

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

**Change to Allow**

**CONSTRUCTION OF THE  
BURMA EVAPORATION BASIN  
TASK ID#3997**

**RESPONSE TO THE DEFICIENCIES AND ORIGINAL  
SUBMITTAL**

**SUBMITTED: January 11, 2012  
RESUBMITTED: June 25, 2012**

C015/0032 Incoming #4138 OK  
Genwal Resources, Inc.  
P. O. Box 910  
East Carbon, Utah 84520  
Phone: (435) 888-4000  
(435) 650-3157  
Fax: (435) 888-4002



June 19, 2012

Mr. Daron Haddock,  
Permit Manager  
1594 West North Temple,  
Suite 1210,  
P.O. Box 145801,  
Salt Lake City, Utah 84114-5801.

**Re: Response to Deficiencies Task #3997, Crandall Canyon Mine, DOGM Permit C\015\032**

Dear Mr. Haddock,

Please find attached six (6) copies of the response to deficiencies for the Burma Pond Construction.

C1 and C2 forms are included.

The Burma Pond Construction bids are out and we would like to begin construction by July 15, 2012.

Should you have any questions please call.

Sincerely,

R. Jay Marshall P.E.  
Project Manager

File in:  
 Confidential  
 Shelf  
 Expandable  
Date Folder 06/22/12 C\015\0032  
Incoming 0002

RECEIVED  
JUN 22 2012  
DIV. OF OIL, GAS & MINING



# APPLICATION FOR PERMIT PROCESSING

<input type="checkbox"/> Permit Change	<input type="checkbox"/> New Permit	<input type="checkbox"/> Renewal	<input type="checkbox"/> Transfer	<input type="checkbox"/> Exploration	<input type="checkbox"/> Bond Release	Permit Number: ACT/015/032
Title of Proposal: Response to Deficiencies Burma Pond Task #3997						Mine: Crandall Canyon Mine
						Permittee: UtahAmerican Energy, 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

<input type="checkbox"/> Yes	<input type="checkbox"/> No	1. Change in the size of the Permit Area? <u>7.32</u> acres Disturbed Area? _____ acres X increase X decrease.
<input type="checkbox"/> Yes	<input type="checkbox"/> No	2. Is the application submitted as a result of a Division Order? DO #
<input type="checkbox"/> Yes	<input type="checkbox"/> No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	4. Does application include operations in hydrologic basins other than as currently approved?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	6. Does the application require or include public notice/publication?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	9. Is the application submitted as a result of a Violation? NOV #
<input type="checkbox"/> Yes	<input type="checkbox"/> No	10. Is the application submitted as a result of other laws or regulations or policies? Explain: Permit Renewal
<input type="checkbox"/> Yes	<input type="checkbox"/> No	11. Does the application affect the surface landowner or change the post mining land use?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2?)
<input type="checkbox"/> Yes	<input type="checkbox"/> No	13. Does the application require or include collection and reporting of any baseline information?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	15. Does application require or include soil removal, storage or placement?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	16. Does the application require or include vegetation monitoring, removal or revegetation activities?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	17. Does the application require or include construction, modification, or removal of surface facilities?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	18. Does the application require or include water monitoring, sediment or drainage control measures?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	19. Does the application require or include certified designs, maps, or calculations?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	20. Does the application require or include subsidence control or monitoring?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	21. Have reclamation costs for bonding been provided for?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	22. Does application involve a perennial stream, a stream buffer zone or discharges to a stream?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

**X Attach 6 complete copies of the application.**

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

David W. Hibbs  
Signed - Name - Position - Date  
President 6/20/12

Subscribed and sworn to before me this 20<sup>th</sup> day of June, 19 2012

Linda Kerns  
Notary Public  
My Commission Expires: 03-27-13, 19       
Attest: STATE OF Utah  
COUNTY OF Carbon



Received by Oil, Gas & Mining <b>RECEIVED</b>  JUN 22 2012  DIV. OF OIL, GAS & MINING
ASSIGNED TRACKING NUMBER

***Response to Deficiencies Task #3997***

***Crandall Canyon Mine***

***DOG M Permit C/015/032***

**Outstanding Issues**  
**Task No. #3997**  
**Construction of Burma Evaporation Basin**

The members of the review team include the following individuals:

Priscilla Burton (PB)  
Steve Christensen (SC)  
Joe Helfrich (JH)  
Ken Hoffman (KH)  
Angela Nance  
James Owen (JO)

## CHAPTER 1

**R645-301-112:** The Permittee must revise page 1-1 of the amendment to identify the new resident agent for Genwal Resources, Inc. As Mr. David Shaver is no longer employed by the company, a new resident agent must be identified. (SC)

*Section 112.220 has been revised to reflect Dave Hibbs as the resident agent. All of Chapter 1 will be replaced except for the Certification at the end.*

**R645-301-117.200;** The Permittee must submit a copy of the Emery County Progress affidavit of publication (dates of publication February 14<sup>th</sup>, 2012 thru March 8<sup>th</sup>, 2012) for incorporation into the MRP. (SC)

*Copies of the Proof of Publication in both the Sun Advocate and Emery County Progress have been added to Appendix 1-8 of The MRP.*

**R645-301-120:** The application has been submitted as a standalone document and should be correctly formatted in accordance with the R645 regulations. (JH)

*The application has been submitted in accordance with the R645 regulations.*

**R645-301-112.330: Murray Energy Corporation Ownership and Control Information**

The AVS database shows John R. Forrelli, as Senior Vice President with a Begin Date of 11/01/10. The MRP shows John R Forrelli as a Vice President with a Begin date of 9/11/07 (which happens to be consistent with his listing under Coal Resources, Inc. - leading me to believe this is possibly a typo). Please address this discrepancy by either updating the information in the MRP or by indicating in a letter the AVS should update their database to reflect the information showing in the current MRP. (AN)

*The Ownership and Control for Murray Energy Corporation has been revised and corrected in Section 3 of Appendix 1-9 of the MRP.*

The AVS database shows Micheal O. McKown, Senior Vice President (HR & LEGAL) with an End Date of 04/08/11. This End Date is not in the current MRP. Please address this discrepancy by updating the information in the MRP. (AN)

*The Ownership and Control for Murray Energy Corporation has been revised and corrected in Section 3 of Appendix 1-9 of the MRP.*

## CHAPTER 2

**645-301-231/100**, The plan should outline on a map the area designated for boulder removal and topsoil salvage. (PB)

*Drawing #1 of Appendix 7-66 shows a plan view of the area designated for boulder removal and storage.*

**R645-301-231.400**, The topsoil storage pile should not be a triangular in cross section, but trapezoidal. (PB)

*Drawings #1, #5, and #6 have been revised showing a trapezoidal shaped topsoil pile.*

**R645-301-244**, The type and quantity of wood fiber mulch (hydro mulch) should be specified. (PB)

*Text has been added into Chapter 3 (f) of Appendix 7-66 to state "A certified noxious weed free straw mulch will be applied to the surface at a rate of 2000 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.*

**R645-301-242**, Redistribution depth of the 1,137 cu yd topsoil will be six inches over the 1.41 acres as described in (Chapter. 2), however, Chap. 3 indicates that the topsoil will be re-spread to a depth of 12 inches in item c. Please make the appropriate correction. (PB)

*Chapter 3 of Appendix 7-66 item "c" has been revised to reflect the planned 6 inches of topsoil redistribution.*

**R645-301-234.230**, Use of surface mulch to provide protection and vegetation establishment on topsoil stockpile is described in Chap. 2; however the quantity per acre should also be described. (PB)

*Text has been added into Chapter 2 of Appendix 7-66 to state "A 1 T/ac straw mulch will be incorporated into the surface soil.*

**R645-301-232.400**, The permitted area is 7.32 acres; however the proposed disturbed area is 1.41 acres. The plan should describe interim reclamation of the land which will not have topsoil removed, but will be affected by equipment moving boulders on topsoil to storage locations. (PB)

*Text in Chapter 5 item #6) of Appendix 7-66 has been revised to state "Areas that are disturbed by boulder removal, where the topsoil has not been removed, will be seeded with the approved seed mix, if necessary.*

### CHAPTER 3

**R645-301-320:** The application needs to include a vegetation map for the proposed disturbance that delineates the dominant vegetative community, (Pinion/Juniper.) (JH)

*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 pinyonjuniper.*

**R645-301-322:** The proposed disturbed are includes high value habitat for Elk, Mule Deer, Black bear and Ferruginous hawks. The application should include maps for these species that clearly delineate the habitat.

*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 the trees of this community.*

The application should also include raptor survey data and maps for any potential nesting raptors within ½ mile of the proposed disturbed area. (JH)

*On May 9<sup>th</sup> EIS performed the annual raptor survey which included the Burma Pond project area. EIS (Darris Jones) reported "no nests or suitable raptor habitat with ½ mile of the Burma Pond project area."*

Any mine water consumption that may affect the four endangered fish species listed needs to be addressed in terms of mine water consumed in acre feet per year. There are two questions that need to be answered here: the first being has the Permittee previously determined the amount of mine water consumption in acre feet per year for the Crandall mine? If so that information needs to be included in the application,

*The Permittee has not previously determined the amount of mine water consumption for the Crandall Canyon Mine. Crandall Canyon has been idle since August of 2007.*

and the second will there be an increase of 10% or more resulting from the installation and operation of the evaporation pond? (JH)

*Text has been added to Chapter 5 of Appendix 7-66 to state "which is estimated to be 1.4 acre feet per year," The offset of 725 AF/Year far exceeds the 1.4 AF/Year evaporation due to the new pond.*

**R645-301-322,-301-342,-301-358:** The application needs to include a protection and enhancement plan for the proposed disturbed area. The Division of Wildlife Resources typically requires a 4/1 acre ration of mitigation to disturbance. There may be areas near and adjacent to the proposed disturbed area where vegetation treatment could be implemented. (JH)

*Text has been revised in Chapter 4 of Appendix 7-66 to state "Mitigation of the 1.1 acer surface disturbance of the Burma evaporation pond UEL 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 UEL for approximately 5.6 acres of habitat improvement based on a cost per acre provided by DWR."*

**R645-301-412,-301-413,-301-414,-302-270,-302,-271,-302-272,-302-273,-302-274,-302-275:** The application needs to include information as required about the post mining land uses of the proposed disturbed area. (JH)

*Information about land use is discussed in Chapter 4 of Appendix 7-66. The text states "The present land use supports wildlife and livestock grazing, and no change in grazing activity will occur after reclamation."*

**R645-301-244,-301-353,-301-354,-301-355,-301-356,-302-280,-302-281,-302-282,-302-283,-302-284:** The application must address the following sub headings of the regulations:

Revegetation: General Requirements

Revegetation: Timing

Revegetation: Mulching and Other Soil Stabilizing Practices and Revegetation: Standards for Success. (JH)

*General Requirements for revegetation is covered in Section 3.41 of Vol "A" of the approved Crandall Canyon MRP. Timing is covered in Section 3.41.100, Mulching and Other Soil Stabilizing Practices is covered in Section 3.41.130 and Standards of Success is covered in Section 3.56 and pages 17 and 18 of Appendix 7-66 Attachment #5.*

**R645-302-313.100** requires that the applicant submit a statement that no prime farmland exists. (PB)

*Text has been added to Chapter 2 of Appendix 7-66 to state that "No prime farmland exists within the project area."*

**R645-301-R645-301-244:** The application should include an Air Pollution Control plan for the evaporation pond. (JH)

*The only source of dust would be from the water trucks. Calculations indicate that 120 truck trips/Year would be required traveling 200 feet at slow speed. This results in only 9 truck miles per year traveling at less than 5MPH. This insignificant impact should not require an air quality permit revision.*

## CHAPTER 4

**R645-301-411:** The applicant needs to address the Land-Use section of the regulations. (JH)

*The Land Use section of the regulations have been addressed in chapter 2 of the submittal. The post mine land use is grazing and wildlife.*

**R645-301-411:** The application should include a statement about the presence or absence of public parks and historic places within the proposed disturbed area. (JH)

*A statement has been added to Chapter 4 of Appendix 7-66 to state "There are no public parks or historic places within the proposed disturbed area."*

## CHAPTER 5

**R645-301-536.320,** A sampling and monitoring plan for the waste should be developed to be conducted at five year intervals (mid-term) or with every 7.5 inches of waste deposited. Grab sampling of the waste should be monitored in accordance with 40 CFR 264.13 and with the parameters described in the Division's Guidelines for Topsoil and Overburden, Tables 3 & 7. (PB)

*Text in (2 of chapter 5 of appendix 7-66 has been added to state "Grab samples of the dried material will be taken once every five years or every 7.5 inches of solid waste deposited. These samples will be analyzed according to the Division's Guidelines for topsoil and Overburden. In addition to the Division's Guidelines the grab sample will be analyzed for Barium, Aluminum, Iron, Zinc, and Nickel. The results of the analysis will be reported during the mid-term review."*

**R645-301-536,** the plan should provide for depth measurement of the iron precipitate layer every five years, occurring during the mid-term review. (PB)

*Text in (2 of chapter 5 of appendix 7-66 has been added to state "Grab samples of the dried material will be taken once every five years or every 7.5 inches of solid waste deposited. These samples will be analyzed according to the Division's Guidelines for topsoil and Overburden. The results of the analysis will be reported during the mid-term review.."*

**R645-301-542.730,** Upon final reclamation, the first 18 inch lift should be incorporated into the mine waste with ripping or other tillage. In this manner, the waste will be incorporated into the soil and will not create a chemical or physical barrier to roots, promoting revegetation success. (PB)

*Text in Chapter 3 a) has been revised to state "the first 18" lift will be incorporated into the mine waste by ripping or other tillage."*

**R645-301.542.200** The applicant must provide a reclamation plan, details, maps, etc. for backfilling and grading and include a commitment to achieve approximate original contour

(AOC) restoration at final reclamation. The applicant may include a reference to the appropriate section of the approved MRP to comply with this requirement. The reference must clearly define the reclamation plan details that will apply to the Burma Basin. (JO)

*Text in Chapter 2 of Appendix 7-66 has been revised to state " 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 new Map #7 has been added to show existing and reclaimed contours.*

**R645-601.542.100** The applicant must include a commitment to reclaim the basin according to and along with its approved reclamation timeline, subject to change based on whether or not discharged mine water requires treatment. (JO)

*A paragraph has been added to Chapter 3 of Appendix 7-66 to state "Reclamation of the project area will be according to and along with the approved reclamation time line found in Section 3.11.100 of the approved MRP, subject to change based on whether or not discharged mine water requires treatment.*

## CHAPTER 7

**R645-301-722.2:** The application shall also include language the Permittee has fulfilled all requirements of the Department of Environmental Quality in relation to a Utah Pollutant Discharge Elimination System (UPDES) permit. (KH)

*The text in Section 7 has been modified to address this. As discussed in Appendix 7-66, the material placed in the pond will be a moist sludge which will quickly dry out and become a fine-grained powder. Also, the pond will not receive inflows except as direct precipitation. Therefore, the pond will not contain any significant water volume. As such, the evaporate pond is not expected to discharge.*

**R645-301-722.300 & 400:** The Permittee shall provide a map showing the locations used to gather baseline data and the location and depth of water wells surrounding the site or add a note to Drawing 3 that no water wells are located within a certain radius. (KH)

*Figure 7-1 has been prepared which shows the location of all water rights and underground rights within one mile radius of the site. Based on this search, there are no groundwater rights within the one-mile search radius. A number of underground records are identified; however, according to State Engineer records these points were either dry holes or were 2 inch wells that were subsequently abandoned.*

**R645-301-724:** The Permittee shall submit baseline ground-water resources, with seasonal quality and quantity of ground water, and usage. (KH)

*Text in Section 7 of Appendix 7-66 has been updated to address this. Based on the data search and the site investigation, there are no ground water resources within general area of the proposed site.*

**R645-301-724.100:** The Permittee shall include the location and ownership for the permit and adjacent areas of the existing wells, springs and other ground-water resources, with seasonal quality and quantity of ground-water, and usage.

*Text in Chapter 7 of Appendix 7-66 has been updated. Figure 7-1 shows the location of the water rights within one mile of the site. Attachment HDI-1 presents a summary table of the rights. No groundwater rights were found and no groundwater resources were identified.*

**R645-301-724.200:** The Permittee shall include the name, location, ownership, and description of all surface water bodies within the proposed permit and adjacent areas and information on surface-water quality & quantity. (KH)

*Text in Chapter 7 of Appendix 7-66 has been updated. Figure 7-1 shows the location of the water rights within one mile of the site. Attachment HDI-1 presents a summary table of the rights. Only two surface water rights were identified for stock watering on Fish Creek. Additionally, water monitoring was conducted by Co-op Mining for the Bear Canyon Mine on Fish Creek just upstream of the site area. This monitoring was conducted from August 1977 through November 1985. During this period only two flow events were recorded.*

**R645-301-724.310:** The Permittee shall determine the extent to which a ground-water monitoring plan is necessary and discuss the determination of the application. (KH)

*The text in Chapter 7 of Appendix 7-66 was modified to address this issue.*

**R645-301-724.310:** The Permittee shall determine the extent to which a surface monitoring plan is necessary and discuss the determination in the application. (KH)

*The text in Chapter 7 of Appendix 7-66 was modified to address this issue.*

**R645-301-724.310L:** The Permittee shall include a determination that the evaporation basin will never discharge to surface water by way of infiltration. (KH)

*The text in Chapter 5 of Appendix 7-66 has been modified to include a liner in the pond. Therefore, the potential for discharge by infiltration is limited.*

**R645-301-724.320:** The Permittee shall provide a determination that the proposed reclamation will prevent material damage to the hydrologic balance outside the permit area. (KH)

*The text of Chapter 7 of Appendix 7-66 was modified to address this issue.*

**R645-301-724.400:** The Permittee shall include climatological factors including: the average seasonal precipitation; the average evaporation rates, the average direction and velocity of prevailing winds; and seasonal temperature ranges. (KH)

*The text of Chapter 7 of Appendix 7-66 was updated to include the requested information.*

**R645-301-728:** The Permittee shall conduct a complete probably hydrologic consequences (PHC) determination. The PHC shall particularly evaluate the existing ground water resources and concentration of metals. (KH)

*The text of Chapter 7 of Appendix 7-66 was updated to include the requested information.*

**R645-301-728.320:** The Permittee shall list all state-appropriated water rights located within the proposed permit area in addition to those located adjacent to the proposed permit area that may be impacted by the project. The listing shall include the water right number, location, quantity, and beneficial use. (KH)

*Text has been added to Chapter 7 of Appendix 7-66 to address these issues.*

**R645-301-731:** The Permittee must provide a plan for use of an engineered cover; or removal of the solids and liner shall be added to address possible underground ponding due to use of an engineered liner. (KH)

*As discussed in Chapter 5 text of Appendix 7-66, an engineered liner will be used for the pond. As a result, the text of Chapter 7 of Appendix 7-66 was modified to account for the reclamation of the pond and liner.*

**R645-301-731.710:** The Permittee shall include the locations of water-supply intakes for current users of surface waters flowing into, out of, and within hydrologic area, and those surface waters which will receive discharges from affected areas in the proposed permit area. (KH)

*Text has been added to Chapter 7 of Appendix 7-66 to address these issues. No discharges are expected from the evaporation pond site to either surface or ground water.*

**R645-301-742.225.2:** The Permittee shall include language committing to retaining the capacity for a 100-year 24-hour storm event at all times. (KH)

*Text has been added to Chapters 5 and 7 of Appendix 7-66 to address these issues*

**R645-301-743.130:** The Permittee must provide a spillway design for the proposed evaporation basin (i.e. either a combination of principal and emergency or a single spillway that meets the requirements of R645-301-746.131, -743.131.1, or -743.131.2). (KH)

*Text has been added to Chapter 5 item 12) of Appendix 7-66 to address this issue.*

**R645-301-745.111:** The Permittee shall use an engineered liner for protection of ground water from leachate and additional sampling shall be conducted to evaluate the dried fill to evaluate long term leaching parameters.

