWAL.

Where necessary, the old workings were widened to accommodate a 48-inch coal haulage conveyor. Proper roof supports were placed in areas where questionable roof control conditions were encountered.

The mining operations has accessed the Hiawatha seam by drifting into the seam from the coal outcrop. The portal area for the Hiawatha seam has three entries: one intake ventilation entry, which will also serve as a haulage route, one neutral coal haulage conveyor entry, and one return airway. The portal access area for the mine has the necessary surface support items such as a ventilation fan, conveyor belt drive, power, etc.

5.23.20 Mining History

The Hiawatha seam, is the only seam to be mined on the leases, has an average thickness of 7.5 feet. The coal heights encountered range from 5.5 to 11 feet except in the sandstone roll area

which is approximately 4.5' high as shown on Plate 6-2. The coal within the permit area is high volatile bituminous. The seam will be accessed at an elevation of 7895 feet. The old works in the Hiawatha seam are accessible and it appears that the immediate roof is a competent sandstone, with bedding ranging from laminated to massive, interrupted by an occasional shale-siltstone lenses varying in thickness from approximately six-inches to two-feet. Roof falls in the old works are confined to the siltstone lenses, and where observed, are usually at intersections of rooms and entries. Falls are generally over the width of the opening extending rib to rib and less than 2-feet thick. The historic mine development plans for the Hiawatha seam are illustrated on Plate 5-2.

Mining was completed in lease ML-21569 as shown Plate 5-2. 1st North, a four entry system with 100' X 60' pillars, has been developed off Main West and runs up the eastern side to the northern boundary of the lease, while 1st Right, a five entry system with 100' X 50' pillars, has been developed up the western side to the northern boundary of the lease. 1st North was used as mains for development of pillar sections 1st Left through 9th Left while 1st Right was used as the bleeder for these pillar sections. 1st Left through 9th Left sections have been developed and pillared. 1st North, 1st Right, and Main West will not be retreat mined. These three sections will be left intact to be used as mains in future mining. Typical entry width is 20' wide.

Lease UTU-68082 has been accessed to the east by the use of the 1st North Submains. First (1st) Right through 4th Right have been developed and 2nd mined while 5th, 6th, and 7th Right (longwall gates) still need to be developed to accommodate 6th and 7th Right longwall panels.

GENWAL attempted to access Sections 25 and 30 of Lease UTU-68082 from 1st North section and 1st Right pillar section. This attempt failed due to low coal height. Isopachs show better coal height on the north and west side of Lease UTU-68082. This area will be accessed through Main West by the development of gates for longwall mining.

Lease UTU-68082, sections 26 and 35, will be accessed by the use of the Main West section. Main West will be developed to the west through Section 35. Longwall panels will be developed north off Main West as shown on Plate 5-2.

Lease ML-21568 has been accessed from Main West by a five entry system (South Mains) which extends southward from the Main West Section along the eastern edge of the lease as shown on Plate 5-2. A five entry bleeder system, 2nd South Bleeder, will be developed in conjunction with the longwall panels (Plate 5-2). Longwall mining will commence with 1st Right South longwall panel and end with the 5th Right South longwall panel and will be accessed from South Mains.

Lease UTU-68082 in Section 1 and 6 will be accessed by the use of the South Mains developed in State Lease ML-21568. Sections 1st Left South through 11th Left South will be developed in that order with the bleeder be developed in conjunction with each section. One longwall panel will be pulled on the east side of South Mains between 1st and 2nd Left South sections (Plate 5-2). 3rd through 11th Left South sections will be room and pillar sections.

GENWAL has made application to the BLM for a right-of-way in order to access federal coal reserves in sections 3 and 10, T. 16 S., R. 6 E. This Incidental Boundary Change application is for a 50 acre modification to the existing permit boundary.

5.23.30 Underground Equipment

Typical mining equipment used in this area will be employed to mine coal in this permit area. Two continuous miners will be employed to mine coal in this lease area. The following is a list of equipment, or equivalent, that may be utilized underground and on the surface as required:

Joy Miners (2) 12 cm 12 (5.5 - 11.5' cutting height)

Roof Bolters (2)

HDDR 13 Fletcher (Min. 6' operating height) (2)

TD143 Lee Norse

Feeder Breakers (2) Stamler 54" (1) Long Airdox 118"

Battery powered scoops and face haulage

Various Electrical Equipment

Long Airdox continuous haulage system

Stamler continuous haulage system

The Longwall System will include:

4LS-2 Joy Longwall Shearer

Kloeckner-Becorit Shields (effective 5-7' height) H & B pan line

H & B head and tail drives

American Longwall Stage loader

Appurtenant pumps

Diesel shield haulers

Other appurtenant equipment as needed.

5.23.40 Geotechnical

Within the projected mining area, conclusions from existing drill hole data (see Appendix 6-5) and from BLM databases excludes the possibility of multiple minable seams being present. The coal seam to be mined on the GENWAL leases occur in the lower part of the Blackhawk Formation. The Formation is comprised of approximately 1000 feet of gray carbonaceous shales, siltstones, coals, and interbedded sandstones of late Cretaceous age. The Star Point Sandstone, a massive cliff forming 700 to 900 foot thick sandstone unit, underlies the Blackhawk Formation and its top serves as a useful lithologic landmark in the area.

An isopach map of the Hiawatha coal seam overburden appears in Plate 6-6. Overburden thickness above the area to be mined in the permit area ranges from 750' to 2400'. Coal pillar height ranges from 5' to 10' in the permit area. A uniaxial compressive strength of 2400 psi (geomechanical tests, Appendix 5-1) was used in the pillar safety factor calculations.

The formations in the physiographic area dip gently 1 to 3 degrees westward off the west flank of the San Rafael Swell. However, locally the mine is relatively flat experiencing a 0 to 2 degree dip to the southeast. The regional structure is broken by several north-south trending, high angle normal faults which offset the lithologic units from less than 1 foot to 250 feet or more. No faults are projected to be encountered within the proposed mine development area.

5.23.50 Initial Pillar Design

Methods used to evaluate safety factors of the pillar design are discussed in Appendix 5-2. Current data indicate that minimum acceptable safety factors range from 1.5 to 2.5. Calculations of previous pillar safety factors are found in Appendix 5-3. Lease ML-21568 pillar safety factors for rooms and main entries ranged from 1.37 to 1.96 and 1.39 to 2.45 respectively. Pillar safety factors for rooms and main entryways in Lease ML-21569 range from 1.47 to 2.45 and 1.78 to 4.37, respectively.

As the ratio of pillar length to height approaches 12, pillars are regarded as being able to bear and load. The pillar recovery plan currently approved by MSHA, DOGM, and the USFS was designed by GENWAL employees with the aid of MSHA Technical Support in Denver and information in a technical report "Coal Pillar Sizing, GENWAL Mine" prepared by Mr. Dan W. Guy of Blackhawk Engineering Co. on 10-1-84. The purpose of the Blackhawk Engineering Report was to evaluate the use of 60' x 60' centers on the entries and rooms during panel development.

5.23.50 Revised Pillar Design

Because pillar sloughage did not develop as had been previously calculated, a new pillar design study was undertaken to determine more precisely the existing site conditions. Using values obtained from the above studies, coupled with the new Seratta studies, and 10 years of mining experience at the Crandall Canyon Mine, a new pillar design was determined. The new data conclude that safety factors alone are not adequate for sizing pillars and that site specific overburden conditions must be considered. The table located on page 29 in Appendix 5-2 present the new factors of safety developed for pillar size and overburden thickness.

Roof span design is derived from the accepted practice in the Wasatch Plateau of 20 foot entry and crosscut widths. Previous experience in the Crandall Canyon and nearby mines have supported this roof span width. Roof span in Leases ML-21568 and ML-21569 is 20 feet in entries and crosscuts. Roof support bolting will consist of a minimum 4 foot resin pins with 5 foot centers during development of each section with the exception of the right-of-way UTU-66838. This lease has roof support consisting of a minimum of 4 foot resin pins with 4 foot centers. The floor of the coal seam grades from a clayey shale less than one foot thick to massive sandstone.

5.23.60 Barrier Perimeters

The barrier pillar around the perimeter of the property has been designed according to Utah mining regulations which is based upon the following formula:

Width = 2 * coal thickness of coal to be extracted in feet + 5 * overburden thickness in feet / 100 + 10'

The perimeter pillar is shown on Plate 5-2. The following selected points were used to establish the pillar size at various locations:

Location	Overburden	Barrier	Coal Height
1. Southwest Corner Tract 1	550 feet	50 feet	6 feet
2. Northwest Corner Tract 2	1550 feet	100 feet	6 feet
3. Western Boundary (Max.)	1700 feet	108 feet	6 feet
4. Northwest Corner U-054762	1500 feet	97 feet	6 feet

5.23.70 Annual Production of Coal

Annual coal production in 1991, 1992, 1993 and 1994 was 877,500, 1,178,089, 1,474,824 and 1,660,900 raw tons, respectively. During 1993-1995 total production tonnage was approximately 1,750,000 raw tons annually. This production was achieved by the use of continuous mining machines, continuous haulage equipment, and/or diesel driven coal haulers. From 1995 to the end of the century total production coal tonnage is forecasted to be 2,500,000 tons, with the aid of longwall mining.

5.23.80 Access To Future Reserves

Access to future reserves will be maintained by the North Mains entries, Main West entries, 1st North, and 1st Right sections. North Mains will maintain access to the mine as well as Main West. Main West will also maintain access to the west and to the South. 1st North will maintain access to the north and east, while 1st Right will maintain access to the north and west. (See Plate 5-2 and page 5-15A). Access to federal coal south and east of the Dellanback fee parcel (i.e., the South Crandall LBA) will be maintained.

5.23.90 Projected Mining by Future Permit for the Planned Life of the Mine

All coal around the permit area has the potential for future mining by the Crandall Canyon Mine. The projected mining for the Incidental Boundary Change area, the Dellanback fee parcel, and the South Crandall lease area is shown on Plate 5-2.

5.23.100 Operating Schedule and Employment

The mine employees approximately 125 people at present. The mine will operate four eight hour production shifts per day, five days a week. Two maintenance crews will operate 8 hours a day, five days a week, to accommodate rockdusting and general cleanup of the mine. When market or mining conditions dictate, production can be expanded to seven days per week, 52 weeks per year.

5.23.110 Safety Training

The mine is equipped with modern emergency facilities and has an organized safety program. All mine employees are required to meet MSHA first aid and safety training requirements. Visitors are required basic training before entering the mine.

5.23.120 Fire Protection

Fire protection will be maintained in accordance with all Federal and State regulations pertaining to coal mining operations. Additionally the fire prevention plan can be found in Appendix 5-18.

5.23.130 Water Systems, Dust Suppression, Dewatering, and Electrical

The sump areas, as shown on Plate 5-4, will have a capacity of approximately 3.0 acre feet of water. The impoundment walls are constructed of concrete block with mortared joints and sealed on both sides. All the contact areas around the walls are sealed with concrete to prevent seepage. These sumps are constructed to allow the sediment to settle out and have an oil skimmer installed, as shown on Plate 5-4, to allow the water to be pumped directly to Crandall Creek under a UPDES permit. All water pumped to Crandall Creek will meet all effluent limitations and will be sampled in accordance with the UPDES permit requirements. Refer to Plate 5-3 for the location of the UPDES discharge point.

5.24 Blasting

There are no structures or dwellings within one mile of the mine permit area; there are no residents within one half mile of the blasting site.

All surface blasting will be done under the direction of a person trained, examined and certified as provided for under the R645 coal rules, Section 105, which is regulated by the Utah Division of Oil, Gas and Mining.

The use of explosives will be done in accordance with R645-31-524 and all applicable Federal laws for storage and use.

All records as required in R645-301-524.700 will be kept at the mine site or at the office for a period of at least three years.

GENWAL will post blasting signs, in accordance with R645-301-524.510, 511 and 512, that is along the edge of any blasting area that is within 100 feet of any public road and at the point where any other road provides access to the blasting area, as well as at all entrances to the permit area from public roads.

GENWAL will control access to the area immediately prior to and after the blast until the certified blaster determines all is clear according to R645 524.531 and 532.

Signals, audible within a half mile, will be given prior to and after the blast as outlined in R645-301-465 and according to the posted sign containing a description of the signals.

All surface blasting will be done between sunrise and sunset, unless other criteria is met in R645-301-524.420. Blasting will be done so as no fly rock will leave the permit area, where practical. Netting or other protective means will be used to achieve this where there exists a possibility of this occurrence. Flyrock traveling in the air or along the ground will not be cast from the blasting site more than ½ the distance to the nearest occupied structure; beyond the area of control required under R645-301-524.530.

For blasts that require more than 5 pounds of explosives, GENWAL will publish a schedule of the blasts and submit a blasting plan to the Division for approval. The blasting plans will be included in Appendix 5-23A.

5.25 Subsidence

The term "subsidence" applies to the deformation or movement in the overburden. The thickness of the overburden ranges from zero at the outcrop to approximately 2400 feet, as shown on Plate 6-2. In general, the strength of the overburden is typical of the late Cretaceous sediments being mined in Eastern Utah and Western Colorado. However, it should be noted that the overburden at the Crandall Canyon mine has substantially more massive sandstones than in other areas (i.e., the Deer Creek Mine). Thus, providing greater overburden strengths and reducing the potential for significant subsidence.

Four methods have been utilized to arrive at the range of the possible maximum subsidence at the Crandall Canyon Mine. The methods are: Dunrud's (USGS) equation (discussed in the text below); Boundary Element Method (BEM) using "TABEX-2D" and a Finite Element Mathematical (FEM) simulation using "ANSYS (Appendix 5-6); and the National Coal Board (NCB) of England Technique (Appendix 5-6). The amount of subsidence varies from 3.9', 5.5', 3.34', and 0.25', respectively. Experience at the mine indicates that the 0.25' range of subsidence most accurately represents specific site conditions under room and pillar conditions and the projected maximum of 3.34' under longwall conditions.

The magnitude of vertical subsidence is a function of coal height, overburden depth, stratigraphy, mining technique, and distance from barrier pillars. According to Dunrud's work completed in 1980, based upon a study of subsidence in an underground coal mine at Somerset, Colorado, (USGS 1980), the maximum amount of subsidence expected is equal to 70% of the coal height extracted, (Figure 5-4). The Somerset subsidence curves are included because the overburden characteristics are similar to those encountered at Crandall Canyon and the lack of reported data indicating amounts of subsidence for western underground coal mines.

The maximum subsidence experienced for western coal mines according to Peng, ranges from 33 to 65% and Gentry and Abel cited examples of 70% of the coal height extracted. Thus, to be conservative, a 70% value will be used within this report. The maximum value may be reduced by the amount of coal not recovered in the mining areas, i.e., 20% of the coal is expected to be unrecoverable in the pillared areas at the Crandall Canyon Mine and approximately 12% for the longwall areas. For the areas near an unmined solid pillar the maximum amount of subsidence is reduced (irrespective of the mining method) according to the graph shown in Figure 5-5 based upon work by Gentry and Abel.

The largest magnitude of subsidence that may occur is 3.9 feet at a point 40 feet east of the section line between Sections 5 and 6 and 1522 feet south of the section line between Sections 32 and 5. The values were calculated by reducing the coal heights shown on Plated 5-2 by 20% which represents the unrecoverable coal in the pillared areas (using a six foot coal height), then multiplying by 70% to obtain the maximum possible subsidence value from Figure 5-4 which assumes a worse case scenario. The subsidence values were reduced according to Figure 5-5 for areas that border a barrier pillar along the perimeter of the lease shown on Plate 5-2.

Horizontal movement which would create slope failure along the escarpment is not expected to occur due to subsidence because only limited coal outcrop occurs within the lease (the east side of the lease area). Within that area of old works no pillar extraction is anticipated.

As with areas in the western part of lease SL-062648 and at the Co-Op's Trail Canyon and Bear Canyon Mines and the Beaver Creek #4 mine, no escarpment failure has occurred. Horizontal movement creating tension or compression cracks can not be projected due to the overburden thickness and lack of jointing density and attitude data along the surface rock exposures.

In addition, GENWAL will second mine no closer than 200 feet to any outcrop (with the exception of portals) and, in accordance with Forest Service Stipulation #20, no mining will be done within a zone that might impact the Joes Valley Fault. This area is determined by a 22 degree angle-of-draw (from vertical) eastward from the surface expression of the Joes Valley Fault was used to project the outer limits of subsidence. Thus, subsidence will not intercept the Joes Valley Fault. If subsidence does occur along the western perimeter, all effects of the subsidence will be maintained within the mining permit boundary. No perennial streams will be affected. On the Dellenbach fee tract mining will not extend closer than 200 feet from the outcrop (other than portals) and no closer than 50 feet from the property boundaries. It should be noted that the mine projections and timing for the Dellenbach tract, and the South Crandall lease and the U-68082 lease mod area are shown on Plate 5-2.

It is accepted practice in this area to use two sources of information for subsidence evaluation. The sources are: 1) "Some Engineering Geologic Factors Controlling Coal Mine Subsidence in Utah and Colorado",Geologic Survey Professional Paper 969, by C. Richard Dunrud, 1976, and 2) "SME Mining Engineering Handbook", Volume 1, by Arthur B. Cummins and Ivan A. Given, 1973. The conclusions based upon the above source material are tempered by on site evaluation and actual experience based on similar mining conditions in late Cretaceous overburdens with similar thicknesses and strengths. The surface area topography within the lease is shown on Plate 3-1, 3-1a, 1-1 and others. The topographic map shows the relative steep sloping sides of the canyons which contains Crandall Canyon Creek, Blind Canyon Creek, and Horse Canyon Creek where rock outcrops are abundant. However, there are few, if any, talus slopes.

5.25.09 Subsidence Control Plan

The Subsidence Control Plan contained herein addresses specifically those items that are required by R645-301-525 Pertaining to Subsidence. This plan is an amendment to the original application filed on December 17, 1980, by GENWAL the SUBSIDENCE CONTROL PLAN FOR GENWAL COAL COMPANY, INC., as prepared by David A. Skidmore and L. G. Manwaring of Coal Systems Inc., on August 28, 1981; and the Mid-term permit revisions dated 5-30-86. The format of the currently approved COAL SYSTEMS report will be used with the conclusions based upon the results of the drilling of the Blind Canyon seam which was obtained in April, 1985, and the Hiawatha seam data obtained to date during mine development. The original application was submitted pursuant to the following: Title 40, Chapter 10, Utah Code Annotated, 1943, as amended,

the "Cooperative Agreement between the United States Department of Interior and the State of Utah"; the Surface Mining Control and Reclamation Act (P. L. 95-87); and all regulations promulgated under those Acts affecting mining operation conducted in the State of Utah.

It should be noted that, according to the stipulations of federal lease UTU-78953, there will be no second mining or subsidence under Little Bear Creek within the South Crandall lease area.

5.25.10 Surface Features and Facilities Subject to Subsidence.

An examination of the surface area as well as of state, federal, and county records indicate there are no man made structures, utilities right-of-ways and public or private resources necessitating protection from subsidence (Plates 5-12, 5-13, and 5-3) within the mine permit boundaries. In addition, aerial inspection of the permit and adjacent area confirmed the absence of existing man made structures. The occurrence of subsidence will not produce material damage or diminution of value of properties or foreseeable use of lands. Possible effects of mine subsidence on groundwater resources are discussed in Chapter 7. Creeks within the area include Crandall Canyon Creek, Blind Canyon Creek, and the left fork of Horse Canyon. Both forks of Crandall Creek are considered to be perennial at least up to the federal lease boundary with State Lease ML-21568.

The surface in the area is controlled and administered by the United States Forest Service with a small southern parcel of land owned by GENWAL (Plate 2-1). The land is used for domestic grazing in the areas of gentle slope and wildlife habitat and recreation over the total acreage. The vegetative resources will not be negatively impacted by subsidence. Thus, the current land use is expected to continue. Similar mining conditions and practices exist at Beaver Creek #4 Mine and CO-OP's Trail Canyon and Bear Creek mines and no significant loss of vegetation has occurred at those sites.

The Crandall Canyon Mine on the western half of lease SL-062648 has experienced second mining under conditions similar to Huntington Canyon and has not experienced any vegetation change, subsidence or escarpment failure. Visual impact will only be observed in the case of a total escarpment failure. Tension cracks, if any do develop, as viewed from the bottom of the canyons will not be visible and the maximum subsidence of three feet when viewed from below and at a distance of greater than ½ mile will not be visible. As per the USFS, there is no marketable timber in the area of potential subsidence.

Since the original submittal, several operations and construction modifications have been submitted to satisfy regulatory compliance requirements. Consideration was given to the subsidence experienced at nearby mines (CO-OP, Beaver Creek #4) exhibiting similar overburden composition and mining methods, on site inspections at the operating Crandall Canyon, CO-OP and Beaver Creek #4 mines and calculation based upon a generally accepted formulas using limited physical coal strength data in determining coal pillar sizes, barrier pillar design and direction of mining. The aforementioned mines were observed from the surface to note any surface effects from subsidence from pillar mining. No substantial affects from mining have been observed. The Crandall Canyon Mine has pillared coal in areas with as little cover as approximately 200' of overburden. The CO-OP

and Beaver Creek #4 mines have pillared under the same types of escarpments as are located at the Crandall Canyon Mine with no apparent failures.

5.25.11 Methods of Coal Removal

The reserve area will be mined in the room and pillar and longwall methods. These methods are described in Section 5.23 of this chapter.

5.25.12 Description of Physical Conditions

The depth of cover is shown on Figure 6-6. Seam thickness of the Hiawatha coal seam is shown on Plate 6-3. The Bear Canyon and Blind Canyon seam thicknesses are shown on Plates 6-4 and 6-5). Structure of the top of the Hiawatha seam is shown on Figure 5-8. A description of the Lithology of the area is found in appendix 6-6. Other mine progress, interval, subsidence, and lithologic maps within this section and in the mine planning section also address the description of physical conditions.

5.25.13 Measures to Prevent Subsidence

In areas where mining may cause undesirable surface movement, steps will be taken to control or prevent subsidence. To prevent subsidence, permanent support can be achieved by selectively mining certain areas, leaving support pillars of coal, and/or by not mining specific areas. Although planned subsidence is not projected outside of the permit area due to the mining of the Hiawatha coal seam within the area of the Crandall Canyon Mine, potential subsidence may occur within areas of retreat mining sections.

The main objectives are to delineate the areas within the lease and adjacent lands that may be affected by subsidence and to determine the extent of the disturbance. Significant guiding design criteria are as follows:

1. Barrier pillars within the lease boundaries left intact to protect adjacent lands.

2. First mining only areas which significantly reduces the potential chances of subsidence.

3. Research indicates that a 20 degree "angle of draw" be used to project maximum extent of subsidence.

   A 20 degrees angle-of-draw was used to project a protection area for perennial streams within the mining area. The 20 degree angle was determined by two documents which show this angle of draw to be representative of the area. A Bureau of Land Management letter to the Utah State Division of Oil, Gas, and Mining dated

Dec. 11, 1991 states that possible draw angle should be in the 15 to 20 degree range. This conclusion was made on previous history of subsidence occurring in the Wasatch Plateau/Book Cliffs area. This letter is provided as Appendix 5-5.

Appendix 5-6 is a report, "Preliminary Study of Potential Subsidence Over the GENWAL Coal Mine". This report includes subsidence calculations, subsidence history, analysis, and charts with final conclusions showing that there may be a maximum subsidence result of 3 to 4 inches within the boundaries of the leased area, and the angle of draw is expected to be approximately 20 degrees.

4. Protection of perennial streams using only first mining directly under and within a 20 degree angle of draw of the stream. GENWAL recognizes that the Division of Wildlife Resources, the Division of Oil, Gas, and Mining, and the United States Forest Service consider all perennial streams to be important to wildlife. A buffer zone is shown on Plate 5-2 where no subsidence will take place until GENWAL has delineated those reaches which exhibit perennial flow, and shown that mining activity will not adversely effect these stream reaches.

5. Protection of the Joes Valley Fault. As depicted on Plate 6-2, the maximum possible subsidence with respect to a 22 degree angle of draw is within the permit area, As shown on Plate 5-2, Mining Projections, all mining will occur within the permit boundary. No mining will be done within limits that might impact the Joes Valley Fault. In accordance with Forest Service Stipulation #20, a 22 degree angle-of-draw (from vertical) eastward from the surface expression of the Joes Valley Fault was used to project the outer limits of subsidence.

6. There are no plans to backfill any area of the mine with waste material in order to reduce subsidence. In order to delineate the maximum limit of possible subsidence in the vicinity of the Crandall Canyon Mine area, a positive limit (draw) angle of 20 degrees from vertical (70 degrees from horizontal) from the lease boundaries was used. A correction for topographic variability was made in order to accurately determine the maximum surface limit of subsidence. The maximum surface limit of possible subsidence is shown on Plate 6-2. A discussion of the methodology used in determining the maximum limit of subsidence is given in Appendix 5-7. Draw angles of 15 degrees or less have been observed in moderately strong overburdens in the Book Cliffs.

The data contained in Appendix 5-2 were used to determine the potential for subsidence under any perennial streams which may be present within the permit area. Plate 7-16 defines the perennial reaches of Horse and Crandall Canyons, as substantiated by field surveys in 1991 and 1992. Using the data from Plate 7-16 only the lower portions of Crandall Canyon have perennial sections under which first mining may occur.

Overburden thicknesses in the upper perennial reaches of Crandall Canyon have been determine to be about 540 feet. Using a pillar size of 70 x 65 and the worst case analytical condition, the factor of safety has been calculated to be 2.2. The coal outcrops within Blind and Horse (both the north and south forks of Horse Canyon) Canyons are above the perennial portions of the stream. Thus, no subsidence will occur under perennial sections of Horse Canyon (the Blind Canyon drainage is ephemeral).

All state appropriated water within the subsidence zone of the South Crandall lease area is shown on Plates 7-14 and 7-15. Plates 5-2(H) and 5-2(BC) show the mine plan for the South Crandall lease area. Plate 5-2(H) shows the mine plan for the U-68082 lease mod area. These maps depict which areas will be longwalled (full extraction) and which areas will be developed as first-mining only. Subsidence Survey Letters of Notification to surface owners and water conservancy districts are included in Appendix 5-25.

The following state appropriated waters are located within the subsidence zone: 93-383, 93-381, 93-483, 93-191, 93-190 and 93-1180. Information about quality, quantity, and ownership of these waters can be found in Chapter 7, Table 7-6, and in Appendix 7-1.

5.25.14 Subsidence Monitoring

An aerial monitoring system for the Crandall Canyon Mine which has been accepted for implementation and vertical and horizontal control have been established using ground control stations, shown on Plate 5-5. (The program is included as Appendix 5-8). Baseline flight lines were flown over Sections 31 and 32 of T15S R9E, Sections 5 and 6 T16S R7E, Sections 1 and 2 T16S R6E, and Sections 35 and 36 T15S R6E in October of 1989. Selected portions and/or all of Sections 34, 35, and 36 T15S R6E and Sections 2 and 3 T16S R6E (Plate 5-5) will be included in the 1995 Fall Survey to ensure that all projected mined areas within LBA#9 are included in the subsidence monitoring program. Control points within and adjacent to the leased area (including the South Crandall lease area) have been established and located by surveying practices. Prior to mining the area was photographed and a pin map was generated.

Aerial surveys will be conducted by GENWAL each year for the areas above and within the 20 degree angle of draw of the actual mined area. Based on a written request by the Forest Service, GENWAL is revising the subsidence monitoring plan. Monitoring will now be conducted annually until subsidence of less than one foot has been measured for three consecutive surveys showing that subsidence is substantially complete.

The following information will be forwarded to the Division on an annual basis when it becomes available:

1. A current map of the underground workings with areas delineated as to where the second mining will begin.
2. The approximate dates when second mining will commence and terminate.
3. The date of monitoring.
4. The vertical and horizontal positions of all monitoring points and pins, directly over and within the 20 degree angle of draw to the mined area, surveyed by aerial photography for that specific year.

There was and has been no evidence of escarpment subsidence or failure. There are no further plans to monitor escarpments in the area not visible from Huntington or Crandall Canyons. The subsidence/escarpment survey results were recorded and submitted to the appropriate regulatory authority. No escarpment failure occurred.

**As of December, 2015, all subsidence monitoring requirements have been successfully met, and there has been no subsidence above 1 foot for the last 5 years. The mine has been temporarily idled after the accident in August, 2007, and mining is anticipated to resume after market conditions improve. In the event of future mining, subsidence monitoring will be continued.

5.25.15 Anticipated Effects of Planned Subsidence

If subsidence does occur, surface effects may include minimal ground lowering and temporary tensional fractures at the margins of the subsided area. Any subsidence occurring on the 160 acre Dellenbach fee tract should have minimal effects on the surface. There are no escarpments, raptor nests, archeology site, streams or springs located the Dellenbach tract. This tract (surface and underground) is privately owned by Genwal Resources Inc. The tract is within the presently approved permit area and is included in the current subsidence monitoring plan.

Subsidence monitoring for the South Crandall lease area and the U-68082 lease mod area will be done according to the existing plan approved for the Crandall Canyon mine. Pre-subsidence base-line aerial surveys have been completed and the initial survey control monuments have been installed on the ground. Additional control points (monuments) will be installed as mining progresses. (Refer to Plates 5-2 and 5-5 for the location of the existing and future monuments.)

In much of the area of the South Crandall lease area, both the Hiawatha and the Blind Canyon seams are proposed for full extraction longwall mining. In these areas the combined thickness of both seams ranges upward to about 12 feet. If surface subsidence in these areas is 80% of total mined seam thickness, then it may be possible to see nearly 10 feet of subsidence in some areas of the lease after mining. It should be noted that the Forest Service and BLM have imposed a special stipulation in the South Crandall federal lease specifically to provide additional protection to the Little Bear spring system. These lease stipulations prohibit full-extraction mining in the following areas;

a) area under the Little Bear stream channel with less than 600' of overburden.
b) area within 1000' of the southeast corner of the lease (to protect the Mill Fork graben.)
c) area within 1000' of southern boundary of lease (to protect possible water-bearing fracture system.)

GENWAL personnel will conduct a surface inspection of all areas where subsidence has occurred no sooner than 6 months but no later than 12 months after extraction mining has occurred. Multiple seam mining beyond spring site LB-7 in Little Bear Canyon is contingent upon a monitoring plan approved by the Division in concurrence with the Forest Service at least two years prior to mining in that area.

5.25.16 Mitigation of Damages

As previously presented within this chapter, no material damage or diminution of value or foreseeable use of lands is expected to occur. GENWAL has been in consultation with the BLM and received their concurrence with the conclusions presented in this document, a copy of the BLM correspondence may be found in Appendix 5-5. Displacement of wildlife due to subsidence may be minimal. However, springs within the potential subsidence limit are a significant resource to the local wildlife and may be impacted.

Seeps and springs within the possible subsidence limit emit water from the North Horn Formation, Price River Formation, Blackhawk Formation, and the Castlegate Sandstone. A limited number of seeps and springs are found to issue from the Blackhawk Formation and Castlegate Sandstone units within the area of possible subsidence limits. These seeps and springs show only limited use by deer and elk. Subsidence from mining in these areas will have minimal impacts on water supplies from seeps and springs in the vicinity of the mine. Water monitoring and the Probable Hydrologic Consequences are discussed in detail in Chapter 7 of this permit.

Seeps and springs within the possible subsidence limit of mining emit water from the North Horn and Price River Formations 100 to 2100 feet (10 to 210 times the coal bed thickness) above the interval to be mined. If repeated subsidence via roof failure occurs, elastic deflation is believed to occur at a distance of nine coal seam thicknesses (90 feet) above the coal. If any tension cracks do develop, they should be sealed by clay migration occurring during elastic deformation. As a result, these seeps and springs should not be affected by subsidence. However, monitoring will be conducted as described in Chapter 7.

GENWAL recognizes the fact that the Division of Wildlife Resources, the Division of Oil, Gas, and Mining and the USFS consider all seeps and springs to be important to wildlife. If, during the monitoring of the springs, non-climatic diminutions of flow from any seep or spring in the area are substantiated, GENWAL will notify the Division of Wildlife Resources, the Division of Oil, Gas, and Mining, the State Engineer and the U. S. Forest Service. If documentation concludes that mining efforts at the Crandall Canyon Mine have reduced or eliminated the flow from the seeps and springs, then acceptable remedial action plans will be submitted for approval and subsequently installed.

In the event subsidence negatively impacts grazing, the applicant will compensate the owner or appropriate the party by paying the fair market value for the loss experienced. Compensation will be made after the grazing loss is proven to have resulted from surface subsidence related to the operation of the Crandall Canyon Mine.

Should any structures such as roads, bridges, etc., be adversely impacted as a direct result of subsidence directly related to the operation of the Crandall Canyon Mine, the operator will repair or replace the structure, whichever is more economical.

Mitigation for potential disruption to the Little Bear Spring will be accomplished through the construction of a water treatment plant which will provide replacement water for the spring if mining activity in the South Crandall lease area affects the quality or quantity of the spring. Construction of this water treatment plant will be done under the provisions of a water replacement agreement between GENWAL Resources, Inc. and the Castle Valley Special Service District who maintain culinary water rights to Little Bear Springs. A copy of this water replacement agreement is included in Appendix 7-51.

Subsidence projections for the South Crandall lease area are depicted on Plates 5-2(H) and 5-2 (BC). Subsidence projections for the U-68082 lease mod area are shown on Plate 5-2(H).

The powerline that crosses the South Crandall lease was built by GENWAL to serve the Crandall Canyon mine. There are no other users on this line. This powerline follows the highline of the ridge and is more than 1500' above the coal seam to be extracted. Due to the depth of cover no damage to this powerline is expected due to subsidence. As full extraction mining approaches under the powerline GENWAL will monitor the situation to ensure that the potential for damage to the powerline is minimized. Most of the powerline within the subsidence zone is visible from the Genwal mine and can be inspected by mine personnel. The section of line on the ridge will be inspected during annual subsidence monitoring. Much of this line utilizes double pole X-braced structures which are inherently stable in design. This line is equipped with ground fault protection which will automatically and instantly de-energize the line in the event of any damage, including grounding and/or short circuiting. Vegetation has been cleared on either side of the powerline within the right-of-way. The powerline runs over the area that was mined out by the ARCO #4 mine, and there was no resulting damage. If any damage occurs GENWAL will be out of power and will immediately make arrangements for any necessary repairs.

It shall be noted that the extent of possible subsidence in the U-68082 lease mod area is difficult to predict because the extent of mining in this area is extremely speculative due to the low coal (5' and less) in this area. However, in keeping with special lease stipulation #1 (see Appendix 1-15A, Attachment 3) there will be no second mining (and hence no subsidence) in any areas where the cover is less than 50 times the seam height plus 50', or approximately 300' overburden. A detailed discussion of this stipulation can be found in Appendix 3-20, (Final Environmental Assessment, Modification of Federal Coal Lease UTU-68082, U.S. Forest Service.)

Genwal has discussed the powerline situation with officials of Utah Power & Light (Dale Robertson), transmission and Distribution; Greg Bean, System Engineering, and Aaron Gibson, Customer Service Representative, verbal communication February 8, 2005). These representatives are very familiar with the surface effects of full extraction longwall mining and are in agreement that the risk to this line is quite minimal. GENWAL commits to immediately notify the Forest Service in the event of any damage to the powerline so that proper fire preventative measures can be implemented as required.

5.25.20 Subsidence Control

GENWAL will comply with all provisions of the approved subsidence control plan and will correct any material damage resulting form subsidence to surface lands as a direct result of the operation of the Crandall Canyon Mine. This will be done to the extent technically and economically feasible, by restoring the land to a condition capable of maintaining the value and reasonably foreseeable uses which it was capable of supporting before subsidence.

The mine plan is designed so that mining will not result in material damage to perennial streams or impoundments having a storage volume of 20 acre feet, or which could result in environmental degradation or safety hazards to streams and associated structures.

5.25.30 Public Notice of Proposed Mining

At least six months prior to mining, or within that period if approved by the Division, all owners and occupants of surface property will be notified, by mail, identifying specific areas in which mining will take place, dates that specific areas will be undermined, and the location or locations where the operator's subsidence control plan may be examined.

5.26 Mine Facilities

The existing surface facilities were partially located in a predisturbed area and the only area where the coal outcropped in the lease area. The existing surface facilities are located in a very limited disturbed area. The culvert expansion project adds the minimally necessary area for additional and improved facilities. The use of a 72" diameter culvert, through which Crandall Creek is routed, is the primary feature used to minimizing the disturbed area within the steeply sloped canyon. See Plate 5-3 for the surface layout and Plates 3-7, 3-8, and 3-9 and 5-20 for the premining land configuration.

A construction sequence for the culvert expansion project is included in Appendix 7-50.

The new facilities will incorporate several design features which will minimize the spread of coal fines and dust compared to the existing facility.

1) With the new system, all coal will be reclaimed by underground feeders located in the reclaim tunnel below the coal pile. During normal operations, coal will not have to be handled by heavy equipment (i.e. dozers and loaders) as with the existing facility.

2) The new coal pile will be contained by the hillside on the south, the new upper mine pad on the west, and the new road extension on the north. This containment will help prevent the pile from spreading. Concrete road barricades (Jersey Barriers) will be placed along the outside edge of the road from the new truck turnaround to the new loadout and beyond which will further limit the spread of coal and coal fines onto the roadway. This new pile configuration is in contrast to the existing design wherein the coal pile is located immediately adjacent to the road and migration of coal onto the roadway is not uncommon especially where mobile equipment is constantly working the pile during the loading and reclaim process.

3) The new truck loadout will be constructed outside of the road alignment in contrast to the existing facility where the loadout is situated directly within the roadway. Because the new loadout will be a state-of-the-art computer controlled facility, coal spills will be minimal compared to the existing facility. However, what little coal spillage that may occur with the new system will be cleaned up immediately and coal fines will report directly to the new sediment pond without being swept across the roadway as is now the case with the existing facility. With the new facility, the coal pile, crusher facility and loadout will all be located on the same side as the sediment pond and away from the existing roadway.

A Forest Service road use permit was obtained from the United States Forest Service, Manti-La Sal National Forest, Price, Utah in order to upgrade, use, and maintain the road to the mine permit area. This Forest Development road does not lie within the permit area and is not included as part of this permit application. The Forest Service road that lies within the disturbed area boundaries is included in the permit area for the purpose of drainage control.

The topsoil was stripped according to the plan, stockpile, and seeded with the topsoil stockpile seed mix. The topsoil stockpiles are protected from encroachment by placing earthen berms, straw bails, silt fences, or equivalent where needed.

There are no pre-existing structures or facilities located within the permit area. GENWAL has constructed a metal building (80' x 40') that is used as an outside shop. A new warehouse and office complex (50' x 25') has been built east of and connected to the existing shop. An additional 30' x 20' shop bay has been approved for construction by the Division and is projected to be constructed in the future.