*The text in Chapter 5 of Appendix 7-66 has been revised to state "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 7-65 of the approved MRP*

*and is the same as that used for the cells in the treatment plant at Crandall Canyon.”*

**R645-301-746.221:** Language will be added to the description and narrative to establishment of suitable vegetation upon reclamation. (KH)

*The text of Chapter 3 and 7 have been modified to include a permanent seed mix for the reclamation of the site.*

**R645-301-746.340** The Permittee shall include a method by which to field evaluate the remaining freeboard to confirm that the 100-year 24-hour capacity is remaining. The Permittee shall include an inspection program for use during months with precipitation to confirm the 100-year 24-hour capacity is remaining. The Permittee shall include a clean out plan to be used at any time the capacity is less than the 100-year 24-hour storm event. The clean out plan must include liquids removal and solids removal as either may be required during the life of the basin. (KH)

*Text has been added to Chapter 7, describing a field marker to be added to the basin which will show the maximum level of standing water below the spillway that the 100-year, 24-hour event could still be stored in.*

**R645-301-761,-762.100,-762.200,-763,-764 and -765:** The Permittee must address the Reclamation requirements relative to hydrology. (KH)

*Section 112.220 has been revised to reflect Dave Hibbs as the resident agent. All*

## CHAPTER 8

**R645-301-830.140.** The mine has adequate bond in place to allow for construction of the basin. However, the applicant must submit updated bond calculation spreadsheets for demolition, earthwork, revegetation, and bond calculation summary. These will be incorporated into the bonding section of the mine’s MRP and will not need to be included with the Burma Basin attachment. Detailed updates to the appropriate bond calculations made in the application, as well as address discrepancies between the applicant and the Division in terms of total estimated reclamation cost of the basin ( the Division’s estimation based on the provided unit costs is lower than the applicants). (JO)

*Chapter 8 has been revised to state that “The calculations below are a summary of the Burma bond revisions. A complete copy of all bond calculation sheets can be found in Appendix 5-20 of the approved MRP.” A complete copy of bond calculation spreadsheets will be added to Appendix 5-20 of the approved Crandall MRP.*

***CHAPTER 1..... Legal, Financial, Compliance, and Related  
Information***

**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:

David Hibbs  
GENWAL Resources, Inc.  
P.O. 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. IPA and Andalex have undivided 50% 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).
- 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 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:

### **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.

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.

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.

### **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.

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.

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 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:

<u>PARCEL</u>	<u>ACREAGE</u>	<u>LEGAL DESCRIPTION</u>
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: SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 32: S $\frac{1}{2}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$
		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 SE $\frac{1}{4}$ NE $\frac{1}{4}$
FEDERAL LEASE U-78953	880.00	T 16 S, R 7 E	
			Section 4: W $\frac{1}{2}$ SW $\frac{1}{4}$ S $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 5: SE $\frac{1}{4}$ S $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ Section 8: E $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ S $\frac{1}{2}$ NW $\frac{1}{4}$ Section 9: NW $\frac{1}{4}$
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
FEE SURFACE AND COAL (Dellenbach)	160.00	T 16 S, R 7 E	
			Section 5: SW $\frac{1}{4}$

BLM RIGHT OF WAY UTU-77975 (underground mining rights)	50.00	T 16 S, R 6 E	Section 3: E $\frac{1}{2}$ E $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ E $\frac{1}{2}$ E $\frac{1}{2}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ E $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 10: NE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$
SITLA/PACIFICORP SUBLEASE	40.0	T 16 S, R 7 E	Section 8: NW $\frac{1}{4}$ NW $\frac{1}{4}$
FOREST SERVICE SPECIAL USE AREAS: (all in T 16 S, R 7 E)			
SEDIMENT POND (7/28/83)	1.5	Section 5: located within SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ ,	
TOPSOIL PILE #1 (8/17/87)	0.2	Section 5: located within SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ ,	
TOPSOIL PILE #2 (8/17/87)	0.2	Section 5: located within SW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ ,	
TOPSOIL PILE #3 (8/17/87)	0.5	Section 4: located within NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ ,	
TOPSOIL PILE #4 (8/17/87)	0.5	Section 4: located within SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$	
SITLA SPECIAL USE LEASE* (Burma Evaporation Basin)	7.32	T 17 S, R 8 E Section 5: located within Lot 6	
<b><u>TOTAL PERMIT AREA</u></b>	<b><u>6795.06</u></b>		

\* For complete legal description, 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
<b><u>TOTAL</u></b>		<b><u>34.47</u></b>	

- 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 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 newspaper 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.

*APPENDIX 1 - 8*

**AFFIDAVIT OF PUBLICATION**

STATE OF UTAH)

ss.

County of Carbon,)

I, Richard Shaw, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State of Utah a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and on the Utah legals.com website, the first publication was on the 14th day of February, 2012, and that the last publication of such notice was in the issue of such newspaper dated the 6th day of March 2012.



Richard Shaw – Publisher

Subscribed and sworn to before me this 6th day of March, 2012.



Notary Public My commission expires January 10, 2015 Residing at Price, Utah

Publication fee, \$ 201.60



**PUBLIC NOTICE FOR PERMIT REVISION  
CRANDALL CANYON MINE**

Genwal Resources, Inc., P.O. Box 910, East Carbon, Utah 85520, has filed with the Utah Division of Oil, Gas and Mining an application to revise the Crandall Canyon Mine Mining and Reclamation Plan (C/015/032). This revision would add 7.32 acres to the existing 6787.74 acre permit area for the purpose of construction an evaporation basin (a.k.a., the Burma Evaporation Basin) to be used as part of the treatment facility for the mine discharge water. Specifically, the basin would be located on SITLA land in lower Huntington Canyon in Lot 6, Section 5, T17S, R8E, SLBM. Copies of this application are available for inspection at the Division of Oil, Gas and Mining, 1594 West Temple, Suite 1210, Salt Lake City, Utah and at the Emery County Courthouse, 75 East Main, Emery, Utah. Comments, objections or requests for an informal conference should be addressed to the Utah Division of Oil, Gas and Mining, 1594 West Temple, Suite 1210, P.O. Box 145801, Salt Lake City, Utah 84114-5801.  
Published in the Sun Advocate February 14, 21, 28 and March 6, 2012.

**AFFIDAVIT OF PUBLICATION**

STATE OF UTAH)

ss.

County of Emery,)

I, Richard Shaw, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State of Utah and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and on the Utah legals.com website; the first publication was on the 14th day of February, 2012, and that the last publication of such notice was in the issue of such newspaper dated the 6th day of March, 2012.



Richard Shaw – Publisher

Subscribed and sworn to before me this 6th day of March 2012.



Notary Public My commission expires January 10, 2015 Residing at Price, Utah

Publication fee, \$ 144.00



**PUBLIC NOTICE FOR PERMIT REVISION  
GRANDALL CANYON MINE**

Genwal Resources, Inc., P.O. Box 910, East Carbon, Utah 85520, has filed with the Utah Division of Oil, Gas and Mining an application to revise the Grandall Canyon Mine Mining and Reclamation Plan (C/015/032). This revision would add 7.32 acres to the existing 6787.74 acre permit area for the purpose of construction an evaporation basin (a.k.a., the Burma Evaporation Basin) to be used as part of the treatment facility for the mine discharge water. Specifically, the basin would be located on SITLA land in lower Huntington Canyon in Lot 6, Section 5, T17S, R8E, SLBM. Copies of this application are available for inspection at the Division of Oil, Gas and Mining, 1594 West Temple, Suite 1210, Salt Lake City, Utah and at the Emery County Courthouse, 75 East Main, Emery, Utah. Comments, objections or requests for an informal conference should be addressed to the Utah Division of Oil, Gas and Mining, 1594 West Temple, Suite 1210, P.O. Box 145801, Salt Lake City, Utah 84114-5801.

Published in the Emery County Progress February 14, 21, 27 and March 6, 2012.

***APPENDIX 1 - 9***

**Section 3****MURRAY ENERGY CORPORATION**

29325 Chagrin Boulevard, Suite 300  
Pepper Pike, Ohio 44122

**Appointment of Officers**

		<u>Begin</u>	<u>End</u>
Robert E. Murray	Chairman, President & Chief Executive Officer	02/23/01 02/23/01	
John R. Forrelli	Vice President, Engineering & Planning	09/11/07	11/01/10
	Senior Vice President	11/01/10	
Robert D. Moore	Executive Vice President & Chief Financial Officer	08/01/08 08/01/08	
Robert Edward Murray	Vice President	09/11/07	
Ryan M. Murray	Vice President	09/11/07	
Roy A. Heidelbach	Asst. Vice President	09/11/07	
P. Bruce Hill	Vice President - Human Resources	12/18/03	11/05/09
B.J. Cornelius	Vice President	08/01/08	
Michael D. Loiacono	Treasurer	02/23/01	
Michael D. Loiacono	Chief Financial Officer	12/20/05	04/23/07
Michael O. McKown	Secretary	02/24/01	
	Senior Vice President, General Counsel & Secretary	08/01/08	
	Senior VP, HR & Legal	03/23/10	04/08/11
G. Christopher Van Bever	Asst. Secretary	10/22/07	

**Incorporation Information:**

State of Incorporation	Ohio; Charter No. 1211519
Date of Incorporation	February 23, 2001
ID#	34-1956752

**Shareholder:**

	<u>Begin</u>	<u>End</u>
Murray Energy Holdings Co. (100%)	06/27/03	
Robert E. Murray	02/23/01	10/21/03

**APPENDIX 1 - 16**

**APPENDIX 1-16**  
**SITLA LEASE 1708**  
**(BURMA EVAPORATION BASIN)**

SPECIAL USE LEASE AGREEMENT NO. 1708

(Industrial)

Fund: School

THIS SPECIAL USE LEASE AGREEMENT (the "Lease") is made and entered into this 4<sup>th</sup> day of January 2017, by and between THE STATE OF UTAH, ACTING BY AND THROUGH THE SCHOOL AND INSTITUTIONAL TRUST LANDS ADMINISTRATION, 675 East 500 South, Suite 500, Salt Lake City, Utah 84102 ("Lessor"), and Genwal Resources, Inc., a Utah corporation, 794 North "C" Canyon Rd., East Carbon, Utah, 84520, with a mailing address of P.O. Box 910, East Carbon, Utah, 84520 ("Lessee").

RECITALS

A. Lessor owns certain state trust lands located in Emery County, Utah, more specifically described in **Exhibit A** attached hereto and incorporated herein by reference.

B. Lessee desires to lease the lands described in **Exhibit A**, for the purpose of constructing, operating, repairing, and maintaining a coal mine discharge water evaporation basin.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, and for other good and valuable consideration, receipt and sufficiency of which are hereby acknowledged, Lessor and Lessee agree as follows:

ARTICLE 1  
LEASE OF PREMISES

1.1. Lease. In consideration of the covenants of Lessee contained in this Lease, Lessor leases to Lessee, effective as of the Commencement Date set forth in **Section 2.1**, the parcel of land situated in Emery County, State of Utah, which is described on **Exhibit A** to this Lease (the "**Premises**"), in "AS-IS" condition, subject to (a) current taxes and assessments, reservations in patents and all rights-of-way, easements, covenants, conditions, restrictions, obligations, liens, encumbrances, and liabilities of record as of the date hereof; (b) all matters which an accurate survey or physical inspection of the Premises would disclose; and (c) all applicable zoning and building requirements and other governmental laws, rules, and regulations now or hereafter in effect, including without limitation all rules and regulations enacted by Lessor with respect to use and management of state trust lands.

1.2. Execution Bonus. Not applicable.

1.3. Permitted Uses. Lessee may use the Premises for all purposes reasonably necessary and useful for constructing, operating, repairing and maintaining a coal mine discharge water evaporation basin (the "**Facility**"), subject to the terms of the Lease. The Facility shall be used to evaporate water discharged from the Crandall Canyon Coal Mine, which after the water is evaporated, shall leave a thin fine grain iron precipitate material ("**Permitted Use**"). Lessee agrees not to conduct or permit to be conducted any industrial or commercial activities not related to the operation of the Facility, or any public or private nuisance, on or from the Premises. Lessee agrees not to permit or commit any waste of the Premises.

1.4. Reservations to Lessor. Subject to the rights and privileges granted to Lessee under this Lease, Lessor hereby excepts and reserves from the operation of this Lease the following rights and privileges:

- (a) Rights-of-Way and Easements. Lessor reserves the right, following consultation with the Lessee, to establish rights-of-way and easements upon, through or over the Premises for roads, pipelines, electric transmission lines, transportation and utility corridors, mineral access, and any other purpose deemed reasonably necessary by Lessor, if Lessor determines in good faith that such grants will not unreasonably interfere with operations under this Lease.
- (b) Minerals. Lessor reserves all oil, natural gas, coal, geothermal resources, metalliferous minerals, sand, gravel and other common varieties, and any other minerals, and the right to lease the same to third parties, as well as the right to utilize the surface estate of the Premises for exploration, development and extraction of the same under terms and conditions that Lessor determines in good faith will not unreasonably interfere with operations under this Lease.
- (c) Use and Disposal of Surface. Subject to the rights granted to the Lessee pursuant to this Lease, Lessor reserves the right, following consultation with the Lessee, to use, lease, sell, or otherwise dispose of the surface estate or any part thereof if Lessor determines in good faith such use or disposal will not unreasonably interfere with operations under this Lease.
- (d) Other Rights and Privileges. Lessor reserves all other rights and privileges of any kind or nature, except as herein granted, provided that any actions under such reservation will not, in Lessor's good faith determination, unreasonably interfere with operations under this Lease.

1.5. Lessee's Inspection of the Premises. Lessee has inspected and investigated the Premises to Lessee's complete satisfaction, observed its physical characteristics and existing conditions, the operations thereon and on adjacent areas, and Lessee hereby waives any and all objections to, complaints about, or claims regarding (including, but not limited to, federal, state or common law based actions and any private right of action under state and federal law, including, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act, and any state or local equivalent, to which the Premises is or may be subject) the Premises and its physical characteristics and existing conditions, including, without limitation, subsurface soil and

water conditions and solid and hazardous waste and hazardous substances on, under or adjacent to the Premises. Lessee further hereby assumes the risk of changes in applicable laws and regulations relating to past, present and future environmental conditions on the Premises and the risk that adverse physical characteristics and conditions, including, without limitation, the presence of hazardous substances or other contaminants, may not have been revealed by its investigation. Lessor is hereby released from all responsibility and liability regarding the operation, condition (including the presence in the soil, air, structures, and surface and subsurface waters, of materials or substances that have been or may in the future be determined to be toxic, hazardous, undesirable or subject to regulation and that may need to be specially treated, handled and/or removed from the Premises under current or future federal, state and local laws and regulations), valuation or utility of the Premises, or its suitability for any purpose whatsoever. Lessee expressly acknowledges that Lessee has not relied on any warranties, promises, understandings or representatives, express or implied oral or written, of Lessor or of any agent of Lessor, relating to the Premises, except as specifically set forth in this Lease.

1.6. Covenant of Quiet Enjoyment. Lessor covenants that so long as Lessee shall perform the obligations of Lessee contained in this Lease and shall not be in default in the performance of any of such obligations, Lessor shall take no action or fail to take any action that would deny Lessee and its permitted sublessees, licensees, successors and assigns the right to freely, peaceably, and quietly have, hold and enjoy full use and enjoyment of the Premises for the purposes for which this Lease is granted.

1.7. Lessor's Access to Premises. Lessor and its agents, at all reasonable times and upon prior notice to Lessee, shall have free and full access to the Premises for the purpose of examining or inspecting the condition thereof, for the purpose of determining if Lessee is performing the covenants and agreements of this Lease, and for the purpose of posting such notices as Lessor may desire to protect the rights of Lessor.

## ARTICLE 2 TERM

2.1. Commencement Date and Original Term. The original term of this Lease (the "**Lease Term**") shall be for a period of thirty (30) years, commencing November 1, 2011, (the "**Commencement Date**") at 12:01 a.m., and continuing to October 31, 2041, subject to the terms and conditions set forth in this Lease which may permit or provide for earlier termination of the Lease.

2.2. Options to Extend Lease Term. Not applicable.

2.3. Termination for Failure to Build. In the event that Lessee has not commenced construction of the Facility, as set forth in the Development Plan described in **Section 4.1(a)**, within three (3) years of the Commencement Date, Lessor may terminate this Lease by giving written notice thereof to Lessee. Such termination shall be effective one year after the giving of such notice if Lessee has not commenced, and is not diligently pursuing to completion, construction of such improvements.

2.4. Holding Over. If Lessee or any successor in interest of Lessee should remain in possession of the Premises after termination of the Lease term without executing a new lease, then such holding over shall be construed as a tenancy from month-to-month, subject to all the covenants, terms, provisions and obligations of this Lease except for the provisions relating to the Minimum Rent payable hereunder, which Minimum Rent, during any holdover period shall be equal to two (2) times the amount of Minimum Rent otherwise calculated to be paid during the holdover period, together with all other sums owing to Lessor hereunder. Nothing contained herein shall be construed as Lessor's permission for Lessee to hold over or as limiting Lessor's remedies against a holdover Lessee, and if the Premises are not surrendered at the end of the Lease term, Lessee shall indemnify Lessor for, from and against any loss or liability resulting from delay by Lessee in so surrendering the Premises, including without limitation, any claims made by any succeeding Lessee based on such delay.

### ARTICLE 3 RENT

#### 3.1. Minimum Rent.

(a) Obligation to Pay Rent. Lessee shall pay to Lessor annually in advance during the Lease Term, the amount set forth in this Section 3.1, such amount, as adjusted from time to time as provided in Section 3.1(c) being referred to as the "**Minimum Rent**". Rent shall be paid annually on or before November 1 of each year of the Lease Term, without any deduction or offset.

(b) Initial Minimum Rent. The Minimum Rent for the first three years of the Lease Term shall be Three Thousand Dollars (\$3,000.00) per annum. Lessor acknowledges the receipt of \$4,202.00, from Lessee, representing payment of the Minimum Rent for the first year of the Lease Term of \$3,000.00, the \$250.00 application fee, the \$252.00 advertising fee, and the \$700.00 lease processing charge.

(c) Rental Adjustments. Lessor may, but is not obligated to, adjust the Minimum Rent every three years. In no event shall the Minimum Rent for any three (3) year period be less than the Minimum Rent for the immediately preceding three (3) year period. Lessor, in its sole discretion, may elect to utilize either of the following methods to calculate the adjusted Minimum Rent:

(i) The Minimum Rent shall multiplied by a fraction, the numerator of which is the Consumer Price Index, published by the U.S. Bureau of Labor Statistics, All Urban Consumers, Western Region Average, All Items (1982-84 = 100) (the "CPI Index") for the most recent month available as of the date of adjustment, and the denominator of which is the CPI Index for the month in which the Commencement Date occurred, or for the month that was the most recent available when the most recent adjustment was made hereunder, as applicable. If, on an adjustment date, the CPI Index does not exist in the format described above, the Lessor may substitute any official index published by a governmental agency which is then in existence and which is then most comparable to the CPI Index.

or

(ii) Lessor may obtain an independent appraisal of the Premises as of the adjustment date. The adjusted Minimum Rent shall be calculated by multiplying the appraised value of the Premises by the then current prime rate, as published by Zion's First National Bank or other statewide financial institution.

3.2. Percentage Rental. Not Applicable

3.3. Net Lease. This is a net lease and it is the intention of the parties that, except as otherwise provided or limited by the specific provisions of this Lease, Lessee shall be responsible for all costs and expenses of the ownership, maintenance, repair and operation of the Premises incurred or accrued during the Lease Term, specifically including real estate taxes payable on account of Lessee's use of the Premises. Any present or future law to the contrary notwithstanding, this Lease shall not terminate, nor shall Lessee be entitled to any abatement, reduction, set-off, counterclaim, defense or deduction with respect to any Rent or other sum payable hereunder, nor shall the obligations of Lessee hereunder be affected, by reason of any damage to or destruction of the Premises or by any taking of the Premises or any part thereof by condemnation, except as provided in this Lease.

3.4. Interest and Penalty on Past Due Obligations. Any amount due to Lessor which is not paid when due and within any applicable notice and cure period shall incur interest at a rate (the "Default Rate") equal to the lesser of: (a) one and one half per cent (1½ %) per month, or (b) the maximum rate of interest permissible under Utah law from the due date until paid. Lessee is also subject to penalties as provided by Utah Administrative Code R850-5-200 (2008) or by any replacement rule that shall be then in effect.

3.5. Audit. Lessor may from time to time cause an audit of Lessee's business to be made for the purpose of verifying the accuracy of the fees paid for any period within the Lease Term. Lessee agrees to make all records available for the audit at offices located within the State of Utah, unless Lessor agrees to a different location. If the results of the audit show that Lessee's payments for any period have been understated, then, within thirty (30) days of the determination of such deficiency, Lessee shall pay any applicable deficiency to Lessor, together with interest thereon at the Default Rate from the date such payment should originally been made until the date actually paid. If the results of the audit show that Lessee's payments for any period have been understated by four percent (4%) or more, then, within thirty (30) days of the determination of such deficiency, Lessee shall also pay Lessor the cost of the audit. If the results of the audit show that Lessee's payment of royalties and all fees for any period have been overstated, then within thirty (30) days of the determination of the overstatement, Lessor shall pay any such applicable overpayment to Lessee.

**ARTICLE 4  
DEVELOPMENT OF THE PREMISES AND  
CONSTRUCTION OF IMPROVEMENTS**

4.1. Construction.

- (a) Development Plan. The Facility shall be constructed and operated in accordance with the following:
- i. the site plan, architectural renderings and environmental controls attached hereto as **Exhibit B** (collectively, the "**Site Plan**"); and
  - ii. the Crandall Canyon Mining and Reclamation Plan (MRP) C/015/032, as amended to include the Premises (the "**Mining Plan**"); and
  - iii. any approvals and/or restrictions or guidelines that may be required by the Utah Division of Oil, Gas and Mining or the Utah Department of Environmental Quality (collectively, the "**UDOGM Approvals**"). The Site Plan, the Mining Plan, and the UDOGM Approvals shall collectively be referred to as the "**Development Plan**".

Lessee shall construct and operate the Facility pursuant to the Development Plan. No material modifications shall be made to the Development Plan without the prior written consent of Lessor, such consent not to be unreasonably withheld or delayed. In the event Lessor fails to consent or object to a proposed modification(s) within thirty (30) days after receiving notice thereof, Lessor's consent shall be deemed approved. In the event Lessee receives a notice of violation from any governmental agency or authority, including the Utah Division of Oil, Gas and Mining ("**UDOGM**"), Lessee shall give Lessor a copy of such notice within twenty (20) days following receipt. Failure to timely give Lessor such notice shall be default under this Lease.

- (b) Construction. No construction may occur on the Premises until such time as: (1) all amendments to the Mining Plan to incorporate the Facility have been completed, and (2) all UDOGM Approvals have been issued. Prior to commencing construction of the Facility, Lessee shall provide copies of all UDOGM Approvals to Lessor. Lessee's construction of the Facility shall be prosecuted diligently to completion and in accordance with the Development Plan. All improvements shall be constructed in a good workmanlike manner, and in accordance with the requirements of any and all laws, ordinances and regulations applicable thereto, including zoning and building code requirements of any municipal or other governmental agency having jurisdiction over the Premises at time said improvements are constructed.
- (c) Construction Bonding. Not applicable.
- (d) As-Built Drawings. Upon completion of the Facility, or from time to time as Lessor may reasonably request, Lessee shall provide Lessor with an as-built survey showing

the location of all physical improvements constructed on the Premises. The as-built survey shall be prepared by a licensed engineer.

4.2. Development at Lessee's Expense. Lessee shall bear all expenses in connection with the development, improvement, construction, alteration and repair of the Premises and all improvements thereon and shall indemnify, defend and hold Lessor and the Premises harmless from any and all claims arising therefrom.

4.3. Mechanics' Liens.

(a) Lessee is Not Lessor's Agent. The parties agree, and notice is hereby given, that Lessee is not the agent of Lessor for the construction, alteration or repair of any Improvements, the same being done at the sole direction and expense of Lessee. All contractors, materialmen, mechanics, and laborers are hereby charged with notice that they must look only to Lessee for the payment of any charge for work done or material furnished on the Premises during the Lease Term. Lessee shall have no right, authority or power to bind Lessor or any interest of Lessor for the payment of any claim for labor or material, or for any charge or expense, incurred by Lessee as to improvements, alterations or repairs on or to the Premises, and Lessee shall post notices on the Premises during all construction work of any nature whatsoever that Lessor is not responsible for any material and labor used on the Premises.

(b) Covenant Against Mechanic's Liens. Lessee shall not suffer or permit to be enforced against the Premises, or any part thereof, and shall indemnify and hold Lessor and the Premises harmless for, from, and against (i) any mechanic's, material men's, contractor's or subcontractor's liens arising from, and (ii) any claim for damage growing out of the work of, any construction, repair, restoration, replacement, or improvement done by or on behalf of Lessee. Lessee shall pay or cause to be paid all of such liens, claims, or demands before any action is brought to enforce the same against the Premises. If Lessee shall in good faith contest the validity of any such lien, claim, or demand, then Lessee shall, at its expense, defend itself and Lessor against the same and shall pay and satisfy any adverse judgment that may be rendered thereon prior to execution thereof and in the event of any such contest Lessee shall at the request of Lessor provide such security and take such steps as may be required by law to release the Premises from the effect of such lien.

## ARTICLE 5 REGULATORY COMPLIANCE

5.1. Observance of Governmental Regulations. In Lessee's use and occupancy of the Premises and the performance by Lessee of its rights and obligations under this Lease, Lessee shall fully comply with all laws, orders, rules, regulations, directives, ordinances and requirements of all governmental authorities having jurisdiction over Premises, or any part thereof, and Lessee shall pay all costs, expenses, liabilities, losses, fines, penalties, claims and demands including, without limitation, attorney's fees as defined in **Section 13.1**, that may in any

way arise out of or be imposed because of the failure of Lessee to comply with such laws, orders, rules, regulations, directives, ordinances and requirements.

5.2. Right of Contest. Lessee shall have the right to contest the validity of any laws, orders, rules, regulations, directives, ordinances and requirements in the manner and under the conditions provided in this Lease with respect to contesting the validity of taxes, assessments or other liens. During such contest, Lessee may refrain from complying therewith, provided that, (a) Lessor is not subjected to criminal prosecution as a result thereof, (b) Lessor's title to the Premises is not subject to lien or forfeiture as a result thereof, and (c) neither the Premises nor any rights or interest of Lessor are otherwise prejudiced or jeopardized thereby.

5.3. Hazardous Materials.

(a) Restrictions on Hazardous Substances; Remedial Work. Lessee shall not cause or permit any Hazardous Substance (as hereinafter defined) to be brought, kept or used in or about the Premises by Lessee, its officers, directors, owners, agents, sublessees, assignees, contractors, subcontractors, invitees, or concessionaires except in commercial quantities not in violation of Applicable Environmental Law and similar to those quantities usually kept on similar premises by others in the same business or profession. Lessee, its officers, directors, owners, agents, employees, sublessees, assignees, contractors, subcontractors, invitees, or concessionaires shall store, use and dispose of such materials in compliance with all applicable federal, state and local laws, including, without limitation, Applicable Environmental Law (as hereinafter defined). If the presence of any Hazardous Substance on, in or under the Premises caused or permitted by Lessee, its officers, directors, owners, agents, employees, sublessees, assignees, contractors, subcontractors, invitees, or concessionaires results in any contamination of the Premises, Lessee shall promptly take all actions, at its sole expense, as are necessary to return the affected area to the condition existing prior to the introduction of any such Hazardous Substance, including, without limitation, any investigation or monitoring of site conditions or any clean up, remediation, response, removal, encapsulation, containment or restoration work required because of the presence of any such Hazardous Substance on, in or under the Premises or any release or suspected release or threat of release of any such Hazardous Substance in the air, soil, surface water or ground water (collectively, the "**Remedial Work**"). Lessee shall obtain all necessary licenses, manifests, permits and approvals to perform the Remedial Work. Lessee shall promptly perform all Remedial Work and the disposal of all waste generated by the Remedial Work in accordance with all Applicable Environmental Law.

(b) Compliance with Applicable Environmental Law. Without limiting the generality of the foregoing or any other provision of this Lease, Lessee shall be solely and completely responsible for insuring that the Premises and all activities thereon (including activities of Lessee, its officers, directors, owners, employees, agents, contractors, subcontractors, sublessees, assignees, licensees, and concessionaires) comply fully with Applicable Environmental Law and for responding to, defending against and/or complying with administrative order, request or demand relating to potential or actual contamination on the Premises, or third party claims (including the claims of current or

future sublessees in the Premises, for Remedial Work or for the costs of any such Remedial Work or for the costs of any such Remedial Work which the third-party claimant has undertaken, whether such order, request, demand or claim names Lessor, Lessee or both, or refers to the Premises in any way, except where the contamination or other violation of Applicable Environmental Law occurred prior to the date of execution of the Lease or was caused solely by Lessor or any prior owner or Lessee (other than sublessees of Lessee) of the Premises. Lessee's responsibility under this Section includes but is not limited to promptly responding to such orders, requests, demands and claims on behalf of Lessor and defending against any assertion of Lessor's financial responsibility or individual duty to perform thereunder.

(c) Definitions. As used herein, the term "**Hazardous Substance**" means any hazardous or toxic substance, material, or waste which is or becomes regulated by any local governmental authority, the State in which the Premises are located, or the United States Government, including, without limitation, (i) any substance, chemical or waste that is or shall be listed or defined as hazardous, toxic or dangerous under Applicable Environmental Law, (ii) any other chemical, material or substance, exposure to which is prohibited, limited or regulated by any federal, state or local governmental authority pursuant to any environmental, health and safety or similar law, code, ordinance, rule, regulation, order or decree and which may or could pose a hazard to the health and safety of occupants or users of the Premises or any part thereof, any adjoining property or cause damage to the environment, (iii) any petroleum products, (iv) PCB's, (v) leaded paint, and (vi) asbestos. As used in this Lease, the term "**Applicable Environmental Law**" shall include the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§ 9601 *et seq.*, the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et seq.*, the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251 *et seq.*, the Clean Air Act, 42 U.S.C. §§ 7401 *et seq.*, the Hazardous Materials Transportation Act, 49 U.S.C. §§ 1801 *et seq.*, the Toxic Substances Control Act, 15 U.S.C. §§ 2601 *et seq.*, and the Safe Drinking Water Act, 42 U.S.C. §§ 300f through 300j-26, as such Acts have been or are hereafter amended from time to time; any so called Superfund or Superlien law; and any other federal, state and local statute, law, ordinance, code, rule, regulation, order or decree regulating, relating to or imposing liability or standards of conduct concerning any hazardous, toxic or dangerous waste, substance or material as now or any time hereafter in effect.

(d) Environmental Indemnity. Lessee shall indemnify, save harmless and defend each of the Lessor Indemnitees (as defined in **Section 6.1**) for, from and against any and all Claims incurred by, sought from or asserted directly or indirectly against any Lessor Indemnitee during or after the term of this Lease as a result of the presence of any Hazardous Substance on, in or under the Premises or any release of any Hazardous Substance into the air, soil, surface water or ground water, which Hazardous Substance was brought, kept or used in or about the Premises by Lessee, its officers, directors, owners, employees, agents, contractors or subcontractors, or as a result of a breach by Lessee of its obligations under this **Section 5.4**. Lessee shall assume, pursuant to the foregoing indemnity, any liabilities or responsibilities which are assessed against any Lessor Indemnitee in any action described under this **Section 5.4**. Lessee shall promptly

provide to Lessor copies of all communications, filings or other writings, photographs or materials given to or received from any Person or Governmental Authority in connection with any cleanup or Remedial Work conducted by Lessee, and shall notify Lessor of, and permit Lessor's representative to attend any meetings or oral communications relating thereto.

5.4. Endangered Species; Migratory Birds. In its use of the Premises Lessee shall take all actions reasonably necessary for the protection of endangered, threatened and sensitive species, as the same may be defined by federal or state law; migratory birds as defined by the Migratory Bird Treaty Act, 16 U.S.C. § 703 *et seq*; and eagles as defined in the Bald and Golden Eagle Protection Act, 16 U.S.C. § 668a *et seq*.

5.5. Antiquities. All articles of antiquity, cultural resources, paleontological resources, and treasure-trove in or upon the Premises are and shall remain the property of Lessor. Prior to surface disturbance of the Premises, Lessee shall obtain cultural resources clearances from Lessor and the State Historic Preservation Officer in accordance with Utah Administrative Code R850-60 and applicable state historic preservation law. All costs associated with archaeological and paleontological investigations on the Premises will be borne by Lessee. In the event that Lessee discovers ancient human remains or a "site" or "specimen," as defined in Section 9-8-302 or 63-73-1 Utah Code Annotated (1953), as amended, on the Premises, Lessee shall cease all construction until such time as such items have been treated in accordance with state law.

5.6. Wildfire. Lessee shall at all times take reasonable precautions to prevent wildfires from starting or spreading on the Premises, and shall comply with all applicable laws, regulations and directives of any governmental agency having jurisdiction with respect to fire prevention and control. In the event that Lessee or its employees, contractors or licensees cause a wildfire that necessitates suppression action, Lessee agrees to reimburse the State of Utah and local fire authorities for the costs of any necessary fire suppression activities incurred as a result of the wildfire.

5.7. Fill Materials and Waste. Lessee shall not allow any deposit of rock, earth, ballast, refuse, garbage, waste matter, chemical, biological or other wastes, hydrocarbons, any other pollutants, or other matter within or upon the Premises, except as specifically authorized by this Lease. If the Lessee fails to remove all non-approved fill material, wastes or materials described above from the Premises, Lessor may at its option remove such materials and charge the Lessee for the cost of removal and disposal.

## ARTICLE 6 INSURANCE AND INDEMNITY

6.1. Indemnification of State.

(a) General Indemnity. Lessee shall indemnify, save harmless and defend Lessor, its officers, directors, trustees, employees, agents, successors, and assigns (collectively the "**Lessor Indemnitees**") for, from and against any and all claims (including, without limitation, third party claims for death or personal injury, environmental contamination,

natural resources damages, or real or personal property damage), actions, administrative proceedings (including informal proceedings), judgments, damages, punitive damages, penalties, fines, costs, liabilities, interest or losses, and sums paid in settlement of claims, attorney's fees, consultant fees, expert fees, and any fees and expenses incurred in enforcing this indemnity incurred by, sought from or asserted directly or indirectly against any of the Lessor Indemnitees during or after the term of this Lease arising out of or in any way related to the use of the Premises under this Lease by Lessee, its employees, contractors, licensees, successors and assigns. Lessee shall assume, pursuant to the foregoing indemnity, any liabilities or responsibilities which are assessed against any Lessor Indemnitee in any action described under this **Section 6.1(a)**. Lessee shall promptly provide to Lessor copies of all communications, filings or materials given to or received from any person, entity or agency in connection with any such claim, and shall notify Lessee of, and permit Lessee's representative to attend any meetings or oral communications relating thereto.

(b) Breach of Lease. Lessee shall indemnify, save harmless and defend the Lessor Indemnitees for, from and against any and all claims (including, without limitation, third party claims for death or personal injury, environmental contamination, natural resources damages, or real or personal property damage), actions, administrative proceedings (including informal proceedings), judgments, damages, punitive damages, penalties, fines, costs, liabilities, interest or losses, and sums paid in settlement of claims, attorney's fees, consultant fees, expert fees, and any fees and expenses incurred in enforcing this indemnity incurred by, sought from or asserted directly or indirectly against any of the Lessor Indemnitees during or after the term of this Lease arising out of or in any way related to any failure of Lessee to comply with any of Lessee's obligations under this Lease.

(c) Survival. The obligations of Lessee and the foregoing indemnities by Lessee set forth in **Section 5.4(d)** and this **Section 6.1** shall survive the termination or expiration of this Lease.