During the summer of 1990, a power line from Utah Power & Light was brought in across the top of the canyon. At this time the use of the diesel generator was terminated. Presently, a state of the art substation and transformer provide all power needs. The high voltage lines from the substation to the mine are run underground in cement covered conduit thus eliminating the need of overhead power poles and transmission lines.

The oil storage and fuel containment area (80' x 20') is located at the west end of the old loadout area. This containment area is of sufficient volume to hold the volume of the largest storage tank found within the containment area plus any additional storm water . The containment area has a valve connected to the drain inside the wall. The valve and drain will provide a means for removing any spills or water in the containment area. A certified SPCC plan outlining emergency action as per R645-301-730 is available at the mine site (Appendix 5-10). Refer to Plate 5-3 for all surface buildings and structures.

An underground bathhouse has been constructed to provide shower and sanitary facilities for the miners. This underground bathhouse was designed and installed in accordance with all State Health, MSHA, and Forest Service regulations. These agencies were contacted prior to the design and implementation for their input and approval as necessary. The water and sewage plans can be found in Appendix 5-11 and 5-12, respectively.

After the South Crandall portals were constructed, three small material storage sheds were placed on the site near the portals (see Plate 5-3). These sheds are all less than 20' x 25' and are of temporary type construction. They are used to store foof-bolt resin, electrical parts and other miscellaneous items. These sheds will be removed prior to final reclamation.

Two mine fans located on the surface, as shown on Plate 5-3, are used to ventilate the mine workings to insure a sufficient amount of oxygen for mine employees to continue operations within the mine. Other structures such as cement guard rails and cement walls have been constructed, with the Division's approval, and are listed within pages 5-33 and 5-34. This list includes the approximate date of completion of each structure and the description of each construction project.

Shotcrete was sprayed onto the cut-slope above the portals, the portal roads, and the coal storage area, as shown on Plate 5-3. A 4" square wire mesh was used, being spaced approximately 1" to 2" away from the existing slope. The wire mesh was secured to the slope with standard metal clips and bolts. Two-inch PVC pipe, perforated for drainage, was inset 2 to 3 feet into the slope at two different elevations, approximately 6" to 12" from the bottom of the project and 12" to 24" from the top of the project. These pipes were spaced 6 to 10 feet apart for the entire length of the project, with 2" to 4" of shotcrete then being sprayed onto the wire mesh. The intent of the project is to stabilize the cut slope to eliminate sloughage and enhance safety for personal.

5.26.10 Specifications for Shotcreting Cut Slopes

Average slope:	1/3:1
Matting:	11 gauge 2" x 4" or 9 gauge 4" x 4" wire mesh 6' wide x full length of slope
Securement:	5/8" x 24" long bolts w/ plates or 3/4" x 24" long rebar type anchors w/ plates
Drainage:	2" PVC pipe, 24" long, perforated, located at top and bottom of slope, 6' to 10' on centers. Pipes will be inset into the slope with the end extending outside the shotcrete. Drainage of the slope will be collected by the 2" PVC pipes and allowed to flow to the outside of the shotcrete.
Shotcrete: (per batch)	1800 lbs sand 800 lbs pea gravel 425 lbs cement 400 lbs fly ash
Application:	Applied with a Reed Sova III or Reed M40 pump w/ accelerator. Minimum thickness applied 2"

See Figure 5-10 for a cross sectional detail of shotcrete application.

This MRP covers the expansion of the surface facilities as shown on Plate 5-3. It should be noted that this represents the initial phase of the Crandall Canyon mine surface improvement. As shown, surface improvements will include a new intake portal, a new belt conveyor portal and a new fan portal.

The new portals will be constructed along the south side of the upper pad of the existing mine-yard (refer to Plate 5-3). This area is presently serving as the parking lot and material storage yard. The new portals will consist of an intake portal, a fan portal, and a belt portal. The intake portal will be used to accommodate fresh air intake into the mine, and also to provide primary travel access into the mine for employees and materials. The fan portal will support a ventilation fan which will suck return ventilation air out of the mine. The belt entry will be located south of the existing coal pile and will contain the main conveyor belt hauling coal out of the mine.

Construction of the portals will be done within the existing permitted disturbed area boundary. The existing disturbed area boundary will not be increased. The existing sediment pond has been sized to accommodate this new portal construction area, so no changes to the sediment pond will be required. Except for adding a new culvert under the access ramp to the new portal, none of the previously approved and existing surface drainage structures will be affected.

In the area of the new south portals, the base of the coal seam is located approximately 17' above (i.e., higher than) the level of the existing mine-yard. An earthen ramp will be constructed on the existing pad to gain access up to the level of the coal seam. In the area of the intake and fan portals, the existing hill slope will be excavated with a back-hoe to expose the coal seam in preparation for construction of the portal canopies. A small elevated pad will also be constructed in front of the fan portal on which the mine fan can later be installed. This fan pad will be constructed as a continuation of the access ramp leading to the intake portal. The access ramp to the intake portal and the fan pad will be constructed partially using the earthen material generated in the process of facing up the coal seam and partially using fill material hauled in from an off-site borrow source. The imported fill material will come from the same source (i.e., the same borrow pit) that supplied the pad material for the recently completed surface expansion. This borrow site would be the Nielson Construction commercial borrow pit located in Huntington Canyon below the power plant. As the access ramp is being constructed a new culvert (C-11A) will be added to handle sheet flow drainage from the upper material yard (see Plate 7-5).

As the access ramp and fan pad are constructed from the existing yard surface up to the level of the coal seam outcrop, some of the new fill material will be placed up against the intervening existing undisturbed slope. Part of the access ramp/fan pad will therefore be constructed on top of the existing slope. Before this ramp/pad is constructed, topsoil along the existing slope below the fan pad and access ramp will be protected in-place using a geotextile cover placed along the undisturbed slope under the fill material. This topsoil protection technique would be identical to the approved method used during construction of the existing surface expansion facilities (Phase I surface expansion).

After the access ramp and fan pad have been constructed (and the underlying in-place topsoil protected with geotextile), the portal excavation can begin. Prior to starting the portal cuts, the existing topsoil at the portal sites will first be salvaged. Topsoil conditions along the south slope

portal area is similar to the conditions at the adjacent coal pile area where topsoil was salvaged during August, 1998. This topsoil salvage effort is described in appendix 2-5, Part II, prepared by Pat Johnson, soil scientist. At that area, according to Ms. Johnson's report, the depth of true topsoil was 3" but an average of 8" - 9" of material was taken due to the operating nature of the backhoes which were employed in the salvage process. In addition, an intensive soil inventory and site investigation was performed on the south slope on August 18, 1998 and is included in Appendix 2-6.

In order to minimize the area of additional disturbance associated with the construction of the south portals these portals will be constructed by excavating individual pockets into the hillside for each portal rather than along a common highwall. Topsoil has already been removed from the belt portal site. By utilizing individual pocket cuts for the portals the total area of new disturbance is expected to be less than 4500 sq. ft. (0.11 acres). Topsoil will be removed from the areas of the south portal pocket cuts prior to excavation as described in Section 2.31.1. According to the Nyenhuis survey, the upper two feet (24 inches) is suitable for salvage. Based on the Nyenhuis soil survey it is anticipated that approximately 9000 cu. ft. (333 yds.) of topsoil will be salvaged from the intake and fan portal cuts.

The salvaged topsoil will be stored on the existing topsoil pile #4 located off-site at the bottom of Crandall Canyon. This topsoil pile is constructed on Forest Service land under a Special Use Permit issued on 8/17/87. This pile #4 was originally constructed in 1997 during Phase 1 of the surface facility expansion. At that time it was designed and constructed sufficiently large to accommodate the additional topsoil storage requirements for the Phase 2 south portal construction. The Forest Service has concurred with the addition of the south portal topsoil to this pile. All topsoil removal, salvage and storage will be over-seen, directed and monitored by an independent soils scientist approved by the Division. A report of the topsoil salvage operation will be prepared by the soil scientist and added to the MRP upon completion as Appendix 2-5, Part III.

After the portal sites have been faced up construction of the portal canopies will begin. These canopies will be constructed from 6" steel I-beams and 1/4" steel plate according the MSHA guidelines. These canopies will measure approximately 8' high by 20' wide and will extend underground as far as needed to insure adequate roof protection. The canopies will be anchored to concrete footers. These canopies will provide a safe structure from which the miners can begin driving the entries back into the coal seam. These portal canopies will be similar to the existing portal canopies. After the intake and fan entries have been driven into the hillside and connected together underground with a cross-cut, work can then be started on construction of the mine fan installation. The fan will be an 8' diameter Spendrup or Joy axial vane (or equivalent) electric powered fan. It will not have a diesel powered back up. It will be mounted on concrete foundations located on the newly constructed fan pad. The fan installation will be very similar to the existing fan structure. While the fan is being installed, the miners will drive the belt entry from inside the mine out to the belt portal. During this phase of development, mined coal will be moved away from the surface with a front-end loader, a mobile radial stacker, or some other temporary means of conveyance. After the belt portal connection is completed, a new conveyor truss will be

installed from a concrete landing at the belt portal out to the existing coal pile. The conveyor will be 48" wide, supported on a steel box truss which will extend from the new portal to the existing stacking tube. An intermediate bent support may be required, depending on final engineering. If this bent is required it will be anchored to a concrete foundation constructed on the existing coal pad. The conveyor will be covered to minimize fugitive dust. The air quality permit will be revised prior to construction to include the new conveyor (see Appendix 5-23). This truss/bent structure will be similar to the existing truss/bent structure, but only one fourth as long. All coal from the mine will then be delivered directly to the existing coal pile and will be crushed and loaded on trucks through the existing coal handling facilities.

The access ramp leading into the portals will be approximately 100' long and 20' wide. It will have jersey barrier guards along both sides. The ramp will be constructed from the imported fill material, laid down in 12" - 18" lifts, and compacted to 90%. The only vehicles using the ramp will be underground mine vehicles going in and out of the mine. Therefore the ramp is not considered a road. Drainage from the ramp will be handled by the existing drainage structures and the new culvert (C-11A) as shown on Plate 7-5. It is estimated that approximately 3500 cubic yards of fill will be needed to construct the access ramp/fan pad. This quantity will be verified after construction on the as-built plans.

Power, water, communications, and other mine infrastructure will be supplied to the south portals as an extension of the pre-existing Crandall Canyon Mine facilities.

Figure 5-11 depicts a typical cross-section through the south portals, showing the pocket cut, access ramp, in-situ soil geotextile protection, and the portal canopy construction.

Figure 5-12 depicts a typical cross section along the south portal conveyor belt structure.

GENWAL is also considering a second possible option for constructing the south portal intake and fan portals. Instead of constructing a ramp up to the level of the coal seam, short tunnels would be driven from the existing yard level up to the coal seam. In this scenario the pocket cuts would be be made into the hillside lower down at the same level as the existing pad. This level is approximately 15' below the base of the coal seam. Since the coal seam sits directly on top of the Star Point Sandstone, this sandstone out-crops at the existing yard level. Tunneling would begin in the sandstone and ramp up underground to the coal seam.

If the tunnels are driven at an incline of 10% they will be about 160' long to where they intersect the base of the coal seam. At 8' high and 20' wide, excavation of the two tunnels (intake and fan) would generate approximately 1900 cu yds. of material during construction. This tunnel excavation material will consist of sandstone mixed with coal. This excess material would be disposed of by placing it in a 6' deep layer along the existing fill bank located between the upper material yard and the coal storage pad. This embankment is part of the designated coal storage area and currently is covered with coal. Therefore, after the tunnel excavation material is layered onto the embankment, it too will be covered over by the active coal pile for the remaining life of the mine. Refer to Figure 13-a and 5-13b for more details of this tunneling construction option.

Upon final reclamation the tunnel excavation material would be hauled back into the mine tunnels where it would be sealed up prior to backfilling the portals. Backfilling and reclamation of the portal pocket cuts would be the same regardless of whether the ramp or tunnel option is selected. If GENWAL elects the tunnel construction option, topsoil will be salvaged in exactly the same manner as described previously. The amount of topsoil salvaged, stored and redistributed would be the same regardless. If the tunnel option is selected, there would be no additional in-place topsoil required to be protected with geotextile, because there would be no fill material placed up against the hillside.

If this option is selected, GENWAL commits to ensuring the protection of the hydrologic balance for surface and groundwater systems as required by R645-301-731. The tunnel excavation material will be tested for acid- and toxic-forming material and the analytical results of this testing will be presented to the Division. The hydrologic balance will be protected in the following manner.

a) The excavation material will consist of fragmented Star Point sandstone. This sandstone outcrops naturally in the minesite area and is one of the major geological features which determine the character of Crandall Canyon and many other canyons in the Wasatch Plateau. This predominant sandstone is not known to be acid- or toxic-forming anywhere in the Utah coalfields. However, further site-specific testing of the sandstone will be conducted prior to any construction.

b) The proposed location of the material storage is on top of the existing pad fill. Any runoff from this area would report to the existing sediment pond.

c) The existing pad fill in the proposed storage area varies between 10' and 40' thick over the bypass culvert and is densely compacted. This thickness of compacted fill material is sufficient to preclude any leaching downward into the bypass culvert or groundwater.

5.26.11 Coal Handling

Coal exits the mine on a 48" conveyor belt, is transferred onto 48" overhead conveyor belt and drops into the run of mine coal stockpile. The coal is reclaimed from the stockpile and is conveyed to crusher station. Crushed coal is then conveyed directly to the silo. From the silo, it is weighed and loaded into coal trucks.

An automated coal processing facility has been installed at the GENWAL mine site. The facility, as-built layout, can be found on Plate 5-6. Design calculations are located in Appendix 5-13.

Coal from the mine is delivered to a concrete stacking tube. This structure will support a nominal 30,000 ton storage pile. The coal is reclaimed from the pile through an underpile drawdown system designed to feed a reclaim conveyor. Reclaimed coal is screened and crushed to a 2 x 0 product, then transported to a computer-operated batch-weight truck loadout facility. From there it is loaded into the trucks and transported off the minesite to market. The new surface facilities has been painted a neutral gray color to blend with the existing environment with minimal visual obtrusiveness.

After the new facilities are operational, the old loadout facilities were completely dismantled and removed from the site. The truck scales were also removed and the road repaved and re-established as a two lane road meeting Forest Service standards. Coal and coal debris will be cleaned from the loadout area and from around the existing retaining wall area. The rehabilitated loadout site will be used for storage of snow and/or road traction material in the winter time and other suitable storage needs in the summer time. A slotted culvert has been installed on the roadway below this storage area. The slotted drain will direct any road runoff and material tracked down the road into the sediment pond for treatment.

5.26.12 Power System, Transmission Lines, Substations, Feeders

Power for the mine, both underground and surface use, is provided by transmission lines from Utah Power, and Light. The substation and transformer built by PEMCO provides 7200 volts to surface and underground power centers. The power lines run in underground cement covered conduit from the substation to a visual disconnect located by the bathhouse portal. From the visual disconnect it travels through 4" steel conduit into the mine. All electrical installations meet the appropriate 30 CFR Part 75 and 77 MSHA regulations. The placement of electrical installations can be found on Plate 5-3. Plate 5-8 gives a detailed layout of the substation and transformer facility.

Utility poles located on the surface will be constructed to protect raptors, all wires will be insulated and there will be no exposed conductors. All electrical installations will be done in accordance with MSHA regulations.

5.26.13 Surface Equipment

Underground supply equipment will be used on the surface as needed. The following is a list of equipment used exclusively on the surface:

Fork Lift	Snow Plow	Front End Loader
Pick-up Trucks	Diesel Tractors	Bobcat tractor
Dozer		

5.26.14 Culinary Water System

The culinary water used at the mine is purchased from a vendor who is supplied from a state approved water system, or taken from the deep well (MW-1) located at the mine portals. This deep well has been installed in accordance with state health regulations for culinary use. The culinary water is placed in containers designed for this purpose. Drinking water at the mine is provided as bottled water.

The water used underground is placed in the mine sumps located underground. The location of the sumps will change as mining progresses across the reserve and will not remain in any one area permanently.

5.26.15 Sewage System

The bathhouse, located underground, and a new proposed bathhouse for the culvert expansion project is designed and constructed in accordance with the State Health Department's rules and regulations. The sewage will be contained in a concrete holding tank and pumped by a licensed contractor and disposed of at a State approved sewage treatment plant. The sanitary facilities underground will comply with all MSHA regulations. The sewage facility can be found in Appendix 5-12.

5.26.16 Sedimentation Control Structures and Water Treatment Facilities

The existing sedimentation pond was reconstructed during the 1986 and 1989 construction seasons and enlarged during the culvert expansion project in accordance with R645-301-526.300, as detailed in the Runoff and Sediment Control Plan located in Chapter 7.

Underground sumps will be built in order to effectively treat underground water before discharging into Crandall Creek, refer to Plate 5-4 for the sump locations. All discharge into the creek will meet effluent limitations of the UPDES permit and monitored in accordance with that permit, (Appendix 5-14). The sediment pond and the underground sumps are the only water treatment facilities proposed at the mine site.

In the fall of 2009 the company constructed a facility on the surface to treat the excessive iron content in the mine discharge water. Details of this facility can be found in Appendix 7-65.

5.26.17 Water Pollution Control

See "Waste Disposal Plans" under the Mining Operation section of this chapter.

In the fall of 2009 the company constructed a facility on the surface to treat the excessive iron content in the mine discharge water. Details of this facility can be found in Appendix 7-65

5.26.18 Air Pollution Control

Coal mining and reclamation activities will be conducted in accordance with R645-301-420 and the Air Quality Approval Order issued by the Utah Division of Air Quality (Appendix 4-7).

5.26.19 Utility Installation and Protection

All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction, or disruption of services provided by oil, gas, and water wells; oil, gas, and coal slurry pipelines, railroads; public utilities; etc. which pass over, under, or through the permit area, unless otherwise approved by the owner of those facilities and the Division.

5.26.20 Operation of Support Facilities

Support facilities will be operated in accordance with a permit issued for the mine to which it is incident or from which its operation results.

Noxious weeds have not occurred in abundance for the previous 3 years. Weeds such as thistle that have been noticed are few and far between and have been controlled by physical removal as needed. If a large quantity of noxious weeds occur, appropriate sprays will be used.

5.27 Transportation Facilities

The coal from the mine will be transported to the rail loadout or final destination by truck. The trucks are typical 45 ton tandem trailer coal haulers used in the Utah coal fields. GENWAL uses a loading site on the Utah Railway located at Mohrland, Utah, a loading facility on the Southern Pacific Railway in Wellington, Utah, and other independently owned loadouts within the Carbon/Emery county area.

The Forest Development Road from Huntington Creek to the truck turn around area was constructed under the definition of a class one road and will be maintained as a primary road, in compliance with the road use permit issued by the U. S. Forest Service, Manti-La Sal National Forest. The forest access road will remain as part of the post mining land use in accordance with the

Forest Service Permit (Appendix 1-2). The Forest Service Access Road, upgraded under the definition of a class two road, is maintained as a primary road. The road connects the main pad area, the truck turn around area, and the Forest Service Parking/Turnaround to the Huntington Canyon Road (State Route 31). The road is designed, maintained and will be restored in accordance with the Forest Service road use permit.

The road from the lower pad area to the upper pad area was built under the definition of a class two road and is maintained as a primary road. It is designed (as shown on Plate 5-10), maintained and restored in accordance with R645-301-527.120. The Ancillary road to the portal area was built under the definition of a class three road and was designed (as Shown on Plate 5-10), is maintained and restored in accordance with R645-527.130.

The Forest Service Development road has been designed and was approved by the USFS prior to construction. The design drawings are on file with the Manti-La Sal National Forest in Price, Utah. During the 1991 construction season GENWAL Resources Inc. improved and asphalted the Forest Service Development road and surface facilities area of the Crandall Canyon Mine (as shown on Plate 5-3). The improvement information covering the haul road and facilities area is addressed in Appendices 5-15, 5-16, and 5-17.

The Forest Service road (primary road) is utilized by coal haul trucks, mining equipment (on a limited basis), support vehicles, employees, and recreational users (public). The two roads located on the permit area, the portal pad road and the access road to the main pad, are utilized by both surface and underground mining equipment, support vehicles, and employee vehicles. The ancillary road to the portal area is utilized by service vehicles on a very limited basis. The ancillary road to the upper unused area has been reseeded.

The forest parking area past the mine site was preserved for recreational/forest service parking and with verbal approval for the short term storage or mine equipment being onloaded/offloaded or moved as a part of upgrading or retrofitting.

Because of the limited space available at the existing site, snow removal and storage is now a problem. Currently, under agreement with the Forest Service, limited snow storage is allowed in the Forest Service trailhead parking area. This practice is less than ideal however. Snow storage in this area limits the amount of available public parking. Snow melt and runoff from the snowpiles often makes the parking area muddy in the springtime and makes sediment control into nearby Crandall Creek more challenging. The expanded operations area should relieve congestion at the site and free up both the parking area and the Forest Service road and make snow storage in the parking area unnecessary. Snow storage will become available in the area of the existing loadout facilities once these facilities have been removed and the area cleaned up properly as part of the overall site expansion project. Snowmelt from this new storage area will be able to report directly to the sediment pond located nearby. There will be absolutely no snow storage in the sediment pond itself.

After construction of the surface expansion is completed, the Forest Development Road 50248 will be returned to double lane width through the permit area to the Forest Service trailhead parking area. This will be accomplished by the following:

a) The existing loadout facilities will be removed and cleaned up and the road will be widened, realigned, and repaved through this area.

b) The existing truckscales and exit ramp will be removed from the middle of the road and the roadway will be re-established and repaved in this area.

c) The existing oil storage shed will be rehabilitated and the roadway will be regraded and repaved in this area. This storage facility has been designed and constructed to adequately contain the volume of the largest storage tank plus the additional volume of any direct precipitation which may accumulated within the containment area.

d) The existing roadway from the loadout up to the truck turnaround area will be widened by approximately 15 feet. This will result in an additional (third) lane which can be used by the trucks as a stacking lane as they wait to enter the loadout to be loaded. This will free up the existing road for unobstructed two-way, two lane traffic to facilitate public use of the road for Forest related activities.

e) The turn-around area will also be widened to allow the trucks to turn in a standard counter-clockwise direction and thereby eliminate the present practice of clockwise cross traffic turnarounds.

f) Construction of the high speed, high efficiency truck loadout will in and of itself help minimize the congested conditions which now exist within the mine site. Presently trucks are often forced to stop along the Forest Service road while waiting to be loaded. The expanded coal storage capabilities and the new high-speed truck loading facilities will allow the trucks to be loaded in a continuous, uninterrupted basis, thereby eliminating the major cause of tie-ups and congestion.

g) After the Forest Service road has been re-established, (i.e. realigned and repaved) the roadway will be striped to properly delineate the travelway through the mine site areas to the Forest Service Trailhead. The travel lanes will be clearly marked to help separate public traffic on the road from truck traffic associated with the coal operations. Signs will also be installed to direct the public to the trailhead and to instruct the public as to which areas within the minesite should be avoided in order to prevent conflicts with the ongoing operations. These direction signs will be readily visible to the motoring public and will conform to the Manual of Uniform Traffic Control Devices .

The plan view for roads may be found on Plate 5-3. The typical cross section for each road and their corresponding profile may be found on Plate 5-10.

The coal trucks exit to the east of the loadout facility and onto the USFS road (see Plate 5-3). Roads in the permit area are inspected in order to determine the maintenance required to minimize and correct erosion problems before they become extensive. Maintenance will be performed as

required to control erosion. This maintenance will include maintaining the ditches, resurfacing when needed and maintaining proper drainage.

See Plates 5-3, 5-10, 5-19, and Appendix 1-2 for more sections and details of the roads within the permitted boundaries. If a road is damaged by a catastrophic event, such as a flood or earthquake, it will be repaired as soon as practical after the damage has occurred.

5.28 Handling and Disposal of Coal, Overburden, Excess Spoil and Coal Mine Waste

5.28.10 Coal Removal, Handling, and Storage

See Section 5.26 of this chapter. See Section 5.4 for removal and reclamation.

5.28.20 Overburden

See Section 5.28.30 for removal and reclamation.

5.28.30 Spoil, Mine Development Waste, and Noncoal Waste Removal, and Overburden

The Crandall Canyon Mine produces a run of mine product for final sale, this product does not contain any mine related rock or development waste. The method of mining used at the Crandall Canyon mine produces no development waste, however small amounts of rock waste are generated in unexpected roof falls and overcasts. This rock waste is not brought to the surface, but is disposed of on pillar lines or stored in areas that have been mined or where no second mining is to be done. The material disposed of on the pillar lines will be of the same nature that naturally caves in the pillaring process, therefore no leachate will be formed other than that associated with normal pillaring.

In no event will the disposal of this material interfere with future recovery of the coal resource without consent of the BLM or the managing agency of the coal resource. In the unlikely event either rock, development, and/or processing waste is encountered, and the volume exceeds the capacity that can be disposed of along pillar lines; GENWAL commits to disposing of the waste in a DOGM approved disposal facility. GENWAL will notify and consult with DOGM regarding disposal sites; all waste disposal will be done in accordance with MSHA regulations.

The waste generated by the normal underground mining activities will be brought outside the mine for disposal. No oil or grease will be intentionally disposed of underground. All solid waste brought to the surface will be disposed of in a trash container until the container becomes full, at which time the container will be transported to a State approved landfill for final disposal.

At the present time the landfills to be used will be the state approved Nielson landfill or American Kinfold landfill (M&P Enterprises, which are located next to the county landfill, approximately 1.5 miles north of Orangeville, Utah, and if another State approved landfill becomes available and is more cost effective, then this landfill will be utilized. The operator will notify the Division prior to any waste disposal in any landfill other than those mentioned. The location of the new landfill and a statement from the DOH indicating the landfill permit number, the permit term and any conditions that the DOH has concerning the disposal of noncoal waste will be submitted to the Division. In no event will liquids be disposed of in landfills that are not permitted to handle such

material. Scrap metal and used equipment will be removed from the mine unless safety considerations prevent removal.

Oil contaminated soil from the gas and oil storage area will be disposed of prior to reclamation or moving of the facility. If oil or gas spills occur outside the containment area, the spill will be contained, cleaned up and disposed of in a permitted facility. The contaminated material will be disposed of at a facility licensed to accept oil/gas contaminated soil or remediated onsite with appropriate approvals from the pertinent regulatory agencies.

5.28.40 Processing Waste

No processing waste is generated at the Crandall Canyon Mine. Only coal is removed from the mine, all of which is trucked off site and sold. Exploratory drill hole data and mining conditions indicate that no development or processing waste will be produced. However, in the unlikely event either rock, development and/or processing waste is encountered, and the volume of waste generated exceeds the capacity that can be disposed of along pillar lines, GENWAL commits to disposing of the waste in a DOGM approved disposal facility. GENWAL will notify and consult with DOGM regarding disposal sites. All disposal operations will be in compliance with Utah Coal Mining regulations R645-301-536 and R645-301-746.

5.28.50 Hazardous Wastes

In the unlikely event that hazardous or toxic material is encountered, GENWAL will notify the Division as well as the State Health Department; the hazardous or toxic material(s) will be disposed of at a facility permitted to accept the specific contaminants found.

5.28.60 Sediment Pond Waste

Sediment removed from the pond during the cleaning process will be hauled to an approved waste disposal facility. Prior to cleaning the sediment pond, representative sediment samples will be collected and analyzed for any acid- and/or toxic forming materials (as listed on page 5-39A). If the analytical results exceed the toxic limit, the waste material will be handled and disposed of in compliance with regulations applicable to acid- and/or toxic forming materials. GENWAL will notify DOGM if the analytical results of the samples show that acid or toxic forming materials are present.

5.28.70 Sanitary Waste

There are less than 10 regularly assigned employees on the surface per shift. These surface employees use the bathhouse for their sanitary waste needs. Waste from the underground bathhouse toilets and showers is pumped to a holding tank located underground. When required the holding tank is pumped and the materials are disposed of by a licensed contractor at a State Health approved disposal site (See Appendix 5-12). GENWAL will keep records of the sewage pumped from the tank by the contractor. The sanitary waste needs for the miners underground will be handled in accordance with MSHA regulations.

5.29 Management of Mine Openings

Five portals have been placed on the Star Point Sandstone in the Hiawatha coal seam. Four of the five portals are used while one of the portals is sealed. Three portals are used for intake ventilation, beltline, and return ventilation. The fourth portal opening is used for access to the underground bathhouse. Two identical fans located at the return portal will operate in parallel. One fan will discharge horizontally and the second vertically.

These portals existed during previous mining attempts and will be utilized during current mining operations. The highwall above the portals has been secured and canopies have been installed to maintain the portals at MSHA standards. During operation of the Crandall Canyon Mine, access to all mine openings are controlled by the operator during working and nonworking hours. Due to public access through the mine site, a security person is located at the mine during times of no work or when surface personnel are not present. Permanent sealing of underground openings is discussed in Section 5.42.71 of this chapter.

5.30 Operational Design and Plans

5.32 Sediment Control

The design of the sediment control structures is presented in Chapter 7, Section 7.42 of this document. The designs are intended to minimize the disturbance to the hydrologic balance by distributing the smallest practical area at any one time during the mining operation through progressive backfilling, grading, and prompt revegetation as required in R645-310-353.200, and to stabilizing the backfilled material to promote a reduction of the rate and volume of runoff in accordance with the regulations.

5.33 Impoundments

The only impoundment on the Crandall Canyon Mine site is the sedimentation pond. The design of the sediment control structures is presented in Chapter 7, Section 7.42 of this document. The sedimentation pond meets criteria of R645-301-533 as shown in Appendix 7-10, page 7.

EarthFax Engineering, Inc. previously conducted the sediment pond design and stability analysis (Chapter 7, Section 7.42 and Appendix 7-6) which determined that the old sediment pond was stable under static and seismic conditions. The redesigned pond, constructed in conjunction with the surface facility expansion, does meet the minimum regulatory requirement of 1v:5h combined upstream and downstream side slopes. Refer to Appendix 7-4 for additional detail on the sediment pond.

5.34 Roads

The primary roads associated with the Crandall Canyon Mine have been located on the most stable available surfaces. They have been surfaced with materials (gravel, road base, asphalt, etc.) approved by the Division as being sufficiently durable for the anticipated volume of traffic and weight and speed of vehicles using the road. All roads falling under DOGM regulations are built on cut material and, as a result, no embankments were used during road construction. The roads are routinely maintained to include repairs to the road surface, blading, filling potholes and adding replacement surface material when needed. Culverts and ditches have been installed and are maintained to sustain the life of the roads during the operational life of the mine. See Plate 7-5A for the location of culverts and Appendix 7-11 for the culvert designs. See Section 5.27 for further information on these roads.

The area not designated as a primary road is the upper pad. This area has been asphalted to the approval of the Division. The pad is utilized for parking, loading and unloading of supplies and equipment, storage for those supplies, a staging area for new and rebuilt underground equipment, and access to the primary road to the portal area. It is maintained to include repair to the pad surface, blading, filling potholes and adding replacement surface material when needed. Roads within the permit area used for mining operations will comply to R645-301-534.100 through R645-534.340.

After the new expansion facilities were completed, the existing loadout facility, including the truckscales, were dismantled and removed from the site. The oil storage shed will also be rehabilitated. The area was then regraded and repaved, allowing the Forest Service road to be re-established as a two lane road. In addition, the existing roadway heading up to the truck turnaround area was widened by approximately 15 feet. This resulted in an additional third lane which can be used by the trucks as a stacking lane as they wait to be loaded. This will free up the existing road for unobstructed two way, two lane traffic to better accommodate public, Forest related use of the road.

The turn around area will also be widened to allow the trucks to turn in a standard counter-clockwise direction and thereby eliminate the present practice of clockwise cross traffic turn arounds.

The expanded coal storage capabilities and the new high-speed truck loading facilities now allow the trucks to be loaded in a continuous, uninterruped basis, thereby eliminating the major cause of tie-ups and congestion.

5.35 Spoil

There are no permanent refuse sites located on the property. All spoil is controlled and maintained as described in Section 5.28.30 and Section 7.54 of Chapter 7.

5.36 Coal Mine Waste

See Section 5.28 of this chapter.

5.37 Regraded Slopes

The following information supplied is incorporated within the currently approved mine plan and variances have been granted. If a slide should occur within the permit area, GENWAL will notify the regulatory authority and comply with the remedial measures required by the regulatory agency.

The applicant concurs, that 1:1 excavation slopes are not suitable in the superficial topsoil deposits and have included slope rounding of these slopes at 1.5:1. If the factor of safety of 0.72 was correct, most areas of the existing canyon would already have failed as the natural slope approaches 1:1 in the entire canyon. Any excavation slope greater than 1:1 (with exception of slope rounding) would be unrealistic and impose unnecessary impact far beyond the current limits. In many instances, a 1.5:1 excavation slope is not realistic as the topography of the canyon exceeds this value.

Careful monitoring of construction in critical areas will be necessary to identify and use the correct design profile (i.e. 1:1, 1/2:1, or 1/4:1 slopes). The stability of the recontoured slopes has been demonstrated by the interim reclamation in evidence at the property. A number of these slopes are in excess of the proposed 1.5 to 1 final reclamation contours and have been in place for over ten (10) years. GENWAL will continue to observe these slopes and in the event that a failure occurs or evidence of instability is noted, such as sloughing, tension fractures, etc., all appropriate regulatory authorities will be notified and an acceptable plan to modify the proposed final reclamation contours will be agreed upon at a minimum of five (5) years prior to cessation of mining.

The roads are used to access the portal and substation areas and operations area as shown on Plate 5-3. Cut slopes of 0.25h:1v for competent bedrock, 0.5h:1v for fractured bedrock and 1h:1v for shallow surficial deposits less than four feet deep overlaying bedrock are proposed for the portal access roads.

A slope stability investigation was submitted by Delta Geotechnical Consultants and is included as Appendix 5-19 with a safety factor of 0.72 for the shallow surficial deposits of the proposed 1:1 cut slopes. Since the safety factor does not comply with UMC 817.162 (c) requirements, cut slopes with 1:1 slopes will be rounded to 1.5:1 in the shallow superficial material. Appendix 5-16 is a stability analysis of the storage pad (upper pad) at the Crandall Canyon Mine prepared by EarthFax Engineering, Inc. A reclamation slope stability analysis has been prepared by JME Consultants and is included in Appendix 5-21. This analysis shows that the minimum static safety factor of 1.3 for the reclamation fill slopes will be met.

5.40 Reclamation Plan

NOTE: See Appendix 5-22(A) for the stand-alone reclamation plan for the East Mountain Emergency Drillpads and Access Roads. See Plate 1-1 for the location of these drillpads and access roads.

See Appendix 7-65 and 7-66 for operations and reclamation of the Burma Evaporative Pond and Treatment plant.

5.41 General

When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

Prior to final sealing of any openings, the BLM will require an on site inspection and a submission of formal sealing methods for approval of the BLM. The formal sealing methods will be presented as a plan including cross sections demonstrating the measures taken to seal or manage mine openings will comply with R645-301-529.100. At the time that the mine closure plan is submitted to the BLM, a copy will be forwarded to the Division for concurrence and approval and for addition to the mine plan on file. A copy will also be placed at the Emery County Recorder's office.

A formal plan will be submitted to the BLM for approval prior to final sealing of any openings. As per their on site inspection and plan approval, the openings will be sealed. All surface equipment, as well as structures, including all concrete foundations, will be removed by the applicant after the permanent cessation of operations.

5.41.10 Temporary Cessation

If operations are to be temporarily suspended for 30 days or longer, the applicant will submit a notice of intention to the Division. This notice will include a description of the extent and nature of existing surface and underground disturbance prior to temporary cessation. The statement will also cover the type of reclamation which will have been accomplished to date and also include the type of ongoing monitoring, number of opening closures, water treatment activities and other topographic rehabilitative efforts which have been or will be undertaken during this period. The applicant will maintain and secure the surface facilities and mine openings.

GENWAL will implement the temporary cessation regulations as follows:

(a) GENWAL shall effectively support and maintain all surface access openings to underground operations, and secure surface facilities in areas in which there are no current operations, but operations are to be resumed under an approved permit. Temporary abandonment shall not relieve GENWAL of its obligation to comply with any provisions of the approved permit.

(b) Before temporary cessation of mining and reclamation operations for a period of thirty days or more, or as soon as it is down that a temporary cessation will extend beyond thirty days, GENWAL shall submit to the Division a notice of intention to cease or abandon operations. This notice shall include a statement of the exact number of surface acres and the horizontal and vertical extent of subsurface strata which have been in the permit area prior to cessation or abandonment, the extent and kind of reclamation of surface area which will have been accomplished, and identification of the backfilling, regrading, revegetation, environmental monitoring, underground opening closures, and water treatment activities that will continue during the temporary cessation.

(c) Each mine entry which is temporarily inactive but has a further projected useful service under the approved permit application, shall be protected by barricades or other covering devices, fenced and posted with signs to prevent access into the entry and to identify the hazardous nature of the opening. These devices shall be periodically inspected and maintained in good operating condition by GENWAL.

(d) Each exploration hole, other drill hole, bore hole, shaft, well or other exposed underground opening which has been identified in the approved permit application for use to return underground workings, or to be used to monitor ground water conditions, shall be temporarily sealed until required for actual use.

5.42 Narratives, Maps, and Plans

5.42.10 Timetable

All reclamation, other than areas handled in interim reclamation, will commence with removal of the surface structures, redistribution of the cut and fill materials and final grading of disturbed surface areas. Within 30 days following completion of final grading (which should be in August), topsoil from the stockpile will be redistributed. Nutrients and soil amendments, if shown to be required by soil tests, shall be applied to the redistributed topsoil before the end of October. Seeding, transplanting and mulching will then proceed when moisture conditions are optimal for planting and seeding. Seeding will commence as soon as the seedbed is finished in the late fall. Tree planting will be done in conjunction with seeding or in the following spring, as soon as one can work the soil.

A reclamation sequence for the mine yard, including the proposed culvert expansion project, is described in Appendix 5-22.

Timetable-Reclamation Activities: First available season following cessation of mining

Normal Access- May 15,

Begin demolition- May 15
Structure removal- May 15 to June 30
Seal portals- Sept 1 to Sept 30
Asphalt Removal- June 15 to June 30
Earthwork/recontouring- May 15 to September 30
Topsoil redistribution- August 30 to Oct 15
Drainage Construction- Sept 1 to Sept 30
Hydroseeding- Sept 15 to Oct 30
Seeding/Planting- Oct 1 to Oct 30

Final Reclamation- (cessation of mining)

Year 1	May	June	July	Aug.	Sept.	Oct.
Structure Removal		———				
Portal Seals					——	
Asphalt Removal			—			
Earthwork/Re-contour		———	———	———	———	
Topsoil Redistribution/Final Grade					———	———
Drainage Construction					——	
Seeding/Mulching						——
Planting						——

Year 2 through 10

Vegetation Monitoring	July 1 to August 30
Hydrologic Monitoring	June 1 to Oct 30 (4 times)
Subsidence Monitoring	July 1 to Oct 30

5.42.20 Final Surface Configuration

All areas affected by surface operations will be graded and restored to approximate original contour. All final grading will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to the equipment operators. Backfilling and grading will proceed so as to eliminate the cut slopes and highwalls. Refer to Plates 5-16, 5-17, and 5-17A. The proposed culvert expansion project will supply all backfill material needed to achieve approximate original contour and to reclaim existing highwalls.