(d) Provisions Relating to All Indemnities. Each provision of this Lease imposing an indemnification obligation on Lessee is in addition to all other indemnification provisions and shall not be construed in a manner that modifies or limits any other indemnification provision in this Lease. All indemnification provisions in this Lease shall survive the expiration or earlier termination of this Lease as to Claims arising or accruing prior to the expiration or earlier termination of this Lease. The indemnification provided by Lessee in this **Section 6.1** and elsewhere in this Lease shall not be construed or interpreted as in any way restricting, limiting or modifying Lessee's insurance or other obligations under this Lease, and such indemnification provisions are independent of Lessee's insurance and other obligations. Lessee's compliance with the insurance requirements and other obligations under this Lease does not in any way restrict, limit or modify Lessee's indemnification obligations under this Lease.

6.2. Casualty Insurance. Not applicable.

6.3. Liability Insurance. Lessee, at the sole cost and expense of Lessee, shall at all times during the Lease Term, maintain in force an insurance policy or policies which will name Lessor and Lessee as insureds against all liability resulting from property damage, injury or death occurring to persons in or about the Premises, with limits for each occurrence of not less than \$2,500,000, combined single limit, with respect to personal injury, death and property damage. The original of such policy or policies shall remain in possession of Lessee; provided, however, that Lessee shall provide Lessor, without necessity of written demand, a duplicate policy or policies of any such insurance.

6.4. Other Insurance. Lessee shall, at all times during the Lease Term and at the sole cost and expense of Lessee, maintain and keep in force:

(a) Workmen's Compensation Insurance. All workmen's compensation insurance on its employees, if any, required under the applicable workmen's compensation laws of the State of Utah;

(b) Environmental Impairment Insurance. Not applicable.

(c) Other Coverages. Such other and additional insurance policies as a prudent ground lessee in the position of Lessee would maintain or as is required from time to time by applicable law, consistent with industry standards applicable to Lessee's business. Lessor shall be an additional insured on all such policies.

6.5. Policy Requirements. All insurance policies required or otherwise provided and maintained under this **Article 6** shall contain provisions to the effect that the insurance shall not be canceled or modified without thirty (30) day's prior written notice to Lessor and that no modification shall be effective unless approved in writing by Lessor. All such policies shall be issued by a company or companies rated "A" or better by the then most current edition of Best's Insurance Guide (or if such guide is no longer published, then having a comparable rating as specified by Lessor from time to time), responsible and authorized to do business in the state in which the Premises are located, as Lessee shall determine, and shall be approved by Lessor.

6.6. Mutual Release of Subrogation Rights. Without in any way limiting the applicability of **Section 6.1**, Lessee and Lessor each hereby release and relieve the other and the officers, directors, owners, shareholders, employees, agents and representatives of the other, and waive their entire right of recovery against the other and the officers, directors, owners, shareholders, employees, agents and representatives of the other, for loss or damage arising out of or incident to the perils insured against under this **Article 6**, which perils occur in, on or about the Premises, whether due to the negligence of Lessor or Lessees or their agents, employees, contractors, concessionaires and/or invitees, but only to the extent of insurance proceeds actually paid. Lessee shall, upon obtaining the policies of insurance required hereunder, give notice to and obtain waiver of subrogation agreements or endorsements from the insurance carrier or carriers concerning the foregoing mutual waiver of subrogation contained in this Lease.

## ARTICLE 7 ASSIGNMENT AND SUBLETTING

### 7.1. Assignments.

- (a) Prohibition against Assignment. Lessee shall not assign all or part of this Lease without Lessor's prior written consent, which consent shall not be unreasonably withheld, and any attempted assignment without such consent shall be null and void, and shall constitute a default under this Lease.
  
- (b) Indirect Transfers. The sale, issuance or transfer of any voting capital stock of Lessee, if Lessee is a corporate entity, or of any ownership interests, if Lessee is a noncorporate entity, or any voting capital stock of any corporate entity which directly or indirectly controls Lessee, or any interests in any noncorporate entity with directly or indirectly controls Lessee which results in a change in the direct or indirect voting control (or a change in the identity of any person, persons, entity or entities with the power to vote or control at least fifty percent (50%) of the voting shares of any class of stock or other interests in Lessee) of Lessee or any corporate or noncorporate entity which directly or indirectly controls Lessee shall be deemed to be an assignment of this Lease within the meaning of this **Section 7.1.**

7.2. Subleases. Lessee shall not sublease all or any part of this Lease without Lessor's prior written consent, which consent may be withheld in Lessor's sole discretion, and any attempted sublease without such consent shall be null and void, and shall constitute a default under this Lease.

7.3. Subleases Subject to this Lease. Any approved sublease shall be subject to all of the terms and conditions of this Lease and each sublessee, by accepting any sublease and entering into possession of any portion of the Premises shall be deemed to have covenanted directly with the Lessor to observe and perform all of the provisions of this Lease as they relate to the portion of the Premises subject to the sublease.

7.4. No Release. No assignment or sublease shall release Lessee from any of Lessee's obligations under this Lease.

## ARTICLE 8 LESSEE FINANCING

8.1. Lessee's Right to Mortgage. Not applicable.

## ARTICLE 9 CONDEMNATION

9.1. Eminent Domain; Cancellation. If the Premises are taken by any entity with the power of eminent domain (a "**Condemning Authority**") or if the Premises are conveyed to a

Condemning Authority by a negotiated sale, or if part of the Premises is so taken or conveyed such that the use of the remaining Premises is materially interfered with, or such that the improvements cannot be rebuilt so that upon completion Lessee may again use the Premises without substantial interference, Lessee may terminate this Lease by giving Lessor written notice at any time after the occurrence of any of the foregoing and such termination shall be effective as of the date of the transfer to the Condemning Authority. If this Lease is terminated pursuant to this **Section 9.1**, Lessor shall refund to Lessee any rent prepaid beyond the effective date of termination.

9.2. Partial Taking. If part of the Premises or any of the Improvements are taken or conveyed without substantially interfering with the use of the Premises, this Lease shall not terminate and rent shall not abate. In such event, Lessor shall receive the portion of the award attributed to the value of the fee title estate taken, and Lessee shall receive all remaining awards and other compensation or sums.

9.3. Basis of Awards. All payments made for any taking or conveyance of the land as described in this **Article 9** shall be paid to Lessor and Lessee hereby agrees that it shall have no claim to any such awards paid to Lessor for the taking of Lessor's fee simple estate. Damages, if any, authorized for the loss of Lessee's leasehold estate shall be determined by the laws of Utah. Lessee shall have the right to full recovery of the costs of improvements located on the Premises. Lessee shall have the right to full recovery of the costs of improvements located on the Premises.

## ARTICLE 10 ADDITIONAL COVENANTS

### 10.1. Water Rights.

(a) Water Rights in Name of Lessor. Any new appropriation of water rights for use in association with this lease or operations upon the Premises shall be made in the name of Lessor and shall be considered an appurtenance to the Premises. Lessee shall have the right to use such water right at no cost during the term of this Lease. Upon termination of the Lease, Lessee shall make all necessary filings to confirm Lessor's ownership of such rights.

(b) Option to Purchase. If Lessee purchases or acquires an existing water right for use in association with this lease or operations upon the Premises, Lessor shall have the option to acquire that portion of such water right as was used on the Premises upon expiration or termination of this Lease. The option price for such water right shall be the fair market value of the water right as of the date of expiration or termination of this Lease. Upon expiration or termination of this Lease, Lessee shall notify Lessor in writing of all water rights purchased or acquired by Lessee for operations on the Premises and its estimate of the fair market value of such water right. Lessor shall then have forty-five (45) days to exercise its option to acquire the water by payment to Lessee of the estimated fair market value. If Lessor disagrees with Lessee's estimate of fair market value, Lessor shall notify Lessee of its disagreement within the 45 day option exercise period. The fair market value of the water right shall then be appraised by a single

appraiser mutually acceptable to both parties, which appraisal shall be final and not subject to review or appeal. If the parties cannot agree upon the choice of an appraiser, the fair market value of the water right shall be determined by a court of competent jurisdiction. Conveyance of any water right pursuant to this paragraph shall be by quit claim deed.

(c) Proration in the Event of Unitization. Not Applicable

10.2. Intermediate Reclamation. Upon completion of construction of individual cells or other facilities on the Premises, Lessee shall reclaim disturbed areas not required for continuing operations by leveling, seeding and other reasonably necessary steps to prevent soil erosion, ensure the establishment of suitable vegetation, and control noxious weeds and pests.

10.3. Waste Certification. The Lessee shall provide upon any transfer of operation, assignment of rights, permanent cessation of operations, or lease termination, certification to the Lessor that, based upon a complete search of all the operator's records for the Lease, and upon its knowledge of past operations, there have been no reportable quantities of hazardous substances as defined in 40 Code of Federal Regulations §302.4, or used oil as defined in Utah Administrative Code R315-15, discharged (as defined at 33 U.S.C. §1321(a)(2)), deposited or released within the Premises, either on the surface or underground, and that all remedial actions necessary have been taken to protect human health and the environment with respect to such substances. Lessee shall additionally provide to Lessor a complete list of all hazardous substances, hazardous materials, and their respective Chemical Abstracts Service Registry Numbers, used or stored on, or delivered to, the Premises. Such disclosure will be in addition to any other disclosure required by law or agreement.

10.4. Bonding. Lessee shall comply with all bonding requirements established for the Facility by the UDOGM in conjunction with the Mine Permit. Upon notice to Lessee, the Lessor may, in its reasonable discretion, determine that any bond on file is insufficient to protect Lessor's interests. In such an event the Lessor shall enter written findings as to the basis for calculation of the perceived insufficiency and enter an order requiring Lessee to execute and file with the Lessor a good and sufficient bond or other financial guarantee acceptable to Lessor in order to guarantee Lessee's performance of all covenants and obligations under this Lease, including reclamation pursuant to Section 12.2. The bond shall remain in full force and effect until liability thereunder is released by Lessor. Lessee shall file any required additional bond with Lessor within thirty (30) days after demand by Lessor. Lessor may increase or decrease the amount of any additional bond from time to time in accordance with the same procedure.

10.5. Survey Monuments. Lessee shall take reasonable precautions to protect, in place, all public land survey monuments and private property corners.

10.6. Fencing. Lessee may fence any portion of the Premises at its own expense. In the event Lessee erects any fencing, Lessee agrees to provide gated access at reasonable locations to Lessor and to any lessees or permittees granted rights or access to or across the Subject Property, or any part thereof, by Lessor pursuant to **Section 1.4**. Lessee shall take appropriate steps,

including fencing, to secure such ponds, structures and facilities from unauthorized access and prevent loss of wildlife.

10.7. Prior Improvements. If existing fences, range improvement projects, or other prior improvements currently exist on the Premises by authority of the Lessor, Lessee shall allow the owner of such improvements to remove them within ninety (90) days of notice from Lessee, with a copy of such notice to Lessor.

## ARTICLE 11 DEFAULT

11.1. Events of Default. Any of the following occurrences or acts shall constitute an event of default ("**Events of Default**") under this Lease:

- (a) Breach of Obligations. If Lessee shall fail to:
  - (i) Pay any Minimum Rent, Additional Rent or other sum, within ten (10) days of the date such payment is due; or
  - (ii) Provide any insurance coverage as required by this Lease, within ten (10) days of written request, or
  - (iii) Observe or perform any other provision hereof and such failure shall continue for thirty (30) days after notice to Lessee of such failure or such longer period as reasonably may be required to cure such default if the same cannot be cured within such 30 day period and Lessee commences to effect the cure within such 30 day period and diligently pursue such cure thereafter.
  
- (b) Bankruptcy. If Lessee shall file a petition in bankruptcy or for reorganization or for an arrangement pursuant to any federal or state bankruptcy law or any similar federal or state law, or shall be adjudicated a bankrupt or shall make an assignment for the benefit of creditors or shall admit in writing its inability to pay its debts generally as they become due, or if a petition or answer proposing the adjudication of Lessee as a bankrupt or its reorganization pursuant to any federal or state bankruptcy law or any similar federal or state law shall be filed in any court and Lessee shall consent to or acquiesce in the filing thereof or such petition or answer shall not be discharged or denied within sixty (60) days after the occurrence of any of the foregoing;
  
- (c) Other Insolvency Events. If a receiver, trustee or liquidator of Lessee or of all or substantially all of the assets of Lessee or of the Premises or Lessee's leasehold interest therein shall be appointed in any proceeding brought by Lessee, or if any such receiver, trustee or liquidator shall be appointed in any proceeding brought against Lessee and shall not be discharged within sixty (60) days after the occurrence thereof, or if Lessee shall consent to or acquiesce in such appointment; or

(d) Abandonment. If, following commencement of development of the Premises and at any time thereafter during the Lease Term, Lessee shall abandon the Premises, with Lessee's cessation of operations for a period of ninety (90) consecutive days to be conclusive evidence that the Premises have been abandoned.

11.2. Remedies. If an Event of Default shall have happened and be continuing, Lessor shall have the following rights and remedies, to the maximum extent available or permitted under applicable law:

(a) Right to Terminate. Lessor shall have the right to give Lessee notice of Lessor's termination of the Lease. Upon the giving of such notice, the term of this Lease and the estate hereby granted shall expire and terminate on the date set forth in such notice as fully and completely and with the same effect as if such date were the date herein fixed for the expiration of the Lease Term, and all rights of Lessee hereunder shall expire and terminate, but Lessee shall remain liable as hereinafter provided.

(b) Right to Re-enter. Lessor shall have the immediate right, whether or not the term of this Lease shall have been terminated pursuant to **Section 11.2(a)**, to re-enter and repossess the Premises by summary proceedings, ejectment, any other legal action or in any lawful manner Lessor determines to be necessary or desirable and to remove all persons and property therefrom. No such re-entry or repossession of the Premises shall be construed as an election by Lessor to terminate the term of this Lease unless a notice of such termination is given to Lessee pursuant to **Section 11.2(a)**.

(c) Reletting of the Premises. At any time or from time to time after the re-entry or repossession of the Premises pursuant to **Section 11.2(b)**, whether or not the term of this Lease shall have been terminated pursuant to **Section 11.2(a)**, Lessor shall use reasonable efforts to relet the Premises for the account of Lessee at a rent which is reasonable in light of the then existing market conditions in the community, in the name of Lessee or Lessor or otherwise, without notice to Lessee, for such term or terms and on such other conditions and for such uses as Lessor, in its absolute discretion, may determine. Lessor may collect and receive any rents payable by reason of such reletting.

(d) No Release. No expiration or termination of the term of this Lease pursuant to **Section 11.2(a)**, by operation of law or otherwise, and no re-entry or repossession of the Premises pursuant to **Section 11.2(b)** or otherwise, and no reletting of the Premises pursuant to **Section 11.2(c)** or otherwise, shall relieve Lessee of its liabilities and obligations hereunder, all of which shall survive such expiration, termination, re-entry, repossession or reletting.

11.3. Remedies Not Exclusive. No right or remedy herein conferred upon or reserved to Lessor is intended to be exclusive of any other right or remedy, and each and every right and remedy shall be cumulative and in addition to any other right or remedy given hereunder, or now or hereafter existing by law, in equity or by statute.

11.4. Lessor Breach. Should Lessor be in default of its obligations under this Lease, Lessee shall notify Lessor of such default in writing. Should such default continue for more than thirty (30) days after Lessor's receipt of such notice, or if such default cannot be cured within thirty (30) days should Lessor have failed to commence and be diligently prosecuting the cure of such default, Lessee shall have, as its sole and exclusive remedy under this Lease, the right to file suit against Lessor in a court of competent jurisdiction for specific performance or damages, as the case may be. Notwithstanding the foregoing, in no event shall Lessee be allowed to any offset or abatement of any rental amounts hereunder, nor shall Lessee be allowed to terminate this Lease, except as specifically provided herein. Notwithstanding anything contained herein to the contrary, Lessee agrees to look solely to the estate and property of the Lessor in the Premises, and subject to the prior rights of any mortgage or beneficiary of any trust deed or any security interest on the same, for the collection of any judgment (or other judicial process) requiring the payment of money by Lessor in the event of any default or breach by Lessor with respect to any of the terms, conditions and covenants of this Lease to be observed and/or performed by Lessor, and no other assets of Lessor shall be subject to levy, execution or other procedures for the satisfaction of Lessee's remedies.

11.5. Force Majeure. If either Party, without fault or negligence by such Party, is rendered unable by Force Majeure, as defined herein, to perform any obligation of under this Lease, other than Lessee's obligation to pay Minimum Rent, Additional Rent, or other consideration, including late fees, then upon such Party promptly giving written notice to the other Party, the performance of such obligation shall be suspended during the period of time the inability to perform continues as a result of an event of Force Majeure, and such Party shall be relieved of liability for its failure to perform during such period of time; provided that the Party asserting an inability to perform shall use its best efforts to correct such inability and to resume promptly its performance as required under the Lease. The term Force Majeure shall mean causes or events such as an act of God, act of civil or military authority, fire, epidemic, flood, earthquake, riot, war, terrorism, sabotage, or other similar cause or event not within such Party's reasonable control, but not including generalized economic conditions, recession, or depression. The written notice provided under this Paragraph shall set forth the particular nature and circumstances of the Force Majeure, the expected effect of the Force Majeure on the Party's performance under the Lease, and the expected date the Party will resume performance.

## ARTICLE 12 OBLIGATIONS ON LEASE TERMINATION

12.1. Improvements. Upon the termination of this Lease for any cause whatsoever, Lessee shall upon request of Lessor immediately surrender peaceable possession of the Premises, including all buildings, structures, fixtures and other improvements (collectively, the "**Improvements**") then located thereon, but not including personal property, in a good, clean and useable condition (ordinary depreciation, reasonable wear and tear, casualty loss, and condemnation loss excepted). In the event Lessor chooses not to retain the Improvements upon the termination or early expiration of the Lease, Lessee shall remove the Improvements within ninety (90) days of notice from the Lessor requiring such, and reclaim the Premises in accordance with **Section 12.2**. Removal of the Improvements and restoration of the Premises shall be at Lessee's sole cost and expense. In the event that Lessee fails to remove the



13.3. Attorney's Fees. If any action is brought by any party to this Lease in respect of its rights under this Lease, the prevailing party shall be entitled to reasonable attorney's fees and court costs as determined by the court. In the event that any person who shall not be a party to this Lease shall institute an action against a party to this Lease in which the other party to this Lease shall be involuntarily and without cause joined as a party, the party against whom said action is instituted shall reimburse the other party to this Lease for all attorney's fees incurred by such party in connection therewith.

13.4. Severability. The invalidity of any provision of this Lease, as determined by a court of competent jurisdiction, shall in no way affect the validity of any other provision hereof.

13.5. Recording. A Memorandum of this Lease may be recorded after execution of this Lease.

13.6. Cumulative Remedies. No remedy or election hereunder shall be deemed exclusive but shall, wherever possible, be cumulative with all other remedies hereunder or at law or in equity.

13.7. Construction. The titles which are used following the number of each Section are so used only for convenience in locating various provisions of this Lease and shall not be deemed to affect the interpretation or construction of such provisions. The parties acknowledge that each party and its counsel have reviewed and revised this Lease. This Lease shall not be construed for or against Lessor or Lessee. References in this Lease to "**Sections**" and "**Articles**" refer to the Sections and Articles of this Lease unless otherwise noted.

13.8. Lessor's Consent. Whenever this Lease provides for or requires the consent or approval of Lessor, such consent or approval may be given or withheld in the sole and absolute discretion of Lessor, unless a standard of reasonableness is expressly stated.

13.9. Successors. Subject to the restrictions contained in **Article 7**, this Lease and all of provisions hereof shall be binding upon and inure to the benefit of the successors and assigns of Lessor and Lessee.

13.10. Governing Law; Venue. The terms, conditions, covenants, and agreements herein contained shall be governed, construed, and controlled according to the laws of the state of Utah. Any action brought in connection with this Lease shall be brought in the Third District Court for Salt Lake County, Utah, subject, however, to any legal requirement for prior exhaustion of administrative remedies.

13.11. Broker's Commission. Lessee and Lessor represent and warrant to each other that there are no claims for brokerage commissions or finder's fees in connection with this Lease and each agrees to indemnify the other for, from and against all liabilities arising from any claims, including any attorney's fees connected therewith, relating to claims arising out of the other's actions.

13.12. Time is of the Essence. Time is of the essence of this Lease and in the performance of all of the covenants and conditions hereof.

13.13. Relationship of the Parties. The relationship of the parties hereto is that of Lessor and Lessee, and it is expressly understood and agreed that Lessor does not in any way, nor for any purpose, become a partner of Lessee or a joint venturer with Lessee in the conduct of Lessee's business, or otherwise, and that the provisions of any agreement between Lessor and Lessee relating to rent are made solely for the purpose of providing a method whereby rental payments are to be measured and ascertained.

13.14. Time Periods. In the event the time for the performance of any obligation or the taking of any action hereunder expires on a Saturday, Sunday or legal holiday, the time for performance or taking such action shall be extended to the next succeeding day which is not a Saturday, Sunday or legal holiday.

13.15. Quitclaim. At the expiration or earlier termination of this Lease, Lessee shall execute, acknowledge and deliver to Lessor, within five (5) days after written demand, from Lessor to Lessee, any quitclaim deed or other document deemed necessary or desirable by Lessor's counsel to remove the cloud of this Lease and the limited right of first refusal granted hereunder from the real property subject to this Lease.

13.16. Tax and Zoning Immunity. Nothing contained in this Lease shall be deemed to constitute a waiver of applicable laws providing tax and zoning immunity to state property or any interest therein or income therefrom.

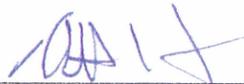
13.17. No Waiver of Sovereign Immunity. By this Lease, Lessor does not waive, limit, or modify any sovereign immunity from suit except as specifically provided herein.

13.18. Entire Agreement. This Lease sets forth all the promises, inducements, agreements, conditions, and understandings between Lessor and Lessee relative to the Premises, and there are no promises, agreements, conditions, or understandings, either oral or written, express or implied, between them other than are set forth therein. No subsequent alteration, amendment, change, or addition to this Lease shall be binding upon Lessor or Lessee unless in writing and signed by each of them.

IN WITNESS WHEREOF, the parties hereto have executed this Lease on the day and year first written above.

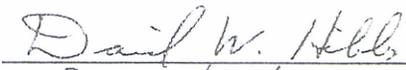
**LESSOR:**

STATE OF UTAH, SCHOOL AND  
INSTITUTIONAL TRUST LANDS  
ADMINISTRATION

By:   
Kevin S. Carter, Director

**LESSEE:**

GENWAL RESOURCES, INC.

By:   
Its: President

APPROVED AS TO FORM:  
MARK L. SHURTLEFF  
ATTORNEY GENERAL

By:   
Special Assistant Attorney General

STATE OF UTAH )  
 : ss.  
COUNTY OF SALT LAKE )

On the 4<sup>th</sup> day of January, 201<sup>2</sup>, appeared before me **Kevin S. Carter**, the Director of the School and Institutional Trust Lands Administration of the State of Utah (SITLA), who, his identity and position having been satisfactorily established to me, affirmed to me upon oath that the governing body of SITLA, has authorized him to execute the foregoing Special Use Lease Agreement No. 1708, and did duly acknowledged in my presence having executed the same for the purpose stated therein.

Seal:

Linda Bianchi  
Notary Public

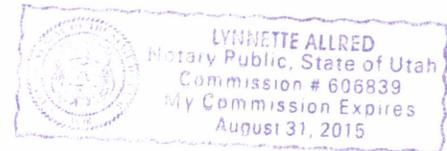


STATE OF Utah )  
 : ss.  
COUNTY OF Carbon )

On this 21<sup>st</sup> day of December, 2011, appeared before me (name) David W. Hibbs, the (title) President of Genwal Resources, Inc., a Utah corporation, who, his/her identity and position having been satisfactorily established to me, affirmed to me upon oath that the governing body of Genwal Resources, Inc. has authorized him/her to execute the foregoing Special Use Lease Agreement No. 1708, and did duly acknowledged in my presence having executed the same for the purpose stated therein.

Seal:

Lynnette Allred  
Notary Public



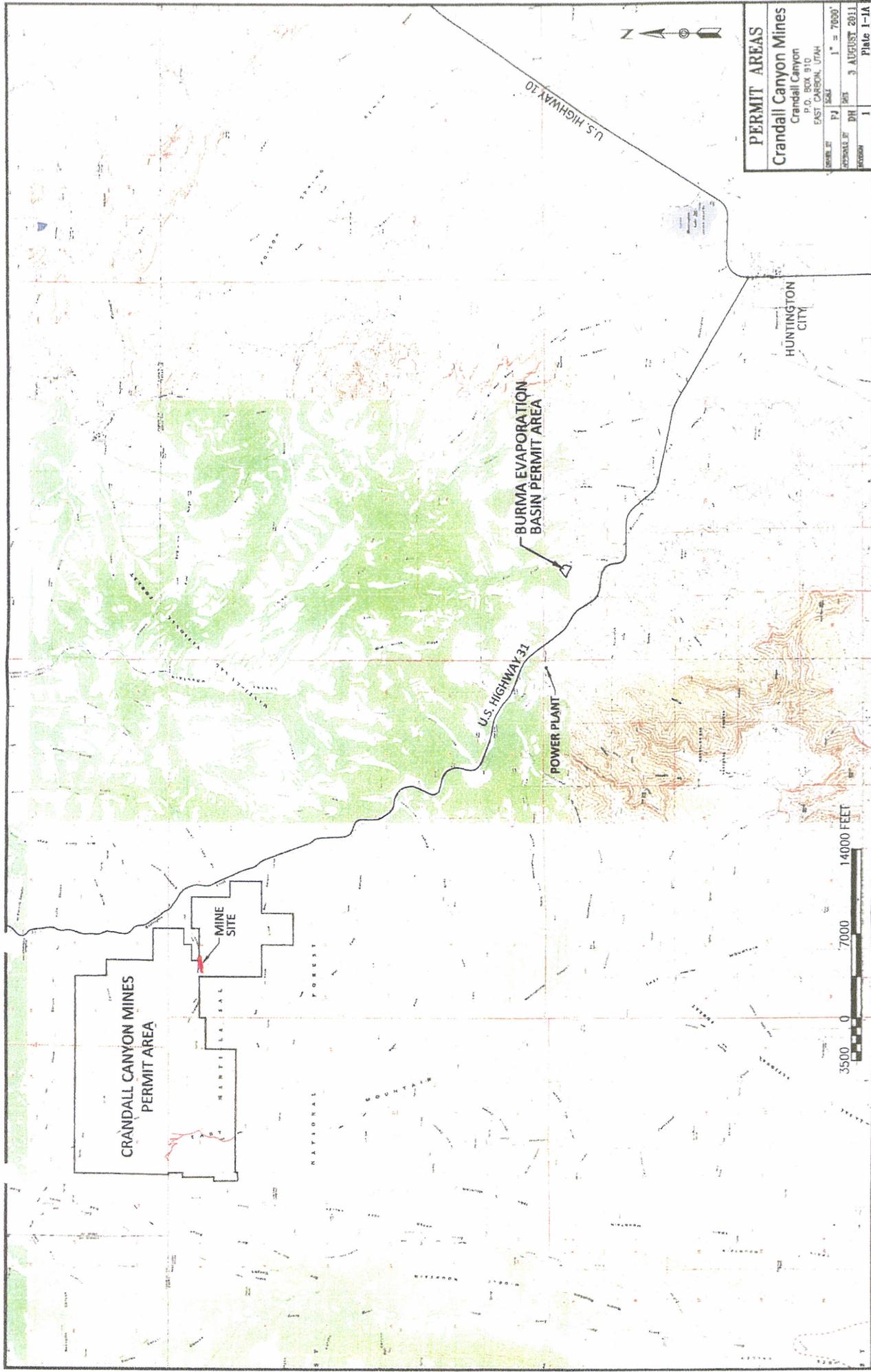
**EXHIBIT A**

**LEGAL DESCRIPTION**

Township 17 South, Range 8 East, SLB&M  
Section 5: Lot 6 (within)

Beginning at a point located S89°55'W a distance of 348.68 feet from the northeast corner of Lot 6 within Section 5, Township 17 South, Range 8 East, of the SLB&M to the east edge of the Old Construction Road; thence S61°55'04"E a distance of 24.47 feet; thence S72°25'21"E a distance of 23.90 feet; thence S64°24'35"E a distance of 21.03 feet; thence S50°52'27"E a distance of 20.76 feet; thence S35°44'44"E a distance of 55.91 feet; thence S02°28'53"W a distance of 44.51 feet; thence S73°13'55"E a distance of 89.66 feet; thence S60°15'20"E a distance of 43.41 feet; thence S41°13'26"E a distance of 32.53 feet; thence S31°03'49"E a distance of 59.87 feet; thence S10°41'32"E a distance 66.67 feet; thence S01°55'27"E a distance of 79.97 feet; thence S11°15'16"E a distance of 60.90 feet; thence S18°48'58"W a distance of 28.67 feet; thence S41°35'52"W a distance of 29.99 feet; thence S53°54'34"W a distance of 28.12 feet; thence S47°10'44"W a distance of 6.91 feet; thence West a distance of 601.02 feet; thence N52°12'01"W a distance of 270.05 feet; thence N49°44'24"E a distance of 101.47 feet; thence N50°04'42"E a distance of 95.86 feet; thence N49°46'07"E a distance of 88.53 feet; thence N52°15'08"E a distance of 91.68 feet; thence N53°24'39"E a distance of 73.72 feet; thence N53°38'00"E a distance of 134.79 feet; thence East a distance of 99.89 feet to the point of beginning. Containing 7.32 acres, more or less.

**EXHIBIT B**  
**DEVELOPMENT PLAN**



PERMIT AREAS			
<b>Crandall Canyon Mines</b>			
Crandall Canyon			
P.O. BOX 310			
EAST CARSON, UTAH			
DATE	BY	SCALE	1" = 7000'
APPROVALS BY	DATE	BY	DATE
PERSON	1	PERSON	3 AUGUST 2011
			PLATE 1-1A



**EVAPORATION BASIN PLAN**  
**Crandall Canyon Mines**  
 Crandall Canyon  
 P.O. BOX 910  
 EAST CARBON, UTAH

DATE	BY	SCALE	1" = 100'
7 SEPT. 2011	DH		
1	1		



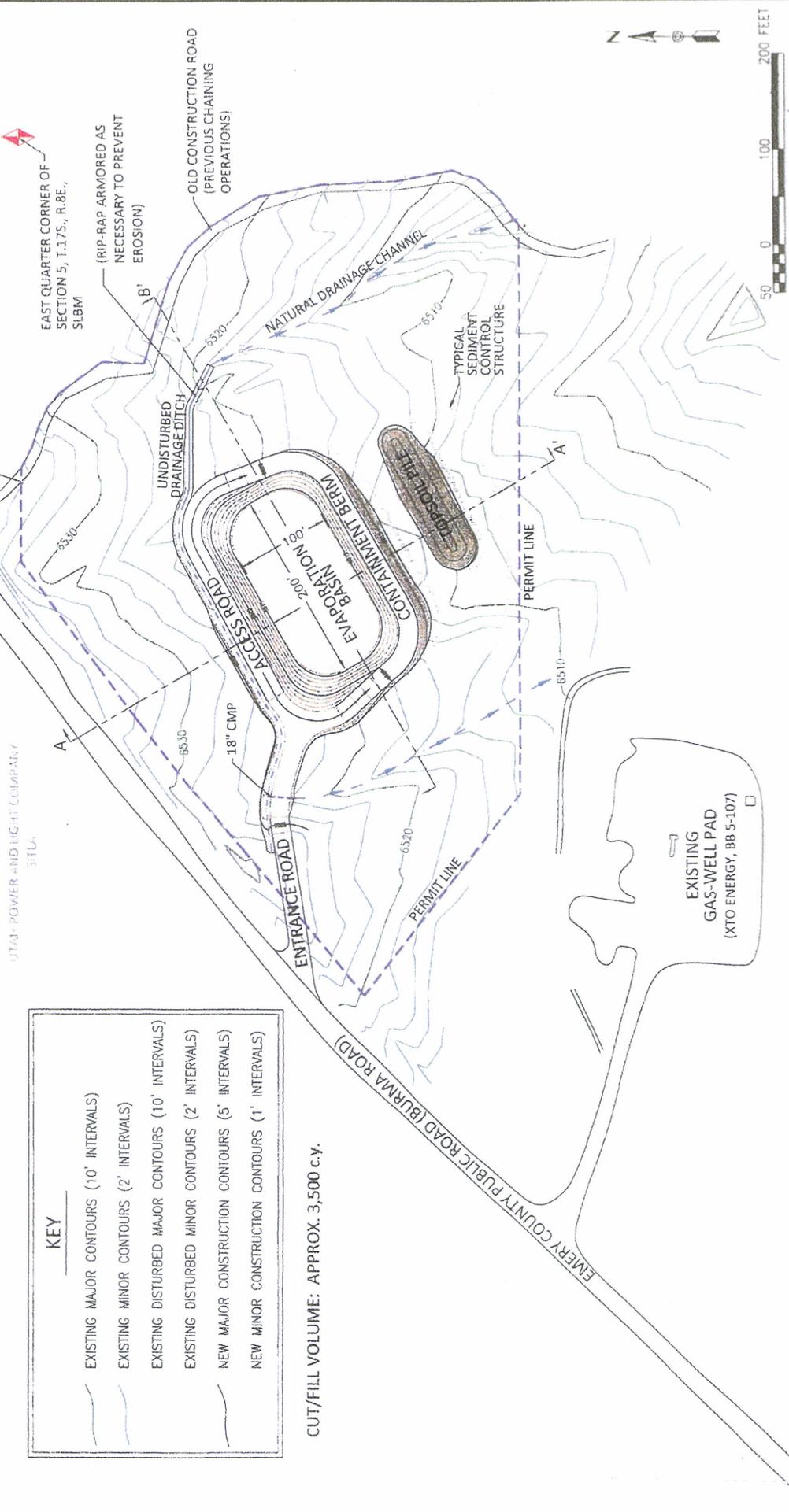
**EVAPORATION BASIN PLAN**

AREA LOCATED IN SECTION 5, TOWNSHIP 17 SOUTH, RANGE 8 EAST, SLBM

**Crandall Canyon Mines**  
 P.O. BOX 910  
 EAST CARBON, UTAH

DATE	BY	SCALE	1" = 100'
APPROVED	DR	22 SEPT. 2011	
NO. 540	1	540	

- NOTES:
1. ALL DIMENSIONS ARE APPROXIMATE. FINAL LOCATIONS AND CONFIGURATIONS OF THE FACILITY STRUCTURES MAY VARY DEPENDING UPON CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
  2. ALL INTERIOR EVAPORATION BASIN SLOPES SHALL BE A MAXIMUM OF 3:1. ALL OTHER CUT/FILL SLOPES SHALL BE A MAXIMUM OF 2:1 UNLESS OTHERWISE NOTED.
  3. MINIMUM INTERIOR RADIUS OF PERIMETER ACCESS ROAD SHALL BE 40'.
  4. BOTTOM OF EVAPORATION BASIN ELEVATION = 6514.5'