A reclamation map showing post construction interim reclamation area, Plate 7-5, and final reclamation, Plates 5-16, 5-17, and 5-17A, accompanies this document. Slope rounding on Plate 5-3 has been revised to meet the required slope of 1.5:1 at the specified reclaimed cross sections.

5.42.30 Interim Reclamation

All surface areas disturbed during construction and which are not needed for mining operations were revegetated in the fall of the year following completion of the construction. This revegetation was performed as described in Chapter 3 of this document.

Disturbed areas within the mine plan area that contribute water directly to the sediment pond have undergone interim reclamation. The goal of this reclamation was to achieve vegetative cover that will minimize erosion thus reducing the amount of soil material entering the sediment pond. To achieve this goal, a standard of 80% vegetative cover was met. Ocular estimates of cover are made each fall (early September) to determine if supplemental seeding is warranted.

A reclamation map showing post construction interim reclamation areas and final reclamation accompanies this chapter as Plate 5-17. The correct number of acres to be revegetated in final reclamation is 8.73 acres.

5.42.40 Bond Release

Before seeking bond release, GENWAL will provide a description of all temporary structures to be removed and reclaimed. No permanent sedimentation ponds, impoundments, and treatment

facilities that meet the requirements of the R645 rules for permanent structures will remain after final reclamation, Phase 2.

5.42.50 Timetable and Plans, Removal of Sedimentation Pond

The sediment pond will remain after the mining operations and through phase 1 reclamation until adequate revegetation has been established to control erosion. Reclaimed disturbed area drainages will be routed to the pond and diversions will be maintained to preserve the integrity of the pond until requirements of R645-301-763.100 have been met. These diversions can be found on Plate 5-16 and 7-5.

Upon approval of phase 1 revegetation, the sediment pond will be cleaned out and the material disposed of in the approved method. The sediment which accumulates in the sediment pond as a result of runoff from the reclaimed area should only be topsoil that has eroded from the reclaimed site (care will be taken not to mix the pond liner with this topsoil). This topsoil will be excavated, stockpiled and allowed to dry. Once the topsoil has been dried the sediment pond will be removed and the area regraded to remove any capability to impound water. Topsoil will be redistributed over the reclaimed sediment pond site and the area reseeded.

Removal of the sediment pond was included during final reclamation to comply with the direct request of the Price Office of the U.S. Forest Service.

5.42.60 Roads

The Forest Service Development Road from Huntington Creek to the Forest Service turn around will remain as part of the post mining land use in accordance with the Forest Service permit shown in Appendix 1-2. During reclamation, the Forest Service access road will be altered to comply with the special use permit. GENWAL has and maintains a "reclamation" bond with the Forest Service which covers the costs for the proposed post-mining road configuration.

As stipulated in the existing Forest Service special use permit (8/26/89) covering the road, during final reclamation the width of the road surface within the permit area will be reduced from a 27 foot subgrade and 22 foot running surface to a 20 foot subgrade and 14 foot running surface. Asphalt and subgrade removed from the permit area as part of this road narrowing will be taken to a RCRA-approved disposal site.

Based on recent correspondence, the Forest Service now indicates that it prefers to have the asphalt totally removed from the road surface upon final reclamation. GENWAL commits to reclaiming the road through the minesite to the specifications stated in the Road Use Permit.

All other roads used for the operation of the Crandall Canyon Mine, within the permit boundaries, will be reclaimed in accordance with R645-301-542.610 through R645-301-542.640.

5.42.70 Final Abandonment of Mine Openings and Disposal Areas

The old truck loadout was dismantled once the new loadout facility became operational. The loadout structures were removed and the excess coal around the area was cleaned up and hauled to the new coal stockpile area. This area will provide a place to store material as well as snow and salt in the winter time.

After the new loadout facilities was constructed, the existing loadout area was removed and the area rehabilitated and cleaned up. These rehabilitation measures include the following:

a) The existing loadout facilities will be dismantled and removed from the site, including the coal bin, crushers, scalehouse and loading chute.

b) The existing truck scale will be removed from the middle of the road and the roadway will be regraded and repaved.

c) The existing oil shed will be rehabilitated and the roadway will be regraded and repaved in this area.

d) The existing coal pile/storage area will be totally cleaned up. All coal and coal products will be removed. The area will then be swept and vacuumed.

e) The hillside below the coal storage area will be dressed up. The mine discharge waterlines will be relocated in a more orderly fashion. Coal products will be vacuumed from the hillside.

5.42.71 Closure and Management of Mine Openings

When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. Prior to the sealing of the mine openings, all combustible material will be removed from the underground bathhouse. All structures that will interfere with sealing of the mine openings will also be removed. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

All combustible material will be removed from underground and hauled to a state approved land fill. The portals will be backfilled with soil and two rows of solid concrete blocks placed across each entry and then backfilled to the surface and recontoured as shown on Plate 5-17. The block stoppings will be placed as far from the surface as is necessary to obtain a competent top and bottom.

5.42.72 Excess Waste

All waste material generated from the removal of the structures will be removed from the property and sold as scrap or disposed of in a state approved land fill. See Section 5.28 of this chapter for more detail on excess waste and spoil.

5.42.80 Estimate of Reclamation Costs

Estimate of reclamation costs are included under Appendix 5-20.

5.53 Backfilling and Grading

Backfilling and regrading of disturbed lands has been designed to restore all disturbed areas affected by surface operations to the approximate original contour of the land. This is made possible by the fill material required by the 1997 facility expansion project. Reclamation of affected areas, including revegetation is outlined in Chapter 3, Section 3.41.

During reclamation, the subsoils or backfill material will be laid down in 12" to 18" lifts and compacted through repeated travel by heavy equipment. This method has been utilized by a number of mines in the area and appears to give excellent compaction prior to topsoiling. In areas with slopes of less than 30%, the subsoil will be ripped to a depth of 18" prior to topsoil placement. In areas having average slopes of more than 30% the subsoil will be ripped to a depth of 12", where practical. Topsoil will then be redistributed in a manner that achieves an approximate, uniform stable thickness and other specifications stated in Chapter 2, Section 2.42 of this document.

5.53.10 Removal or Reduction of Cut Slopes and Highwalls

Prior to backfilling and grading of the highwall area above the portals and the cutslopes above the old coal loadout area and the pocket cuts at the south portals, existing shotcrete, wire mesh, clips, and other related material will be removed and disposed of in an appropriate manner. All noncombustible material generated from the removal of shotcrete will be disposed of underground (within the mine) prior to the sealing of the portals. All other waste generated will be removed and disposed of in an appropriate State permitted land fill.

Backfilling and grading will proceed so as to eliminate the cut slope, pocket cuts and highwall. Refer to Plate 5-3 for the highwall location. The cut slope above the coal stockpile area will be backfilled to match the approximate original contour with fill material from the Expansion Area pad. The Forest Service Trailhead Access Road will be left in place, but the surface will be modified to meet design specifications, as directed, by the Forest Service (see Appendix 1-2). See Plate 5-17 for the Forest Service road location.

The stability of the reclaimed highwall and cutslopes has a safety factor greater than 1.3 and is shown in Appendix 5-21.

No highwalls or remnants will remain after reclamation.

5.53.20 Terracing and Erosion Control

No terracing will be done. All final grading and surface preparation of overburden completed prior to the redistribution of the topsoil will be done along the contour to minimize erosion in areas with slopes less than 30%. In areas with slopes greater than 30% the grading, preparation and placement in a direction other than generally parallel to the contour will be used.

5.53.30 Refuse Piles

There are no refuse piles at the Crandall Canyon mine site.

5.53.40 Surface Coal Mining

There will be no surface coal mining at the Crandall Canyon Mine.

5.60 Performance Standards

All mining and reclamation operations at the Crandall Canyon Mine will be conducted in accordance with the R645 rules and this permit.

CHAPTER 5

FIGURES

Figure 5-4

Figure 5-5

Figure 5-8

Figure 5-9

Figure 10

APPENDIX 5-20

Bond Estimate (DOGM Determination)

APPENDIX 5-21

Reclamation Fill Stability Analysis At The Crandall Canyon Mine Emery County, Utah

March 12, 1997

APPENDIX 5-22

Crandall Canyon Mine Site Reclamation Plan

APPENDIX 5-23A

Blasting Plan

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5-3	Surface Facility Map
5-3A	Burma Pond As-Constructed
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5-18	Underground Bathhouse, As Built
5-19	Typical Road Sections, 3 sheets
5-20	Original Surface Contour Map

~~Note: Bold number plates and appendices are included with this submittal.~~

5.23.30 Underground Equipment

Typical mining equipment used in this area will be employed to mine coal in this permit area. Two continuous miners will be employed to mine coal in this lease area. The following is a list of equipment, or equivalent, that may be utilized underground and on the surface as required:

Joy Miners (2) 12 cm 12 (5.5 - 11.5' cutting height)

Roof Bolters (2)

HDDR 13 Fletcher (Min. 6' operating height) (2)

TD143 Lee Norse

Feeder Breakers (2) Stamler 54" (1) Long Airdox 118"

Battery powered scoops and face haulage

Various Electrical Equipment

Long Airdox continuous haulage system

Stamler continuous haulage system

The Longwall System will include:

4LS-2 Joy Longwall Shearer

Kloeckner-Becorit Shields (effective 5-7' height) H & B pan line

H & B head and tail drives

American Longwall Stage loader

Appurtenant pumps

Diesel shield haulers

Other appurtenant equipment as needed.

5.23.40 Geotechnical

Within the projected mining area, conclusions from existing drill hole data (see Appendix 6-5) and from BLM databases excludes the possibility of multiple minable seams being present. The coal seam to be mined on the GENWAL leases occur in the lower part of the Blackhawk Formation. The Formation is comprised of approximately 1000 feet of gray carbonaceous shales, siltstones, coals, and interbedded sandstones of late Cretaceous age. The Star Point Sandstone, a massive cliff forming 700 to 900 foot thick sandstone unit, underlies the Blackhawk Formation and its top serves as a useful lithologic landmark in the area.

An isopach map of the Hiawatha coal seam overburden appears in Plate 6-6. Overburden thickness above the area to be mined in the permit area ranges from 750' to 2400'. Coal pillar height ranges from 5' to 10' in the permit area. A uniaxial compressive strength of 2400 psi (geomechanical tests, Appendix 5-1) was used in the pillar safety factor calculations.

The formations in the physiographic area dip gently 1 to 3 degrees westward off the west flank of the San Rafael Swell. However, locally the mine is relatively flat experiencing a 0 to 2 degree dip to the southeast. The regional structure is broken by several north-south trending, high angle normal faults which offset the lithologic units from less than 1 foot to 250 feet or more. No faults are projected to be encountered within the proposed mine development area.

5.23.5(0) Initial Pillar Design

Methods used to evaluate safety factors of the pillar design are discussed in Appendix 5-2. Current data indicate that minimum acceptable safety factors range from 1.5 to 2.5. Calculations of previous pillar safety factors are found in Appendix 5-3. Lease ML-21568 pillar safety factors for rooms and main entries ranged from 1.37 to 1.96 and 1.39 to 2.45 respectively. Pillar safety factors for rooms and main entryways in Lease ML-21569 range from 1.47 to 2.45 and 1.78 to 4.37, respectively.

As the ratio of pillar length to height approaches 12, pillars are regarded as being able to bear and load. The pillar recovery plan currently approved by MSHA, DOGM, and the USFS was designed by GENWAL employees with the aid of MSHA Technical Support in Denver and information in a technical report "Coal Pillar Sizing, GENWAL Mine" prepared by Mr. Dan W. Guy of Blackhawk Engineering Co. on 10-1-84. The purpose of the Blackhawk Engineering Report was to evaluate the use of 60' x 60' centers on the entries and rooms during panel development.

5.23.50 Revised Pillar Design

Because pillar sloughage did not develop as had been previously calculated, a new pillar design study was undertaken to determine more precisely the existing site conditions. Using values obtained from the above studies, coupled with the new Seratta studies, and 10 years of mining experience at the Crandall Canyon Mine, a new pillar design was determined. The new data conclude that safety factors alone are not adequate for sizing pillars and that site specific overburden conditions must be considered. The table located on page 29 in Appendix 5-2 present the new factors of safety developed for pillar size and overburden thickness.

Roof span design is derived from the accepted practice in the Wasatch Plateau of 20 foot entry and crosscut widths. Previous experience in the Crandall Canyon and nearby mines have supported this roof span width. Roof span in Leases ML-21568 and ML-21569 is 20 feet in entries and crosscuts. Roof support bolting will consist of a minimum 4 foot resin pins with 5 foot centers during development of each section with the exception of the right-of-way UTU-66838. This lease has roof support consisting of a minimum of 4 foot resin pins with 4 foot centers. The floor of the coal seam grades from a clayey shale less than one foot thick to massive sandstone.

5.23.60 Barrier Perimeters

The barrier pillar around the perimeter of the property has been designed according to Utah mining regulations which is based upon the following formula:

Width = 2 * coal thickness of coal to be extracted in feet + 5 * overburden thickness in feet / 100 + 10'

The perimeter pillar is shown on Plate 5-2. The following selected points were used to establish the pillar size at various locations:

Location	Overburden	Barrier	Coal Height
1. Southwest Corner Tract 1	550 feet	50 feet	6 feet
2. Northwest Corner Tract 2	1550 feet	100 feet	6 feet
3. Western Boundary (Max.)	1700 feet	108 feet	6 feet
4. Northwest Corner U-054762	1500 feet	97 feet	6 feet

5.23.70 Annual Production of Coal

Annual coal production in 1991, 1992, 1993 and 1994 was 877,500, 1,178,089, 1,474,824 and 1,660,900 raw tons, respectively. During 1993-1995 total production tonnage was approximately 1,750,000 raw tons annually. This production was achieved by the use of continuous mining machines, continuous haulage equipment, and/or diesel driven coal haulers. From 1995 to the end of the century total production coal tonnage is forecasted to be 2,500,000 tons, with the aid of longwall mining.

5.23.80 Access To Future Reserves

Access to future reserves will be maintained by the North Mains entries, Main West entries, 1st North, and 1st Right sections. North Mains will maintain access to the mine as well as Main West. Main West will also maintain access to the west and to the South. 1st North will maintain access to the north and east, while 1st Right will maintain access to the north and west. (See Plate 5-2 and page 5-15A). Access to federal coal south and east of the Dellanback fee parcel (i.e., the South Crandall LBA) will be maintained.

5.23.90 Projected Mining by Future Permit for the Planned Life of the Mine

All coal around the permit area has the potential for future mining by the Crandall Canyon Mine. The projected mining for the Incidental Boundary Change area, the Dellanback fee parcel, and the South Crandall lease area is shown on Plate 5-2.

5.23.100 Operating Schedule and Employment

The mine employees approximately 125 people at present. The mine will operate four eight hour production shifts per day, five days a week. Two maintenance crews will operate 8 hours a day, five days a week, to accommodate rockdusting and general cleanup of the mine. When market or mining conditions dictate, production can be expanded to seven days per week, 52 weeks per year.

5.23.~~10~~110 Safety Training

The mine is equipped with modern emergency facilities and has an organized safety program. All mine employees are required to meet MSHA first aid and safety training requirements. Visitors are required basic training before entering the mine.

5.23.1~~1~~20 Fire Protection

Fire protection will be maintained in accordance with all Federal and State regulations pertaining to coal mining operations. Additionally the fire prevention plan can be found in Appendix 5-18.

5.23.1~~2~~30 Water Systems, Dust Suppression, Dewatering, and Electrical

The sump areas, as shown on Plate 5-4, will have a capacity of approximately 3.0 acre feet of water. The impoundment walls are constructed of concrete block with mortared joints and sealed on both sides. All the contact areas around the walls are sealed with concrete to prevent seepage. These sumps are constructed to allow the sediment to settle out and have an oil skimmer installed, as shown on Plate 5-4, to allow the water to be pumped directly to Crandall Creek under a UPDES permit. All water pumped to Crandall Creek will meet all effluent limitations and will be sampled in accordance with the UPDES permit requirements. Refer to Plate 5-3 for the location of the UPDES discharge point.

Horizontal movement which would create slope failure along the escarpment is not expected to occur due to subsidence because only limited coal outcrop occurs within the lease (the east side of the lease area). Within that area of old works no pillar extraction is anticipated.

As with areas in the western part of lease SL-062648 and at the Co-Op's Trail Canyon and Bear Canyon Mines and the Beaver Creek #4 mine, no escarpment failure has occurred. Horizontal movement creating tension or compression cracks can not be projected due to the overburden thickness and lack of jointing density and attitude data along the surface rock exposures.

In addition, GENWAL will second mine no closer than 200 feet to any outcrop (with the exception of portals) and, in accordance with Forest Service Stipulation #20, no mining will be done within a zone that might impact the Joes Valley Fault. This area is determined by a 22 degree angle-of-draw (from vertical) eastward from the surface expression of the Joes Valley Fault was used to project the outer limits of subsidence. Thus, subsidence will not intercept the Joes Valley Fault. If subsidence does occur along the western perimeter, all effects of the subsidence will be maintained within the mining permit boundary. No perennial streams will be affected. On the Dellenbach fee tract mining will not extend closer than 200 feet from the outcrop (other than portals) and no closer than 50 feet from the property boundaries. It should be noted that the mine projections and timing for the Dellenbach tract, and the South Crandall lease and the U-68082 lease mod area are shown on Plate 5-2.

It is accepted practice in this area to use two sources of information for subsidence evaluation. The sources are: 1) "Some Engineering Geologic Factors Controlling Coal Mine Subsidence in Utah and Colorado",Geologic Survey Professional Paper 969, by C. Richard Dunrud, 1976, and 2) "SME Mining Engineering Handbook", Volume 1, by Arthur B. Cummins and Ivan A. Given, 1973. The conclusions based upon the above source material are tempered by on site evaluation and actual experience based on similar mining conditions in late Cretaceous overburdens with similar thicknesses and strengths. The surface area topography within the lease is shown on Plate 3-1, 3-1a, 1-1 and others. The topographic map shows the relative steep sloping sides of the canyons which contains Crandall Canyon Creek, Blind Canyon Creek, and Horse Canyon Creek where rock outcrops are abundant. However, there are few, if any, talus slopes.

5.25.~~10~~09 Subsidence Control Plan

The Subsidence Control Plan contained herein addresses specifically those items that are required by R645-301-525 Pertaining to Subsidence. This plan is an amendment to the original application filed on December 17, 1980, by GENWAL the SUBSIDENCE CONTROL PLAN FOR GENWAL COAL COMPANY, INC., as prepared by David A. Skidmore and L. G. Manwaring of Coal Systems Inc., on August 28, 1981; and the Mid-term permit revisions dated 5-30-86. The format of the currently approved COAL SYSTEMS report will be used with the conclusions based upon the results of the drilling of the Blind Canyon seam which was obtained in April, 1985, and the Hiawatha seam data obtained to date during mine development. The original application was submitted pursuant to the following: Title 40, Chapter 10, Utah Code Annotated, 1943, as amended,

5.25.10 Surface Features and Facilities Subject to Subsidence.

An examination of the surface area as well as of state, federal, and county records indicate there are no man made structures, utilities right-of-ways and public or private resources necessitating protection from subsidence (Plates 5-12, 5-13, and 5-3) within the mine permit boundaries. In addition, aerial inspection of the permit and adjacent area confirmed the absence of existing man made structures. The occurrence of subsidence will not produce material damage or diminution of value of properties or foreseeable use of lands. Possible effects of mine subsidence on groundwater resources are discussed in Chapter 7. Creeks within the area include Crandall Canyon Creek, Blind Canyon Creek, and the left fork of Horse Canyon. Both forks of Crandall Creek are considered to be perennial at least up to the federal lease boundary with State Lease ML-21568.

The surface in the area is controlled and administered by the United States Forest Service with a small southern parcel of land owned by GENWAL (Plate 2-1). The land is used for domestic grazing in the areas of gentle slope and wildlife habitat and recreation over the total acreage. The vegetative resources will not be negatively impacted by subsidence. Thus, the current land use is expected to continue. Similar mining conditions and practices exist at Beaver Creek #4 Mine and CO-OP's Trail Canyon and Bear Creek mines and no significant loss of vegetation has occurred at those sites.

The Crandall Canyon Mine on the western half of lease SL-062648 has experienced second mining under conditions similar to Huntington Canyon and has not experienced any vegetation change, subsidence or escarpment failure. Visual impact will only be observed in the case of a total escarpment failure. Tension cracks, if any do develop, as viewed from the bottom of the canyons will not be visible and the maximum subsidence of three feet when viewed from below and at a distance of greater than ½ mile will not be visible. As per the USFS, there is no marketable timber in the area of potential subsidence.

Since the original submittal, several operations and construction modifications have been submitted to satisfy regulatory compliance requirements. Consideration was given to the subsidence experienced at nearby mines (CO-OP, Beaver Creek #4) exhibiting similar overburden composition and mining methods, on site inspections at the operating Crandall Canyon, CO-OP and Beaver Creek #4 mines and calculation based upon a generally accepted formulas using limited physical coal strength data in determining coal pillar sizes, barrier pillar design and direction of mining. The aforementioned mines were observed from the surface to note any surface effects from subsidence from pillar mining. No substantial affects from mining have been observed. The Crandall Canyon Mine has pillared coal in areas with as little cover as approximately 200' of overburden. The CO-OP

Overburden thicknesses in the upper perennial reaches of Crandall Canyon have been determine to be about 540 feet. Using a pillar size of 70 x 65 and the worst case analytical condition, the factor of safety has been calculated to be 2.2. The coal outcrops within Blind and Horse (both the north and south forks of Horse Canyon) Canyons are above the perennial portions of the stream. Thus, no subsidence will occur under perennial sections of Horse Canyon (the Blind Canyon drainage is ephemeral).

All state appropriated water within the subsidence zone of the South Crandall lease area is shown on Plates 7-14 and 7-15. Plates 5-2(H) and 5-2(BC) show the mine plan for the South Crandall lease area. Plate 5-2(H) shows the mine plan for the U-68082 lease mod area. These maps depict which areas will be longwalled (full extraction) and which areas will be developed as first-mining only. Subsidence Survey Letters of Notification to surface owners and water conservancy districts are included in Appendix 5-25.

The following state appropriated waters are located within the subsidence zone: 93-383, 93-381, 93-483, 93-191, 93-190 and 93-1180. Information about quality, quantity, and ownership of these waters can be found in Chapter 7, Table 7-6, and in Appendix 7-1.

5.25.14 Subsidence Monitoring

~~The applicant commits to implement the proposed subsidence control plan and applicant hereby incorporates the same into this submittal.~~ An aerial monitoring system for the Crandall Canyon Mine which has been accepted for implementation and vertical and horizontal control have been established using ground control stations, shown on Plate 5-5. (The program is included as Appendix 5-8). Baseline flight lines were flown over Sections 31 and 32 of T15S R9E, Sections 5 and 6 T16S R7E, Sections 1 and 2 T16S R6E, and Sections 35 and 36 T15S R6E in October of 1989. Selected portions and/or all of Sections 34, 35, and 36 T15S R6E and Sections 2 and 3 T16S R6E (Plate 5-5) will be included in the 1995 Fall Survey to ensure that all projected mined areas within LBA#9 are included in the subsidence monitoring program. Control points within and adjacent to the leased area (including the South Crandall lease area) have been established and located by surveying practices. Prior to mining the area was photographed and a pin map was generated.

Aerial surveys will be conducted by GENWAL each year for the areas above and within the 20 degree angle of draw of the actual mined area. Based on a written request by the Forest Service, GENWAL is revising the subsidence monitoring plan. Monitoring will now be conducted annually until subsidence of less than one foot has been measured for three consecutive surveys showing that subsidence is substantially complete.

The following information will be forwarded to the Division on an annual basis when it becomes available:

1. A current map of the underground workings with areas delineated as to where the second mining will begin.
2. The approximate dates when second mining will commence and terminate.
3. The date of monitoring.
4. The vertical and horizontal positions of all monitoring points and pins, directly over and within the 20 degree angle of draw to the mined area, surveyed by aerial photography for that specific year.

There was and has been no evidence of escarpment subsidence or failure. There are no further plans to monitor escarpments in the area not visible from Huntington or Crandall Canyons. The subsidence/escarpment survey results were recorded and submitted to the appropriate regulatory authority. No escarpment failure occurred.

**As of December, 2015, all subsidence monitoring requirements have been successfully met, and there has been no subsidence above 1 foot for the last 5 years. The mine has been temporarily idled after the accident in August, 2007, and mining is anticipated to resume after market conditions improve. In the event of future mining, subsidence monitoring will be continued.

5.25.15 Anticipated Effects of Planned Subsidence

If subsidence does occur, surface effects may include minimal ground lowering and temporary tensional fractures at the margins of the subsided area. Any subsidence occurring on the 160 acre Dellenbach fee tract should have minimal effects on the surface. There are no escarpments, raptor nests, archeology site, streams or springs located the Dellenbach tract. This tract (surface and underground) is privately owned by Genwal Resources Inc. The tract is within the presently approved permit area and is included in the current subsidence monitoring plan.

Subsidence monitoring for the South Crandall lease area and the U-68082 lease mod area will be done according to the existing plan approved for the Crandall Canyon mine. Pre-subsidence base-line aerial surveys have been completed and the initial survey control monuments have been installed on the ground. Additional control points (monuments) will be installed as mining progresses. (Refer to Plates 5-2 and 5-5 for the location of the existing and future monuments.)

In much of the area of the South Crandall lease area, both the Hiawatha and the Blind Canyon seams are proposed for full extraction longwall mining. In these areas the combined thickness of both seams ranges upward to about 12 feet. If surface subsidence in these areas is 80% of total mined seam thickness, then it may be possible to see nearly 10 feet of subsidence in some areas of the lease after mining. It should be noted that the Forest Service and BLM have imposed a special stipulation in the South Crandall federal lease specifically to provide additional protection to the Little Bear spring system. These lease stipulations prohibit full-extraction mining in the following areas;

a) area under the Little Bear stream channel with less than 600' of overburden.
b) area within 1000' of the southeast corner of the lease (to protect the Mill Fork graben.)
c) area within 1000' of southern boundary of lease (to protect possible water-bearing fracture system.)

GENWAL personnel will conduct a surface inspection of all areas where subsidence has occurred no sooner than 6 months but no later than 12 months after extraction mining has occurred.

5.26.10 Specifications for Shotcreting Cut Slopes

Average slope:	1/3:1
Matting:	11 gauge 2" x 4" or 9 gauge 4" x 4" wire mesh 6' wide x full length of slope
Securement:	5/8" x 24" long bolts w/ plates or 3/4" x 24" long rebar type anchors w/ plates
Drainage:	2" PVC pipe, 24" long, perforated, located at top and bottom of slope, 6' to 10' on centers. Pipes will be inset into the slope with the end extending outside the shotcrete. Drainage of the slope will be collected by the 2" PVC pipes and allowed to flow to the outside of the shotcrete.
Shotcrete: (per batch)	1800 lbs sand 800 lbs pea gravel 425 lbs cement 400 lbs fly ash
Application:	Applied with a Reed Sova III or Reed M40 pump w/ accelerator. Minimum thickness applied 2"

See Figure 5-10 for a cross sectional detail of shotcrete application.

This MRP covers the expansion of the surface facilities as shown on Plate 5-3. It should be noted that this represents the initial phase of the Crandall Canyon mine surface improvement. As shown, surface improvements will include a new intake portal, a new belt conveyor portal and a new fan portal.

In the fall of 2009 the company constructed a facility on the surface to treat the excessive iron content in the mine discharge water. Details of this facility can be found in Appendix 7-65.

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5.26.317 Water Pollution Control

See "Waste Disposal Plans" under the Mining Operation section of this chapter.

In the fall of 2009 the company constructed a facility on the surface to treat the excessive iron content in the mine discharge water. Details of this facility can be found in Appendix 7-65

5.26.418 Air Pollution Control

Coal mining and reclamation activities will be conducted in accordance with R645-301-420 and the Air Quality Approval Order issued by the Utah Division of Air Quality (Appendix 4-7).

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5.26.2119 Utility Installation and Protection

All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction, or disruption of services provided by oil, gas, and water wells; oil, gas, and coal slurry pipelines, railroads; public utilities; etc. which pass over, under, or through the permit area, unless otherwise approved by the owner of those facilities and the Division.

5.26.220 Operation of Support Facilities

Support facilities will be operated in accordance with a permit issued for the mine to which it is incident or from which its operation results.

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Noxious weeds have not occurred in abundance for the previous 3 years. Weeds such as thistle that have been noticed are few and far between and have been controlled by physical removal as needed. If a large quantity of noxious weeds occur, appropriate sprays will be used.

5.27 Transportation Facilities

The coal from the mine will be transported to the rail loadout or final destination by truck. The trucks are typical 45 ton tandem trailer coal haulers used in the Utah coal fields. GENWAL uses a loading site on the Utah Railway located at Mohrland, Utah, a loading facility on the Southern Pacific Railway in Wellington, Utah, and other independently owned loadouts within the Carbon/Emery county area.

material. Scrap metal and used equipment will be removed from the mine unless safety considerations prevent removal.

Oil contaminated soil from the gas and oil storage area will be disposed of prior to reclamation or moving of the facility. If oil or gas spills occur outside the containment area, the spill will be contained, cleaned up and disposed of in a permitted facility. The contaminated material will be disposed of at a facility licensed to accept oil/gas contaminated soil or remediated onsite with appropriate approvals from the pertinent regulatory agencies.

5.28.40 Processing Waste

No processing waste is generated at the Crandall Canyon Mine. Only coal is removed from the mine, all of which is trucked off site and sold. Exploratory drill hole data and mining conditions indicate that no development or processing waste will be produced. However, in the unlikely event either rock, development and/or processing waste is encountered, and the volume of waste generated exceeds the capacity that can be disposed of along pillar lines, GENWAL commits to disposing of the waste in a DOGM approved disposal facility. GENWAL will notify and consult with DOGM regarding disposal sites. All disposal operations will be in compliance with Utah Coal Mining regulations R645-301-536 and R645-301-746.

5.28.50 Hazardous Wastes

In the unlikely event that hazardous or toxic material is encountered, GENWAL will notify the Division as well as the State Health Department; the hazardous or toxic material(s) will be disposed of at a facility permitted to accept the specific contaminants found.

5.28.60 Sediment Pond Waste

Sediment removed from the pond during the cleaning process will be hauled to an approved waste disposal facility. Prior to cleaning the sediment pond, representative sediment samples will be collected and analyzed for any acid- and/or toxic forming materials (as listed on page 5-39A). If the analytical results exceed the toxic limit, the waste material will be handled and disposed of in compliance with regulations applicable to acid- and/or toxic forming materials. GENWAL will notify DOGM if the analytical results of the samples show that acid or toxic forming materials are present.

5.28.70 Sanitary Waste

There are less than 10 regularly assigned employees on the surface per shift. These surface employees use the bathhouse for their sanitary waste needs. Waste from the underground bathhouse toilets and showers is pumped to a holding tank located underground. When required the holding tank is pumped and the materials are disposed of by a licensed contractor at a State Health approved disposal site (See Appendix 5-12). GENWAL will keep records of the sewage pumped from the tank by the contractor. The sanitary waste needs for the miners underground will be handled in accordance with MSHA regulations.

5.29 Management of Mine Openings

Five portals have been placed on the Star Point Sandstone in the Hiawatha coal seam. Four of the five portals are used while one of the portals is sealed. Three portals are used for intake ventilation, beltline, and return ventilation. The fourth portal opening is used for access to the underground bathhouse. Two identical fans located at the return portal will operate in parallel. One fan will discharge horizontally and the second vertically.

These portals existed during previous mining attempts and will be utilized during current mining operations. The highwall above the portals has been secured and canopies have been installed to maintain the portals at MSHA standards. During operation of the Crandall Canyon Mine, access to all mine openings are controlled by the operator during working and nonworking hours. Due to public access through the mine site, a security person is located at the mine during times of no work or when surface personnel are not present. Permanent sealing of underground openings is discussed in Section 5.42.71 of this chapter.

5.30 Operational Design and Plans

5.32 Sediment Control

The design of the sediment control structures is presented in Chapter 7, Section 7.42 of this document. The designs are intended to minimize the disturbance to the hydrologic balance by ~~disturbuting~~distributing the smallest practical area at any one time during the mining operation through progressive backfilling, grading, and prompt revegetation as required in R645-310-353.200, and to stabilizing the backfilled material to promote a reduction of the rate and volume of runoff in accordance with the regulations.

The roads are used to access the portal and substation areas and operations area as shown on Plate 5-3. Cut slopes of 0.25h:1v for competent bedrock, 0.5h:1v for fractured bedrock and 1h:1v for shallow surficial deposits less than four feet deep overlaying bedrock are proposed for the portal access roads.

A slope stability investigation was submitted by Delta Geotechnical Consultants and is included as Appendix 5-19 with a safety factor of 0.72 for the shallow surficial deposits of the proposed 1:1 cut slopes. Since the safety factor does not comply with UMC 817.162 (c) requirements, cut slopes with 1:1 slopes will be rounded to 1.5:1 in the shallow superficial material. Appendix 5-16 is a stability analysis of the storage pad (upper pad) at the Crandall Canyon Mine prepared by EarthFax Engineering, Inc. A reclamation slope stability analysis has been prepared by JME Consultants and is included in Appendix 5-21. This analysis shows that the minimum static safety factor of 1.3 for the reclamation fill slopes will be met.

5.40 Reclamation Plan

NOTE: See Appendix 5-22(A) for the stand-alone reclamation plan for the East Mountain Emergency Drillpads and Access Roads. See Plate 1-1 for the location of these drillpads and access roads.

See Appendix 7-65 and 7-66 for operations and reclamation of the Burma Evaporative Pond and Treatment plant.

5.41 General

When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

Prior to final sealing of any openings, the BLM will require an on site inspection and a submission of formal sealing methods for approval of the BLM. The formal sealing methods will be presented as a plan including cross sections demonstrating the measures taken to seal or manage mine openings will comply with R645-301-529.100. At the time that the mine closure plan is submitted to the BLM, a copy will be forwarded to the Division for concurrence and approval and for addition to the mine plan on file. A copy will also be placed at the Emery County Recorder's office.

A formal plan will be submitted to the BLM for approval prior to final sealing of any openings. As per their on site inspection and plan approval, the openings will be sealed. All surface equipment, as well as structures, including all concrete foundations, will be removed by the applicant after the permanent cessation of operations.

~~5.41.10MW-1 Supply Well Abandonment~~

~~Upon permanent cessation of mining operations, the water supply well, MW-1, will be permanently abandoned in accordance with regulations promulgated by the Utah Division of Water~~

~~Rights. This will include filling of the well with a neat cement grout in accordance with the regulations.~~

Temporary Cessation

If operations are to be temporarily suspended for 30 days or longer, the applicant will submit a notice of intention to the Division. This notice will include a description of the extent and nature of existing surface and underground disturbance prior to temporary cessation. The statement will also cover the type of reclamation which will have been accomplished to date and also include the type of ongoing monitoring, number of opening closures, water treatment activities and other topographic rehabilitative efforts which have been or will be undertaken during this period. The applicant will maintain and secure the surface facilities and mine openings.

GENWAL will implement the temporary cessation regulations as follows:

(a) GENWAL shall effectively support and maintain all surface access openings to underground operations, and secure surface facilities in areas in which there are no current operations, but operations are to be resumed under an approved permit. Temporary abandonment shall not relieve GENWAL of its obligation to comply with any provisions of the approved permit.

(b) Before temporary cessation of mining and reclamation operations for a period of thirty days or more, or as soon as it is down that a temporary cessation will extend beyond thirty days, GENWAL shall submit to the Division a notice of intention to cease or abandon operations. This notice shall include a statement of the exact number of surface acres and the horizontal and vertical extent of subsurface strata which have been in the permit area prior to cessation or abandonment, the extent and kind of reclamation of surface area which will have been accomplished, and identification of the backfilling, regrading, revegetation, environmental monitoring, underground opening closures, and water treatment activities that will continue during the temporary cessation.

(c) Each mine entry which is temporarily inactive but has a further projected useful service under the approved permit application, shall be protected by barricades or other covering devices, fenced and posted with signs to prevent access into the entry and to identify the hazardous nature of the opening. These devices shall be periodically inspected and maintained in good operating condition by GENWAL.

(d) Each exploration hole, other drill hole, bore hole, shaft, well or other exposed underground opening which has been identified in the approved permit application for use to return underground workings, or to be used to monitor ground water conditions, shall be temporarily sealed until required for actual use.

5.42 Narratives, Maps, and Plans

5.42.10 Timetable

All reclamation, other than areas handled in interim reclamation, will commence with removal of the surface structures, redistribution of the cut and fill materials and final grading of disturbed surface areas. Within 30 days following completion of final grading (which should be in August), topsoil from the stockpile will be redistributed. Nutrients and soil amendments, if shown to be required by soil tests, shall be applied to the redistributed topsoil before the end of October. Seeding, transplanting and mulching will then proceed when moisture conditions are optimal for planting and seeding. Seeding will commence as soon as the seedbed is finished in the late fall. Tree planting will be done in conjunction with seeding or in the following spring, as soon as one can work the soil.

A reclamation sequence for the mine yard, including the proposed culvert expansion project, is described in Appendix 5-22.

Timetable-Reclamation Activities: First available season following cessation of mining

Normal Access- May 15,

Begin demolition- May 15
Structure removal- May 15 to June 30
Seal portals- Sept 1 to Sept 30
Asphalt Removal- June 15 to June 30
Earthwork/recontouring- May 15 to September 30
Topsoil redistribution- August 30 to Oct 15
Drainage Construction- Sept 1 to Sept 30
Hydroseeding- Sept 15 to Oct 30
Seeding/Planting- Oct 1 to Oct 30

Final Reclamation- (cessation of mining)

Year 1	May	June	July	Aug.	Sept.	Oct.
~~Struct. remove~~ Structure Removal				_____		
Portal Seals					____	
Asphalt ~~remove~~Removal				___		
~~Earthwork/recontour~~Earthwork/Re-contour				_____		
Topsoil ~~redistribution/final g~~Redistribution/Final Grade						_____
Drainage Construction					____	
Seeding/Mulching						____
Planting						____

Year 2 through 10

Vegetation Monitoring	July 1 to August 30
Hydrologic Monitoring	June 1 to Oct 30 (4 times)
Subsidence Monitoring	July 1 to Oct 30

5.42.20 ~~through 5.42.32~~ Final Surface Configuration

All areas affected by surface operations will be graded and restored to approximate original contour. All final grading will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to the equipment operators. Backfilling and grading will proceed so as to eliminate the cut slopes and highwalls. Refer to Plates 5-16, 5-17, and 5-17A. The proposed culvert expansion project will supply all backfill material needed to achieve approximate original contour and to reclaim existing highwalls.

A reclamation map showing post construction interim reclamation area, Plate 7-5, and final reclamation, Plates 5-16, 5-17, and 5-17A, accompanies this document. Slope rounding on Plate 5-3 has been revised to meet the required slope of 1.5:1 at the specified reclaimed cross sections.

5.42.30 Interim Reclamation

All surface areas disturbed during construction and which are not needed for mining operations were revegetated in the fall of the year following completion of the construction. This revegetation was performed as described in Chapter 3 of this document.

Disturbed areas within the mine plan area that contribute water directly to the sediment pond have undergone interim reclamation. The goal of this reclamation was to achieve vegetative cover that will minimize erosion thus reducing the amount of soil material entering the sediment pond. To achieve this goal, a standard of 80% vegetative cover was met. Ocular estimates of cover are made each fall (early September) to determine if supplemental seeding is warranted.

A reclamation map showing post construction interim reclamation areas and final reclamation accompanies this chapter as Plate 5-17. The correct number of acres to be revegetated in final reclamation is 8.73 acres.

5.42.40 Bond Release

Before seeking bond release, GENWAL will provide a description of all temporary structures to be removed and reclaimed. No permanent sedimentation ponds, impoundments, and treatment

5.42.72 ~~through 5.42.742~~ Excess Waste

All waste material generated from the removal of the structures will be removed from the property and sold as scrap or disposed of in a state approved land fill. See Section 5.28 of this chapter for more detail on excess waste and spoil.

5.42.80 Estimate of Reclamation Costs

Estimate of reclamation costs are included under Appendix 5-20.

5.53 Backfilling and Grading

Backfilling and regrading of disturbed lands has been designed to restore all disturbed areas affected by surface operations to the approximate original contour of the land. This is made possible by the fill material required by the 1997 facility expansion project. Reclamation of affected areas, including revegetation is outlined in Chapter 3, Section 3.41.

During reclamation, the subsoils or backfill material will be laid down in 12" to 18" lifts and compacted through repeated travel by heavy equipment. This method has been utilized by a number of mines in the area and appears to give excellent compaction prior to topsoiling. In areas with slopes of less than 30%, the subsoil will be ripped to a depth of 18" prior to topsoil placement. In areas having average slopes of more than 30% the subsoil will be ripped to a depth of 12", where practical. Topsoil will then be redistributed in a manner that achieves an approximate, uniform stable thickness and other specifications stated in Chapter 2, Section 2.42 of this document.

5.53.10 Removal or Reduction of Cut Slopes and Highwalls

Prior to backfilling and grading of the highwall area above the portals and the cutslopes above the old coal loadout area and the pocket cuts at the south portals, existing shotcrete, wire mesh, clips, and other related material will be removed and disposed of in an appropriate manner. All noncombustible material generated from the removal of shotcrete will be disposed of underground (within the mine) prior to the sealing of the portals. All other waste generated will be removed and disposed of in an appropriate State permitted land fill.

Backfilling and grading will proceed so as to eliminate the cut slope, pocket cuts and highwall. Refer to Plate 5-3 for the highwall location. The cut slope above the coal stockpile area will be backfilled to match the approximate original contour with fill material from the Expansion Area pad. The Forest Service Trailhead Access Road will be left in place, but the surface will be modified to meet design specifications, as directed, by the Forest Service (see Appendix 1-2). See Plate 5-17 for the Forest Service road location.

The stability of the reclaimed highwall and cutslopes has a safety factor greater than 1.3 and is shown in Appendix 5-21.

No highwalls or remnants will remain after reclamation.

5.53.20 Terracing and Erosion Control

No terracing will be done. All final grading and surface preparation of overburden completed prior to the redistribution of the topsoil will be done along the contour to minimize erosion in areas with slopes less than 30%. In areas with slopes greater than 30% the grading, preparation and placement in a direction other than generally parallel to the contour will be used.

5.53.30 Refuse Piles

There are no refuse piles at the Crandall Canyon mine site.

5.53.40 Surface Coal Mining

There will be no surface coal mining at the Crandall Canyon Mine.

5.60 Performance Standards

All mining and reclamation operations at the Crandall Canyon Mine will be conducted in accordance with the R645 rules and this permit.

Appendix 5-20

Bonding Information

RECLAMATION COST ESTIMATE

CRANDALL CANYON MINE

EMERY COUNTY, UTAH

DECEMBER 2015

Prepared for:

COAL SERVICES GROUP

ST. CLAIRSVILLE, OHIO

Prepared by:

J. T. Paluso, P. E.

EIS ENVIRONMENTAL & ENGINEERING CONSULTING

Helper, Utah

Coal Services Group

On September 18, 2015, EIS Environmental & Engineering Consulting (EIS) was given permission by Mr. Brain Bailey of Coal Services Group to determine the reclamation costs associated with Crandall Canyon Mine located in Emery Country, Utah. Reclamation costs were based upon reclamation plans that are currently approved by the Utah Division of Oil, Gas, and Mining (UDOGM) and are calculated as of November 30, 2015.

The following procedures were used to develop the reclamation and salvage costs.

1. The quantities from Mining and Reclamation Plans were used to develop the new reclamation cost.

2. *R. S. Means Building Construction Cost Data 74th Annual Edition* was used to determine demolition costs. The *Caterpillar Performance Handbook Edition 45th* was used to determine equipment types base on equipment listed in the reclamation plan. The equipment operating costs and labor costs were determined using an average costs from the local contractors.

3. Salvage value for major surface equipment could not be determined because the information could not be found that described the type of equipment being used and the condition of this equipment during final reclamation.

4. Calls were made to local steel salvage yards to get an average cost for salvage value for structural steel. The average salvage cost for structural steel is $65.00 per ton.

5. Approximately 1% of the total volume of a building is structural steel. This is based upon information developed from mines, which are located in Carbon County.

6. Information concerning seed mix and plants to be transplanted at the facility was obtained from the UDOGM. The quantities of plants and seed mix were obtained from UDOGM. Costs were obtained from Maple Leak Seed International.

Final Mine Costs

Reclamation	**$1,607,329**
Salvage Value	**$ 36,706**

CALCULATIONS

Crandall Canyon Mine
C/015/032

30 November 2015

Bond Amount

Direct Costs		
Subtotal Demolition and Removal	$785,560	
Subtotal Backfilling and Grading	$421,393	
Subtotal Revegetation	$86,267	
Subtotal Direct Costs	$1,293,221	
Indirect Costs		
Mob/Demob	$129,322	10.0%
Contingency	$64,661	5.0%
Engineering Redesign	$32,331	2.5%
Main Office Expense	$87,939	6.8%
Project Management Fee	$32,331	2.5%
Subtotal Indirect Costs	$346,583	26.8%
Subtotal	$1,639,804	
Salvage Cost	$36,706	
Total	$1,603,098	

Cost factors

Means Number	Material	Unit Cost	Units
Concret Demo1	Concrete Demolition	11.72	CY
31 23 16.42 1300	Front End Loader 3 CY	2.09	CY
31 23 23.20 1025	12 CY (16 ton) Dump Truck 5 mi. rod.trip	13.35	CY
City Sanitation Price	City Sanitation	3.09	CY
02 41 16.13 0020	Steel bld. Large	0.28	CF
	Utility Pole	103.00	EA
02 41 13.30 0800	Guard Rail	12.17	LF
02 41 13.60 1700	Chain link, posts & fabric remove only	3.07	LF
23 05 05.10 3600	Mechanical equipment heavy	795.00	Ton
31 23 16.42 0260	Backhoe, hydraulic Bulk Bank Measure	1.44	CY
02 65 10.30 1029	9000 gal to 12000 gal tank	1050.00	EA
02 65 10.30 0130	9000 gal to 12000 gal tank	1325.00	EA
Nielson Con	Nielson Construction	7.21	Ton
31 23 23.20 1025	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	10.80	CY
02 41 16.17 4200	On Site Disposal	9.07	CY
02 41 13.56 1900	Wire Removal	5.39	LF
26 05 05.10 1900	Wire Removal	19.60	LF
26 05 05.10 0160	Conduit	5.50	LF
22 05 05.10 1140	Fixtures	94.50	EA
02 41 16.13 0080	Masonry bld. Large	0.31	CF
AML1	Seal Portals	5200.00	EA
02 41 16.13 0100	Mixture of types, average	0.31	CF
AML 3	Plug Well	5000.00	EA
02 41 16.13 0050	Concrete bld. Large	0.40	CF
31 23 16.42 0260	Backhoe, hydraulic Bulk Bank Measure	1.44	CY
02 41 13.17 5010	Pavement Removal, Bituminous 3"	4.33	SY
31 25 14.16 1000	Silt Fence	1.15	LF
31 37 13.10 0370	Riprap Dumped 300 lb. average	30.52	Ton
	Bare root seedinings 11" to 16" med. Soil	1.35	EA
Reveg 005	Hydro Spreader (equip. & labor)	20.40	MSF
Crandall 15321	Seed Non Riparian Area	281.83	$/Ac
Reveg 002	Hydro Spreader (equip. & labor)	20.40	MSF
Reveg 001	Hay 1" Material Only	132.00	MSF
Crandall 15322	Transplant Non Riparian	206.05	$/Ac
Crandall 15323	Transplant North Slope	1915.00	$/Ac
Crandall 15324	Seed Riparian Area	289.88	$/Ac
Crandall 15325	Transplant Riparian	554.39	$/Ac
01 54 33 4360	D9R Semi-U EROPS (9-52) (2H2077)	200.00	
01 54 33 4360	Hourly Cost		
01 54 33 4870	988G II ((6-13) 1H2008) 2005	190.00	
01 54 33 4870	Hourly Cost		
01 54 33 5600	769D (21-11) (2nd2007)	160.00	
01 54 33 5600	Hourly Cost		

01 54 33 0320	CAT 385B	275.00	
01 54 33 0320	Hourly Cost		
01 54 33 5300	Dump Truck	100.00	
01 54 33 5300	Hourly Cost		
04 54 33 0470	446D Backhoe Loaders	95.00	
01 54 33 0470	Hourly Cost		
01 54 33 6950	6,000 Gal H2O Truck Diesel (2nd2008)	125.00	
01 54 33 6950	Hourly Cost		
01 54 33 7200	Pick-up Truck 4x4 1 Ton	40.00	
01 54 33 7200	Hourly Cost		
	Foreman Average Outside	42.00	
	Labor	32.00	
	Heavy Equip. Operator (Heavy)		
	Heavy Equip. Operator (Med)		
01 54 33 4310	D7R Semi-U EROPS	165.00	
01 54 33 4310	Hourly Cost		
01 54 33 0300	Cat 350	350.00	
01 54 33 0300	Hourly Cost		
01 54 33 0470	Cat 420	85.00	
01 54 33 0470	Hourly Cost		
02 41 13.232930	Demolilton 18" CMP	17.40	LF
31 23 16.13 0050	Excavate 3/8 CY excavator	7.19	CY

Demolition and Removal	
Shop 01	37363
Ventilation Fan 02	11827
Rock Dust Silo 03	1926
Concrete Dump Pad 04	7662
Power Center 05	21109
Power Poles 06	5263
Underground Bathhouse 07	9115
Portals 08	31200
Belt Portals 09	5200
Crusher Pad 10	4476
Mine Belt 11	1988
Silo 13	47260
Weight Shed 14	550
Bulk Oil 15	10776
Truck Pad 17	1119
General Storage 18	16433
Reclaim Hopper Belt 19	3975
Visual Disconnect 20	18
New Shop 21	14595
Shop Extension 22	4382
Shotcrete Slopes 23	1611
Fan Transformer 24	247
Chain Link Fence 25	368
Concrete Guard 26	2498
Retaining Wall 27	4743
Culverts 28	6803
Guard Rail 29	1460
Inlets 30	1353
Sed Pond Culvert 31	47
Gabion Retaining Wall 32	2983
Water Wells 33	20000
Headwalls 34	5611
Overland Conveyor Supports 35	1020
Reclaim Tunnel 36	3042
Feeder Boxes 37	4009
Reclaim Conveyor Supports 38	108
Crusher Platform Supports 39	1527
Feeder Conveyor Supports 40	108
Scale Pad 41	7039
New Scale House 42	2153
Proposed Bathhouse 43	0
Coal Silo 44	3074
Conveyor 45	8526
Parking Lot 46	61730
Rubber Liner 47	25838
Culvert Bedding Removal 48	147691
Off Site Dump Fee 49	159952
Drainage Control 50	67542
Water Treatment Area 51	7771
Burma Basin 52	468
	785560

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Shop 01																		
		Structure's Demolition Cost	Steel bld. Large	02 41 16.13 0020	0.28	CF	160	20	20							FT		64000	CF	17920
		Structure's Vol Demolished															0.35	830	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi, rod.trip	31 23 23.20 1025	13.35	CY												830	CY	11076
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		830	Ton	5982
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concrete Demolition	11.72	CY	160	20	0.5							FT		59	CY	695
		Concrete's Vol. Demolished															1.3	77	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												77	CY	161
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.80	CY												77	CY	832
		Disposal Cost	On Site Disposal		9.07	CY												77	CY	699
		Subtotal																		2386
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		37363

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Ventilation Fan 02																		
		Structure's Demolition Cost	Steel bld, Large	02 41 16.13 0020	0.28	CF	60	20	16.67							FT		20004	CF	5601
		Structure's Vol Demolished															0.35	259	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												259	CY	3462
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		259	Ton	1870
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		[illegible]
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	60	20	0.5							FT		22	CY	260
		Concrete's Vol. Demolished															1.3	29	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												29	CY	60
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												29	CY	312
		Disposal Cost	On Site Disposal		9.07	CY												29	CY	262
		Subtotal																		[illegible]
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		11827

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Rock Dust Silo 03																		
		Structure's Demolition Cost	Steel bld, Large	02 41 16.13 0020	0.28	CF			30	12						FT		3393	CF	950
		Structure's Vol Demolished															0.35	44	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												44	CY	587
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		44	Ton	317
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		1554
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	2	3	2							4	FT	2	CY	21
		Concrete's Vol. Demolished															1.3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												2	CY	5
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												2	CY	25
		Disposal Cost	On Site Disposal		9.07	CY												2	CY	21
		Subtotal																		72
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		1926

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Concrete Dump Pad 04																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	30	25	1							FT		28	CY	326
		Concrete's Vol. Demolished															1.3	36	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												36	CY	75
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												36	CY	390
		Disposal Cost	On Site Disposal		9.07	CY												36	CY	328
		Subtotal																		1119
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	135	130	0.25							FT		163	CY	1905
		Concrete's Vol. Demolished															1.3	211	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												211	CY	442
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												211	CY	2282
		Disposal Cost	On Site Disposal		9.07	CY												211	CY	1916
		Subtotal																		6544
		Total																		7662

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Power Center 05																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Mechanical Equipment	Mechanical equipment heavy	23 05 05.10 3600	795.00	Ton							5				Ton		5	Ton	3975
		Transformer	Mechanical equipment heavy	23 05 05.10 3600	795.00	Ton							2				Ton		2	Ton	1590
		Underground Wire	Wire Removal	02 41 13.56 1900	5.39	LF	900										LF		900	LF	4851
		Aerial Wire	Wire Removal	26 05 05.10 1900	19.60	LF	500										LF		500	LF	9800
		Chain Link Fence	Chain link, posts & fabric remove only	02 41 13.60 1700	3.07	LF	120										LF		120	LF	368
		Subtotal																			20584
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	25	21	0.67									FT		13	CY	153
		Concrete's Vol, Demolished																1.3	17	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09														17	CY	35
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.80														17	CY	183
		Disposal Cost	On Site Disposal		9.07														17	CY	154
		Subtotal																			525
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol, Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			21109

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Power Poles 06																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Remove Wire	Wire Removal	26 05 05.10 1900	19.60	LF	180									LF		180	LF	3528
		Remove Conduit	Conduit	26 05 05.10 0160	5.50	LF	100									LF		100	LF	550
		Remove Fixtures	Fixtures	22 05 05.10 1140	94.50	EA									6	EA		6	EA	567
		Remove Poles	Utility Pole	0	103.00	EA									6	EA		6	EA	618
		Subtotal																		5263
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		5263

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Underground Bathhouse 07																		
		Structure's Demolition Cost	Masonry bld, Large	02 41 16.13 0080	0.31	CF						14000				CF		14000	CF	4340
		Structure's Vol Demolished															0.35	181	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi, rod,trip	31 23 23.20 1025	13.35	CY												181	CY	2423
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		181	Ton	1308
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		8071
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		70	20	0.5						FT		26	CY	304
		Concrete's Vol. Demolished															1.3	34	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												34	CY	70
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod,trip	31 23 23.20 1025	10.80	CY												34	CY	364
		Disposal Cost	On Site Disposal		9.07	CY												34	CY	306
		Subtotal																		1044
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		9115

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Portals 08																		
		Structure's Demolition Cost	Seal Portals	AML1	5200.00	EA									6	EA		6	EA	31200
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		31200
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal											[redacted]							
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal											[redacted]							
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal											[redacted]							
		Total																		31200

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Belt Portals 09																		
		Structure's Demolition Cost	Seal Portals	AML1	5200.00	EA									1	EA		1	EA	5200
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		5200
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		5200

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Crusher Pad 10																			
		Structure's Demolition Cost	Steel bld. Large	02 41 16.13 0020	0,28	CF	36	20	1								FT		720	CF	202
		Structure's Vol Demolished																0,35	9	CY	
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage	12 CY (16 ton) Dump Truck 5 mi, rod.trip	31 23 23.20 1025	13,35	CY													9	CY	125
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7,21	Ton								1			Ton/CY		9	Ton	67
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			[illegible]
		Equipment's Disposal Cost																			
		Dismantling Cost	Mechanical equipment heavy	23 05 05.10 3600	793,00	Ton							3				Ton		3	Ton	2385
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			[illegible]
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY	36	20	1								FT		27	CY	313
		Concrete's Vol. Demolished																1,3	35	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY													35	CY	72
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10,80	CY													35	CY	374
		Disposal Cost	On Site Disposal		9,07	CY													35	CY	314
		Subtotal																			1074
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY						418					CF		15	CY	181
		Concrete's Vol. Demolished																1,3	20	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY													20	CY	42
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10,80	CY													20	CY	217
		Disposal Cost	On Site Disposal		9,07	CY													20	CY	183
		Subtotal																			623
		Total																			4476

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Mine Belt 11																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Equipment's Disposal Cost																			
		Dismantling Cost	Mechanical equipment heavy	23 05 05.10 3600	795.00	Ton							2.5				Ton		2.5	Ton	1988
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			1988
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			1988

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Silo 13																			
		Structure's Demolition Cost	Mixture of types, average	02 41 16.13 0100	0.28	CF			75	30							FT		53015	CF	14844
		Structure's Vol Demolished																0.35	687	CY	
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY													687	CY	9174
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton								1			Ton/CY		687	Ton	4955
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			28973
		Equipment's Disposal Cost																			
		Dismantling Cost	Mechanical equipment heavy	23 05 05.10 3600	795.00	Ton							20				Ton		20	Ton	15900
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			15900
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demol	11.72	CY	160	20	0.5								FT		59	CY	695
		Concrete's Vol. Demolished																1.3	77	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY													77	CY	161
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY													77	CY	832
		Disposal Cost	On Site Disposal		9.07	CY													77	CY	699
		Subtotal																			2386
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			47260

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Weight Shed 14																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY						2				CY		2	CY	23
		Concrete's Vol. Demolished															1.3	3	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												3	CY	5
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod,trip	31 23 23.20 1025	10.80	CY												3	CY	28
		Disposal Cost	On Site Disposal		9.07	CY												3	CY	24
		Subtotal																		81
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY						235				CF		9	CY	102
		Concrete's Vol. Demolished															1.3	11	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												11	CY	24
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod,trip	31 23 23.20 1025	10.80	CY												11	CY	122
		Disposal Cost	On Site Disposal		9.07	CY												11	CY	103
		Subtotal																		350
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY						80				CF		3	CY	35
		Concrete's Vol. Demolished															1.3	4	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												4	CY	8
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod,trip	31 23 23.20 1025	10.80	CY												4	CY	42
		Disposal Cost	On Site Disposal		9.07	CY												4	CY	35
		Subtotal																		119
		Total																		550

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Bulk Oil 15																		
		Structure's Demolition Cost	Masonry bld. Large	02 41 16.13 0080	0.31	CF	55	20	10							FT		11000	CF	3410
		Structure's Vol Demolished															0.35	143	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												143	CY	1904
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		143	Ton	1028
		Subtotal																		6342
		Tank																		
		Dismantling Cost	9000 gal to 12000 gal tank	02 65 10.30 0130	1325.00	EA									1	EA		1	EA	1325
		Transportation Cost	9000 gal to 12000 gal tank	02 65 10.30 1029	1050.00	EA									1	EA		1	EA	1050
		Disposal Costs	9000 gal to 12000 gal tank		325	EA									1	EA		1	EA	325
		Subtotal																		2700
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	55	0.5							FT		20	CY	239
		Concrete's Vol. Demolished															1.3	26	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												26	CY	55
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												26	CY	286
		Disposal Cost	On Site Disposal		9.07	CY												26	CY	240
		Subtotal																		820
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	150	2	1							FT		11	CY	130
		Concrete's Vol. Demolished															1.3	14	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												14	CY	30
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												14	CY	156
		Disposal Cost	On Site Disposal		9.07	CY												14	CY	131
																				447
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	20	0.5							FT		7	CY	87
		Concrete's Vol. Demolished															1.3	10	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												10	CY	20
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												10	CY	104
		Disposal Cost	On Site Disposal		9.07	CY												10	CY	87
																				298
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	0.67	8.4							FT		4	CY	49
		Concrete's Vol. Demolished															1.3	5	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												5	CY	11
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												5	CY	59
		Disposal Cost	On Site Disposal		9.07	CY												5	CY	49
		Subtotal																		168
		Total																		10776

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Truck Pad 17																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY						750				CF		28	CY	326
		Concrete's Vol. Demolished															1.3	36	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												36	CY	75
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod,trip	31 23 23.20 1025	10.80	CY												36	CY	390
		Disposal Cost	On Site Disposal		9.07	CY												36	CY	328
		Subtotal																		$1119
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		$1119

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		General Storage 18																		
		Structure's Demolition Cost	Steel bld. Large	02 41 16.13 0020	0.28	CF	20	60	23							FT		27600	CF	7728
		Structure's Vol Demolished															0.35	358	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												358	CY	4776
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		358	Ton	2580
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		15084
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	67.5	0.67							CF		34	CY	393
		Concrete's Vol. Demolished															1.3	44	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												44	CY	91
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	10.80	CY												44	CY	470
		Disposal Cost	On Site Disposal	On Site Disposal	9.07	CY												44	CY	395
		Subtotal																		1349
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		16433

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Reclaim Hopper Belt 18																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Equipment's Disposal Cost																			
		Dismantling Cost	Mechanical equipment heavy	23 05 05.10 3600	795.00	Ton							5				Ton		5	Ton	3975
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			3975
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			3975

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Visual Disconnect 20																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Equipment's Disposal Cost	Moved to Lila Canyon Mine																		
		Dismantling Cost																			
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	4	6	0.5								FT		0	CY	5
		Concrete's Vol. Demolished																1.3	1	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY													1	CY	1
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod,trip	31 23 23.20 1025	10.80	CY													1	CY	5
		Disposal Cost	On Site Disposal		9.07	CY													1	CY	5
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			18

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		New Shop 21																		
		Structure's Demolition Cost	Steel bld, Large	02 41 16.13 0020	0.28	CF	20	62.5	20							FT		25000	CF	7000
		Structure's Vol Demolished															0.35	324		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												324	CY	4326
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		324	Ton	2337
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		[illegible]
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	62.5	0.5							FT		23	CY	271
		Concrete's Vol. Demolished															1.3	30	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												30	CY	63
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												30	CY	325
		Disposal Cost	On Site Disposal		9.07	CY												30	CY	273
		Subtotal																		[illegible]
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		14595

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Shop Extension 22																		
		Structure's Demolition Cost	Steel bld, Large	02 41 16.13 0020	0.28	CF	20	30	12							FT		7200	CF	2016
		Structure's Vol Demolished															0.35	93		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												93	CY	1246
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		93	Ton	673
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		3935
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	30	0.5							FT		11	CY	130
		Concrete's Vol. Demolished															1.3	14	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												14	CY	30
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												14	CY	156
		Disposal Cost	On Site Disposal		9.07	CY												14	CY	131
		Subtotal																		447
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		4382

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Shotcrete Slopes 23																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY						40				CY		40	CY	469
		Concrete's Vol. Demolished				CY											1.3	52	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												52	CY	109
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												52	CY	562
		Disposal Cost	On Site Disposal		9.07	CY												52	CY	472
		Subtotal																		1611
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		1611

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Fan Transformer 24																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Equipment's Disposal Cost																			
		Dismantling Cost	Mechanical equipment heavy	23 05 05.10 3600	795.00	Ton							0.25				Ton		0.25	Ton	199
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			199
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		8	8	0.67							FT		1	CY	14
		Concrete's Vol. Demolished																1.3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY													2	CY	3
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.60	CY													2	CY	17
		Disposal Cost	On Site Disposal		9.07	CY													2	CY	14
		Subtotal																			48
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			247

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Chain Link Fence 25																		
		Structure's Demolition Cost	Chain link, posts & fabric remove only	02 41 13.60 1700	3.07	LF	120									LF		120	LF	368
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		368
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		368

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Concrete Guard 26																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY	530	2	3							FT		118	CY	1380
		Concrete's Vol. Demolished															1,3	153	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY												153	CY	320
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10,80	CY												153	CY	1654
		Disposal Cost	On Site Disposal		9,07	CY												153	CY	1389
		Subtotal																		4743
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY	259	10	0,67							FT		62	CY	727
		Concrete's Vol. Demolished															1,3	81	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY												81	CY	169
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10,80	CY												81	CY	871
		Disposal Cost	On Site Disposal		9,07	CY												81	CY	731
		Subtotal																		2498
		Total																		7241

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Retaining Wall 27																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	530	2	3							FT		116	CY	1380
		Concrete's Vol. Demolished															1.3	153	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												153	CY	320
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod trip	31 23 23.20 1025	10.80	CY												153	CY	1654
		Disposal Cost	On Site Disposal		9.07	CY												153	CY	1389
		Subtotal																		4743
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		4743

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Culverts 28																		
		UD-1	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	295	3.5	7							FT		268	CY	385
		C2,C4,C6,C10	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	600	2	4							FT		178	CY	256
		C1	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	60	1.5	3							FT		10	CY	14
		C12	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	65	1.25	2.5							FT		10	CY	14
		C3, C7, C9, C11	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	251	1	2							FT		19	CY	27
		UD-3	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	500	1.5	3							FT		83	CY	120
		C5	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	120	1	2							FT		9	CY	13
		Bypass	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	1400	2	4							FT		415	CY	597
		Main Creek	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	1400	6	12							FT		3733	CY	5376
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		6803

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Guard Rail 29																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost	Guard Rai	02 41 13.30 0800	12.17	LF	120									LF		120	LF	1460
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		1460
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		1460

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Inlets 30																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Equipment's Disposal Cost																			
		Dismantling Cost	Mechanical equipment heavy	23 05 05.10 3600	795,00	Ton							1				Ton		1	Ton	795
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			795
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY						11				3	CY		33	CY	387
		Concrete's Vol. Demolished																1,3	43	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY													43	CY	90
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10,80	CY													43	CY	463
		Disposal Cost	On Site Disposal	On Site Disposal	9,07	CY													43	CY	389
		Subtotal																			1329
		Concrete Demolition																			
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY	4	6	0,67								FT		1	CY	7
		Concrete's Vol. Demolished																1,3	1	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY													1	CY	2
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10,80	CY													1	CY	8
		Disposal Cost	On Site Disposal		9,07	CY													1	CY	7
		Subtotal																			24
		Total																			1353

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Sed Pond Culvert 31																		
		CMP 24	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY	110	2	4							FT		33	CY	47
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steal Truck																		
		Transportation Cost Steal Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		47
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		47

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Gabion Retaining Wall 32																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY						2000				CF		74	CY	868
		Concrete's Vol. Demolished															1,3	96	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,09	CY												96	CY	201
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi., rod.trip	31 23 23.20 1025	10,80	CY												96	CY	1040
		Disposal Cost	On Site Disposal		9,07	CY												96	CY	873
		Subtotal																		2983
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		2983

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Water Wells 33																		
		Structure's Demolition Cost	Plug Well	AML 3	5000.00	EA									4	EA		4	EA	20000
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		20000

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Headwalls 34																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		15	18	0.5						FT		6	CY	70
		Concrete's Vol. Demolished															1.3	8	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												8	CY	16
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												8	CY	84
		Disposal Cost	On Site Disposal		9.07	CY												8	CY	71
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY						3600				CF		133	CY	1563
		Concrete's Vol. Demolished															1.3	173	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												173	CY	362
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												173	CY	1872
		Disposal Cost	On Site Disposal		9.07	CY												173	CY	1572
		Subtotal																		5369
		Total																		5611

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Overland Conveyor Supports 35																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		7	7	2						6	FT		22	CY	255
		Concrete's Vol. Demolished															1.3	23	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												28	CY	59
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												28	CY	306
		Disposal Cost	On Site Disposal		9.07	CY												28	CY	257
		Subtotal																		877
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		2	2	4						6	FT		4	CY	42
		Concrete's Vol. Demolished															1.3	5	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												5	CY	10
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												5	CY	50
		Disposal Cost	On Site Disposal		9.07	CY												5	CY	42
		Subtotal																		143
		Total																		1020

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Reclaim Tunnel 36																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		170	12	1						FT		76	CY	886
		Concrete's Vol. Demolished															1,3	98	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												98	CY	205
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod trip	31 23 23.20 1025	10.80	CY												98	CY	1061
		Disposal Cost	On Site Disposal		9.07	CY												98	CY	891
		Subtotal																		3042
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		3042

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Feeder Boxes 37																		
		Structure's Demolition Cost	Concrete bld. Large	02 41 16.13 0050	0.40	CF	13.5	16.5	8.8						3	FT		5881	CF	2352
		Structure's Vol Demolished															0.35	76	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 16.42 1300	13.35	CY												76	CY	1018
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		76	Ton	550
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		3930
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	8	5	0.5						3	FT		2	CY	26
		Concrete's Vol. Demolished															1.3	3	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												3	CY	6
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.60	CY												3	CY	31
		Disposal Cost	On Site Disposal		9.07	CY												3	CY	26
		Subtotal																		89
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		4009

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Reclaim Conveyor Supports 38																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY	4,5	4,5	1						2	FT		2	CY	18
		Concrete's Vol. Demolished															1,3	3	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,06	CY												2	CY	4
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10,60	CY												2	CY	21
		Disposal Cost	On Site Disposal		9,07	CY												2	CY	18
		Subtotal																		60
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11,72	CY	2	4	2						2	FT		1	CY	14
		Concrete's Vol. Demolished															1,3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2,06	CY												2	CY	3
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10,60	CY												2	CY	17
		Disposal Cost	On Site Disposal		9,07	CY												2	CY	14
		Subtotal																		48
		Total																		108

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Crusher Platform Supports 39																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		8	8	3					4	FT		28	CY	333
		Concrete's Vol. Demolished															1.3	37	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												37	CY	77
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod,trip	31 23 23.20 1025	10.80	CY												37	CY	399
		Disposal Cost	On Site Disposal		9.07	CY												37	CY	335
		Subtotal																		1145
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY		4	4	4					4	FT		9		111
		Concrete's Vol. Demolished															1.3	12		
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												12		26
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod,trip	31 23 23.20 1025	10.80	CY												12		133
		Disposal Cost	On Site Disposal		9.07	CY												12		112
		Subtotal																		382
		Total																		1527

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Feeder Conveyor Supports 40																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	4.5	4.5	1						2	FT		2	CY	18
		Concrete's Vol. Demolished															1.3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												2	CY	4
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.50	CY												2	CY	21
		Disposal Cost	On Site Disposal		9.07	CY												2	CY	18
		Subtotal																		58
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	2	4	2						2	FT		1	CY	14
		Concrete's Vol. Demolished															1.3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												2	CY	3
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.50	CY												2	CY	17
		Disposal Cost	On Site Disposal		9.07	CY												2	CY	14
		Subtotal																		48
		Total																		106

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Scale Pad 41																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	20	0.5						2	FT		15	CY	174
		Concrete's Vol. Demolished															1.3	19	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												19	CY	40
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.80	CY												19	CY	208
		Disposal Cost	On Site Disposal		9.07	CY												19	CY	175
		Subtotal																		597
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	12	60	1						2	FT		53	CY	625
		Concrete's Vol. Demolished															1.3	69	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												69	CY	145
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.80	CY												69	CY	749
		Disposal Cost	On Site Disposal		9.07	CY												69	CY	626
		Subtotal																		2146
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	12	60	2						2	FT		107	CY	1250
		Concrete's Vol. Demolished															1.3	139	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												139	CY	290
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod.trip	31 23 23.20 1025	10.80	CY												139	CY	1498
		Disposal Cost	On Site Disposal		9.07	CY												139	CY	1258
		Subtotal																		4295
		Total																		7039

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		New Scale House 42																		
		Structure's Demolition Cost	Steel bld, Large	02 41 16.13 0020	0.26	CF	20	20	8							FT		3200	CF	896
		Structure's Vol Demolished															0.35	41		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi, rod,trip	31 23 23.20 1025	13.35	CY												41	CY	554
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		41	Ton	299
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		1749
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	20	20	0.5							FT		7	CY	87
		Concrete's Vol. Demolished															1.3	10	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												10	CY	20
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod,trip	31 23 23.20 1025	10.80	CY												10	CY	104
		Disposal Cost	On Site Disposal		9.07	CY												10	CY	87
		Subtotal																		298
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	3	8	1.5							FT		1	CY	16
		Concrete's Vol. Demolished															1.3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												2	CY	4
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod,trip	31 23 23.20 1025	10.80	CY												2	CY	19
		Disposal Cost	On Site Disposal		9.07	CY												2	CY	16
		Subtotal																		54
		Concrete Demolition																		
		Demolition Cost	Concrete Demolition	Concret Demo1	11.72	CY	0.66	80	0.66							FT		1	CY	15
		Concrete's Vol. Demolished															1.3	2	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												2	CY	4
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi, rod,trip	31 23 23.20 1025	10.80	CY												2	CY	18
		Disposal Cost	On Site Disposal		9.07	CY												2	CY	15
		Subtotal																		52
		Total																		2153

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Proposed Bathhouse 43																		
		Structure's Demolition Cost																		0
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		0
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		0
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		0
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		[illegible]
		Concrete Demolition																		
		Demolition Cost																		0
		Concrete's Vol. Demolished																		
		Loading Cost																		0
		Transportation Cost																		0
		Disposal Cost																		0
		Subtotal																		[illegible]
		Concrete Demolition																		
		Demolition Cost																		0
		Concrete's Vol. Demolished																		
		Loading Cost																		0
		Transportation Cost																		0
		Disposal Cost																		0
		Subtotal																		[illegible]
		Concrete Demolition																		
		Demolition Cost																		0
		Concrete's Vol. Demolished																		
		Loading Cost																		0
		Transportation Cost																		0
		Disposal Cost																		0
		Subtotal																		[illegible]
		Total																		0

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Coal Silo 44																		
		Structure's Demolition Cost	Steel bld, Large	02 41 16.13 0020	0.25	CF			60	12						FT		6786	CF	1900
		Structure's Vol Demolished															0.35	88	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod,trip	31 23 23.20 1025	13.35	CY												88	CY	1174
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton		88	Ton	634
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		3074
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		3074

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Conveyor 45																		
		Structure's Demolition Cost	Steel bld. Large	02 41 16.13 0020	0.28	CF	5	780	4							CF		15600	CF	4368
		Structure's Vol Demolished															0.35	202	CY	
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage	12 CY (16 ton) Dump Truck 5 mi. rod.trip	31 23 23.20 1025	13.35	CY												202	CY	2700
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	Nielson Construction	Nielson Con	7.21	Ton							1			Ton/CY		202	Ton	1458
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		8529

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Parking Lot 46																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost	Pavement Removal, Bituminous 3"	02 41 13.17 5010	4.33	SY						4800				SY		4800	SY	20784
		Equipment's Vol. Demolished							0.25							FT	1.3	520	CY	
		Loading Costs	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												520	CY	1087
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												520	CY	5616
		Disposal Costs	On Site Disposal		9.07	CY												520	CY	4716
		Subtotal																		32203
		Concrete Demolition																		
		Demolition Cost	Pavement Removal, Bituminous 3"	02 41 13.17 5010	4.33	SY						4400				SY		4400	SY	19052
		Concrete's Vol. Demolished							0.25								1.3	477	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												477	CY	997
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												477	CY	5152
		Disposal Cost	On Site Disposal		9.07	CY												477	CY	4326
		Subtotal																		29527
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		61730

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Rubber Liner 47																			
		Structure's Demolition Cost	Mechanical equipment heavy	23 05 05.10 3600	795,00	Ton							32,5				Ton		32,5	Ton	25838
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			25838
		Equipment's Disposal Cost																			
		Dismantling Cost																			
		Equipment's Vol. Demolished																			
		Loading Costs																			
		Transportation Cost																			
		Disposal Costs																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			25838

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Culvert Bedding Removal 48																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel																		
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY						1295				CY		1295	CY	1865
		Concrete's Vol. Demolished															1.3	1684	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												1684	CY	3519
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												1684	CY	18182
		Disposal Cost	On Site Disposal		9.07	CY												1684	CY	15269
		Subtotal																		38834
		Concrete Demolition																		
		Demolition Cost	Backhoe, hydraulic Bulk Bank Measure	31 23 16.42 0260	1.44	CY						3630				CY		3630	CY	5227
		Concrete's Vol. Demolished															1.3	4719	CY	
		Loading Cost	Front End Loader 3 CY	31 23 16.42 1300	2.09	CY												4719	CY	9863
		Transportation Cost	12 CY (16 ton) Dump Truck 1/2 mi. rod.trip	31 23 23.20 1025	10.80	CY												4719	CY	50965
		Disposal Cost	On Site Disposal		9.07	CY												4719	CY	42801
		Subtotal																		108856
		Total																		147691