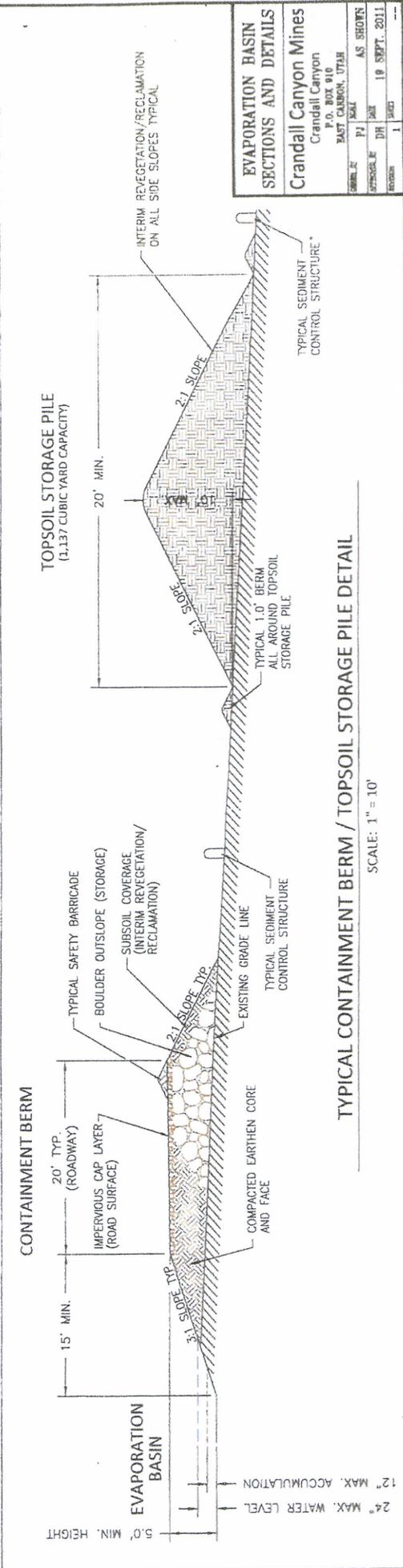
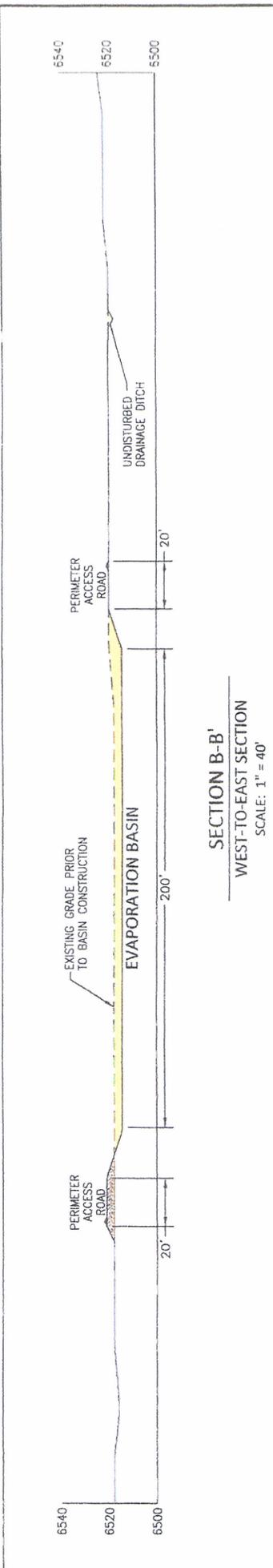
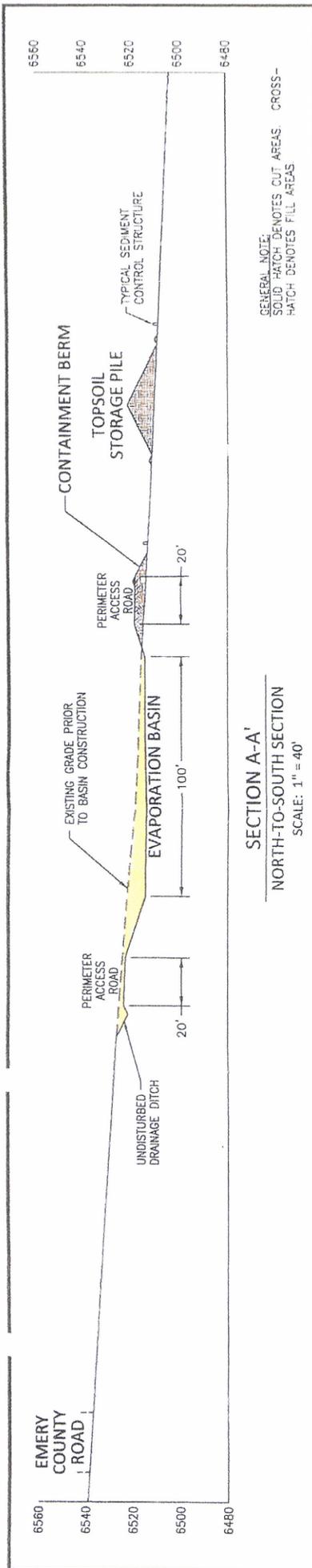


UTAH POWER AND LIGHT COMPANY  
 5111

KEY	
(Solid line)	EXISTING MAJOR CONTOURS (10' INTERVALS)
(Dashed line)	EXISTING MINOR CONTOURS (2' INTERVALS)
(Dotted line)	EXISTING DISTURBED MAJOR CONTOURS (10' INTERVALS)
(Dash-dot line)	EXISTING DISTURBED MINOR CONTOURS (2' INTERVALS)
(Long-dash line)	NEW MAJOR CONSTRUCTION CONTOURS (5' INTERVALS)
(Short-dash line)	NEW MINOR CONSTRUCTION CONTOURS (1' INTERVALS)

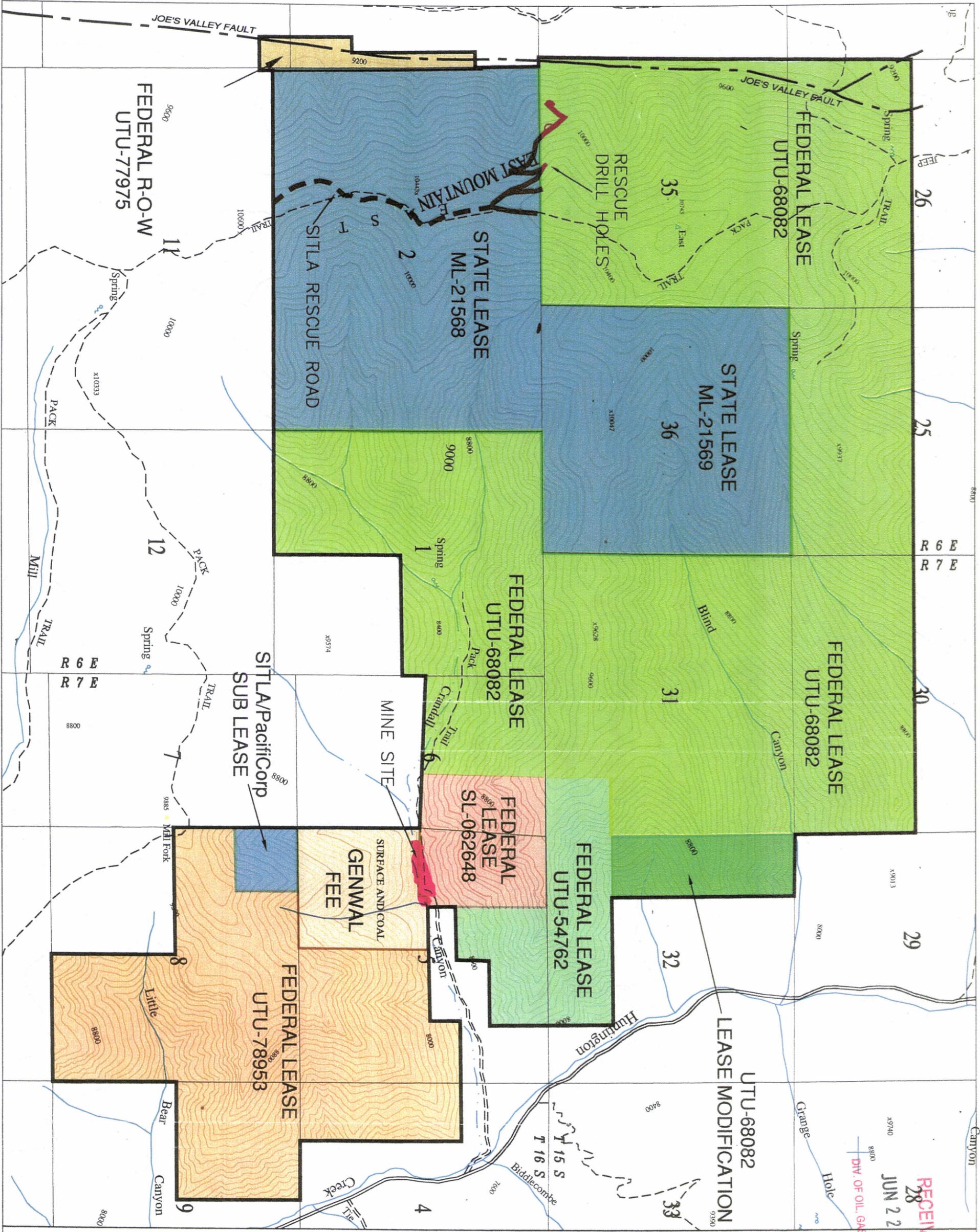
CUT/FILL VOLUME: APPROX. 3,500 c.y.





<b>EVAPORATION BASIN SECTIONS AND DETAILS</b>			
<b>Crandall Canyon Mines</b>			
Crandall Canyon P.O. BOX 910 EAST CARBON, UTAH			
DESIGNED BY	PI	SCALE	AS SHOWN
CHECKED BY	DH	DATE	18 SEPT. 2011
REVISION	1	SHEET	---

*MAPS.....*



RECEIVED  
 JUN 22 2012  
 DIV. OF OIL, GAS & MINING

**GENWAL**  
 RESOURCES, INC.  
 P.O. Box 1077, 794 North "C" Canyon Rd, Price Utah  
 Telephone: (435) 888-4000

**CRANDALL CANYON MINE  
 LEASE / PERMIT AREA MAP**

REV: 11	ACAD: LEASE SOCRAN9
DATE: 8-01-11	BY: JDS
SCALE: 1"=2000'	PLATE #: 1-1



**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).

RECEIVED  
JUN 22 2012  
DIV. OF OIL, GAS & MINING

CRANDALL CANYON MINES  
PERMIT AREA

MINE  
SITE

POWER PLANT

U.S. HIGHWAY 31

BURMA EVAPORATION  
BASIN PERMIT AREA

I CERTIFY THIS MAP TO BE TRUE AND CORRECT  
TO THE BEST OF MY KNOWLEDGE.



HUNTINGTON  
CITY

U.S. HIGHWAY 10



PLATE 1-1A  
LOCATION MAP

Crandall Canyon Mines  
Crandall Canyon  
P.O. BOX 910  
EAST CARBON, UTAH

DRAWN BY	PJ	SCALE	1" = 7000'
APPROVED BY	DH	DATE	11 OCT. 2011
REVISION	1		PLATE 1-1A

**CHAPTER 7 ..... REPLACEMENT PAGES**

- 7-56 Investigation of Potential for Little Bear Spring Recharge
- 7-57 Determination of Recharge Location of Little Bear Spring (Dye Tracing)
- 7-58 Summary of Hydro logic Baseline Information, South Crandall Lease
- 7-59 Little Bear Spring Study (Initial study, 1998) AquaTrack
- 7-60 Little Bear Spring Study (Expanded Study, 1999) AquaTrack
- 7-61 Mill Fork Resistivity Study, 2001 AquaTrack
- 7-62 Little Bear Spring (2<sup>nd</sup> Expanded Study, 2001) AquaTrack
- 7-63 Hydrology/Geology Map of Little Bear Watershed
- 7-64 Baseline Information for the U-68082 Lease Mod Area
- 7-65 Mine Discharge Water Iron Treatment Facility
- 7-66 Burma Evaporation Basin

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

**CHAPTER 7  
LIST OF PLATES**

<b><u>PLATE NUMBER</u></b>	<b><u>DESCRIPTION</u></b>
PLATE 7-1	Crandall Creek Plan and Profile
PLATE 7-2	Crandall Creek Cross Sections
PLATE 7-3	Proposed Pond Details
PLATE 7-4	**DELETED**
PLATE 7-4A	**DELETED**
PLATE 7-5	Drainage Map
PLATE 7-5A(1,2)	As-Built Cross Sections
PLATE 7-5B	**DELETED**
PLATE 7-5C	Watershed Boundary Map
PLATE 7-6	**DELETED**
PLATE 7-6A	**DELETED**
PLATE 7-7	Exploration Drill Hole and Hiawatha Coal Outcrop Locations
PLATE 7-8	Blind Canyon Watershed Land Types
PLATE 7-9	Terratek Blind Canyon Watershed Subsidence Modeling
PLATE 7-10	Blind Canyon Watershed Land Types & Drainage
PLATE 7-11	Pre & Postmining Blind Canyon Topography
PLATE 7-12	Seep and Spring Locations
PLATE 7-13	**DELETED**
PLATE 7-14	Groundwater Rights

## Surface Water

### **Streams**

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

### UPDES

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

### **Mine Discharge**

1	Pre-002	Pre-treated Mine Water	Flow, field parameters and Table 7-4(A) parameters monthly
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### **Ledge seep water flow:**

The treatment area is separated from the portal bench above by a massive sandstone ledge of bare sandstone rock. There are several seeps emanating from this ledge and this seep water drains down the ledge toward the area of the settling basin. Based on previous measurements, the flow is minimal (approximately 2-5 gpm), but constant. A concrete trough has been poured behind the existing retaining wall (between the ledge rock and the back of the wall) to collect this seepage water and route it through a 4" PVC pipe to the settling basin overflow culvert inlet. In this manner the seepage water is contained, can be monitored, and is also subject to treatment thru dilution. The flow data collected from monitoring this seep will be provided to the Division and will assist in determining the most appropriate geotechnical method for future reclamation of this area, i.e., final reclamation. Monitoring will be conducted monthly, although freeze/thaw conditions in winter months will have to be factored into interpreting the data. The monitoring information will be provided to the Division (via the electronic water monitoring data base) on a monthly basis and will continue until the Division determines that it is no longer necessary, and at a minimum, until such time as the revised final reclamation plan has been approved, since this information will be needed in order to properly design the approximate-original-contour requirements for the "old loadout area".

At the lower end of the treatment facility, the treated minewater water is collected into a buried pipeline which crosses underneath the road and connects to the existing discharge line. In this manner the treated water ends up reporting to the Crandall Canyon drainage (by way of the main bypass culvert) at the existing approved UPDES outfall point.

There is every reason to believe that water will permanently discharge from the Crandall Mine portals. The iron level of the mine water historically was very low, and began rising only after the water began to build up and impound within the mine workings following the mine collapse of 2007. At the present time (January, 2012) it is uncertain whether or not long-term treatment of the mine discharge water will be required, because naturally-occurring chemical processes within the mine could potentially bring the iron content of the water to within compliance limits at some time in the future. This scenario is currently being addressed under Division Order DO-10 and is a matter of on-going legal negotiations between the company and the Division, as mandated by the Board of Oil, Gas and Mining. Until such time as the final terms of these on-going negotiations have been fully implemented, the company commits to collecting additional hydrologic baseline data. This data includes:

- a) flow quantities from the seep in the sandstone ledge above the treatment facility,.
- b) measurement of the discharge rate from the sealed portals; either continuously (e.g., using a data logger) or at a minimum, daily.
- c). monthly whole water chemical analysis and field measurements of the untreated mine discharge as specified on Table 7-4(A).

#### **7.42.22 Sedimentation Pond**

##### **Design**

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

### **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

**APPENDIX 7-66.....BURMA EVAPORATION BASIN**

**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.....SILTA Special Use Lease 1708

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

## 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 Attachment 2). 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 would be approximately 1.41 acres. This would 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.

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, subject to change based on whether or not discharged mine water requires treatment.

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.

- 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.
- g) A certified noxious weed-free straw mulch will be applied to the surface at a rate of 2000 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, would also be applied at this time.

#### **Chapter 4, Land Use:**

The site is located in a well-developed industrial area. And is situated less than 1.5 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 mentioned 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.

### **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" would 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, at two truckloads per day, and 4000 gallons per truckload. This works out to be about 64,200 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 2400 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 1.5 inches per year or less. It is anticipated that the material would not accumulate more than 24" deep in the bottom of the basin during the operational life of the facility, which would take more than 16 years to accumulate to this level. This would then allow the material to be covered with the necessary 48" of backfill at the time of final reclamation.

It should be noted that the preceding volume accumulation estimate is based on rough assumptions, and could 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 would 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. The

entire subject of long-term treatment requirements is presently being discussed and negotiated as part of the legal resolution of Division Order DO-10A. Since the operational future of the Burma evaporation facility is tied totally to the operational requirements of the Crandall water treatment, it is assumed that one of the following future scenarios will ultimately unfold:

1) The dried sludge material would be left in place and buried on-site as part of the final reclamation process. The material would 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 Appendix 10.

2) Grab samples of the dried material will be taken once every five years or every 7.5 inches of solid waste deposited. These samples will be analyzed according to the Division's Guidelines for topsoil and Overburden. In addition to the Division's Guidelines the grab sample will be analyzed for Barium, Aluminum, Iron, Zinc, and Nickel. The results of the analysis will be reported during the mid-term review. Excess dried material could be removed from the basin if needed and taken to an approved disposal site, such as ECDC.

3) The basin could be enlarged if needed to accommodate additional future accumulation needs. This could be accomplished by extending the length of the basin either to the east or the west within the existing site. The site could 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 would 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 would 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 would be constructed, and an alternate sludge disposal system might 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 evaluated on an ongoing basis as part of the five-year permit renewal process and the on-going negotiations between the Division and the company as a result of Division Order DO-10A.

It should be noted that the iron sludge material has been tested in the lab 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 of 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 outslope 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 would 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 7-65 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 would be about 4 inches and for the 100yr event would be about 4.5 inches. Hence, there is no statistical probability that the basin would 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  $1 \times 10^{-8}$  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 ¾ 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 could 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 would 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 would 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 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 would 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 would be totally contradictory to the designed intent of the facility. The only water entering the pond in an uncontrolled manner would 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 would be about 4.26 inches, while the 100 year/24 hour event would 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 and 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.

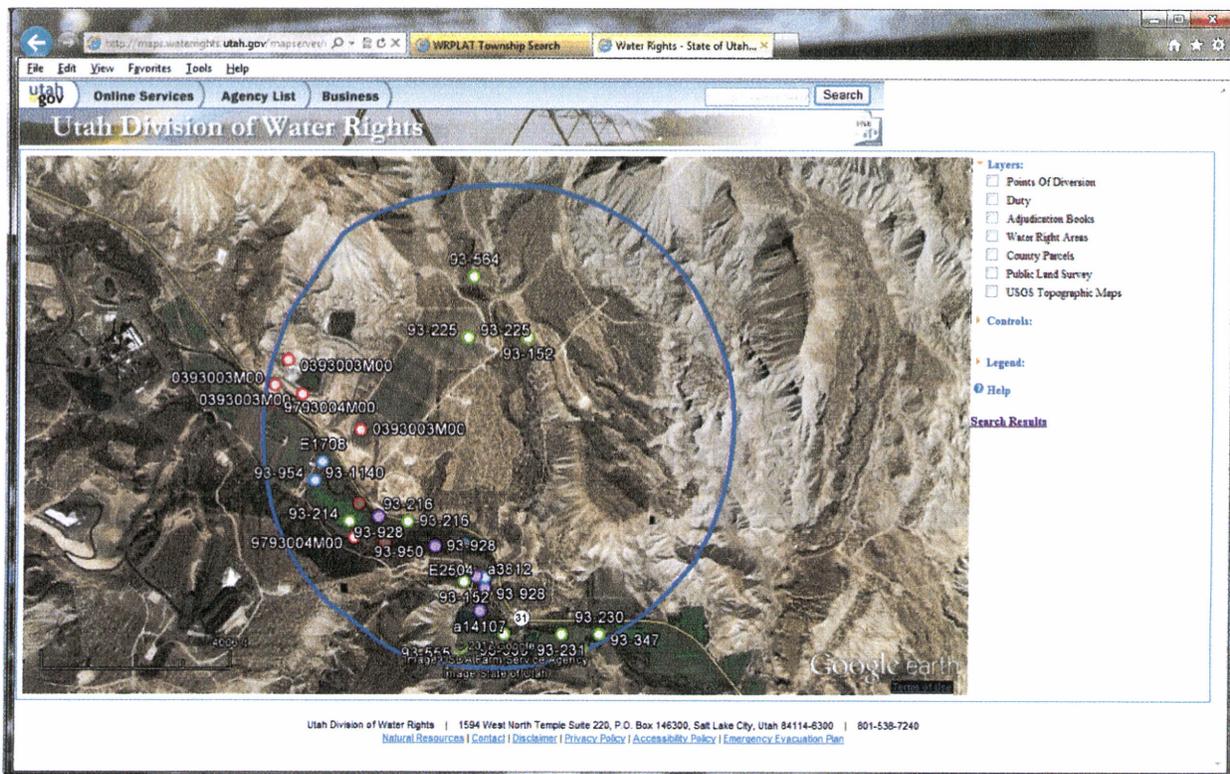


Figure 7-1. Water Rights Locations

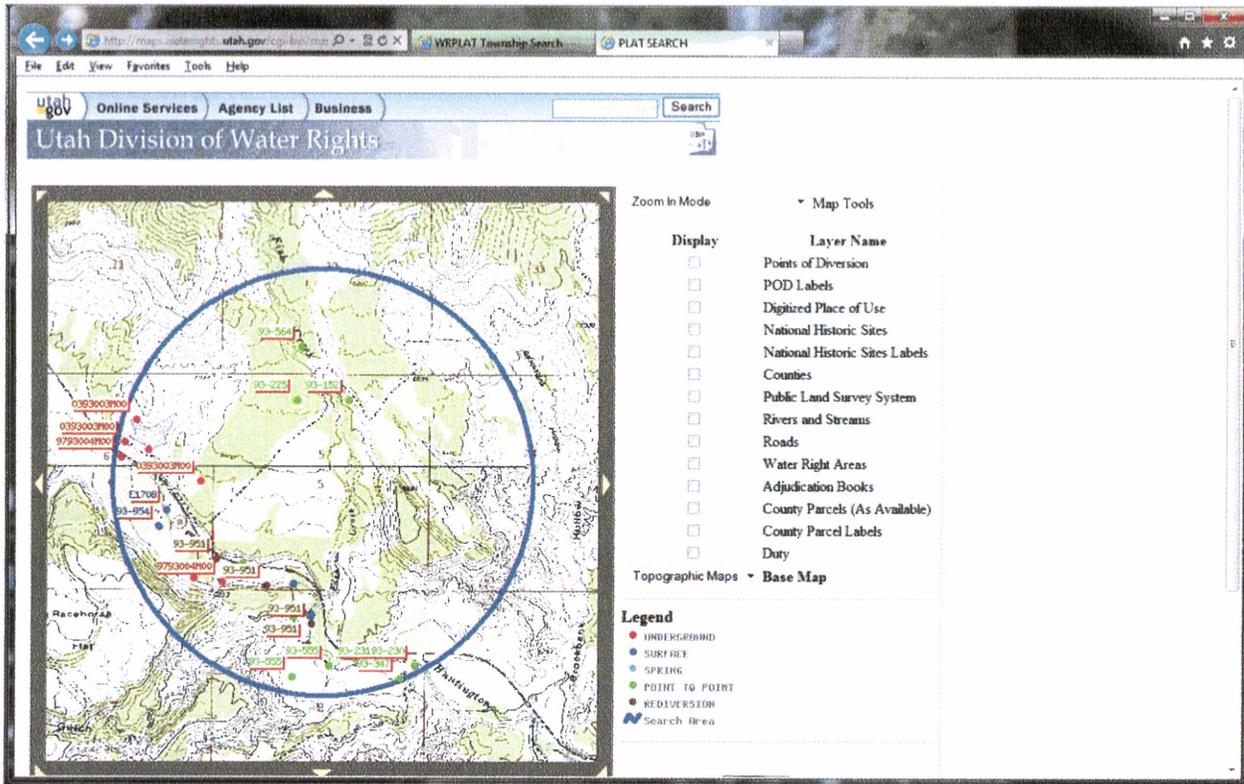


Figure 7-2. Topographic Map of Search Area

## Chapter 8, Bonding:

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 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.  
 $2,363 \text{ yd} \times \$2.46/\text{yd} = \$5,812.98$

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.

$$1,137 \text{ yd} \times \$4.02/\text{yd} = \$4,570.74$$

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

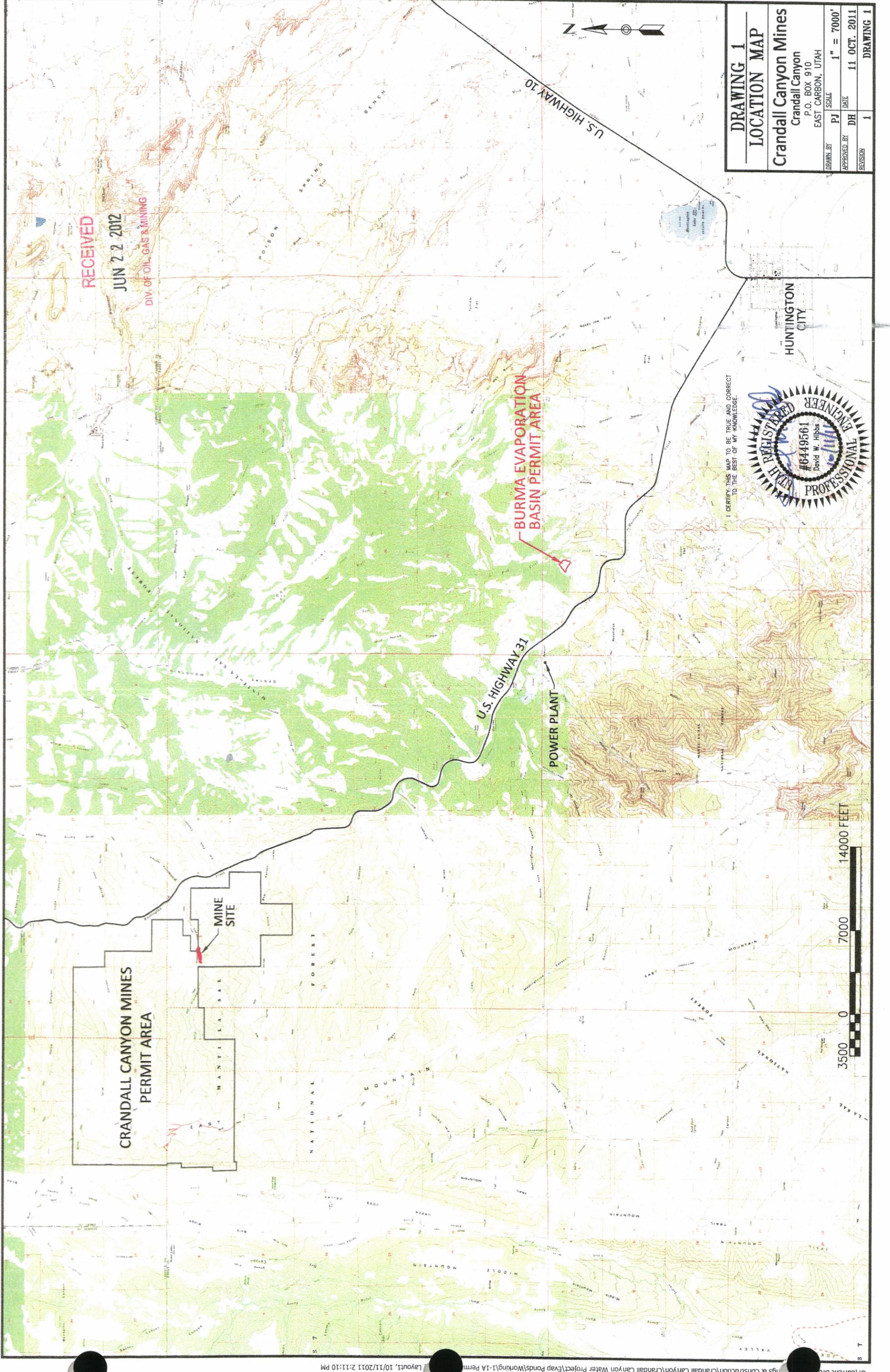
Demolition	\$ 198.67
Earthwork	\$10,383.72
Revegetation	<u>\$ 7,279.00</u>
Sub-total	\$17,861.39

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  $\$17,861.39 \times 1.3727 = \$24,518.33$

# 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
Drawing 7	Final Contour (AOC)



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<b>DRAWING 1</b>	
<b>LOCATION MAP</b>	
<b>Crandall Canyon Mines</b>	
Crandall Canyon P.O. BOX 910 EAST CARBON, UTAH	
DRAWN BY PJ	SCALE 1" = 7000'
APPROVED BY DH	DATE 11 OCT. 2011
REVISION 1	DRAWING 1

HUNTINGTON CITY



I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

BURMA EVAPORATION  
 BASIN PERMIT AREA

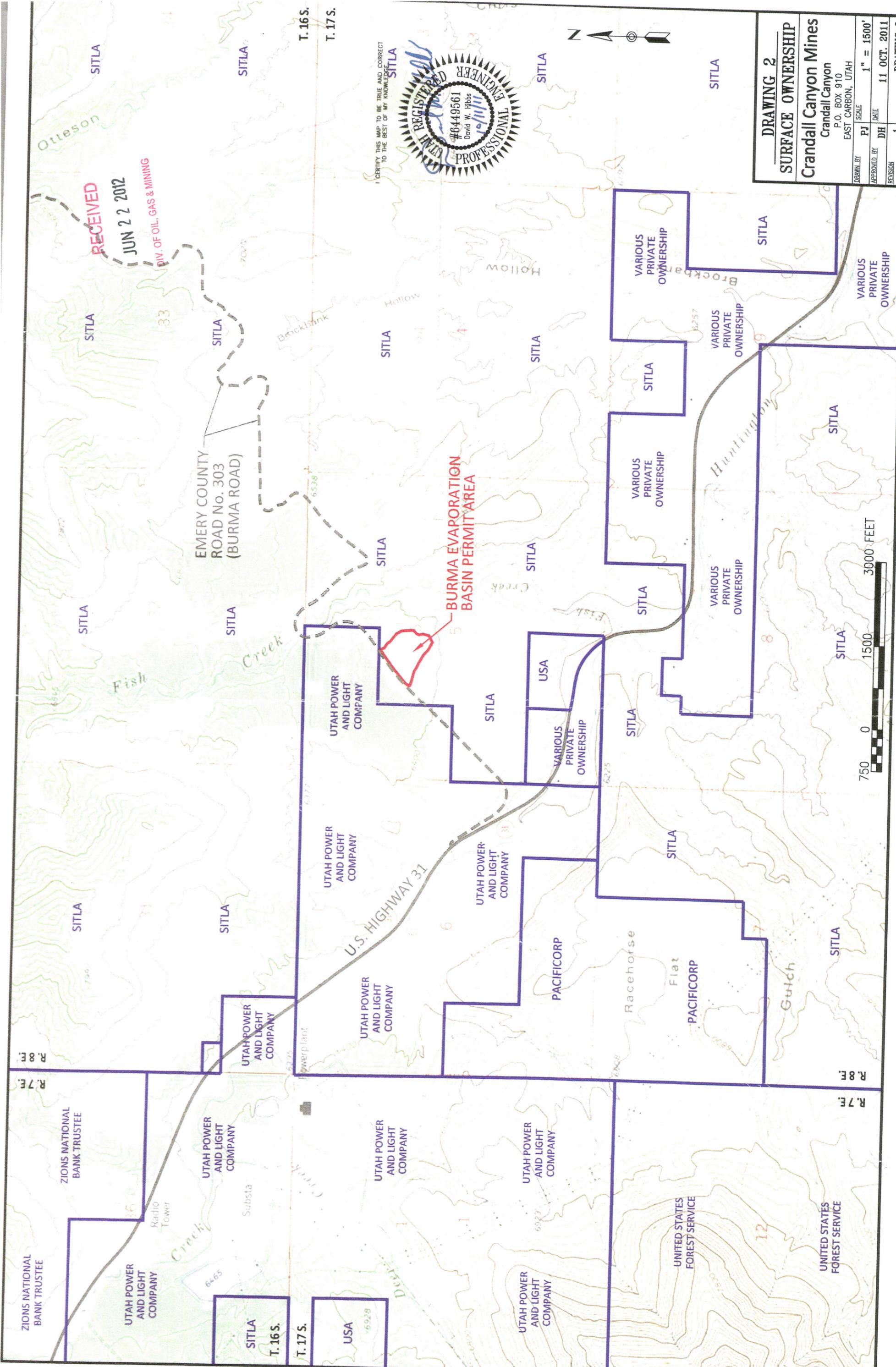
U.S. HIGHWAY 31

POWER PLANT

CRANDALL CANYON MINES  
 PERMIT AREA

MINE SITE

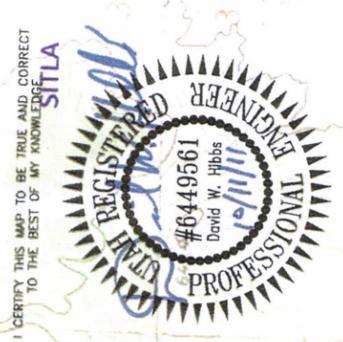




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**JUN 22 2012**  
 DIV. OF OIL, GAS & MINING

EMERY COUNTY  
 ROAD No. 303  
 (BURMA ROAD)

**BURMA EVAPORATION  
 BASIN PERMIT AREA**



I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.



<b>DRAWING 2</b>	
<b>SURFACE OWNERSHIP</b>	
<b>Crandall Canyon Mines</b>	
Crandall Canyon P.O. BOX 910 EAST CARBON, UTAH	
DRAWN BY	PJ
APPROVED BY	DH
SCALE	1" = 1500'
DATE	11 OCT. 2011
REVISION	1



RECEIVED  
JUN 22 2012

DAVID S. BRESLER, P.E.

**DRAWING 3**  
**EVAPORATION BASIN**  
**PLAN VIEW**  
**WITH PHOTO**  
**BACKGROUND**

**Crandall Canyon Mine:**  
 Crandall Canyon  
 P.O. BOX 910  
 EAST CARBON, UTAH

DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	DH	DATE	11 OCT. 2011
REVISION	1	SHEET	DRAWING 3

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.



AREA LOCATED IN  
 SECTION 5,  
 TOWNSHIP 17 SOUTH,  
 RANGE 8 EAST, SLBM

0 50 100 200 FEET



PHOTO OBTAINED FROM GOOGLE EARTH.

**NOTES:**

1. ALL DIMENSIONS ARE APPROXIMATE. FINAL LOCATIONS AND CONFIGURATIONS OF THE FACILITY STRUCTURES MAY VARY DEPENDING UPON CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
2. ALL INTERIOR EVAPORATION BASIN SLOPES SHALL BE A MAXIMUM OF 3:1. ALL OTHER CUT/FILL SLOPES SHALL BE A MAXIMUM OF 2:1 UNLESS OTHERWISE NOTED.
3. MINIMUM INTERIOR RADII OF PERIMETER ACCESS ROAD SHALL BE 40'.
4. BOTTOM OF EVAPORATION BASIN ELEVATION = 6514.5'
5. VEGETATION GRUB PILES TO BE LOCATED AS CONVENIENT.
6. LINE BOTTOM OF POND WITH ENGINEERED POND LINER.

**KEY**

- EXISTING MAJOR CONTOURS (10' INTERVALS)
- EXISTING MINOR CONTOURS (2' INTERVALS)
- EXISTING DISTURBED MAJOR CONTOURS (10' INTERVALS)
- EXISTING DISTURBED MINOR CONTOURS (2' INTERVALS)
- NEW MAJOR CONSTRUCTION CONTOURS (5' INTERVALS)
- NEW MINOR CONSTRUCTION CONTOURS (1' INTERVALS)

**CUT/FILL VOLUME: APPROX. 3,500 c.y.  
(MAY VARY UPON AS-BUILT)**

**AREA LOCATED IN SECTION 5, TOWNSHIP 17 SOUTH, RANGE 8 EAST, SLBM RECEIVED**

**JUN 22 2012**

**DIV. OF OIL, GAS & MINING  
PERMIT LINE P.O.B.**

UTAH POWER AND LIGHT COMPANY  
SITLA

EAST QUARTER CORNER OF SECTION 5, T.17S., R.8E., SLBM

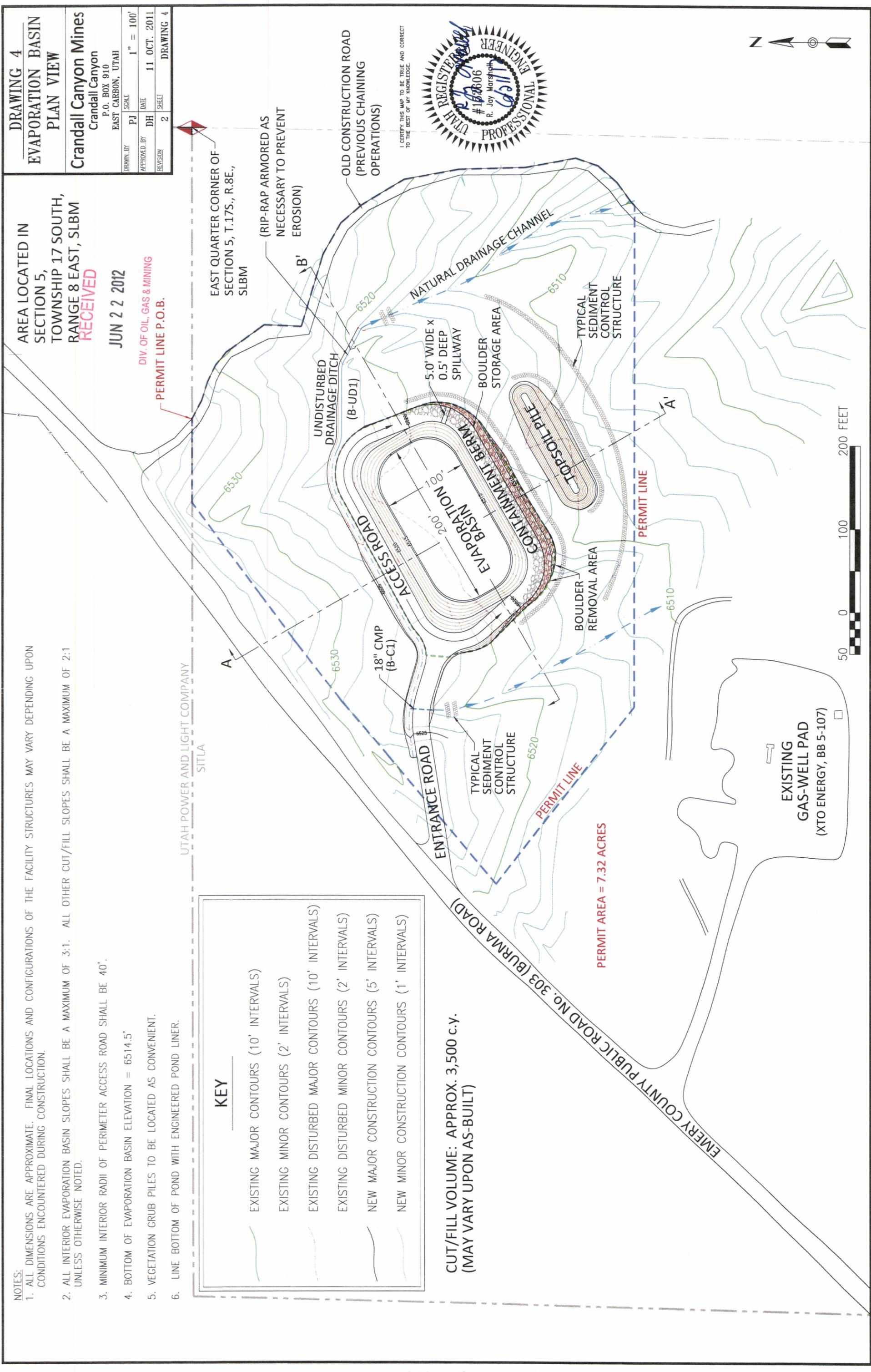
(RIP-RAP ARMORED AS NECESSARY TO PREVENT EROSION)

OLD CONSTRUCTION ROAD (PREVIOUS CHAINING OPERATIONS)

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.