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Off Site Dump Fee 49																		
		Structure's Demolition Cost																		
		Structure's Vol Demolished																		
		Bubble's Weight (exclude steel)																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Non Steel Truck																		
		Transportation Cost Non Steel Drive																		
		Disposal Cost Non Steel	City Sanitation	City Sanitation Price	2.42	CY						66096				CY		66096	CY	159952
		Steel's Weight																		
		Truck's capacity																		
		Haulage																		
		Transportation Cost Steel Truck																		
		Transportation Cost Steel Truck Drive																		
		Disposal Cost Steel																		
		Subtotal																		159952
		Equipment's Disposal Cost																		
		Dismantling Cost																		
		Equipment's Vol. Demolished																		
		Loading Costs																		
		Transportation Cost																		
		Disposal Costs																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Concrete Demolition																		
		Demolition Cost																		
		Concrete's Vol. Demolished																		
		Loading Cost																		
		Transportation Cost																		
		Disposal Cost																		
		Subtotal																		
		Total																		159952

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Drainage Control 50																			
		Structure's Demolition Cost																			
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			
		Filter Material	Silt Fence	31 25 14.16 1000	1.15	LF	3000										LF		3000	LF	3450
		Riprap	Riprap Dumped 300 lb. average	31 37 13.10 0370	30.52	Ton							2100				Ton		2100	Ton	64092
		Subtotal																			67542
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			67542

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Water Treatment Area 51																			
		Concrete Demolition Cost		Concret Demo1	11.72	CY					1499	165					CY		215	CY	2514
																		1.3			
		Loading Cost		31 23 23.20 1025	2.09	CY													215	CY	448
		Transportation Cost		31 23 23.20 1025	13.35	CY													215	CY	2864
		Disposal Cost		02 41 16.17 4200	9.07	CY													215	CY	1946
		Subtotal																			7771
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			7771

Ref.	Task	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
		Burma Basin 52																			
		CMP 24	Demolition 18" CMP	02 41 13.232930	17.40	LF	20		1.5								FT		20	FT	348
		Structure's Vol Demolished																			
		Bubble's Weight (exclude steel)	Excavate 3/8 CY excavator	31 23 16.13 0050	7.19	CY	20	5	4.5			17					CY		17	CY	120
		Truck's capacity																			
		Haulage																			
		Transportation Cost Non Steel Truck																			
		Transportation Cost Non Steel Drive																			
		Disposal Cost Non Steel																			
		Steel's Weight																			
		Truck's capacity																			
		Haulage																			
		Transportation Cost Steel Truck																			
		Transportation Cost Steel Truck Drive																			
		Disposal Cost Steel																			
		Subtotal																			31
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Concrete Demolition																			
		Demolition Cost																			
		Concrete's Vol. Demolished																			
		Loading Cost																			
		Transportation Cost																			
		Disposal Cost																			
		Subtotal																			
		Total																			468

Backfilling and Grading

Backfilling and Grading	311050
Topsoil Grading	47002
Support Equipment and Labor	63342
	421,393

	Equipment Cost	Hourly Operating Rate	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate Units	Units	Equip. + Labor Time/Dis.	Unit	Cost
Backfill and Grading															
Ripping Fill Area															
D9R Semi-U EROPS (9-52) (2H2077)	200.00				200.00	1	200.00	$/HR	57387	CY	1473	CY/HR	39.0	HR	7792
Backfill On Site															
988G II ((6-13) 1H2008) 2005	190.00				190.00	1	190.00	$/HR	70192	CY	498	CY/HR	140.9	HR	26780
Hauling															
769D (21-11) (2nd2007)	160.00				160.00	2	320.00	$/HR	70192	CY	498	CY/HR	140.9	HR	45103
Place with excavator															
CAT 385B	275.00				275.00	1	275.00	$/HR	12805	CY	181.3	CY/HR	70.6	HR	19423
Place with dozer															
D9R Semi-U EROPS (9-52) (2H2077)	200.00				200.00	1	200.00	$/HR	57387	CY	215	CY/HR	266.9	HR	53383
Subtotal															144690
Backfill Off Site															
Loading															
988G II ((6-13) 1H2008) 2005	190.00				190.00	1	190.00	$/HR	66096	CY	583	CY/HR	113.4	HR	21541
Hauling															
Dump Truck	100.00				100.00	12	1200.00	$/HR	66096	CY	583	CY/HR	113.4	HR	136047
Subtotal															157587
Miscellaneous Removal/Excavation Stream Channel															
446D Backhoe Loaders	95.00				95.00	1	95.00	$/HR	1560	CY	151.1	CY/HR	10.3	HR	981
Total															311050

	Equipment Cost	Hourly Operating Rate	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate Units	Units	Equip. + Labor Time/Dis.	Unit	Cost
Topsoil Grading															
Load From Topsoil Stockpile															
Load															
988G II ((6-13) 1H2008) 2005	190.00				190.00	1	190.00	$/HR	10737	CY	298.9	CY/HR	35.9	HR	6825
Haul															
Dump Truck	100.00				100.00	5	500.00	$/HR	10737	CY	298.9	CY/HR	35.9	HR	17961
Subtotal															24786
Place Topsoil															
Place with Wheel Loader															
988G II ((6-13) 1H2008) 2005	190.00				190.00	1	190.00	$/HR	7354	CY	160.1	CY/HR	45.9	HR	8727
Grading															
D7R Semi-U EROPS	165.00				165.00	1	165.00	$/HR	7354	CY	145	CY/HR	50.7	HR	8368
Excavator															
CAT 385B	275.00				275.00	1	275.00	$/HR	3383	CY	181.7	CY/HR	18.6	HR	5120
Subtotal															22216
Total															47002

	Equipment Cost	Hourly Operating Rate	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate Units	Units	Equip. + Labor Time/Dis.	Unit	Cost
Support Equipment and Labor															
6,000 Gal H2O Truck Diesel (2r	125.00				125.00	1	125.00	$/HR					306	HR	38250
Pick-up Truck 4x4 1 Ton	40.00				40.00	1	40.00	$/HR					306	HR	12240
Foreman				42.00	42.00	1	42.00	$/HR					306	HR	12852
															63342

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Vegetation																		
	Non Riparian																		
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor)	Reveg 005	20.40	MSF					6					AC		261.36	MSF	5332
	Hydroseed Materials	Seed Non Riparian Area	Crandall 15321	281.83	$/AC					6					AC		6	AC	1691
	Hydromulch Equipment and Labor	Hydro Spreader (equip. & labor)	Reveg 002	20.40	MSF					6					AC		261.36	MSF	5332
	Hydormulch Material	Hay 1" material only	Reveg 001	132.00	MSF					6					AC		261.36	MSF	34500
	Transplant																		
	Non Riparian																		
	Transplant Labor 150/AC	Bare root seedinings 11" to 16" med. Soil	0	1.35	EA									675	EA		675	EA	911
	Transplant Material	Transplant Non Riparian	Crandall 15322	206.05	$/AC					4.5					AC		4.5	AC	927
	Transplant North Slope																		
	In addition to Non-Riparian Trans.																		
	Transplant Labor 150/Ac.	Bare root seedinings 11" to 16" med. Soil	0	1.35	EA									2300	EA		2300	EA	3105
	Transplant Material	Transplant North Slope	Crandall 15323	1915.00	$/AC					1.8					AC		1.8	AC	3447
	Riparian																		
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor)	Reveg 005	19.8	MSF					0.3					AC		13.07	MSF	259
	Hydroseed Materials	Seed Riparian Area	Crandall 15324	289.88	$/AC					0.3					AC		0.30	AC	87
	Hydromulch Equipment and Labor	Hydro Spreader (equip. & labor)	Reveg 002	20.40	MSF					0.3					AC		13.07	MSF	267
	Hydormulch Material	Hay 1" material only	Reveg 001	132.00	MSF					0.3					AC		13.07	MSF	1725
	Transplant																		
	Riparian																		
	Transplant Labor 150/Ac.	Bare root seedinings 11" to 16" med. Soil	0	1.35	EA									189	EA		189	EA	255
	Transplant Material	Transplant Riparian	Crandall 15325	554.39	$/AC					0.3					AC		0.3	AC	166
	Burma Basin	Burma Pond																	
		Hydro Spreader (equip. & labor)	Reveg 005	20.40	MSF					1.41							61.42	MSF	1253
		Seed Non Riparian Area	Crandall 15321	281.83	$/Ac					1.41							1.41	AC	397
		Hydro Spreader (equip. & labor)	Reveg 005	20.40	MSF					1.41							61.42	MSF	1253
		Hay 1" Material Only	Reveg 001	132.00	MSF					1.41							61.42	MSF	8107
[redacted]	Subtotal												[redacted]						69014
	Revegetation																		
	Assume 25% revegetation rate																		17253
	Total																		86267

	Cubic Feet in Structure	Percentage of Steel in Structure	Feet of Steel	Pounds of Steel in Structure	Tons
Shop 01	64000	1.00%	640	319104	160
Ventilation Fan 02	20004	1.00%	200	99740	50
Rock Dust Silo 03	3393	1.00%	34	16917	8
Crusher Pad 10	720	1.00%	7	3590	2
Silo 13	53015	1.00%	530	264330	132
General Storage 18	27600	1.00%	276	137614	69
New Shop 21	25000	1.00%	250	124650	62
Shop Extension 22	7200	1.00%	72	35899	18
New Scale House 42	3200	1.00%	32	15955	8
Proposed Bathhouse 43	0	1.00%	0	0	0
Coal Silo 44	6786	1.00%	68	33834	17
Conveyor 45	15600	1.00%	156	77782	39
					565

Salvage Costs 36,706

Assumptions:

1. Approximately 1.00% of the building total volume is structure steel.
2. Salavage value for structural steel at the present time is $65.00 per ton.

7.52.25 Normal Water Flow

Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

7.53 Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed and reclaimed to comply with R645-301-733, R645-301-734, R645-301-743 and R645-301-745 and R645-301-760. Refer to sections 7.33, 7.34, 7.43, 7.45 and 7.60 in this plan.

7.54 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste

Disposal areas for excess spoil, coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed to comply with R645-301-735, R645-301-736, R645-301-745, R645-301-746, R645-301-747 and R645-301-760. Refer to sections 7.35, 7.36, 7.45, 7.46 7.47 and 7.60 in this plan.

7.55 Casing and Sealing of Wells

All wells will be managed to comply with R645-301-748 and R645-301-765. Water monitoring wells will be managed on a temporary basis according to R645-301-738. Refer to sections 7.38, 7.48, and 7.65 in this plan.

Iron sludge material from the minewater treatment facility (described in Appendix 7-65) will be hauled off-site and disposed of at the Burma evaporation basin facility as described in Appendix 7-66.

7.60 Reclamation

Sealing of Mine Openings

The Applicant has drilled from the Hiawatha seam upwards to the Blind Canyon seam as described in Chapter 6. The drilling occurred in areas that pillar extraction will occur and no provisions were made to seal the bore hole.

Temporary sealing of the portals, if needed, will be accomplished by the construction of protective barricades or other covering devices, fenced and posted with signs indicating the hazardous nature of the opening. Permanent closure plans will include sealing the portals as per the request of the U.S.G.S. (See Section 5.29).

Upon cessation of mining operations all drift openings to the surface from underground will be backfilled, regraded and reseed as per Section 5.40 of this plan. Prior to final sealing of any openings, the U.S.G.S. will require an on site inspection and a submission of formal sealing methods for approval. The formal sealing methods will be presented as a plan including cross

~~Note: Bold number plates and appendices are included with this submittal.~~

7.52.25 Normal Water Flow

Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

7.53 Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed and reclaimed to comply with R645-301-733, R645-301-734, R645-301-743 and R645-301-745 and R645-301-760. Refer to sections 7.33, 7.34, 7.43, 7.45 and 7.60 in this plan.

7.54 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste

Disposal areas for excess spoil, coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed to comply with R645-301-735, R645-301-736, R645-301-745, R645-301-746, R645-301-747 and R645-301-760. Refer to sections 7.35, 7.36, 7.45, 7.46 7.47 and 7.60 in this plan.

7.55 Casing and Sealing of Wells

All wells will be managed to comply with R645-301-748 and R645-301-765. Water monitoring wells will be managed on a temporary basis according to R645-301-738. Refer to sections 7.38, 7.48, and 7.65 in this plan.

Iron sludge material from the minewater treatment facility (described in Appendix 7-65) will be hauled off-site and disposed of at the Burma evaporation basin facility as described in Appendix 7-66.

7.60 Reclamation

Sealing of Mine Openings

The Applicant has drilled from the Hiawatha seam upwards to the Blind Canyon seam as described in Chapter 6. The drilling occurred in areas that pillar extraction will occur and no provisions were made to seal the bore hole.

Temporary sealing of the portals, if needed, will be accomplished by the construction of protective barricades or other covering devices, fenced and posted with signs indicating the hazardous nature of the opening. Permanent closure plans will include sealing the portals as per the request of the U.S.G.S. (See Section 5.29).

Upon cessation of mining operations all drift openings to the surface from underground will be backfilled, regraded and reseed as per Section 5.40 of this plan. Prior to final sealing of any openings, the U.S.G.S. will require an on site inspection and a submission of formal sealing methods for approval. The formal sealing methods will be presented as a plan including cross

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

** Note: Monitoring of all In-Mine Monitoring wells has been discontinued since the mine was sealed up following the 2007 collapse of the mine. (See Plate 7-18 for locations)

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Ground Water

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APPENDIX 7-65

CRANDALL CANYON MINE

MINE DISCHARGE WATER IRON TREATMENT FACILITY

Discussion	
Attachment 1	Maelstrom Oxidizer Unit
Attachment 2	**DELETED, JANUARY, 2012**
Attachment 3	Pit Liner Information
Attachment 4	**DELETED, JANUARY, 2012**
Attachment 5	**DELETED, JANUARY, 2012**
Attachment 6	Drainage Information
Attachment 7	Safety Factor Determination
Attachment 8	Construction Specifications and Drawings
Attachment 9	Temporary Use of Crandall Sediment Pond
Attachment 10	MSDS Sheets for Nalco 7763 and Nalco 8187
Attachment 11	Estimated Operating Costs

draining into the sediment pond as disturbed area drainage. The basin berm, which supports the concrete barrier wall, serves to effectively separate the settling basin from the disturbed area drainage around it. Effectively, all surface drainage now bypasses the treatment facility area, and there is no co-mingling of storm surface runoff with the mine discharge water undergoing treatment. Relevant drainage information from Appendix 7-4 is included in Attachment 6 for ease of reference. This attachment also contains information that shows the adequacy of the basin spillway and the discharge pipe to handle the combined flow of the mine water and a 10 year/24 hour precipitation event on the surface.

While the facility is neither an ASCA nor a small area exemption, it represents a small area within the disturbed area wherein runoff is treated along with the mine discharge water and discharges through an approved UPDES outfall point, and therefore does not drain to the sediment pond. Also, the outer toe of the berm located adjacent to the Forest Service road has been armored with concrete jersey barriers sufficient to prevent potential erosion from surface runoff along the road, and to route surface drainage around the basin into drainage ditch DD-10, thence into culvert C-4, and thence into the sediment pond. Calculations in Appendix 7-4 show that these drainage structures are adequately sized to handle the bypass flow (at a peak of about 1200 gpm) in addition to the 10 yr-24 hr precipitation event design flow.

RECLAMATION AND BONDING

At such time as the water treatment facility is no longer needed, the facility will be reclaimed. This could be at the time of final reclamation or prior to it, depending on circumstances at the time. The existing facility is currently approved and bonded for reclamation by the Division. Presently (January, 2016) the company and the Division are in negotiated discussions regarding the requirements for possible long-term treatment. As part of these negotiations, the Division and the company have agreed upon projected operating costs of the existing facility. These costs, and the stipulation agreement, are included in Attachment 11.

BASELINE MONITORING

Additional baseline data has been incorporated into the approved plan. This data includes: 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) operational performance data demonstrating the effectiveness of the existing treatment system methodology. Specifics of the baseline monitoring for the ledge seep and the raw mine water discharge can be found in Chapter 7 text in Section 7.31.2.

Operational performance data: The company commits to gathering data to reflect on the effectiveness of the oxidation/settling methodology employed in the existing system. This data will be collected monthly and will be provided to the Division via email. Samples will be collected from the 12" HDPE pipeline prior to the oxidizer unit, and at the UPDES sampling point at the outlet of the settling basin. The parameters will include the following:

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Attachment 11

Estimated Operating Costs

Princess Water Treatment

	Actual Costs	
Operations	**2014**	**2015**
Labor	$ 54,152.00	$ 54,152.00
Chemical	$ 39,714.39	$ 39,154.88
Sampling	$ 39,389.81	$ 33,156.95
Utilities (Power & Propane)	$ 32,813.60	$ 33,960.78
Operations Subtotal	$ 166,069.79	$ 160,424.61
Maintenance		
Pump Repairs/ Maint.	$ 2,215.41	$ 1,045.51
Sludge Haul & Maint.	$ 64,284.13	$ 87,778.21
Maintenance Subtotal	$ 66,499.54	$ 88,823.72
TOTAL	**$ 232,569.33**	**$ 249,248.33**

Haulage

Estimated Hauls/year	240	
Truck Size	4000	Gallons
Percent Solids	3%	
Compaction	90%	
Total Hauled	960,000	Gallons
Total Hauled	128,333	Cubic Feet
Total Volume/year	4,278	Cubic Feet
Total Volume/year	158	Cubic Yards
Total Volume/year	0.10	acre-feet
Basin Raise	2.6	inches
Accumulate to 24"	9.4	

APPENDIX 7-66

BURMA EVAPORATION BASIN

APPENDIX 7-66
BURMA EVAPORATION BASIN

Description and Narrative

Attachments:

Attachment 1....Construction Drawings
- Drawing 1 Location Map
- Drawing 2 Surface Ownership
- Drawing 3 Plan View with Photo Background
- Drawing 4 Plan View
- Drawing 5 Cross Section, Typical
- Drawing 6 Undisturbed Drainage

Attachment 2.....Pond Liner Information

Attachment 3.....Legal Description of Lease/Permit Area

Attachment 4.....Archeology Report, Senco-Phenix Archeological Consultants

Attachment 5.....Vegetation, Wildlife Habitat & Sensitive Species Report, Mt. Nebo Scientific

Attachment 6.....Order 2 Soils Survey, Long Resource Consultants

Attachment 7.....Hydrology Study, Blackhawk Engineering

Attachment 8.....BLM Recommended Reclamation Seed Mix

Attachment 9.....Emery County Road Encroachment Permit

Attachment 10....Laboratory Analysis of Sludge Material

Attachment 11....Stability Analysis, Blackhawk Engineering

Attachment 12....MSDS Sheets for Coagulant and Flocculent

Attachment 13....Water Rights Summary

Attachment 14....PHC

Attachment 15 . . Raptor Report

Attachment 16 . . Air Quality Information

DESCRIPTION AND NARRATIVE

Introduction: At present (January, 2012), the Crandall Mine is discharging water into nearby Crandall Creek, a tributary to Huntington Creek. This water is above the UPDES compliance limit for iron. Therefore, the company has constructed a water treatment facility at the minesite to reduce the iron concentration to within acceptable legal discharge levels. This facility utilizes an aeration unit (to change the iron compound chemistry), a chemical injection system to coagulate and flocculate the precipitated iron, and a settling basin to allow the precipitated iron to accumulate. At regular intervals the iron sludge material is cleaned from the bottom of the basin and disposed of off-site. This settled sludge material has been laboratory tested for RCRA metals and has been determined to be non-toxic, non-hazardous, and non-acid-forming. When dried it forms a fine-grain orange colored inert material.

Previously, the sludge material was hauled to the company-owned Wildcat Loadout, which is a SMCRA permitted facility (UDOGM permit C/007/033), and was disposed of in one of the larger sediment ponds at the site. However, in the summer of 2011, the company transferred ownership of the Wildcat Loadout facility to the Intermountain Power Agency (IPA). Therefore the site was no longer available for disposal of the Crandall iron sludge material, and the company sought an alternate disposal site.

The newly selected site is located in Emery County in lower Huntington Canyon, near the Utah Power and Light Huntington power plant, and is adjacent to the Emery County Road #303, known locally as the "Burma Road". Therefore, the new facility is called the Burma Evaporation Basin site. The site is located approximately 10 miles down-canyon from the Crandall Canyon Mine.

The Burma disposal facility will consist of a shallow evaporation basin. It is located on land owned by Utah School and Institutional Trust Lands Administration (SITLA). It is located in an industrial area, proximate to the coal-fired power plant, coal storage piles, fly-ash disposal ponds, commercial gravel pits, and numerous gas wells. The waste-rock disposal area for the Deer Creek Mine is also located nearby.

Chapter 1, Legal: The Burma evaporation basin site is located on a 7.32 acre parcel of SITLA land within Lot 6, Section 5, T17S, R8E, SLBM, as shown on the drawings in Attachment 1. Construction and operation of the site is authorized under Special Use Lease 1708 issued by SITLA on January 5, 2011 (see Appendix 1-16 of the approved MRP). A legal description of the lease area/permit area is included in Attachment 3.

The Emery County Road Department has approved an Encroachment Permit #201139 to allow an access road into the site from Emery County Road #303, a.k.a., the Burma Road. See Attachment 9.

Chapter 2, Soils: An Order 2 soils survey was completed at the site by Long Resource Consultants (see Attachment 6). The area contains a preponderance of large boulders and gravels. In fact, several large-scale commercial gravel pits are presently operating in the area within a quarter-mile of the site. Nearby earthwork associated with road-building and construction of gas-well pads clearly show evidence of the significant number of large boulders encountered in surface excavation. The soils report concludes, *"The presence of large amounts of rock fragments will make topsoil salvage difficult, but not impossible. Boulders and large stones should be removed during the topsoil salvage process to the extent that is reasonable."* The report also recommends that an average of 30 cm (1 foot) of surface material be salvaged for topsoil. However, due to the preponderance of large boulders within the surface material, estimated at about 50% of the surface exposure, the average depth of topsoil material can be approximated at 6" averaged over the entire area. No prime farmland exists within the project area.

The company proposes to initially remove the larger boulders and either place them within the outslope of what will become the basin berm, or if necessary (depending on total quantity encountered) also store them in separate storage piles, prior to topsoil salvage. The site has a gradual and fairly consistent gradient of about 5%, sloping to the southeast, as shown on Drawing 4, Attachment 1. The basin will be constructed about 100' wide by 200' long, generally following the contour, with the long axis trending in a northeast-southwest direction, as shown on Drawing 1. The basin will be constructed by cutting (excavating) the upper portion of the site and filling the lower portion. This is similar to the method used to construct the gas-well pad located immediately to the south of the site, which can be clearly seen in the aerial photograph in Drawing 3, Attachment 1. Therefore the boulder storage will be located on the lower (southern) part of the site. After the large boulders have been removed and stockpiled, the topsoil material will be salvaged. As with the boulders, to facilitate construction, the topsoil will be collected and stockpiled at the lower end of the site. The topsoil storage pile will be constructed in a long linear configuration, measuring approximately 10' high, 40' wide and 170' long. This will allow the pile to remain relatively low, thereby minimizing densification. Based on the proposed design of the evaporation basin, the actual area of disturbance associated with construction will be approximately 1.41 acres. This will include construction of the entrance road, access road, evaporation basin and containment berm. The area under and around the topsoil pile location is not included in this disturbed area calculation since no topsoil removal will occur in this area. Assuming a 6" average depth of topsoil salvage (averaged over the entire 1.41 acre disturbed area), the pile will contain a volume of about 1,137 cubic yards of material. A more complete description of the construction sequence of the basin and associated structures is presented in the Chapter 5-Engineering discussion below.

Upon completion of topsoil salvage, the topsoil pile will be pocked (roughened) and re-seeded. The BLM has provided a seed mix specifically designed for this area, based on reclamation standards for other projects in the area. This seed mix is listed in Attachment 8. After topsoil salvaging is complete, the topsoil pile will be re-seeded using this prescribed mix. A 1 T/ac straw mulch will be incorporated into the surface soil. The pocking, re-seeding and wood straw

are all measures to help minimize erosion, and promote a healthy interim re-vegetation until the time of final reclamation. A containment berm made of sub-soil material, and a siltation control structure (such as excelsior logs) will be installed around the perimeter of the pile to prevent erosional loss of topsoil material from the pile. A topsoil identification sign will be installed on the pile upon completion. After construction, an as-built drawing of the pile will be prepared and supplied to the Division, and a final assessment of the volume of salvaged material will be updated in the MRP.

During topsoil salvaging and stockpiling operations the Company commits to having a professional soils monitor on site. The purpose of this person will be to make sure that all topsoil resources are properly salvaged, to maintain accurate inventory of the material, take photos, and generally make sure that the salvage and stockpiling operations are done according to the plan. The monitor will be someone familiar with topsoil salvaging and pre-approved by the Division. After the soil salvaging is completed, a final report will be prepared and submitted to the Division.

Chapter 3, Biology:

The evaporation basin site is located at an elevation of 6400' on the broad pediment outslope extending from the base of the surrounding cliffs. The area was surveyed for vegetation, wildlife habitat and sensitive species by Dr. Patrick Collins of Mt. Nebo Scientific. The report of findings is located in Attachment 5. The area is primarily a Pinyon-Juniper community. As clearly visible in the aerial photos, the area has been chained by the federal government in the past, presumably for range enhancement and habitat improvement.

The report concludes that construction of the facility is not expected to impact any threatened, endangered or candidate species.

The Dominant vegetative community over the entire project area is pinyon -juniper. Map 1 of the Vegetation, Wildlife Habitat & sensitive Species report is an aerial photo showing the total area as being chained pinyon –juniper.

As is discussed on page 12 of the Vegetation, Wildlife Habitat & Sensitive Species report, the entire area (shown on Map 1) is considered crucial winter range for Rocky Mountain elk and Mule deer. The entire study area (shown on Map 1) is considered year-long substantial habitat for Black bear. Finally, the entire area (pinyon-juniper) could be used by Ferruginous hawks because they often nest in this community.

Reclamation of the project area will be according to and along with the approved reclamation time line found in Section 3.41.100 of the approved MRP. In the event that discharged mine water no longer requires treatment and/or the basin is no longer receiving sludge, the reclamation time line for the Burma basin will be adjusted as follows: Reclamation will begin after three years without receiving sludge, and reclamation will be completed within one year of

commencement.

Upon final reclamation the area will be re-seeded with a seed mix recommended by the BLM. This seed mix is based on the agency's familiarity with other reclamation projects in the area, and the specific findings of the Mt. Nebo Scientific vegetation survey. Refer to Attachment 5 for the recommended seed mix.

On final reclamation, the evaporation basin area will be backfilled and graded to approximate original contour (AOC), and topsoil will be re-applied to the reclaimed area. (See Map #7)

a) To ensure that the lined pond will not continue to hold water after reclamation, the pond liner will be breached prior to reclamation (see Chapter 7).

b) A minimum of 48" of fill will be placed over the dried-out contents of the excavated basin. Backfill will be placed in 18" compacted lifts until approximate original contour is achieved. The first 18" lift will be incorporated into the mine waste by ripping or other tillage. Because the area is relatively flat, and because the dried out iron precipitate material left in place is not expected to accumulate to a total depth of more than 18", the basin can be backfilled with at least 48" of material and still resemble the approximate original contour. The fill will be obtained from the adjacent road pad fill, which is the original material initially excavated from the basin.

   A certified noxious weed-free straw mulch will be incorporated into the replaced soil with surface roughening at a rate of 2,000 pounds per acre and held to the surface with 1,000 pounds per acre of a wood fiber mulch and tackifier applied to the surface at a rate of 500 pounds per acre. Fertilizer, if determined necessary by soil testing, will also be applied at this time.

c) Large boulder, which had been stored in separate stockpiles, will be scattered within and on top of the backfilled material in a random arrangement during the backfilling operations in an effort to replicate the original geomorphology.

d) Topsoil will then be spread out over the area at an application rate of approximately 6" thick.

e) The surface will be gouged with irregular depressions approximately 24" x 36" x 18" deep. This will also mix the hay into the upper portion of the soil surface.

f) The appropriate seed mix (Attachment 8) will be either broadcast by hand or hydroseeded on the area at the rate specified on the table.

Chapter 4, Land Use/Air Quality:

The site is located in a well-developed industrial area. And is situated less than1.5 miles from the Huntington Power Plant and its associated coal storage piles and fly-ash disposal ponds. Within a mile from the site are located several commercial gravel pits, and numerous operating gas wells. The waste-rock disposal area for the Deer Creek Mine is also located less than a mile away.

As mention ed previously, the site has been "chained" in the past by the federal government (BLM), a practice whereby the native juniper-pinyon trees were ripped out by bulldozers. Evidence of this previous disturbance is clearly visible in the aerial photo background on Drawing 3, Attachment 1.

There will be no change in the current land use of the area following reclamation of the site. The present land use supports wildlife and livestock grazing, and no change in grazing activity will occur after reclamation. However, during operation of the evaporation basin, which is tied to the permit term of the Crandall Canyon Mine, approximately 1.4 acres of the site will be temporarily incapable of supporting wildlife or domestic grazing.

Mitigation of the 1.4 acer surface disturbance of the Burma evaporation pond UEI will partner with the Division of Wildlife resources, DWR, in a Utah Partners in Conservation Development, UPCD, project , Pinyon Juniper treatment for deer and elk crucial winter range, in locations at or near the Burma pond or as designated by DWR. Funding will be provided by UEI for approximately 5.6 acres of habitat improvement based on a cost per acre provided by DWR.

The site is located adjacent to the Emery County Road #303, also known locally as the Burma Road. The County has issued an encroachment permit (201139) from this road for access to the evaporation basin. (See Attachment 9).

A Class 3 (intensive) cultural resource survey has been completed at the site by Senco-Phenix Archeological Consultants, with negative findings (see Attachment 4).

There are no public parks or historic places within the proposed disturbed area.

Utah Division of Air Quality was contacted and the Burma pond project was explained in detail to determine if an Air Quality Permit or modification was required. It was determined by Utah Division of Air Quality that the emissions turned out to be insignificant and that the permit for Crandall Canyon did not need to be modified. See Attachment #16 of the application for email correspondence between UEI and DAQ.

Chapter 5, Engineering:

As depicted on the drawings in Attachment 1, the facility will consist of a large, shallow evaporation pond, measuring approximately 100' wide by 200' long. It will be constructed about five feet (60") deep, although only the bottom 36" will be utilized for sludge storage/water retention, leaving the top 24" as freeboard. Based on past experience, it is anticipated that cleanout sludge-water from the Crandall water treatment facility will be hauled to the site about twice a week, approximately 2-3 truckloads per day, and 4000 gallons per truckload, depending on weather and road conditions. Due to the low iron levels, cleaning can be suspended at any time, up to 4 months a year if sludge build up in the cells indicate cleaning is not necessary. This works out to be about 130,000 cu. ft. per year hauled to the site for disposal. The iron cleanout "sludge" material has typically been analyzed at about 5% solids, and 95% water by weight, and even less by volume, perhaps 2-3% solids. Therefore, after evaporation of the water, which is estimated to be 1.4 acre feet per year, the actual volume of solids left to accumulate in the basin is expected to average about 4,300 cu ft. per year. Spread out to dry over the 20,000 square foot bottom of the evaporation basin, the rate of solids accumulation in the basin is expected to be 2.6 inches per year or less. It is anticipated that the material will not accumulate more than 24" deep in the bottom of the basin during the operational life of the facility, which according to current deposit rates, will take more than 16 years to accumulate to this level. This will then allow the material to be covered with the necessary 48" of backfill at the time of final reclamation.

Consumption calculation show that the mine currently discharges approximately 400 GPM which equates to 644.3 acre feet per year. The evaporation pond will consume approximately 1.4 acre feet per year for a net gain of 642.9 acre feet per year.

It should be noted that the preceding volume accumulation estimate is based on rough assumptions, and will vary significantly upon actual practice. However, prior experience with sludge disposal at the Wildcat Loadout site has demonstrated that the amount of solid material remaining after evaporation is actually quite small, and will indicate that the above assumptions are reasonable.

At present, there is some uncertainty as to the future treatment requirements for the Crandall Mine discharge water, in terms of the longevity of treatment and the degree of treatment. With the approval of the application of the Crandall water treatment, it is assumed that the following scenarios will ultimately unfold:

1) The dried sludge material will be left in place and buried on-site as part of the final reclamation process. The material will be buried under 48" of inert earthen material during reclamation, topsoiled and re-vegetated. As noted previously, the material has been analyzed as is neither toxic, hazardous nor acid-forming, and contains no RCRA metals, as shown by the laboratory result presented in Appendix10.

2) The accumulated depth of sludge will be monitored and reported in the annual report and that grab samples of the dried material will be taken every five years or

with 7.5 inches of solid waste deposited. Grab samples of the waste will be shipped using chain of custody forms, and will be prepared at the laboratory using TCLP Method 1311, and will be analyzed for all RCRA metals using EPA Method 200.7 or 200.8 and will be monitored for hazardous concentrations in accordance with 40 CFR 264.13.

Grab samples of the accumulated sludge will be taken for analysis of the following metals of agronomic concern: aluminum by Synthetic Precipitation Leaching Procedure (SPLP, SW846 Method 1312) , and plant available iron, zinc, and nickle analyzed by DTPA extractable, and by the methods described for all parameters listed in the Division's Guidelines for Topsoil and Overburden, Tables 3 & 7.

Excess dried material will be removed from the basin if needed and taken to an approved disposal site, such as ECDC.

3) The basin will be enlarged if needed to accommodate additional future accumulation needs. This would be accomplished by extending the length of the basin either to the east or the west within the existing site. The site will easily accommodate an enlargement of the basin of over three times the currently proposed size. The company acknowledges that any future modification of the facility will require additional SMCRA permitting amendments.

3) There is a possibility that the iron content of the Crandall mine discharge water may naturally drop down to within compliance levels such that future treatment is no longer required, and hence, sludge disposal at the Burma evaporation facility will no longer be required.

4) There is a possibility that if the iron levels remain high and treatment is required in perpetuity then a more permanent, long-term treatment facility will be constructed, and an alternate sludge disposal system could be incorporated into that facility.

5) The status of the need for treatment at the mine and subsequent disposal at the evaporation basin is evaluated a minimum of once per week, weather permitting, on an ongoing basis.

6) In the event of temporary cassation at the Berma Pond site, the sludge will be covered with six inches of subsoil and an interim seeding of crested wheatgrass (Agropyron cristatum) . Notice will be given as required by R645-301-515.321.

7) The waste will be routinely compacted and covered to prevent combustion and wind-borne waste.

It should be noted that the iron sludge material has been tested in the lab using the EPA 200.7 method for RCRA metals, and has been found to be non-toxic, non-hazardous and non-acid forming. (See Attachment 10). Also, the chemicals used in the water treatment (coagulant and flocculant) are all NSF-60 certified. (See Attachment 12).

For comparison purposes, the evaporation basin will be approximately the same size as the nearby gas-well pad located immediately to the south of the site. The basin will be ringed by an access road which will allow the trucks to dump the sludge at any point around the perimeter of the basin. The perimeter access road will also allow trucks to enter the site, dump their load and exit the site without needing to back up and turn around.

As shown in plan view and cross-section view of Drawings 4 and 5 (Attachment 1), the basin will be constructed generally in the following sequence:

1) Prior to any construction-related disturbance at the site, a sediment control structure will be installed around the lower (down-drainage) part of the site. This will consist of a double row of over-lapping excelsior logs staked firmly into the ground. These excelsior logs will provide the primary sediment control during construction, but will be left in place to provide long-term permanent sediment control for the site as well.

2) Perimeter markers will be installed around the boundary of the site to delineate the maximum extent of surface disturbance. Permit signs will also be installed specifying the DOGM permit number and legally-required permittee contact information.

3) The entrance road will then be established into the site. This short (200' long) road segment will exit the Emery County "Burma" Road as per the county-issued encroachment permit (see Attachment 9), and will enter the site along grade from the west side of the property.

4) Included as part of the entrance road construction will be the establishment of an upper drainage ditch. The purpose of this ditch is to permanently divert undisturbed surface drainage around the facility site, both during construction and thereafter throughout the operational life if the facility. It will parallel the entrance road and head east around the top of the site, and discharge into the predominant natural drainage structure located in the eastern part of the site.

5) Grubbing and clearing the area of vegetation, primarily small-growth juniper-pinyon trees, will then commence. The grubbed trees will be stockpiled at the lower end of the site, and will serve as micro-habitat for small animals.

6) The larger surface boulders will then be removed and stockpiled. Many of these boulders are quite large and may require to be broken up using a hoe-ram. These boulders will be relocated to the lower side of the basin and placed in a linear pile which will ultimately become the out slope of the containment berm of the evaporation basin.

Depending on the volume of boulders encountered, excess boulders beyond those that can be incorporated into the berm may be stockpiled separately out of the way at the lower end of the site until final reclamation. Areas that are disturbed by boulder removal, where the topsoil has not been removed, will be seeded with the approved seed mix, if necessary.

7) Removal of available topsoil material will follow. According to the topsoil survey (see Attachment 6) there is approximately 12" of suitable topsoil material available for salvage, in those areas where topsoil exists. However, due to the preponderance of large boulders occurring on and within the surface material, estimated at about 50% of the surface exposure, the average depth of topsoil material averaged over the entire area can be mathematically approximated at 6". The topsoil will be gathered and placed in a topsoil pile located at the lower end of the site. It is estimated that approximately 1,137 cubic yards of topsoil will be collected, and stored in low-lying linear shaped piles as described in Chapter 2, Topsoil above. It should be noted that much of the boulder salvage and topsoil salvage may be done at the same time due to the natural occurrence of the boulders as part of the pre-existing surface material.

8) After the boulders and topsoil have been salvaged, construction of the evaporation basin will begin. The basin will be constructed using dozers starting at the upper part of the site, and simultaneously excavating the top portion of the basin and filling in the lower portion. Cut and fill will be balanced to provide the finished basin above with the containment berm below. Granular material excavated from the basin will be used to construct the structural core of the berm. This granular material, forming the upslope section of the containment berm will be compacted to 90% using vibratory equipment and/or wheel rolling. It should be noted that this earthen material in its native condition is a well-suited construction medium, as evidenced by the fact that there are several large-scale commercial gravel operations in the immediate area extracting this same material for local highway projects and other civil engineering projects.

9) The containment berm will be made wide enough (at least 20' wide) to serve as the perimeter access road for the tanker disposal trucks. As noted above, the outslope of the berm will be constructed of the large boulders salvaged from the surface, while the core of the berm (and the upslope section which will be subject to contact with the impounded sludge-water), will be constructed from the smaller-sized gravel material excavated from the basin area, and compacted in-place within the berm. The top of the berm will be capped with a 12" thick layer of gravel which will form an impervious layer over the boulders, and also as a suitable running surface (roadway) for the sludge delivery trucks. The berm outslope boulders will be covered with a 6"-12" layer of subsoil material which will serve as a medium for interim contemporaneous reclamation. A stability analysis for the construction of this earthen berm is included in Attachment 11.

10) A continuation of the perimeter access road will be constructed (20' wide) around the upper side of the basin. Rather than being constructed on fill, this upper road will be

constructed as a shallow cut in the native ground. In final design, this upper access road will be a continuation of the entrance road.

11) To protect groundwater from potential exposure to leachate, an engineered liner will be installed in the interior of the pond. The proposed liner is described in Attachment #2 of Appendix 7-66 of the approved MRP and is the same as that used for the cells in the treatment plant at Crandall.

12). It should be emphasized that this basin is not expected to normally impound much if any water, only temporarily after cleaning disposal. At an average of 80,000 gallons of diluted sludge material per two-month cleaning cycle (as explained above), coming primarily during the concentrated two-week cleaning periods, the maximum depth of standing water at any given time is not anticipated to exceed 5 inches. In between the anticipated two-month cleaning cycles, the evapo-transpiration process is expected to quickly eliminate any standing water to a damp, thin concentrated filter-cake, or dry out completely. This assumption has been verified through previous experience when the material was disposed of at the Wildcat Loadout facility. The basin will be constructed 5' deep, primarily to provide ample excavated fill material to be replaced to a depth of 48" at time of final reclamation. With a 5' basin depth, the cleaning water could actually fill to a standing depth of 36" and still allow 24" of freeboard to the top of the containment berm.

The basin is not designed to ever discharge and all of-site drainage is diverted around the pond. However, at DOGM requirements, a single small 5' x 6" emergency spillway has been designed into the structure as shown on Drawing #4. This will allow the release, in a controlled fashion, of any flows in the highly improbable chance that water filled the pond. Other than the watery material disposed of from the Crandall treatment, the only water entering the basin will be from natural rainfall or snowfall. The 10-year, 24-hour event in this area is 2.00 inches and the 100-year, 24-hour event is 2.59 inches. As discussed in Chapter 7, the anticipated rise in water level from the 10yr event will be about 4 inches and for the 100yr event will be about 4.5 inches. Hence, there is no statistical probability that the basin will ever fill with water above the 18" freeboard level to the spillway elevation in the berm, given the fact that no undisturbed drainage reports to the basin. The basin can better be envisioned as a large depressed evaporation area rather than an impoundment structure.

13) The in-slopes to the basin will be constructed to a shallow slope of 3 vertical to 1 horizontal. With these gentle in-slopes, and the shallow depth of containment, there will be no necessity for any perimeter barricade or fence for wildlife protection, or public safety. Also, as mentioned previously, the basin contents (dried iron precipitate material) has been tested as non-toxic, non-hazardous and non-acid forming, posing no public health threat.

14) Based on the design shown on Drawings 4 and 5 of Attachment 1, the computer-generated volume of excavation is 3,500 cubic yards. Of this volume, 1,137 cubic yards

will be removed as topsoil and stockpiled separately. The remaining 2,363 cubic yards of excavation (cut) will be used to construct the berm of the basin.

Chapter 6, Geology:

An Order 2 Soils Survey was performed at the site by Bob Long of Long Resource Consultants (see Attachment 5). According to this report, the geology of the area is described as follows:

"The project area is situated on an alluvial fan that is on top of a terrace pediment mantle. The terrace consists of alluvium and colluvium derived from the nearby sandstone of the North Horn, Blackhawk, Castlegate and Mancos formations (Witkind, et. al., 2006). The pediment mantle is underlain by sandstone and shale of the Mancos formation (Witkind, et. al., 2006). The thickness of the pediment mantle is variable, but neither sandstone nor shale parent material was observed in the soil test pits."

The report includes numerous photographs which clearly show the geologic nature of the site.

This geologic description of the site area is in accord with the studies of the USGS for the San Rafael drainage basin. Once the Wasatch Plateau meets the San Rafael Valley, the area is a alluvial/colluvial terrace pediment that has incised ephemeral drainages that have dissected the terrace pediments into the underlying Mancos Shale Formation. This formation consists of mainly shale deposits with some interbedded sandstone tounges. According to Hintze (1988), in this area the Mancos Shale is approximately 3,200 feet thick. The sandstone tounges tend to thin to the north. Typically, the Mancos Shale is not considered an aquifer, though to the south of the site area, there have been some wells that have been completed in the sandstone tounges of the formation.

The shale layers of the Mancos Shale are considered to quite tight. Based on published data, the hydraulic conductivity for these strata are estimated to be $1x10^{-8}$ cm/sec (Freeze and Cherry, 1979).

To the northeast and southwest of the site, the Fish Creek and Huntington Creek drainages, respectively, have cut through the terrace pediments into the underlying Mancos Shale. The Fish Creek drainage is an ephemeral drainage that is about 100 to 200 feet vertically below the proposed site area. The Huntington Creek drainage is a perennial stream that is about 200 feet vertically below the site area. Thus, the proposed site area is located on a higher ridge, elevated above the surrounding drainages.

Chapter 7, Hydrology:

Climatic Conditions

The proposed site is located in Section 5, T 17S, R 8E SLBM. Representative site climatic conditions including average monthly temperature, average seasonal precipitation, average evaporation rates, and average wind direction and velocity are presented in the following tables. Temperature and precipitation data were from the Castledale Station. Evaporation data were from the Ferron Station. Wind direction and velocity data were from the Price Airport. These are the closest data gathering points for these data. Given the site elevation and location, they are fairly representative of the site.

Average Monthly Temperature - F°

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MAX	35.2	41.9	53.2	62.5	72.1	82.7	88.5	85.8	77.6	65.2	50.1	37.9
MIN	6.7	14.3	23.5	30.7	38.6	46.5	53.4	51.3	42.1	31.5	20.4	10.7

Average Monthly Precipitation - inches

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Precip	0.60	0.56	0.52	0.54	0.65	0.47	0.77	1.06	0.87	0.84	0.51	0.53
SF	5.9	3.2	1.3	0.3	0.2	0	0	0	0	0.1	1.0	4.0
SD	2	1	0	0	0	0	0	0	0	0	0	0

Average Monthly Evaporation - inches

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AVG	0.00	0.00	0.00	5.20	5.66	8.06	6.58	6.39	5.49	3.53	0.00	0.00

Average Monthly Wind Direction and Velocity

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DIR	N	N	N	N	N	N	N	N	N	N	N	N
VEL	5.1	5.8	7.9	8.5	8.4	8.2	7.0	6.6	6.9	6.7	5.8	5.2

Baseline Information

A records search was conducted to determine the existing water rights in the area of the site. Figure 7-1 shows the location of all surface and groundwater rights and points of rediversion within one mile of the center of Section 5, T 17S, R8E. These records are also summarized in Attachment #13 with a listing of the sites which includes the water rights number, location, quantity, and beneficial use.

As can be seen in the figure, there are no groundwater sources within ½ mile of the site area. The groundwater resources are limited to the alluvial aquifer of Huntington Creek. The remaining rights are surface water rights for either stockwatering or irrigation rediversion. A number of underground records are identified beyond the ½ mile area; however, according to State Engineer records these points were either dry holes or were 2-inch wells that were subsequently abandoned.

Based on the area depicted in Figure 7-1, no active ground water wells, springs, or other expressions have been identified within the search area. Thus, no ground water data are available for either quality or quantity.

A search of the area of the site was conducted to determine any surface or ground water sources. First, a records search for water rights was conducted one mile from the center of section 5. Then, a field survey was conducted to identify any springs or seeps within the area. This evaluation just found surface water expression in Huntington Creek and in isolated sections of the Fish Creek channel. No ground water occurrences were identified.

The only other surface water body that exists within the one mile radius is the PacificCorp pond located about 3/4 mile west of the site. This pond is a make-up water pond for the Huntington Power Plant. The pond is located in the adjacent southwestern drainage from the proposed site.

Based on the water rights search, only two surface water rights were identified within ½ mile of the site. These are for stock watering on Fish Creek. Additionally, the DOGM water database records were searched and the Co-op Mining, Lower Fish Creek monitoring station, located off the road just above the proposed site, was identified. According to the records, this site only had two flow events during the period of record from August 1977 through November 1985. This supports the ephemeral nature of the stream flow. Given this flow condition and the vertical and horizontal isolation of the proposed site from the creek, there is no significant potential for impact from the proposed site.

Additionally, because of the installation of the engineered liner in the pond as described in Chapter 5, there is very little possibility of leakage or infiltration from the pond would reach either the surface water and groundwater in the area of the pond.

If the liner were to leak and the leachate were to be released to the groundwater system, based on the hydraulic conductivity of the underlying Mancos Shale, there is little possibility of significant movement of the released water. The pond is located about 150 feet above the Fish Creek drainage and about 1320 feet horizontally away. The porosity of the shale strata will be

approximately 0.1. Using the hydraulic conductivity reported in Chapter 6, an evaluation of the average linear velocity of groundwater flow for the leachate shows that the time for movement from the pond area to the nearest surface water body will be in excess of 100,000 years. Therefore, the likelihood of any significant impacts to surface or groundwater sources is very small.

As mentioned in previous sections of this narrative, the site is located on a terrace pediment, a relatively flat (planar) surface, which is gently sloping to the east at about 5%. This can be seen in the aerial photos (Drawing 3, Attachment 1), the photos in the vegetation report (Attachment 5) and the soils report (Attachment 6), as well as the contours shown on Drawing 4 , Attachment 1. As described in the Geology Section, the site is located, on the high point, between the Fish Creek and Huntington Creek drainages. There are two minor (shallow) ephemeral drainage channels (actually, more like drainage depressions) located within the site, as shown on the site plan (Attachment 1). The layout of the proposed evaporation pond is such that the pond structure is located essentially in between these two small drainages.

An evaluation of the probable hydrologic consequences of the evaporation pond portion of the permit area was conducted. This report is included with Attachment 14. Based on the projected impacts, UEI has attempted to minimize the impacts from the operation. The undisturbed areas are being diverted around the facilities and the disturbed areas are being collected in the pond. Therefore, there is likely no impact from this portion of the operation.

Due to these limited impacts and the ephemeral nature of the site, it is likely that there will be very little runoff from the site and no leakage for the pond. Any attempt at surface water sampling will generally result in no flow. As such, due to the total containment of the pond, it is proposed that no additional ground water or surface water monitoring be conducted for this site.

Drainage Control

Enclosed in this Appendix is a hydrologic report prepared by Blackhawk Engineering (see Attachment 7). This report analyses the some of the factors addressed below, such as the direct precipitation reporting to the basin and the sizing of the undisturbed drainage structures. This report references the Drawings in Attachment 1 and utilizes the area delineations shown on Drawing 6.

As shown on Drawings 4 and 6 (Attachment 1), an undisturbed drainage ditch will be constructed along the upper (northern) side of the facility. This will serve to route all undisturbed drainage around the site and direct it into one of the existing natural drainage channels in the immediate area.. Because the undisturbed drainage area above the facility is relatively small (2.3 acres) the undisturbed drainage ditch can be sized accordingly. This ditch will be armored with rip-rap as needed to prevent erosion.

Prior to release of diverted flows into the natural drainage channel, all water from the ditch will be passed through a sediment control structure, such as a double row of excelsior logs. Runoff

from the perimeter access road/containment berm will be directed back into the evaporation pond. The out slopes of the containment berm, as well as the topsoil pile, will be roughened and revegetated to prevent erosion. A sediment control structure (i.e., a double row of excelsior logs) will be installed around the lower perimeter of both the containment berm outslope and the topsoil pile as an additional means of sediment control. And finally, a third row of excelsior logs will be installed at the lower end of the site prior to construction to provide sediment control during construction. This sediment control structure will be left in place after construction, and will provide a final line of control while the interim reclamation vegetation is being established.

Attachment 7 contains a hydrology report prepared by Blackhawk Engineering which describes the methodology for determining the direct precipitation into the basin, the sizing of the undisturbed drainage ditch, and the sizing of the culvert under the access road. This report relies on area determinations presented on Drawing 6 of Attachment 1.

Even though the facility is referred to as an evaporation pond, in reality it is not envisioned to ever contain more than a few inches of standing water at any one time. This will be after the regular cleaning cycles, as described above in the Chapter 5, Engineering section. The entire purpose of the pond is to provide a means for full evaporation of the watery sludge material, hence it is anticipated that there will never be any discharge from the pond, which will be totally contradictory to the designed intent of the facility. The only water entering the pond in an uncontrolled manner will be from direct precipitation to the pond itself. Based on climatological information for the area, the precipitation from a 10 year/24 hour event is projected at 2.00 inches and the 100 year/24 hour event is estimated to be 2.59 inches. Given the small area of the facility subject to direct precipitation (1.16 acres), the anticipated water volume to the pond is 0.172 ac-ft for the 10 year/24hour event and 0.223 ac-ft for the 100 year/24 hour event. Based on the proposed stage capacity curve for the proposed pond, at the top of the design sludge storage level (3 ft from the bottom of the pond) the calculated depth of water reporting to the pond for the 10 year/24 hour event will be about 4.26 inches, while the 100 year/24 hour event will be about 4.44 inches. Supporting calculations are presented in Attachment 7. Therefore, direct precipitation can easily be contained within the capacity of the evaporation basin. This amount of water will quickly evaporate and not be a difficulty to handle.

As discussed in the Chapter 5 discussion, at the requirement of DOGM, an emergency spillway has been included in the design of the evaporation pond. This structure will be able to pass in a controlled fashion a flow up to 5.84 cfs (see Attachment 7). The pond is designed to be a total containment pond and to evaporate the waters that are collected.

Additionally, to ensure that the 100-year, 24-hour event can be stored in the pond at any point, a marker will be installed at an elevation 4.44 inches below the spillway elevation. This will allow a field determination to be made that there is sufficient storage for the 100-year event available in the pond.

Reclamation

Once the evaporation pond is no longer required for the drying of the sludge, the pond will be reclaimed as described in Chapters 3 and 5. Following completion of the regrading, the stockpiled soils will be spread and the site reseeded with the appropriate seed mix in Attachment 8.

Some concerns have been raised regarding the potential for the pond to collect water in the subsurface following reclamation due the presence of the buried liner. This will not be a problem. During the reclamation activities, it is planned that the liner will be breached in at least one location to ensure that it no longer holds water. Therefore, this concern is addressed.

The site area will be regraded as discussed in Chapters 3 and 5. The access road and culvert will be removed and the pond covered an regraded. Also the undisturbed diversion channel will be removed . The regraded surface will closely approximate the pre-existing surface (see Drawing 7). As there were no significant drainages within the proposed site area, it is proposed that two gentle swales be constructed in the reclaimed surface to convey the runoff across the reclaimed surface and back to the natural surface downstream. Based on the evaluation of the site, the reclaimed hydrology will consist of broad swales with channel slopes to match the existing configuration. The width of the swales will be about 4 to 5 feet wide with a depth of between 6 to 12 inches. Riprap will be installed on an as needed basis based on field monitoring of the reclaimed surface.

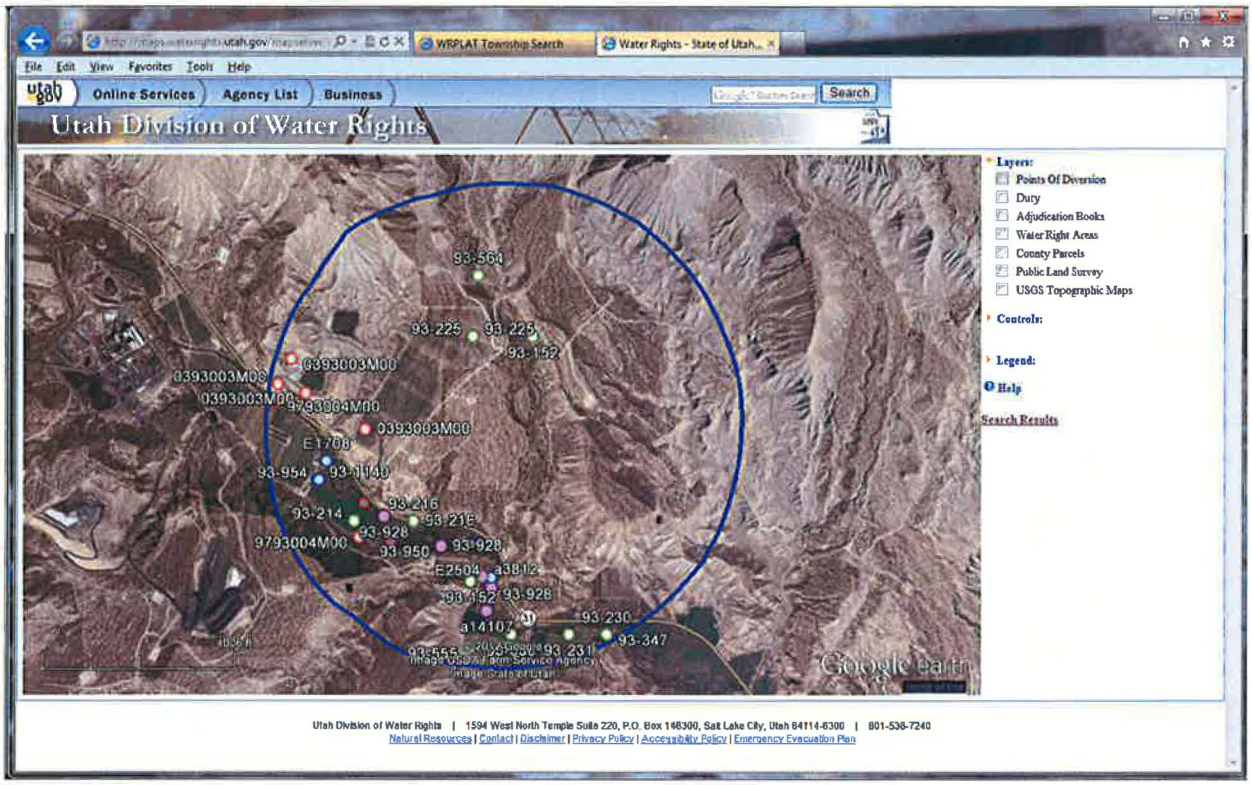

Figure 7-1. Water Rights Locations

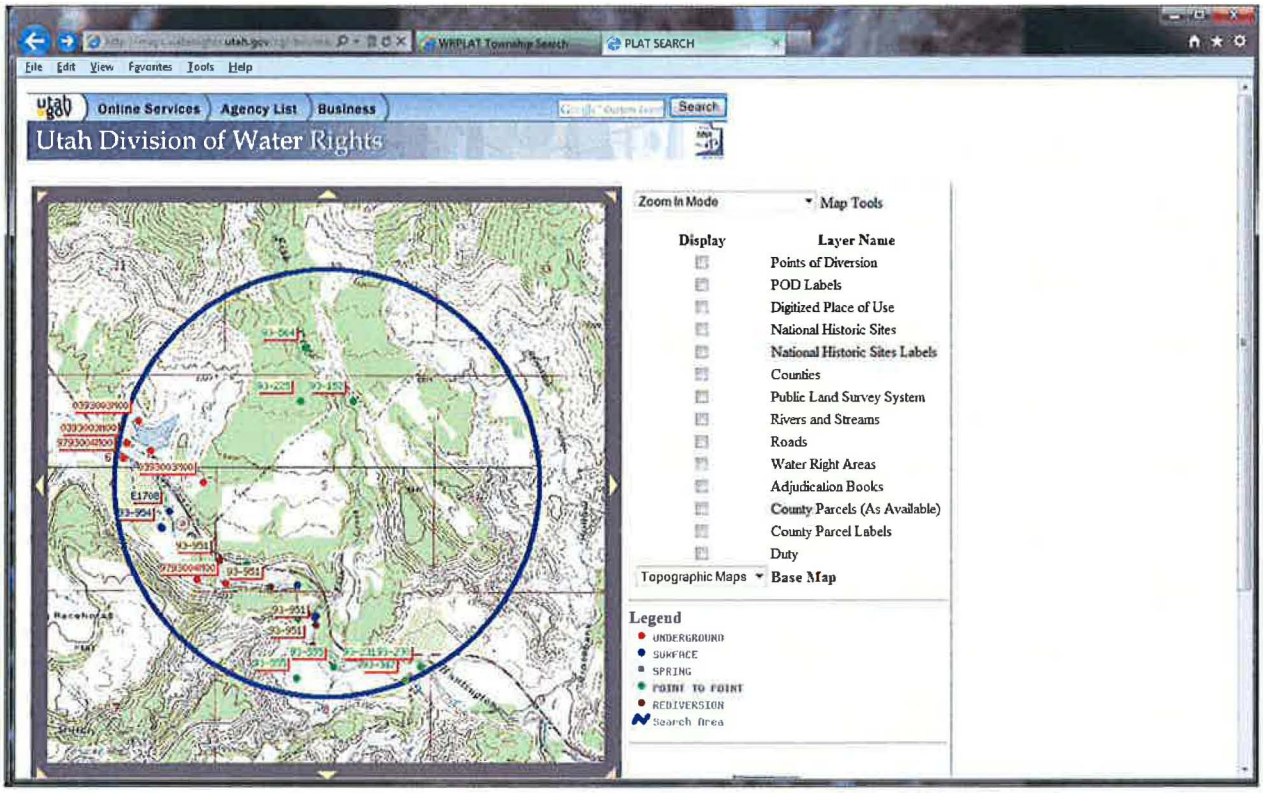

Figure 7-2. Topographic Map of Search Area

Chapter 8, Bonding:

A complete copy of all bond calculation sheets including a summary, can be found in Appendix 5-20 of the MRP.

ATTACHMENT 1

CONSTRUCTION DRAWINGS

Drawing 1	Location Map
Drawing 2	Surface Ownership
Drawing 3	Plan View with Photo Background
Drawing 4	Plan View
Drawing 5	Cross Section, Typical
Drawing 5A	Detail Spillway/Clean out Marker
Drawing 6	Undisturbed Drainage
Drawing 7	Final Contour (AOC)

ATTACHMENT 2

Pond Liner Information

ATTACHMENT 3

LEGAL DESCRIPTION OF LEASE/PERMIT AREA

ATTACHMENT 4

ARCHEOLOGY REPORT
SENCO-PHENIX ARCHEOLOGICAL CONSULTANTS

ATTACHMENT 5

VEGETATION AND WILDLIFE REPORT
MT. NEBO SCIENTIFIC

ATTACHMENT 6

ORDER 2 SOILS SURVEY
LONG RESOURCE CONSULTANTS

ATTACHMENT 7

SEDIMENTATION AND DRAINAGE CONTROL PLAN
BLACKHAWK ENGINEERING

ADDENDUM

ADDITIONAL CALCULATIONS

Stage-Area-Storage for Pond 1P: Burma Pond

Elevation (feet)	Storage (acre-feet)
6,390.00	0.000
6,390.10	0.046
6,390.20	0.093
6,390.30	0.140
6,390.40	0.187
6,390.50	0.235
6,390.60	0.283
6,390.70	0.332
6,390.80	0.381
6,390.90	0.430
6,391.00	0.480
6,391.10	0.530
6,391.20	0.581
6,391.30	0.632
6,391.40	0.684
6,391.50	0.736
6,391.60	0.789
6,391.70	0.842
6,391.80	0.895
6,391.90	0.949
6,392.00	1.003
6,392.10	1.058
6,392.20	1.113
6,392.30	1.169
6,392.40	1.225
6,392.50	1.281
6,392.60	1.338
6,392.70	1.396
6,392.80	1.454
6,392.90	1.512
6,393.00	1.571
6,393.10	1.630
6,393.20	1.690
6,393.30	1.750
6,393.40	1.811
6,393.50	1.872
6,393.60	1.934
6,393.70	1.996
6,393.80	2.058
6,393.90	2.121
6,394.00	2.185
6,394.10	2.249
6,394.20	2.313
6,394.30	2.378
6,394.40	2.444
6,394.50	2.510
6,394.60	2.576
6,394.70	2.643
6,394.80	2.710
6,394.90	2.778
6,395.00	2.847

Stage-Discharge for Pond 1P: Burma Pond

Elevation (feet)	Primary (cfs)
6,390.00	0.00
6,390.10	0.00
6,390.20	0.00
6,390.30	0.00
6,390.40	0.00
6,390.50	0.00
6,390.60	0.00
6,390.70	0.00
6,390.80	0.00
6,390.90	0.00
6,391.00	0.00
6,391.10	0.00
6,391.20	0.00
6,391.30	0.00
6,391.40	0.00
6,391.50	0.00
6,391.60	0.00
6,391.70	0.00
6,391.80	0.00
6,391.90	0.00
6,392.00	0.00
6,392.10	0.00
6,392.20	0.00
6,392.30	0.00
6,392.40	0.00
6,392.50	0.00
6,392.60	0.00
6,392.70	0.00
6,392.80	0.00
6,392.90	0.00
6,393.00	0.00
6,393.10	0.00
6,393.20	0.00
6,393.30	0.00
6,393.40	0.00
6,393.50	0.00
6,393.60	0.00
6,393.70	0.00
6,393.80	0.00
6,393.90	0.00
6,394.00	0.00
6,394.10	0.00
6,394.20	0.00
6,394.30	0.00
6,394.40	0.00
6,394.50	0.00
6,394.60	0.51
6,394.70	1.45
6,394.80	2.68
6,394.90	4.16
6,395.00	5.84

10yr-24hr Hydrograph for Pond 1P: Burma Pond

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.04	0.000	6,393.00	0.00
5.50	0.04	0.002	6,393.00	0.00
6.00	0.04	0.003	6,393.01	0.00
6.50	0.04	0.005	6,393.01	0.00
7.00	0.05	0.007	6,393.01	0.00
7.50	0.05	0.009	6,393.02	0.00
8.00	0.05	0.011	6,393.02	0.00
8.50	0.06	0.013	6,393.02	0.00
9.00	0.07	0.016	6,393.03	0.00
9.50	0.07	0.019	6,393.03	0.00
10.00	0.09	0.023	6,393.04	0.00
10.50	0.12	0.027	6,393.05	0.00
11.00	0.17	0.033	6,393.06	0.00
11.50	0.30	0.042	6,393.07	0.00
12.00	0.85	0.115	6,393.19	0.00
12.50	0.21	0.130	6,393.22	0.00
13.00	0.14	0.137	6,393.23	0.00
13.50	0.11	0.142	6,393.24	0.00
14.00	0.09	0.146	6,393.25	0.00
14.50	0.08	0.150	6,393.25	0.00
15.00	0.07	0.153	6,393.26	0.00
15.50	0.06	0.156	6,393.26	0.00
16.00	0.05	0.158	6,393.26	0.00
16.50	0.05	0.160	6,393.27	0.00
17.00	0.05	0.162	6,393.27	0.00
17.50	0.05	0.164	6,393.27	0.00
18.00	0.04	0.166	6,393.28	0.00
18.50	0.04	0.168	6,393.28	0.00
19.00	0.04	0.169	6,393.28	0.00
19.50	0.03	0.171	6,393.29	0.00
20.00	0.03	0.172	6,393.29	0.00

100yr-24hr Hydrograph for Pond 1P: Burma Pond

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
5.00	0.05	0.000	6,393.00	0.00
5.50	0.05	0.002	6,393.00	0.00
6.00	0.05	0.004	6,393.01	0.00
6.50	0.06	0.007	6,393.01	0.00
7.00	0.06	0.009	6,393.02	0.00
7.50	0.06	0.012	6,393.02	0.00
8.00	0.07	0.014	6,393.02	0.00
8.50	0.08	0.017	6,393.03	0.00
9.00	0.10	0.021	6,393.04	0.00
9.50	0.10	0.025	6,393.04	0.00
10.00	0.12	0.030	6,393.05	0.00
10.50	0.16	0.035	6,393.06	0.00
11.00	0.22	0.043	6,393.07	0.00
11.50	0.38	0.055	6,393.09	0.00
12.00	1.10	0.149	6,393.25	0.00
12.50	0.27	0.168	6,393.28	0.00
13.00	0.19	0.178	6,393.30	0.00
13.50	0.14	0.184	6,393.31	0.00
14.00	0.11	0.190	6,393.32	0.00
14.50	0.10	0.194	6,393.32	0.00
15.00	0.09	0.198	6,393.33	0.00
15.50	0.08	0.202	6,393.34	0.00
16.00	0.07	0.205	6,393.34	0.00
16.50	0.07	0.207	6,393.35	0.00
17.00	0.06	0.210	6,393.35	0.00
17.50	0.06	0.213	6,393.36	0.00
18.00	0.05	0.215	6,393.36	0.00
18.50	0.05	0.217	6,393.36	0.00
19.00	0.05	0.219	6,393.37	0.00
19.50	0.04	0.221	6,393.37	0.00
20.00	0.04	0.223	6,393.37	0.00

ATTACHMENT 8

BLM RECOMMENDED SEED MIX

ATTACHMENT 9

EMERY COUNTY ROAD ENCROACHMENT PERMIT

ATTACHMENT 10

LABORATORY ANALYSIS OF SLUDGE MATERIAL

ATTACHMENT 11

STABILITY ANALYSIS
BLACKHAWK ENGINEERING

ATTACHMENT 12

MSDS SHEETS, COAGULANT AND FLOCCULANT

ATTACHMENT 13

WATER RIGHTS SUMMARY

ATTACHMENT 14

BONDING CALCULATIONS

ATTACHMENT 15

Raptor Information

ATTACHMENT 16

Air Quality Information

Chapter 5, Engineering:

As depicted on the drawings in Attachment 1, the facility will consist of a large, shallow evaporation pond, measuring approximately 100' wide by 200' long. ~~It~~ It will be constructed about five feet (60") deep, although only the bottom 36" will be utilized for sludge storage/water retention, leaving the top 24" as freeboard. Based on past experience, it is anticipated that cleanout sludge-water from the Crandall water treatment facility will be hauled to the site about ~~10 each eight-hour days (two working weeks) every two months~~twice a week, ~~at two~~approximately 2-3 truckloads per day, and 4000 gallons per truckload. ~~This~~, depending on weather and road conditions. Due to the low iron levels, cleaning can be suspended at any time, up to 4 months a year if sludge build up in the cells indicate cleaning is not necessary. This works out to be about ~~64~~130,~~200~~000 cu. ft. per year hauled to the site for disposal. ~~The~~ The iron cleanout "sludge" material has typically been analyzed at about 5% solids, and 95% water by weight, and even less by volume, perhaps 2-3% solids. Therefore, after evaporation of the water, which is estimated to be 1.4 acre feet per year, the actual volume of solids left to accumulate in the basin is expected to average about ~~2400~~4,300 cu ft. per year. Spread out to dry over the 20,000 square foot bottom of the evaporation basin, the rate of solids accumulation in the basin is expected to be ~~less than 1~~2.56 inches per year or less. ~~It~~ It is anticipated that the material will not accumulate more than 24" deep in the bottom of the basin during the operational life of the facility, which according to current deposit rates, will take more than 16 years to accumulate to this level. This will then allow the material to be covered with the necessary 48" of backfill at the time of final reclamation.

Consumption calculation show that the mine currently discharges approximately 400 GPM which equates to 644.3 acre feet per year. The evaporation pond will consume approximately 1.4 acre feet per year for a net gain of 642.9 acre feet per year.

It should be noted that the preceding volume accumulation estimate is based on rough assumptions, and will vary significantly upon actual practice. However, prior experience with sludge disposal at the Wildcat Loadout site has demonstrated that the amount of solid material remaining after evaporation is actually quite small, and will indicate that the above assumptions are reasonable.

At present, there is some uncertainty as to the future treatment requirements for the Crandall Mine discharge water, in terms of the longevity of treatment and the degree of treatment. With the approval of the application of the Crandall water treatment, it is assumed that the following scenarios will ultimately unfold:

1) The dried sludge material will be left in place and buried on-site as part of the final reclamation process. The material will be buried under 48" of inert earthen material during reclamation, topsoiled and re-vegetated. As noted previously, the material has been analyzed as is neither toxic, hazardous nor acid-forming, and contains no RCRA metals, as shown by the laboratory result presented in

with 7.5 inches of solid waste deposited. Grab samples of the waste will be shipped using chain of custody forms, and will be prepared at the laboratory using TCLP Method 1311, and will be analyzed for all RCRA metals using EPA Method 200.7 or 200.8 and will be monitored for hazardous concentrations in accordance with 40 CFR 264.13.

Grab samples of the accumulated sludge will be taken for analysis of the following metals of agronomic concern: aluminum by Synthetic Precipitation Leaching Procedure (SPLP, SW846 Method 1312) , and plant available iron, zinc, and nickle analyzed by DTPA extractable, and by the methods described for all parameters listed in the Division's Guidelines for Topsoil and Overburden, Tables 3 & 7.

Excess dried material will be removed from the basin if needed and taken to an approved disposal site, such as ECDC.

3) The basin will be enlarged if needed to accommodate additional future accumulation needs. This would be accomplished by extending the length of the basin either to the east or the west within the existing site. The site will easily accommodate an enlargement of the basin of over three times the currently proposed size. The company acknowledges that any future modification of the facility will require additional SMCRA permitting amendments.

3) There is a possibility that the iron content of the Crandall mine discharge water may naturally drop down to within compliance levels such that future treatment is no longer required, and hence, sludge disposal at the Burma evaporation facility will no longer be required.

4) There is a possibility that if the iron levels remain high and treatment is required in perpetuity then a more permanent, long-term treatment facility will be constructed, and an alternate sludge disposal system could be incorporated into that facility.

5) The status of the need for treatment at the mine and subsequent disposal at the evaporation basin ~~will be~~is evaluated a minimum of once per week, weather permitting, on an ongoing basis ~~as. part of the five-year permit renewal process.~~

6) In the event of temporary cassation at the Berma Pond site, the sludge will be covered with six inches of subsoil and an interim seeding of crested wheatgrass (Agropyron cristatum) . Notice will be given as required by R645-301-515.321.

7) The waste will be routinely compacted and covered to prevent combustion and wind-borne waste.

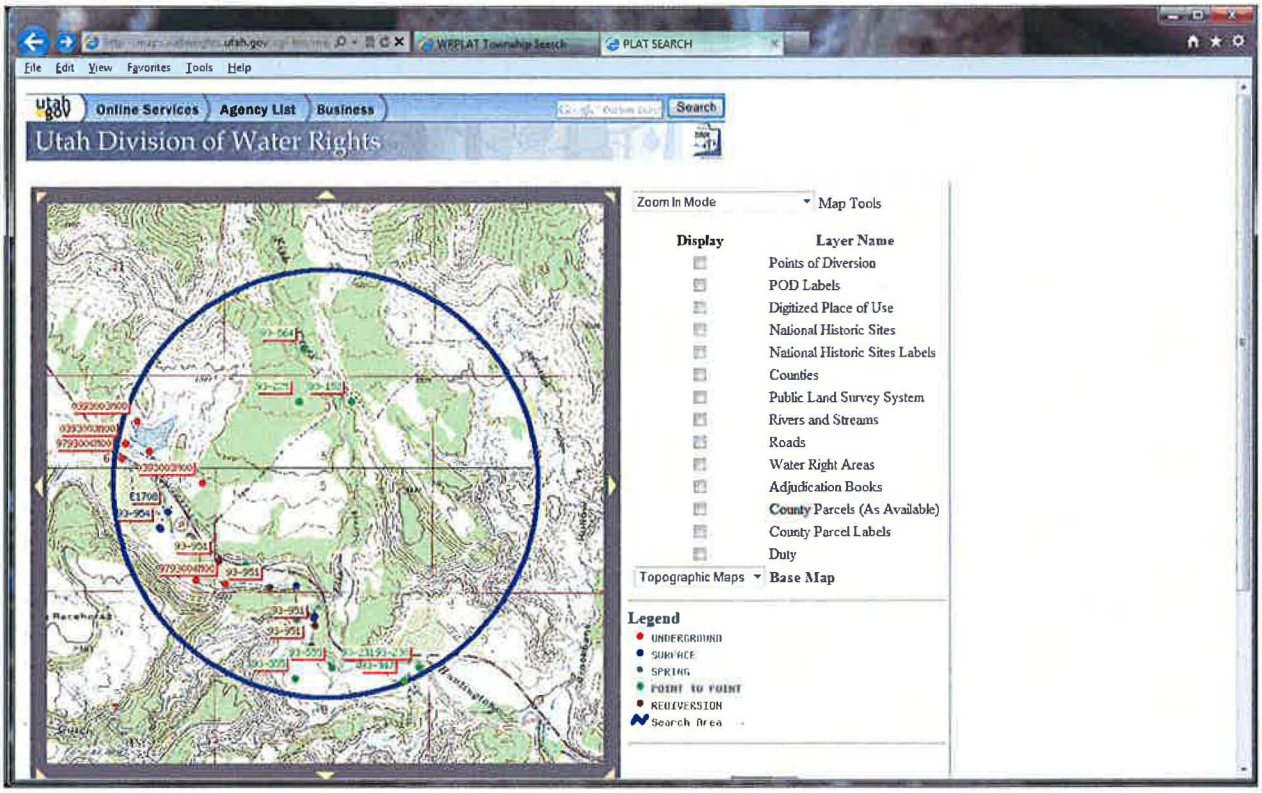

Figure 7-2. Topographic Map of Search Area

Chapter 8, Bonding:

~~All unit costs herein presented are taken from the format of the presently (October, 2011) approved Crandall Canyon Mine bonding calculations. The calculations below are a summary of the Burma bond revisions.~~ A complete copy of all bond calculation sheets including a summary, can be found in Appendix 5-20 of the ~~approved~~ MRP.

~~1) Demolition~~

~~The only structure to be removed is a 20' long 18" diameter culvert crossing the access road.~~

~~a) Demolition of one culvert = $198.67~~

2) Earthwork

b) backfill and grading of the basin (of 2,363 cubic yards)

According to the presently approved Crandall reclamation costs the cost of backfill on-site is $173,310 for 70,192 yds = $2.46 per yd.
2,363 yd x $2.46/ yd = $5,812.98

c) topsoil replacement (of 1137 cubic yards)
According to the presently approved Crandall reclamation costs (Feb, 2006) the cost of topsoil redistribution is $43,170 for 10,737 yds = $4.02 per yd.
1,137 yd x $4.02/yd = $4,570.74

3) Revegetation (of 1.41 acres)

d) revegetation of 1.41 acres
The cost of revegetation is $7,279 for 1.41 acres.

Total direct reclamation costs are therefore calculated to be
Demolition$ 198.67

~~Earthwork$10,383.72~~
~~Revegetation $ 7,279.00~~
~~Sub-total$17,861.39~~

~~Indirect costs and escalation costs are presently $1,697,800 / $1,236,798 = 1.3727 or 37.27% of the direct costs. Therefore, the estimated total reclamation bonding cost for the Burma evaporation facility is $17,861.39 x 1.3727 = $24,518.33~~

ATTACHMENT 1

CONSTRUCTION DRAWINGS

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CRANDALL CANYON MINE
LEASE / PERMIT AREA MAP

REV: 13	ACAD: 1-1 LEASE MAP R13
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 1-1

UTAH REGISTERED PROFESSIONAL ENGINEER
#6449561
David W. Hibbs
1/13/16

RESCUE DRILL HOLES

SITLA RESCUE ROAD

MINE SITE

SURFACE AND COAL
DELLENBACK FEE

FEDERAL LEASE
UTU-78953

FEDERAL LEASE
UTU-88990

NIELSON FEE

LEGEND
UDOGM PERMIT BOUNDARY
MINE SURFACE FACILITIES
THE PERMIT AREA IS ENTIRELY WITHIN THE MANTI – LA SAL NATIONAL FOREST

NOTE:
SEE PLATE 1-1A FOR LOCATION OF BURMA EVAPORATION POND (PERMIT AREA).

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G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\1-1 LEASE MAP REV13.dwg, Plate 1-1, 1/11/2016 9:27:00 AM, 1:1

27 26 25 30 29 28 27

34 35 36 31 32 33 34

3 2 1 6 5 4 3

10 11 12 7 8 9 10

T 15 S
T 16 S

R6E
R7E

FEDERAL LEASE
UTU-68082

STATE LEASE
ML-21569

FEDERAL LEASE
UTU-68082

FEDERAL LEASE
UTU-68082(M)

FEDERAL LEASE
UTU-68082

RESCUE
DRILL HOLES

FEDERAL LEASE
U-54762

FEDERAL
LEASE
UTSL-062648

STATE LEASE
ML-21568

FEDERAL
LEASE
UTU-68082

FEDERAL R.O.W.
UTU-77975

OUTCROP

SITLA RESCUE ROAD

DELLENBACK
FEE LEASE

FEDERAL LEASE
UTU-88990

FEDERAL LEASE
UTU-78953

NIELSON
FEE LEASE

STRIKE / AVG. DIP
6% S.E.

N

1000' 0 2000' 4000'

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- SECTION LINE
- LEASE LINES
- EXISTING MINE WORKINGS
- RETAINED FEDERAL LEASE AREA
- FEDERAL LEASE AREA RELINQUISHED
- NON-FEDERAL LEASE AREAS

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CRANDALL CANYON MINES
2013 LEASE RELINQUISHMENTS

REVISION:	1	ACAD:	LEASE RELINQUISHMENTS R1
DATE:	01-13-2016	BY:	PJJ
SCALE:	1" = 2000'	PLATE #:	1-2

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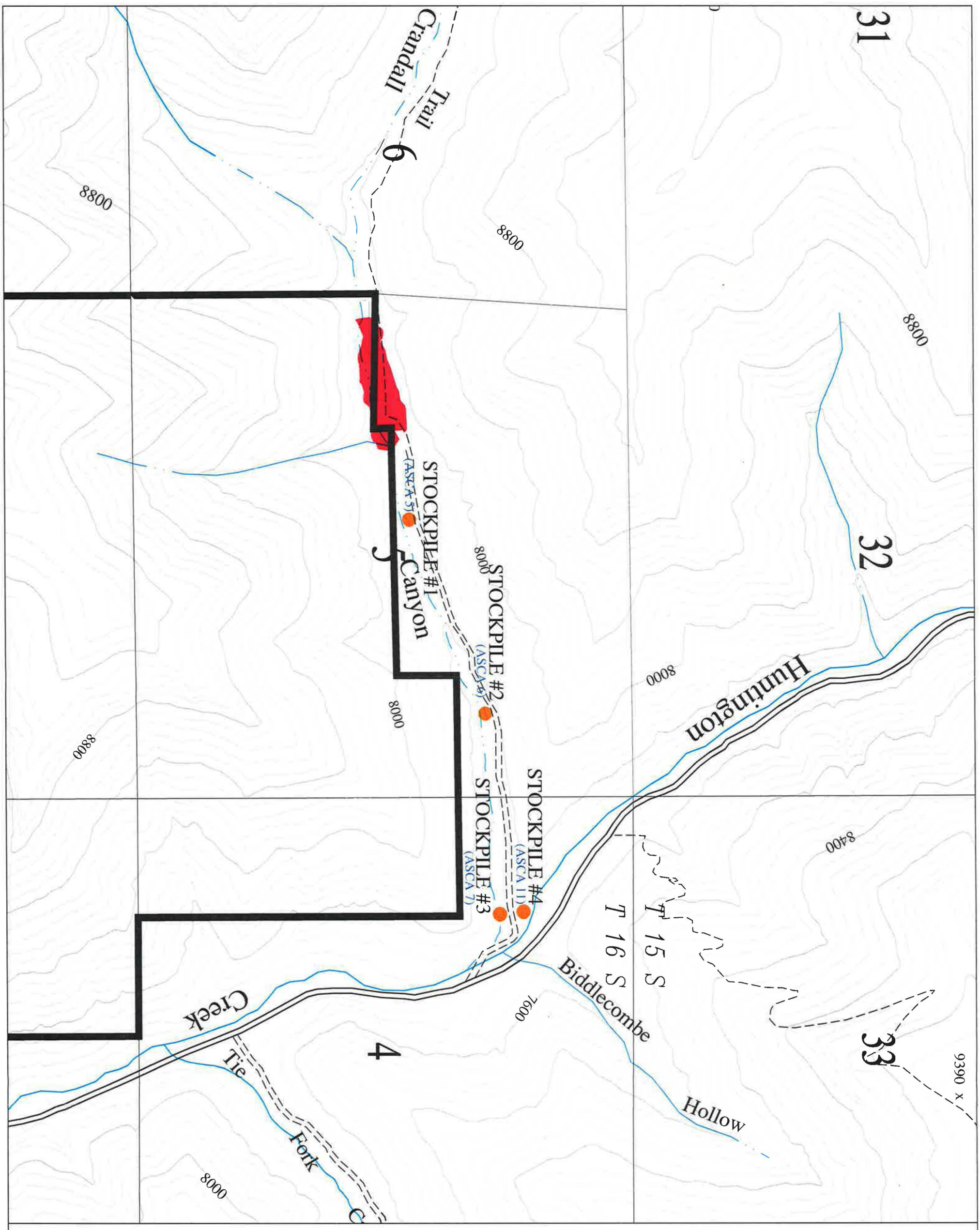

LEGEND

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

STOCKPILE LOCATIONS (PERMIT AREA)

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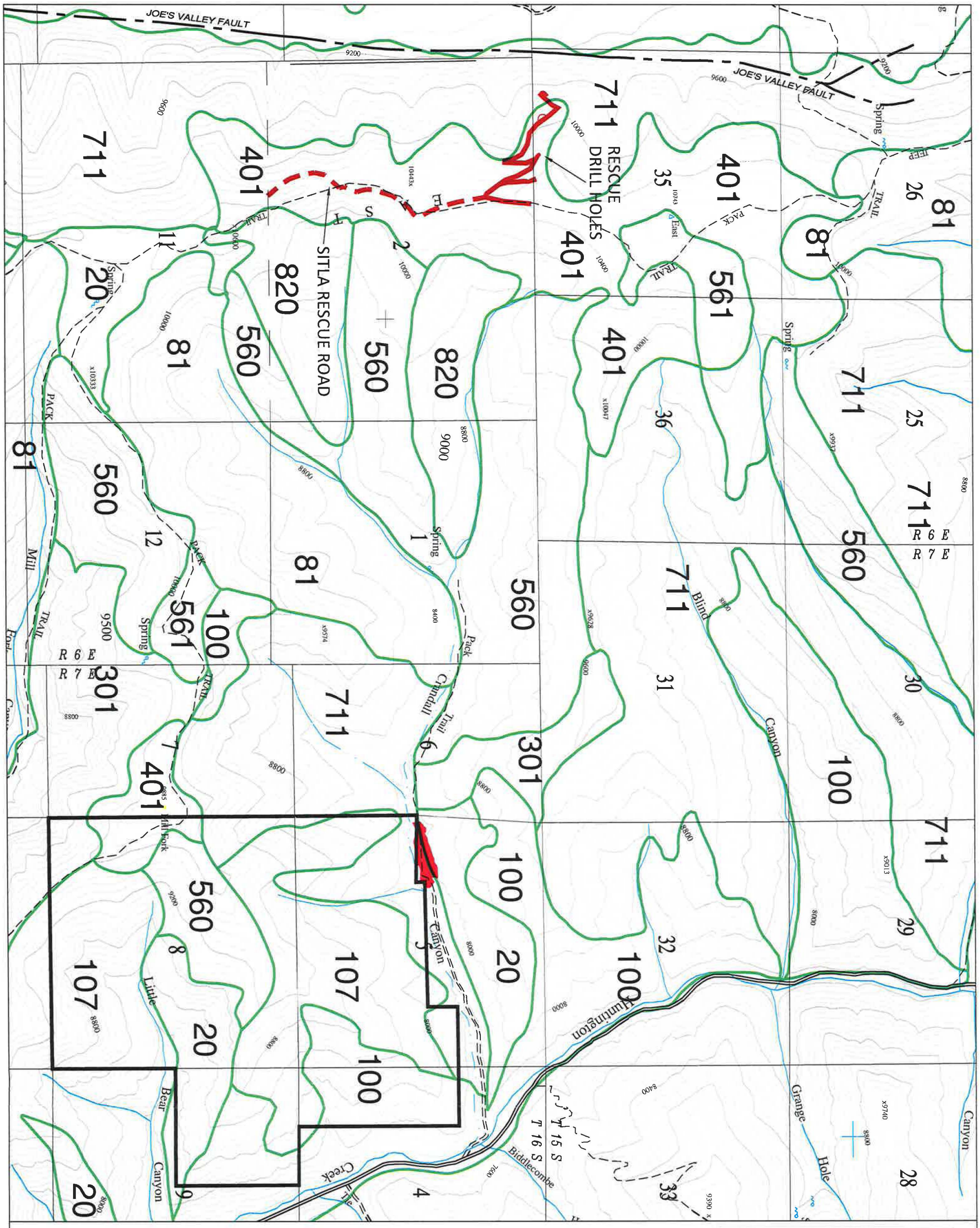
CRANDALL CANYON MINE
TOPSOIL STOCKPILE LOCATIONS

REV: 4	ACAD: STOCKPILE LOCATIONS
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=1000'	PLATE #: 2-3

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\2-6 REGIONAL SOILS MAP R10.dwg, Plate 2-6, 1/11/2016 9:35:45 AM, 1:1



SOIL TYPE KEY

8	GREYBACK FAMILY-CRYOTHENTS COMPLEX
20	STRYCH-PATHEAD-PODO FAMILIES-RUBBLELAND COMPLEX
41	CASTINO FAMILY
42	BECKS FAMILY-CRYAQUOLLS-SILAS FAMILY COMPLEX
81	BUNDO-LUCKY STAR-SCOUT FAMILIES COMPLEX
100	GRALIC-BEHANIN-ELWOOD FAMILIES COMPLEX
107	CURECANTI-ELWOOD-DUSCHENE FAMILIES COMPLEX
301	GREYBACK-LOAMY, MIXED (NONACIDIC) LITHIC CRYORTHENTS-BACHELOR FAMILIES COMPLEX
401	ADEL-MERINO FAMILIES COMPLEX
560	CLAYBURN-BROAD CANYON FAMILIES COMPLEX
561	CLAYBURN-FAIM-BEHANIN FAMILIES COMPLEX
711	BUNDO-LUCKY STAR-ADEL FAMILIES COMPLEX
820	LUCKY STAR-BUNDO-ADEL FAMILIES COMPLEX

SOURCE: Manti-LaSal Forest Service, 1995

SOIL TYPE BOUNDARY

MINE SURFACE FACILITIES

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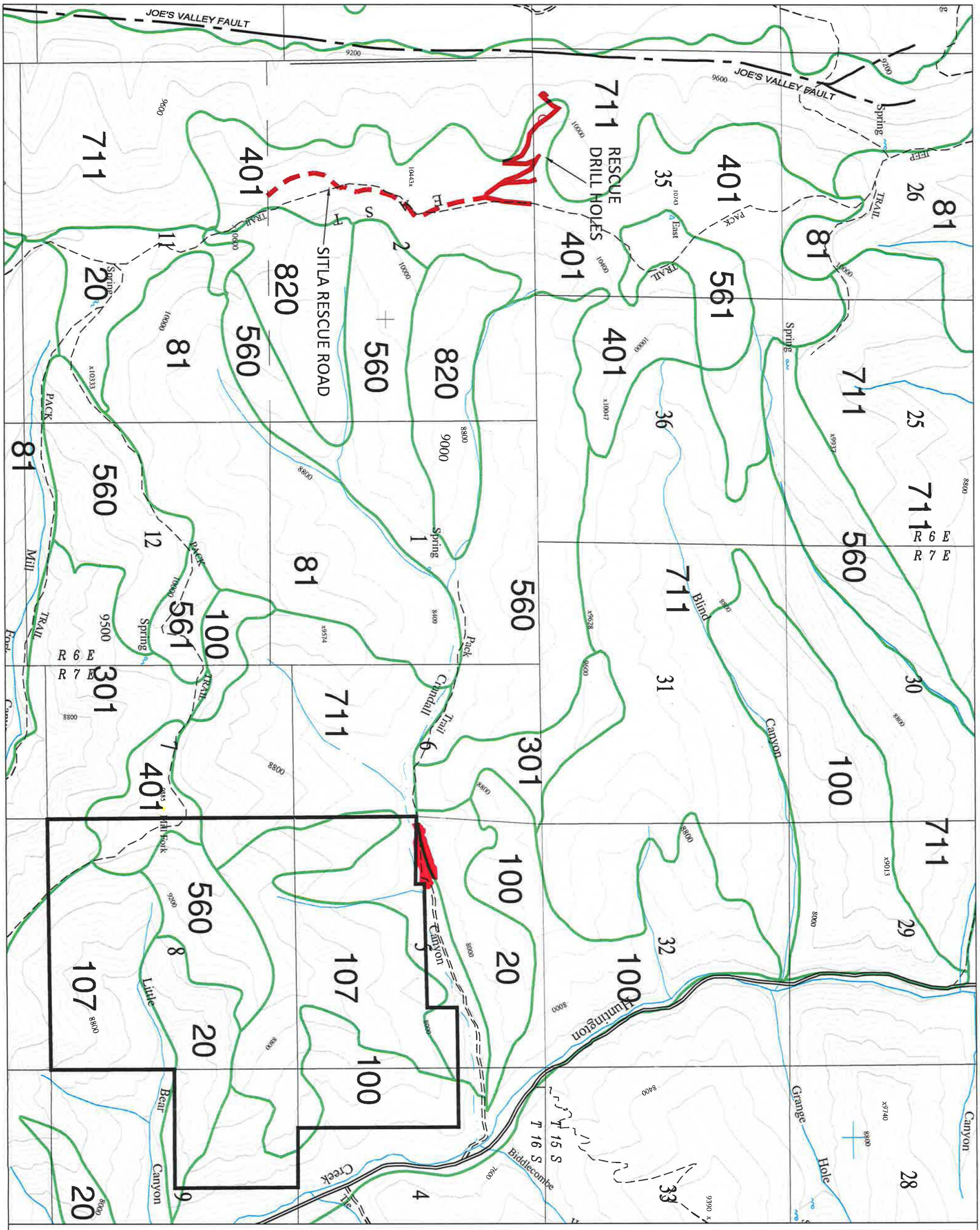
CRANDALL CANYON MINE
REGIONAL SOILS MAP

REV: 10	ACAD: REGIONAL SOILS MAP
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000	PLATE #: 2-6

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\2-6 REGIONAL SOILS MAP R10.dwg, Plate 2-6, 1/11/2016 9:35:45 AM, 1:1



SOIL TYPE KEY

8	GREYBACK FAMILY-CRYOTHENTS COMPLEX
20	STRYCH-PATHEAD-PODO FAMILIES-RUBBLELAND COMPLEX
41	CASTINO FAMILY
42	BECKS FAMILY-CRYAQUOLLS-SILAS FAMILY COMPLEX
81	BUNDO-LUCKY STAR-SCOUT FAMILIES COMPLEX
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561	CLAYBURN-FAIM-BEHANIN FAMILIES COMPLEX
711	BUNDO-LUCKY STAR-ADEL FAMILIES COMPLEX
820	LUCKY STAR-BUNDO-ADEL FAMILIES COMPLEX

SOURCE: Manti-LaSal Forest Service, 1995

SOIL TYPE BOUNDARY

MINE SURFACE FACILITIES

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CRANDALL CANYON MINE
REGIONAL SOILS MAP

REV: 10	ACAD: REGIONAL SOILS MAP
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000	PLATE #: 2-6

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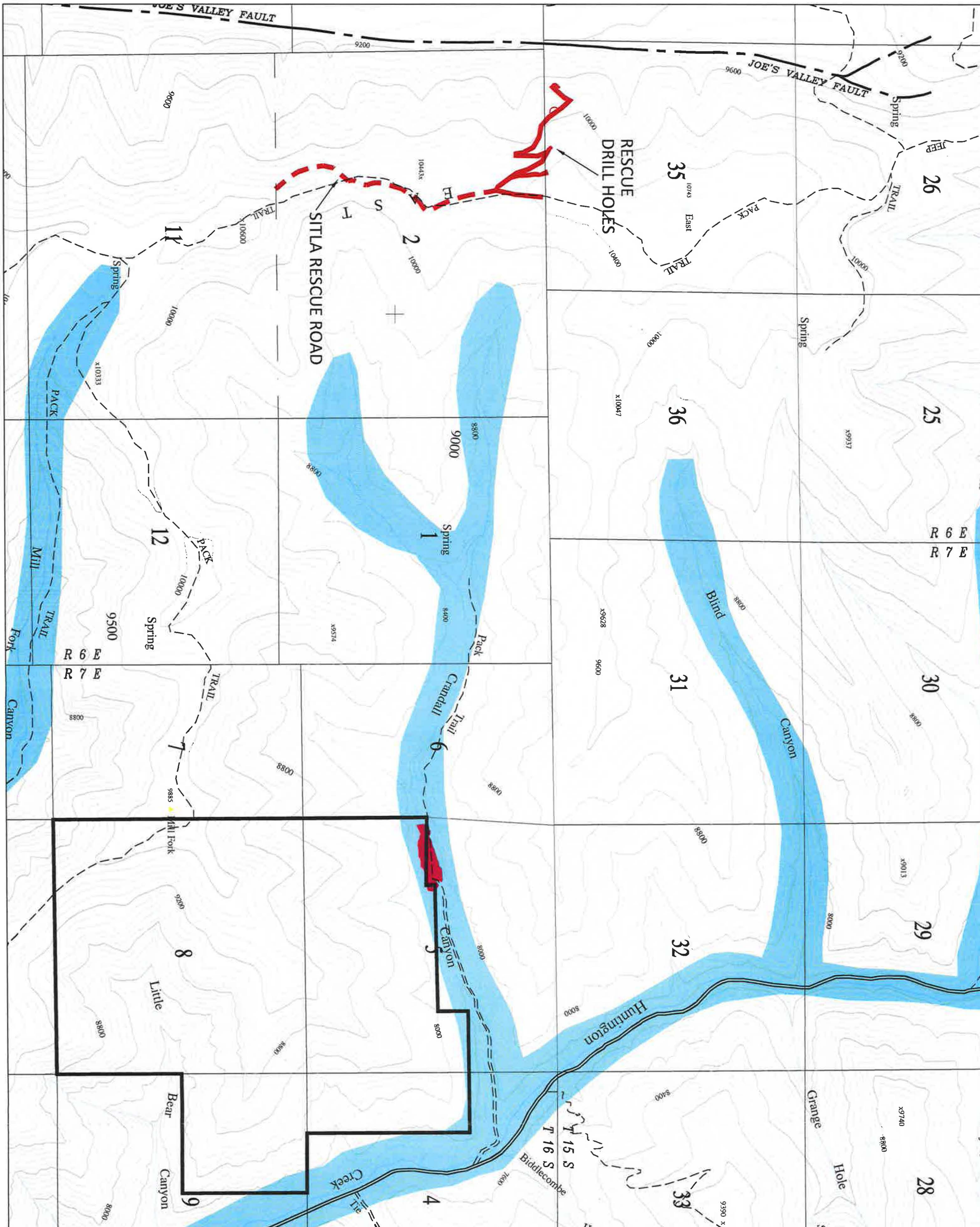

LEGEND

MOOSE - YEAR ROUND SOURCE: U.D.W.R. 2004	
UDOGM PERMIT BOUNDARY	
MINE SURFACE FACILITIES	

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CRANDALL CANYON MINE
WILDLIFE MAP - MOOSE

REV: 10	ACAD: WILDLIFE-MOOSE R10
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 3-1 (A)

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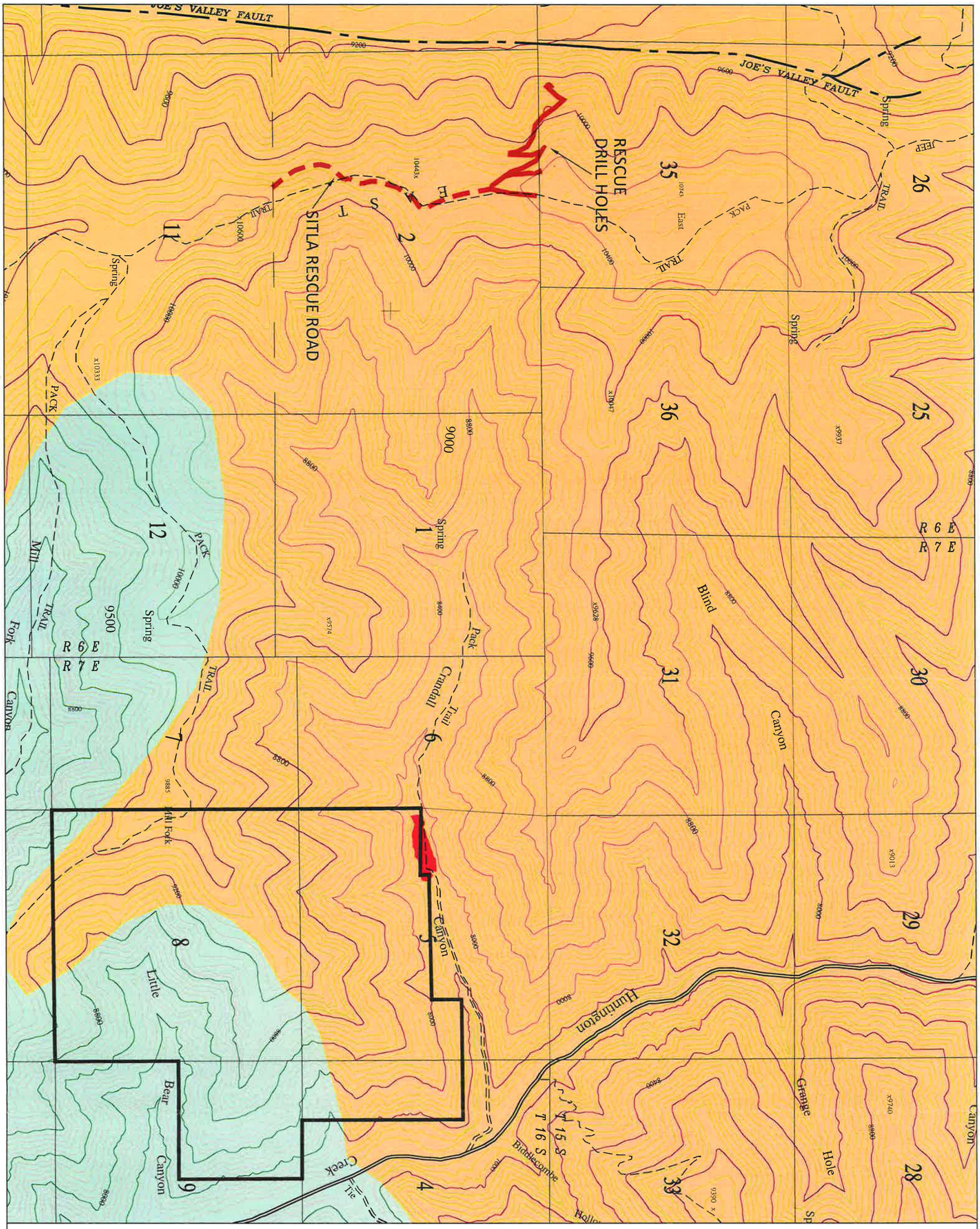

LEGEND

ELK - SUMMER

ELK - WINTER

SOURCE: U.D.W.R. 2004

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

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CRANDALL CANYON MINE
WILDLIFE MAP - ELK

REV: 11	ACAD: WILDLIFE-ELK R11
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 3-1 (B)

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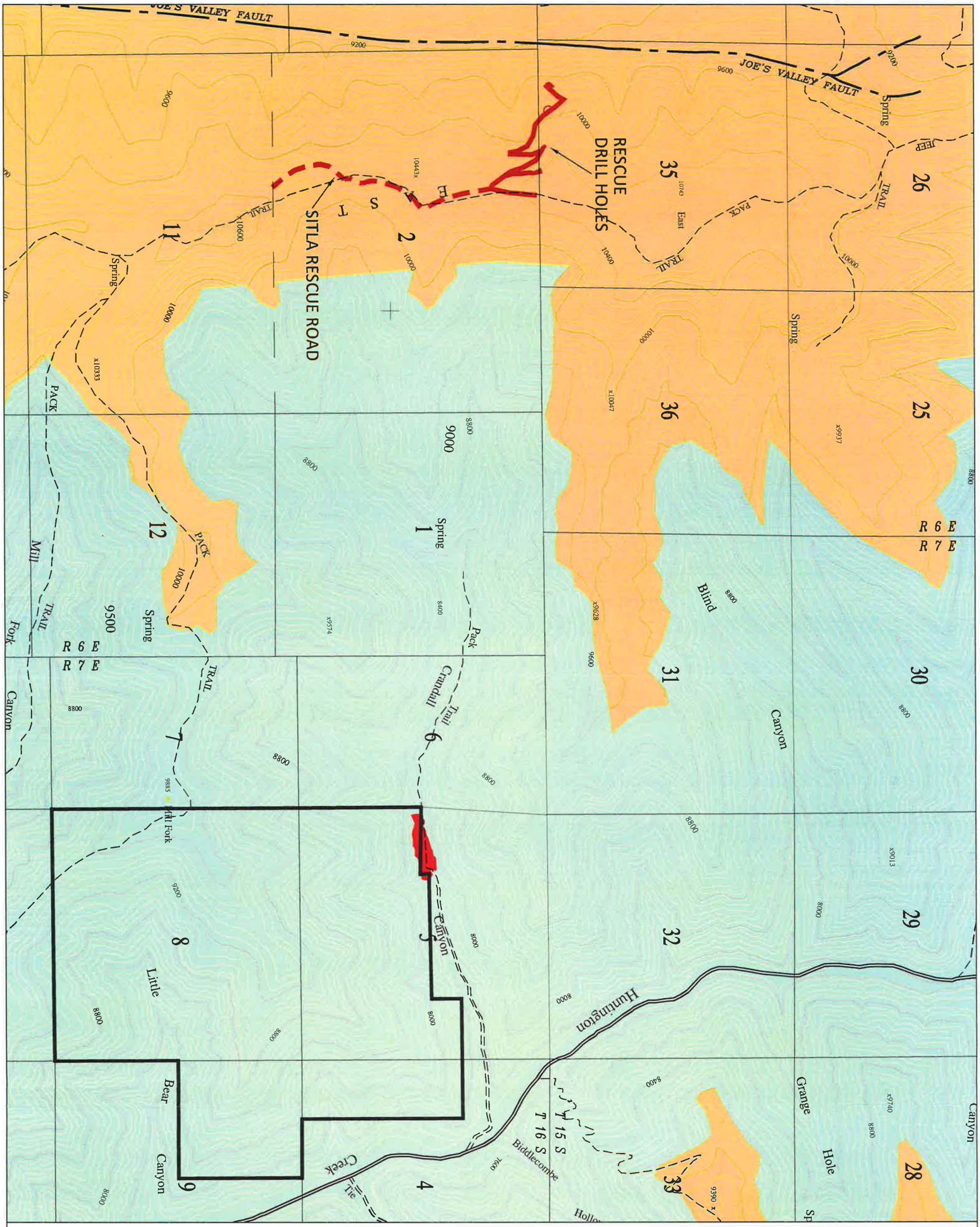

LEGEND

DEER - SUMMER

DEER - WINTER

SOURCE: U.D.W.R. 2004

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

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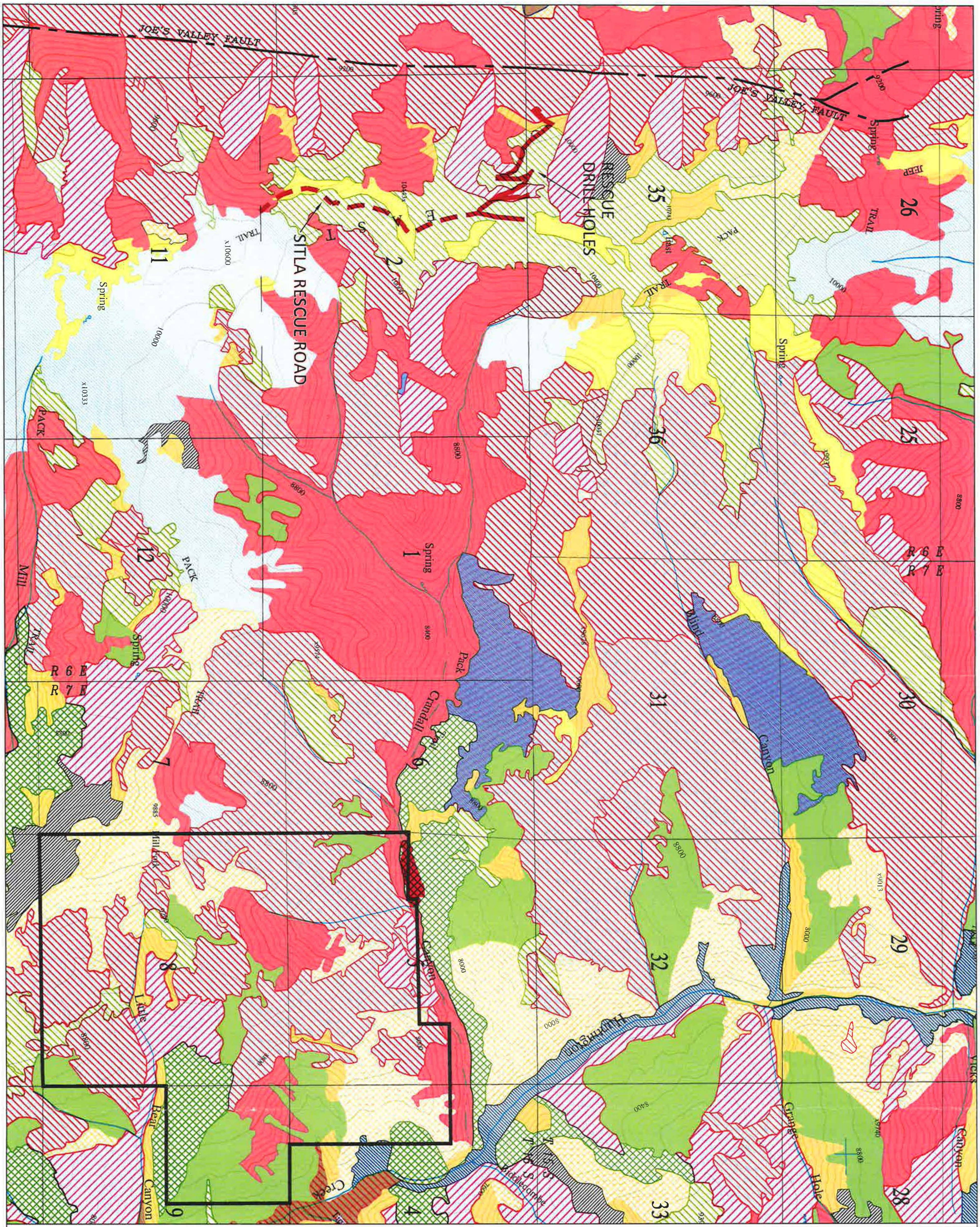
CRANDALL CANYON MINE
WILDLIFE MAP - DEER

REV: 11	ACAD: WILDLIFE-DEER R11
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 3-1 (C)

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\3-2 VEGETATION MAP R11.dwg, Layout3, 1/11/2016 10:26:04 AM, 1:1



LEGEND VEGETATION TYPES

ASPEN	PERENNIAL FORB
ASPEN WITH CONIFER	PERENNIAL GRASSLAND
ASPEN WITH MOUNTAIN BRUSH	PERENNIAL WETLAND
BARREN ROCK OR LEDGE	ROCKY MOUNTAIN JUNIPER
BLUE SPRUCE	SAGEBRUSH
CURLLEAF MOUNTAIN MAHOGANY	SPRUCE-FIR
DOUGLAS FIR	TREE DOMINATED RIPARIAN
LIMBER/BRISTLECONE PINE	
MOUNTAIN BRUSH	
OAK BRUSH	

SOURCE: U.S.F.S. 2005

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

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CRANDALL CANYON MINE
REGIONAL VEGETATION MAP

REV: 11	ACAD: VEGETATION MAP R11
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000	PLATE #: 3-2

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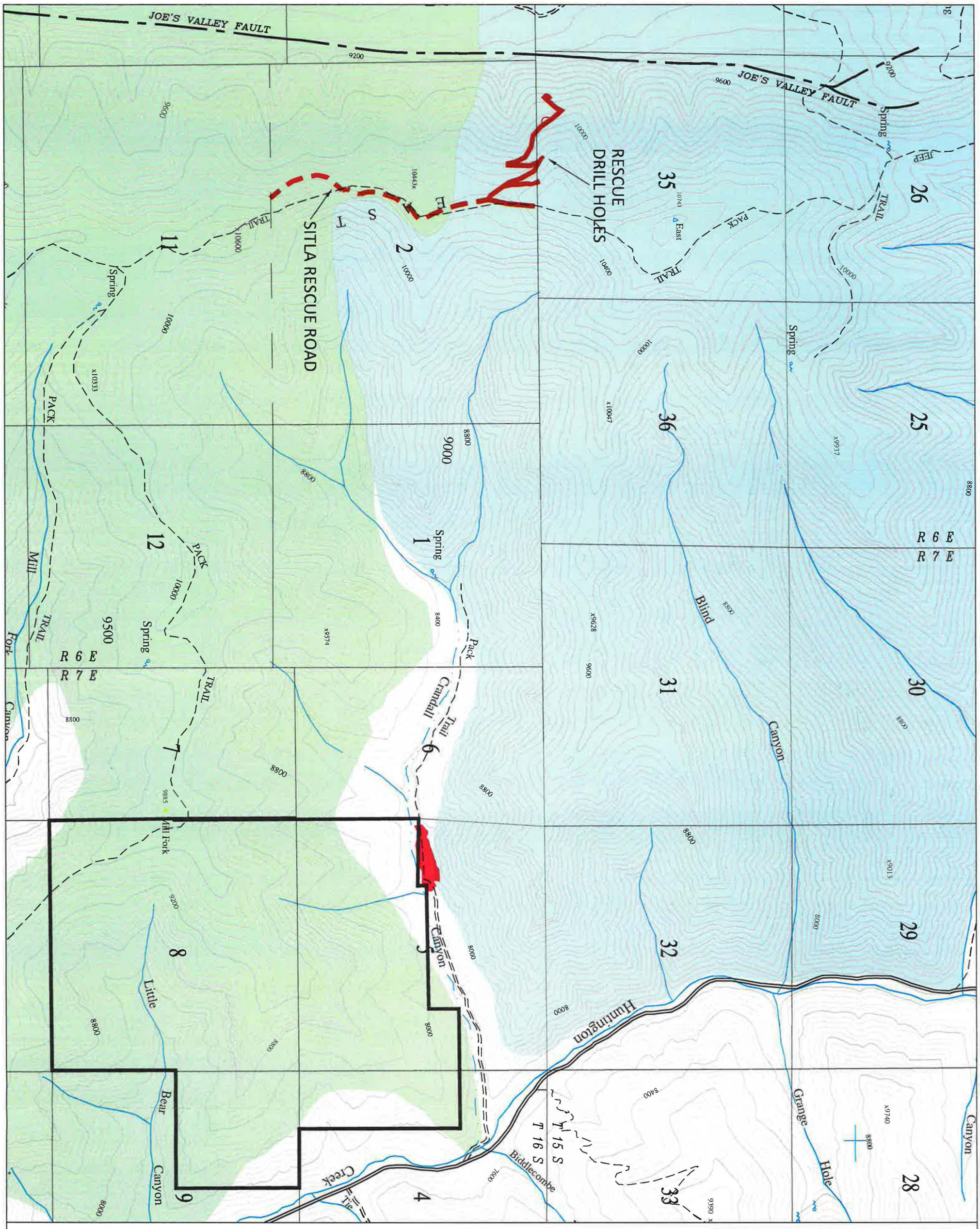

LEGEND

CRANDALL CANYON SHEEP & GOAT ALLOTMENT
CRANDALL RIDGE SHEEP & GOAT ALLOTMENT
TRAIL MOUNTAIN COW & HORSE ALLOTMENT

SOURCE— Manti-LaSal Forest Service, 1998

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

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David W. Hibbs
#6449561

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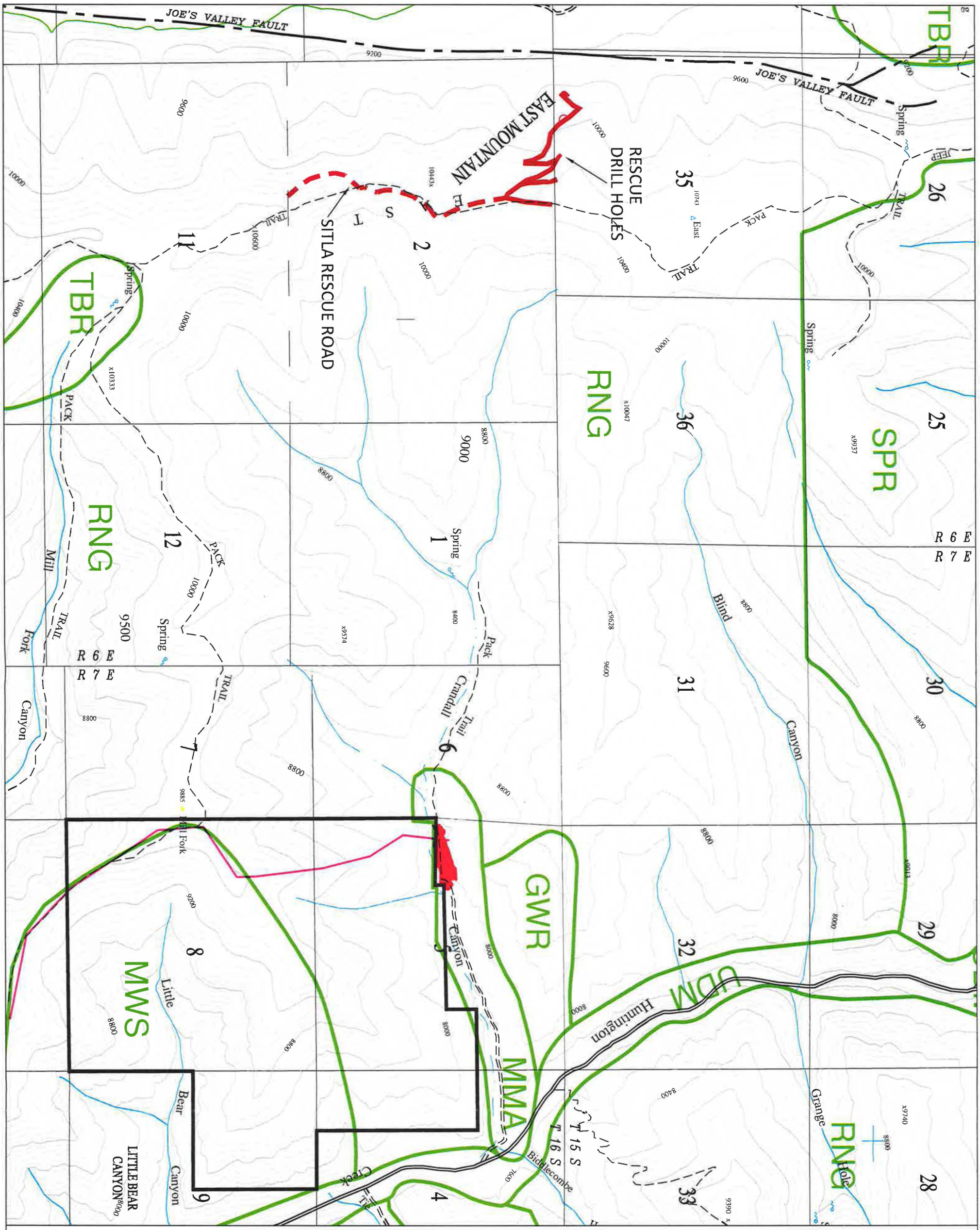
Telephone: (435) 888-4000

CRANDALL CANYON MINE GRAZING ALLOTMENTS

REV: 9	ACAD: LAND USE R9
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 4-1

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\4-2 LAND USE R10.dwg, Layout2, 1/11/2016 11:29:55 AM, 1:1



LEGEND

LAND USE BOUNDARY LINE	
MAIN POWER LINE	
WOOD FIBER PRODUCTION & HARVEST	TBR
GENERAL BIG GAME WINTER RANGE	GWR
LEASABLE MINERAL DEVELOPMENT	MMA
RANGELAND MAINTENANCE	RNG
MUNICIPAL WATER SUPPLY	MWS
UTILITY CORRIDORS & WINDOWS	UCW
KEY BIG GAME WINTER RANGE	KWR
SEMI-PRIMITIVE RECREATION USE	SPR
UNDEVELOPED MOTORIZED SITE	UDM
DEVELOPED RECREATIONAL SITE	DRS
GAS WELL	

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

SOURCE:
FOREST LAND AND RESOURCE MANAGEMENT PLAN,
1986 MANAGEMENT UNITS.

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CRANDALL CANYON MINE
LAND USE MAP

REV: 10	ACAD: LAND USE R10
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 4-2

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\4-3 OIL AND GAS R10.dwg, Layout1, 1/11/2016 11:37:56 AM, 1:1

JOE'S VALLEY FAULT

RESCUE DRILL HOLES

SITLA RESCUE ROAD

COTTONWOOD OIL AND GAS ANALYSIS AREA

HUNTINGTON CANYON OIL AND GAS ANALYSIS AREA

R 6 E
R 7 E

T 15 S
T 16 S

LEGEND

GAS WELL

BOUNDARY OF ANALYSIS AREA

SOURCE:
FOREST LAND AND RESOURCE MANAGEMENT PLAN, 1986 MANAGEMENT UNITS.

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

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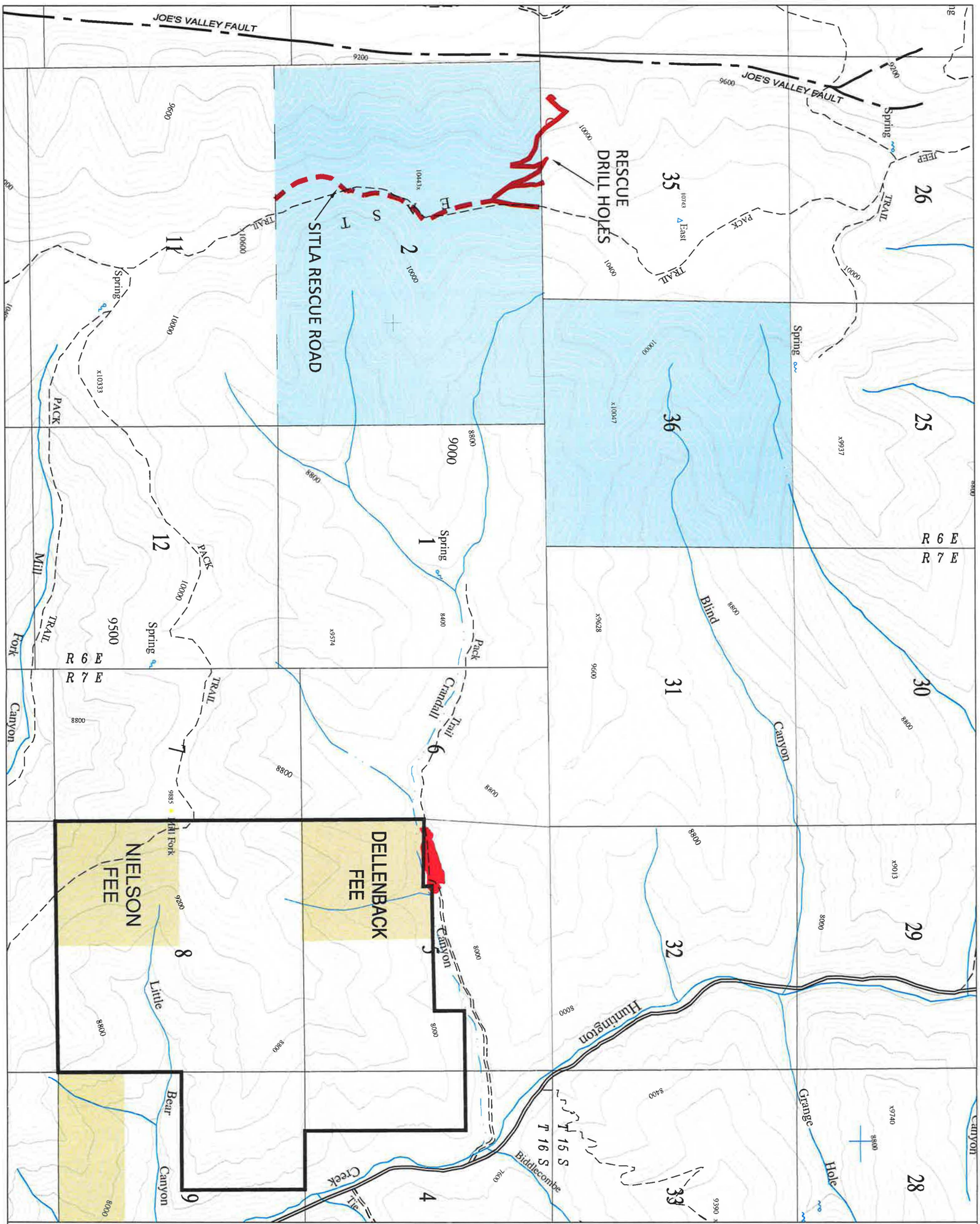
CRANDALL CANYON MINE
OIL & GAS DEVELOPMENT

REV: 10	ACAD: OIL AND GAS R10
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 4-3

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\4-4 SURFACE OWNERSHIP R10.dwg, Layout3, 1/11/2016 11:41:31 AM, 1:1



LEGEND

PRIVATE

SCHOOL & INSTITUTIONAL TRUST LANDS ADMINISTRATION

U.S. FOREST SERVICE

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

UNSHADED AREA

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CRANDALL CANYON MINE
SURFACE OWNERSHIP MAP

REV: 10	ACAD: SURFACE OWNERSHIP R10
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 4-4

AS-CONSTRUCTED BURMA EVAPORATION POND - PLAN VIEW

Crandall Canyon Mines
Crandall Canyon
P.O. BOX 910
EAST CARBON, UTAH

DRAWN BY: PJ	SCALE: 1" = 100'
APPROVED BY: DH	DATE: 01-13-16
REVISION: 2	PLATE #: 5-3A

KEY

AS-CONSTRUCTED MAJOR CONTOURS (10' INTERVALS)

AS-CONSTRUCTED MINOR CONTOURS (2' INTERVALS)

AREA LOCATED IN SECTION 5, TOWNSHIP 17 SOUTH, RANGE 8 EAST, SLBM

UTAH POWER AND LIGHT COMPANY
SITLA

PERMIT LINE P.O.B.

EAST QUARTER CORNER OF SECTION 5, T.17S., R.8E., SLBM

UTAH REGISTERED #6449561 David W. Hibbs 1/13/16 PROFESSIONAL ENGINEER

SEDIMENT MARKER - CLEANOUT AT 6519.0'

UNDISTURBED DRAINAGE DITCH (B-UD1)

OLD CONSTRUCTION ROAD (PREVIOUS CHAINING OPERATIONS)

18" CMP (B-C1)

ACCESS ROAD

ENTRANCE ROAD

GATE

191'

89'

EVAPORATION BASIN

5.0' WIDE x 0.5' DEEP SPILLWAY

CONTAINMENT BERM

BOULDER STORAGE AREA

NATURAL DRAINAGE CHANNEL

TOPSOIL PILE (860 C.Y.)

TYPICAL SEDIMENT CONTROL STRUCTURE

FIELD FENCE

PERMIT LINE

PERMIT AREA = 7.32 ACRES

PERMIT LINE

EMERY COUNTY PUBLIC ROAD No. 303 (BURMA ROAD)

EXISTING GAS-WELL PAD
(XTO ENERGY, BB 5-107)

6540 6530 6520 6510

50 0 100 200 FEET

N

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G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\S-3A Burma Pond As-Built.dwg, As-Built Plan, 1/11/2016 4:21:39 PM, 1:1

AREAS OF PROPOSED OR ACTUAL SECOND MINING SUBJECT TO POSSIBLE SUBSIDENCE

RESCUE DRILL HOLES

SITLA RESCUE ROAD

MILL FORK

E 1/4 COR SEC #5

SECTION CORNER (FOUND)

1/4 COR. (FOUND)

T. 15 S.
T. 16 S.

R. 6 E.
R. 7 E.

NOTES:
1. SUBSIDENCE IS SUBSTANTIALLY COMPLETE AS OF THE DATE OF THIS DRAWING. ACCORDING TO THE 2014 SUBSIDENCE MONITORING REPORT, ALL MONITORING POINTS HAVE NOT RECORDED SUBSIDENCE GREATER THAN SIX INCHES SINCE 2012.

SUBSIDENCE CONTROL POINT △ 4

INITIAL COORDINATES LEVEL OF SUBSIDENCE CONTROL POINTS

CONTROL POINT	NORTHING	EASTING	ELEVATION
1	410092.47	2098132.85	8442.6
1A	411049.12	2099227.84	7947.3
1B	410683.22	2097282.38	8025.1
2	410340.61	2095796.0	8041.9
2A	410002.74	2095524.69	8225.1
3	410113.74	2093255.08	7932.5
MILL FORK	405134.87	2092946.18	9888.45

ALL COORDINATES ARE SHOWN AT SEA LEVEL: CAF=1.000397447

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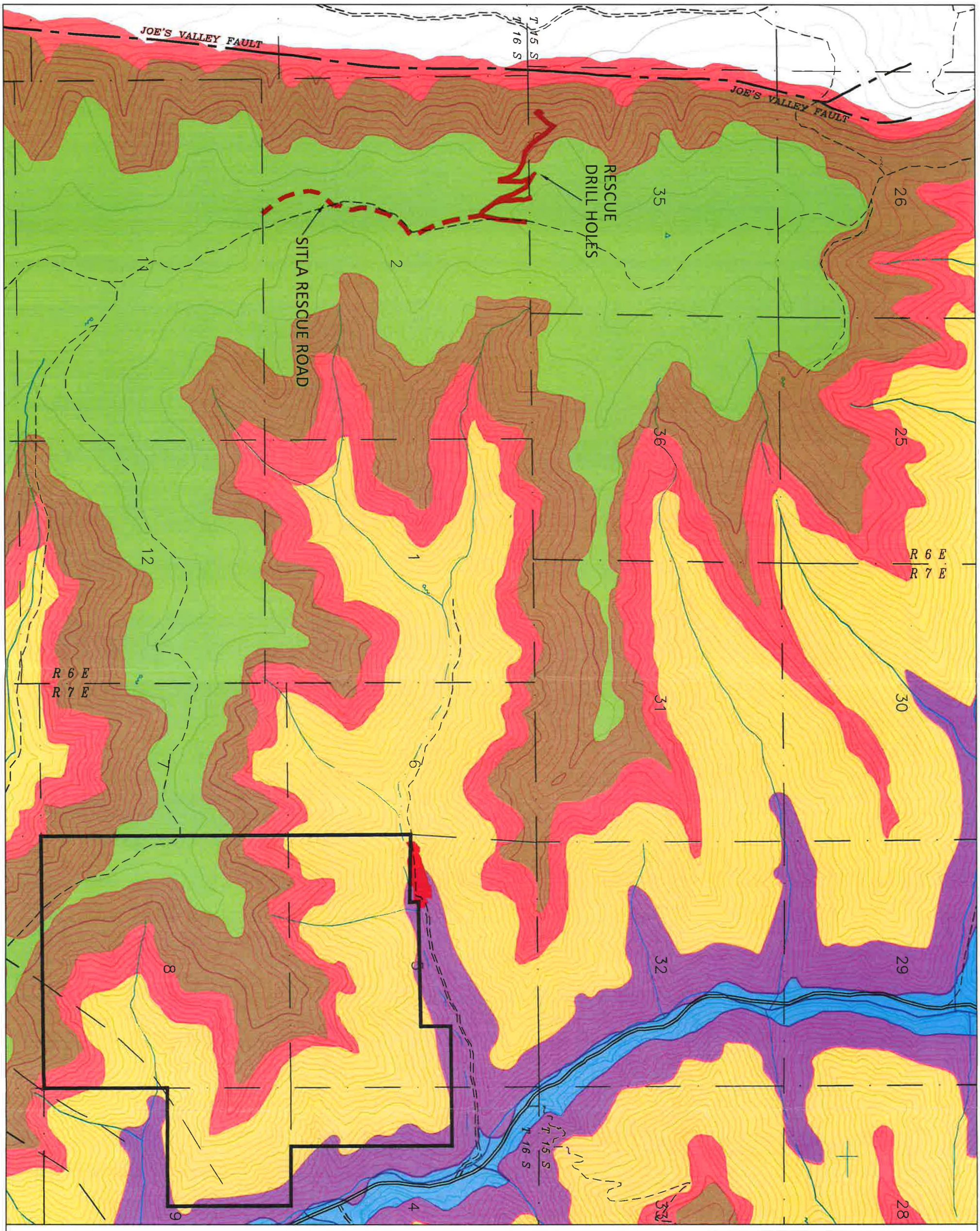
CRANDALL CANYON MINE
SUBSIDENCE MAP

REV: 8	ACAD: SUBSIDENCE MONITORING R8
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"= 2000'	PLATE #: 5-5

G:\Current Drawings\MRP-Maps\Crandall Canyon\2015 Mid-Term Review\5-5 SUBSIDENCE MONITORING R8.dwg, Layout2, 1/11/2016 1:29:58 PM, 1:1

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\6-1 GEOLOGY MAP R10.dwg, Layout2, 1/11/2016 1:33:03 PM, 1:1



LEGEND:

500' CONTOUR:

TKn:		*NORTH HORN FORMATION*
Kpr:		*PRICE RIVER FORMATION*
Kc:		*CASTLEGATE SANDSTONE*
Kbh:		*BLACKHAWK FORMATION*
Ksp:		*STAR POINT SANDSTONE*
Krmm:		*MASUK MEMBER*

UDOGM PERMIT BOUNDARY

SOURCE: *USGS MISCELLANEOUS INVESTIGATION SERIES MAP 1–1631 GEOLOGIC MAP OF THE MANTI 30' x 60' QUADRANGLE*

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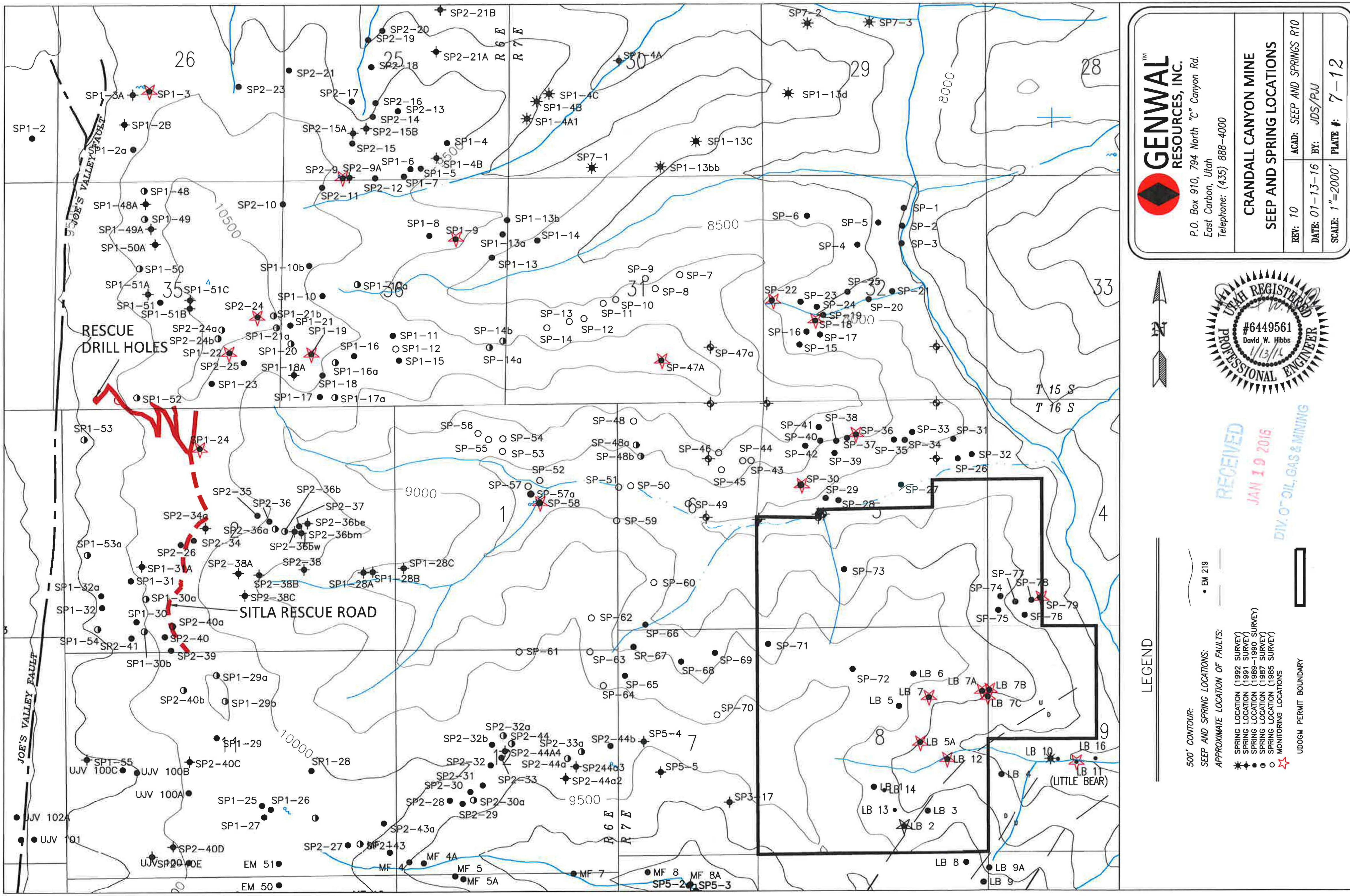
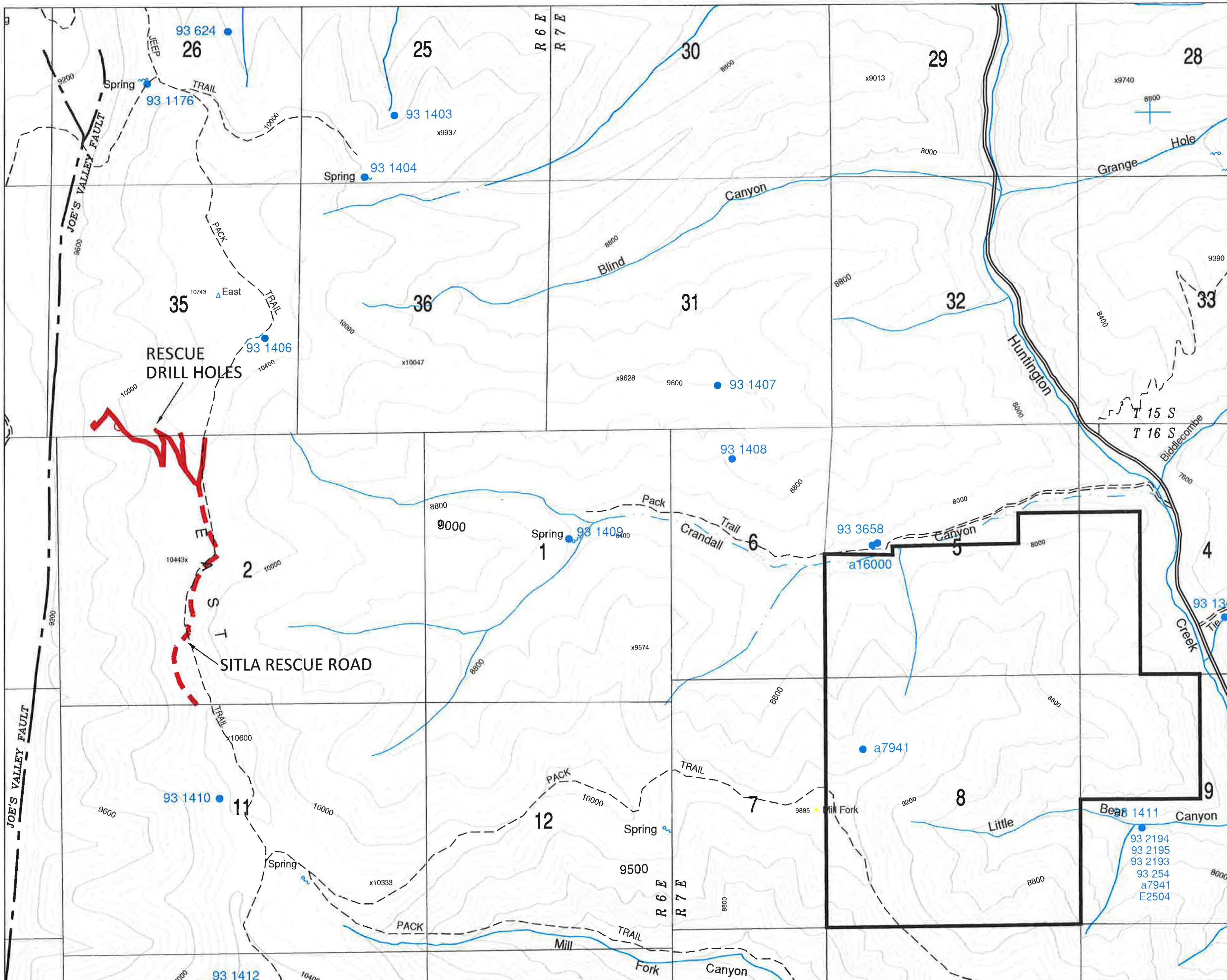
CRANDALL CANYON MINE
GEOLOGY

REV: 10	ACAD: GEOLOGY MAP R10
DATE: 01–13–16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 6–1



G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\7-12 SEEP AND SPRINGS R10.dwg, Layout3, 1/11/2016 1:36:31 PM, 1:1


93 624
26
25
R 6 E
R 7 E
30
29
28
JEEP
TRAIL
Spring
93 1176
93 1403
x9937
Spring
93 1404
JOE'S VALLEY FAULT
x9013
x9740
8800
8000
Hole
Grange
Canyon
Blind
PACK
TRAIL
35
10743
East
36
31
32
33
93 1406
x10047
x9628
9600
93 1407
Huntington
RESCUE
DRILL HOLES
T 15 S
T 16 S
Biddlecombe
93 1408
8800
9000
Spring
93 1409
1
Pack
Trail
Crandall
6
93 3658
Canyon
5
a16000
4
10443x
2
E
A
S
T
x9574
93 134
Tie
Creek
SITLA RESCUE ROAD
TRAIL
x10600
a7941
PACK
TRAIL
93 1410
11
12
Spring
7
9885
Mill Fork
8
9
Bear
93 1411
Little
Canyon
93 2194
93 2195
93 2193
93 254
a7941
E2504
Spring
x10333
9500
PACK
TRAIL
Mill
Fork
Canyon
93 1412
N

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\7-14 GRNDWTR RIGHTS R10.dwg, Layout3, 1/11/2016 1:40:29 PM, 1:1

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CRANDALL CANYON MINE
GROUNDWATER RIGHTS

REV: 10		ACAD: GRNDWTR RIGHTS R10	
DATE: 01-13-16		BY: JDS/PJJ	
SCALE: 1"=2000		PLATE #: 7-14	

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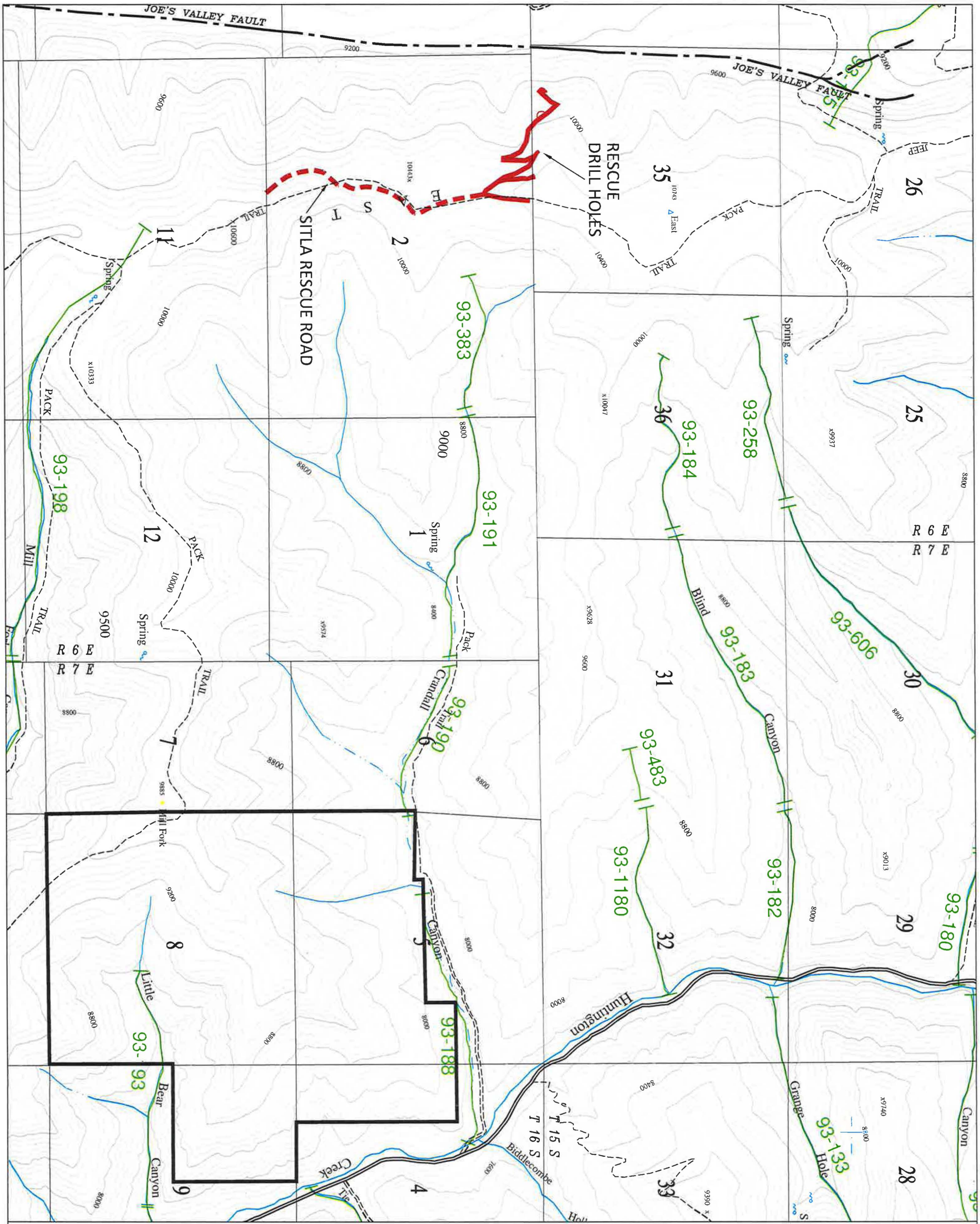
LEGEND

WATER RIGHT — 93 1412

UDOGM PERMIT BOUNDARY

THE PERMIT AREA IS ENTIRELY WITHIN THE MANTI - LA SAL NATIONAL FOREST

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\7-15 SURFACE WTR RIGHTS R10.dwg, Layout2 (2), 1/11/2016 1:45:36 PM, 1:1



LEGEND

UDOGM PERMIT BOUNDARY

MINE SURFACE FACILITIES

THE PERMIT AREA IS ENTIRELY WITHIN THE MANTI – LA SAL NATIONAL FOREST

EXTENT OF SURFACE WATER RIGHT 93-198

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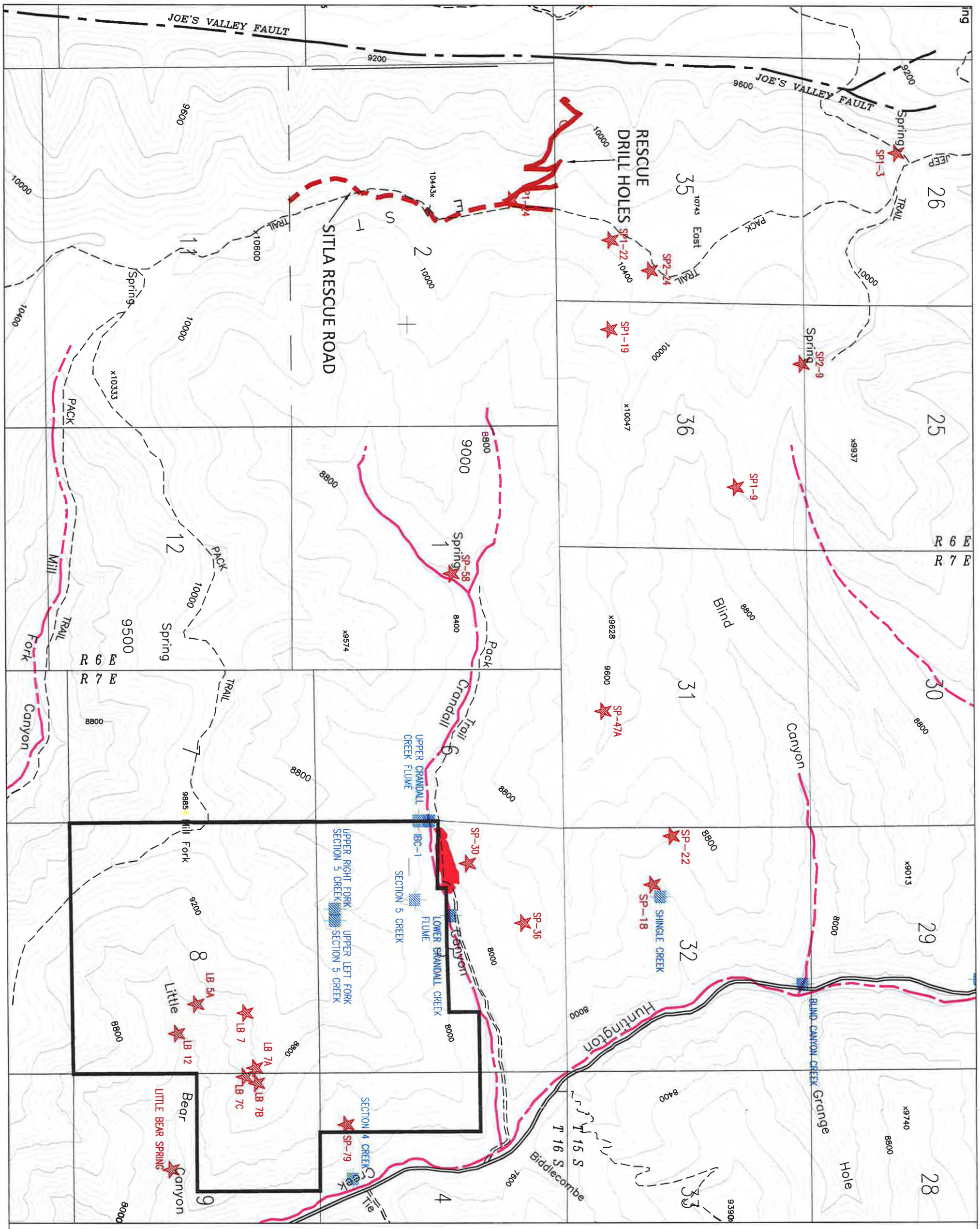
CRANDALL CANYON MINE
SURFACE WATER RIGHTS

REV: 10	ACAD: SURFACE WTR RIGHTS R10
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 7-15

G:\Current Drawings\MRP Maps\Crandall Canyon\2015 Mid-Term Review\7-18 WATER SITES MAP R11.dwg, Layout2, 1/11/2016 1:53:24 PM, 1:1



LEGEND

- MINE SURFACE FACILITIES
- UDOGM PERMIT BOUNDARY
- PERENNIAL STREAM REACHES (based on 1992 thru 1998 observations)
- MONITORING LOCATIONS OF SURFACE SPRINGS
- MONITORING LOCATIONS OF UNDERGROUND WELLS
- MONITORING LOCATIONS OF STREAMS

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CRANDALL CANYON MINE
WATER MONITORING SITES MAP

REV: 11	ACAD: WATER SITES MAP R11
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=2000'	PLATE #: 7-18


LEGEND
Mined Out Areas
Lease Boundary
Permit Area
Projected Subsidence
Seam Iso—Pac
Depth of Cover
Surface Drill Hole
NOTES:
1. CONTINUOUS MINING AREAS MAY BE INFLUENCED BY GEOLOGIC ANOMALIES WHICH MAY INCLUDE, BUT ARE NOT LIMITED TO COAL THICKNESS, COAL QUALITY, AND MINING CONDITIONS.
2. NO SECOND MINING UNDER LITTLE BEAR DRAINAGE CHANNEL AS PER LEASE STIPULATION.
3. SUBSIDENCE IS SUBSTANTIALLY COMPLETE AS OF THE DATE OF THIS DRAWING. ACCORDING TO THE 2014 SUBSIDENCE MONITORING REPORT, ALL MONITORING POINTS HAVE NOT RECORDED SUBSIDENCE GREATER THAN SIX INCHES SINCE 2012.
BLIND CANYON SEAM
PRINCESS MINE
FEDERAL LEASE UTU-78953
FEDERAL LEASE UTU-88990
DELLENBACK FEE TRACT
NELSON FEE TRACT
FOREST SERVICE SPECIAL USE PERMIT AREA
PORTALS
TRESPASS AREA SUMMARY
PROJECTED DIKES
CLAY DIKE
JOE'S VALLEY FAULT
SYMPATHETIC FAULT
HUNTINGTON RIVER
HIGHWAY 31
CRANDALL CANYON CREEK
LITTLE BEAR DRAINAGE CHANNEL
LITTLE BEAR SPRING
OUTCROP
1/4 COR. (FOUND)
Mill Fork Lease (PacifiCorp)
12.5 kVA Power Line
T. 15 S.
T. 16 S.
R. 6 E.
R. 7 E.
BC: 4.8' HIA: 5.2' INTER: 102'
BC: 4.8' HIA: 6.9' INTER: 86'
BC: 6.9' HIA: 5.0' INTER: 100.9'
BC: 8.8' HIA: 4.2' INTER: 74.2'
BC: 4.0' HIA: 5.3' INTER: 94'
BC: 3.2' HIA: 4.0' INTER: 114'
BC: 2.0' HIA: 6.5' INTER: 115'
BC: 6.2' HIA: 6.75' INTER: 92'
Mine projections depicted in the fringe areas beyond the SMCRA permit area are speculative and based on future reserve acquisitions.
No mining will be conducted in these areas unless those reserves are acquired in the future and permitted according to federal, state, and local permitting requirements.
Genwal Resources acknowledges that permission to mine within the permit boundary does not imply permission to mine beyond the permit boundary in the future.
I hereby certify that the design and/or map contained herein was prepared by me or under my supervision and is true and correct to the best of my knowledge.
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Telephone: (435) 888-4000
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CRANDALL CANYON MINE AND PRINCESS MINE
REV: 8
ACAD REF: H AND BC MINE PLAN R8
DATE: 01-13-16
BY: JDS/PJJ
SCALE: 1"=600'
PLATE #: 5-2 (BC)

LEGEND

Mined Out Areas
Lease Boundary
Permit Area
Projected Subsidence
Seam Iso-Pac
Depth of Cover
Surface Drill Hole

NOTES:

1. CONTINUOUS MINING AREAS MAY BE INFLUENCED BY GEOLOGIC ANOMALIES WHICH MAY INCLUDE, BUT ARE NOT LIMITED TO COAL THICKNESS, COAL QUALITY, AND MINING CONDITIONS.

2. NO SECOND MINING UNDER LITTLE BEAR DRAINAGE CHANNEL AS PER LEASE STIPULATION.

3. SUBSIDENCE IS SUBSTANTIALLY COMPLETE AS OF THE DATE OF THIS DRAWING. ACCORDING TO THE 2014 SUBSIDENCE MONITORING REPORT, ALL MONITORING POINTS HAVE NOT RECORDED SUBSIDENCE GREATER THAN SIX INCHES SINCE 2012.

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I hereby certify that the design and/or map contained herein was prepared by me or under my supervision and is true and correct to the best of my knowledge.

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CRANDALL CANYON MINE AND PRINCESS MINE MINE PLAN

REV: 8	ACAD REF: H AND BC MINE PLAN R8
DATE: 01-13-16	BY: JDS/PJJ
SCALE: 1"=600'	PLATE #: 5-2 (H)