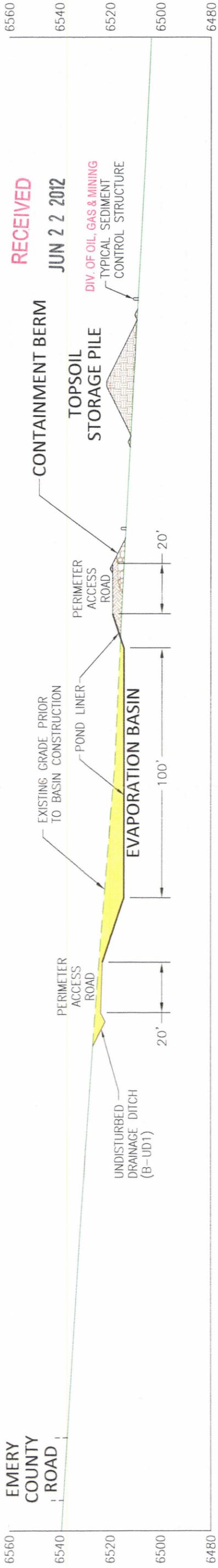
<b>DRAWING 4</b>	
<b>EVAPORATION BASIN PLAN VIEW</b>	
<b>Crandall Canyon Mines</b>	
Crandall Canyon P.O. BOX 910 EAST CARBON, UTAH	
DRAWN BY PJ	SCALE 1" = 100'
APPROVED BY DH	DATE 11 OCT. 2011
REVISION 2	SHEET DRAWING 4



**EXISTING GAS-WELL PAD  
(XTO ENERGY, BB 5-107)**

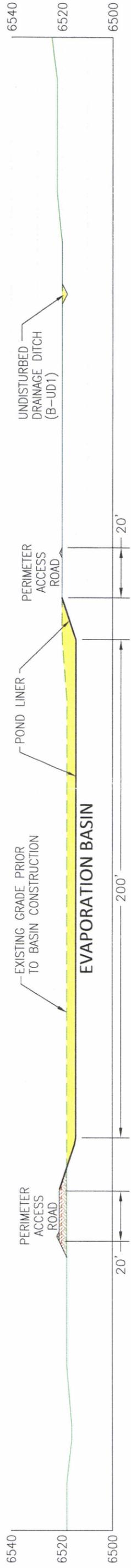
**PERMIT AREA = 7.32 ACRES**

**EMERY COUNTY PUBLIC ROAD No. 303 (BURMA ROAD)**



**SECTION A-A'**  
NORTH-TO-SOUTH SECTION  
SCALE: 1" = 40'

GENERAL NOTE:  
SOLID HATCH DENOTES CUT AREAS. CROSS-  
HATCH DENOTES FILL AREAS.

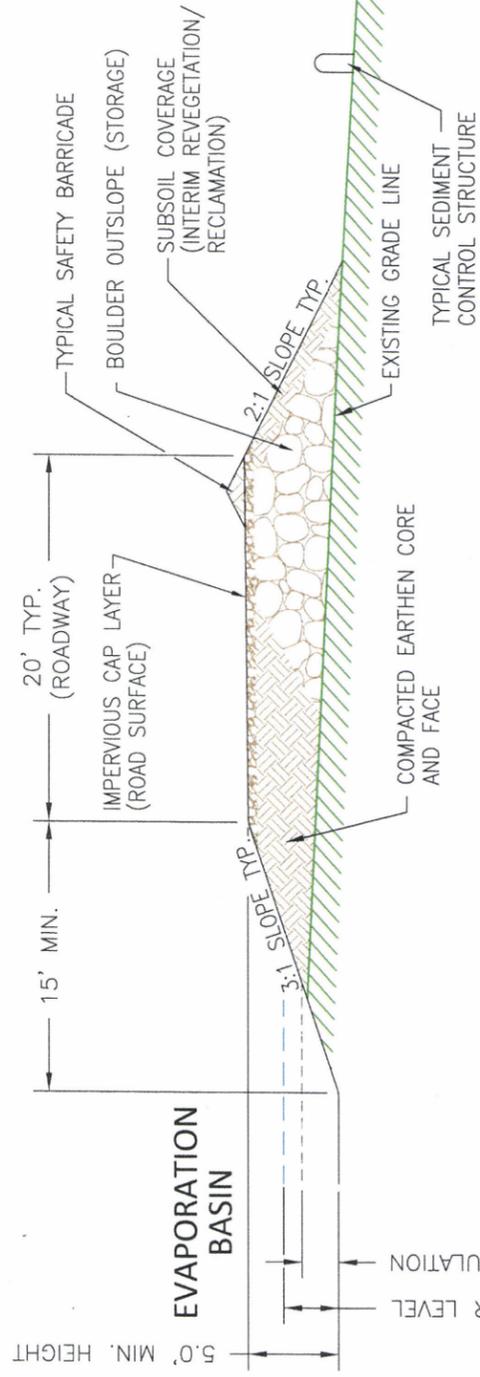


**SECTION B-B'**  
WEST-TO-EAST SECTION  
SCALE: 1" = 40'

I CERTIFY THIS MAP TO BE TRUE AND CORRECT  
TO THE BEST OF MY KNOWLEDGE.



**CONTAINMENT BERM**



**TYPICAL CONTAINMENT BERM / TOPSOIL STORAGE PILE DETAIL**

SCALE: 1" = 10'

**DRAWING 5**  
**EVAPORATION BASIN**  
**CROSS SECTION, TYPICAL**

<b>Crandall Canyon Mines</b>	
Crandall Canyon	
P.O. BOX 910	
EAST CARBON, UTAH	
DRAWN BY	PJ
APPROVED BY	DH
SCALE	AS SHOWN
DATE	11 OCT. 2011
REVISION	2
SHEET	DRAWING 5

**NOTES:**

1. ALL DIMENSIONS ARE APPROXIMATE. FINAL LOCATIONS AND CONFIGURATIONS OF THE FACILITY STRUCTURES MAY VARY DEPENDING UPON CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
2. ALL INTERIOR EVAPORATION BASIN SLOPES SHALL BE A MAXIMUM OF 3:1. ALL OTHER CUT/FILL SLOPES SHALL BE A MAXIMUM OF 2:1 UNLESS OTHERWISE NOTED.
3. MINIMUM INTERIOR RADII OF PERIMETER ACCESS ROAD SHALL BE 40'.
4. BOTTOM OF EVAPORATION BASIN ELEVATION = 6514.5'
5. VEGETATION GRUB PILES TO BE LOCATED AS CONVENIENT.

**KEY**

- EXISTING MAJOR CONTOURS (10' INTERVALS)
- EXISTING MINOR CONTOURS (2' INTERVALS)
- EXISTING DISTURBED MAJOR CONTOURS (10' INTERVALS)
- EXISTING DISTURBED MINOR CONTOURS (2' INTERVALS)
- NEW MAJOR CONSTRUCTION CONTOURS (5' INTERVALS)
- NEW MINOR CONSTRUCTION CONTOURS (1' INTERVALS)

CUT/FILL VOLUME: APPROX. 3,500 c.y.  
(MAY VARY UPON AS-BUILT)

AREA LOCATED IN SECTION 5, TOWNSHIP 17 SOUTH, RANGE 8 EAST, SLBM RECEIVED

JUN 2 2 2012

DIV. OF OIL, GAS & MINING  
PERMIT LINE P.O.B.

UTAH POWER AND LIGHT COMPANY  
SITLA

EAST QUARTER CORNER OF SECTION 5, T.17S., R.8E., SLBM

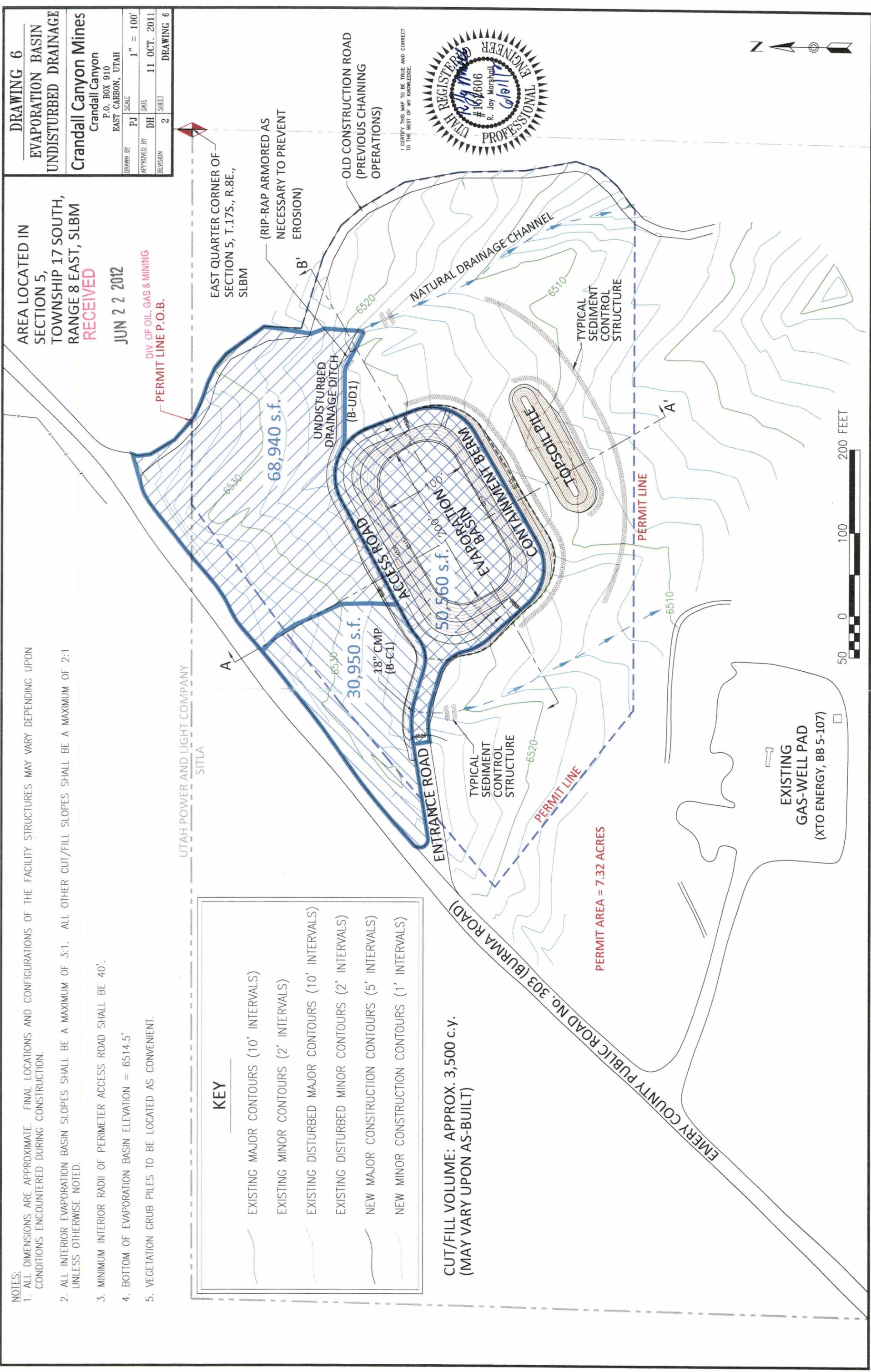
(RIP-RAP ARMORED AS NECESSARY TO PREVENT EROSION)

OLD CONSTRUCTION ROAD (PREVIOUS CHAINING OPERATIONS)

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.



<b>DRAWING 6</b>	
EVAPORATION BASIN UNDISTURBED DRAINAGE	
Crandall Canyon Mines Crandall Canyon P.O. BOX 910 EAST CARBON, UTAH	
DRAWN BY PJ	SCALE 1" = 100'
APPROVED BY DH	DATE 11 OCT. 2011
REVISION 2	SHEET DRAWING 6



NOTES:  
 1. FINAL RECLAMATION CONTOURS WILL CONFORM TO THE APPROXIMATE ORIGINAL CONTOURS.

AREA LOCATED IN  
 SECTION 5,  
 TOWNSHIP 17 SOUTH,  
 RANGE 8 EAST, SLBM

JUN 22 2012

DIV. OF OIL, GAS & MINING

PERMIT LINE P.O.B.

UTAH POWER AND LIGHT COMPANY  
 SITLA

**KEY**

- EXISTING MAJOR CONTOURS (10' INTERVALS)
- EXISTING MINOR CONTOURS (2' INTERVALS)
- RECLAIMED MAJOR CONTOURS (10' INTERVALS)
- RECLAIMED MINOR CONTOURS (2' INTERVALS)

**DRAWING 7**  
**EVAPORATION BASIN**  
**FINAL CONTOUR/AOC**  
**Crandall Canyon Mines**  
 Crandall Canyon  
 P.O. BOX 910  
 EAST CARBON, UTAH

DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	JM	DATE	30 MAY 2012
REVISION	1	SHEET	DRAWING 7

EAST QUARTER CORNER OF  
 SECTION 5, T.17S., R.8E.,  
 SLBM

OLD CONSTRUCTION ROAD  
 (PREVIOUS CHAINING  
 OPERATIONS)

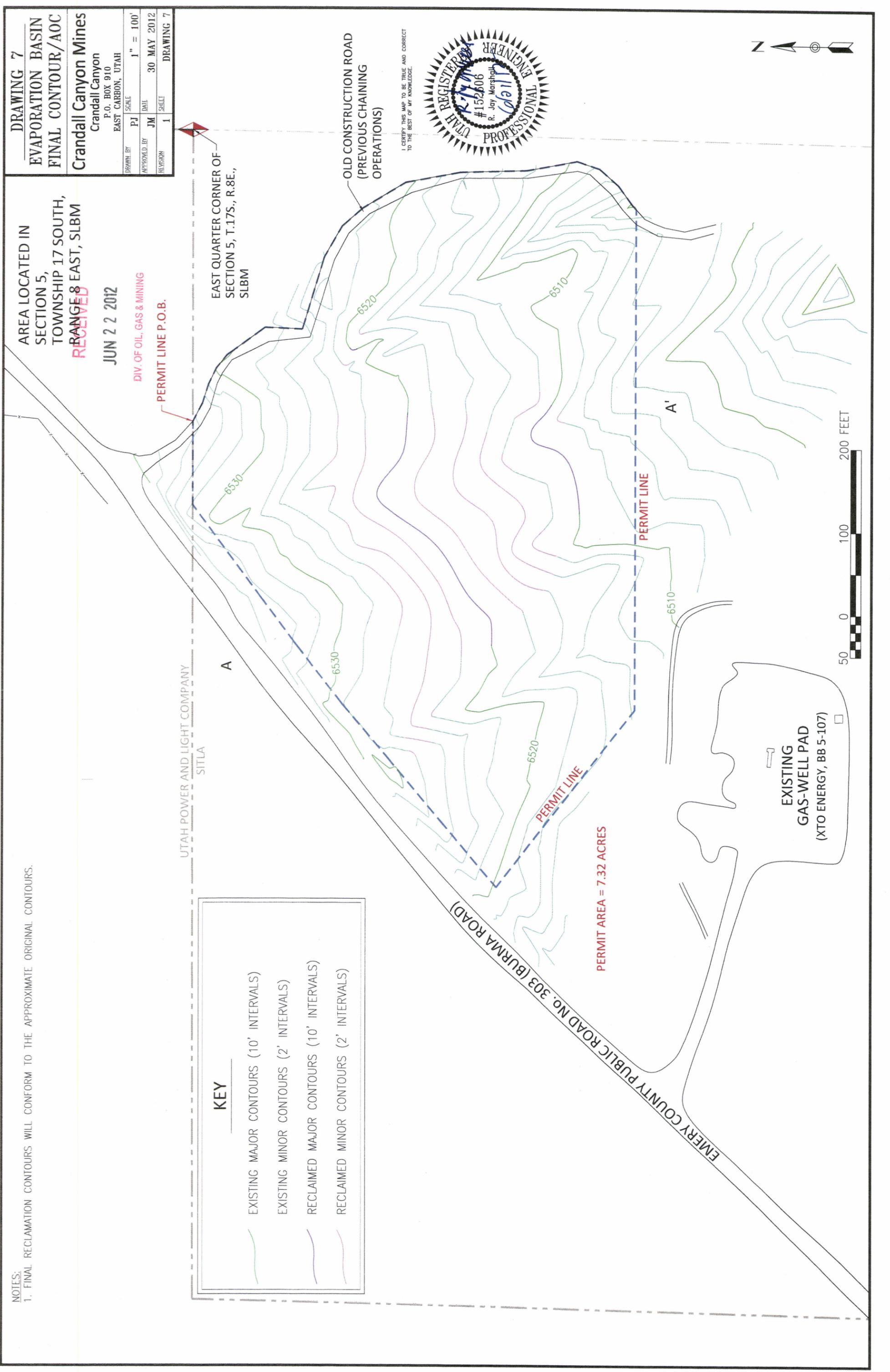
I CERTIFY THIS MAP TO BE TRUE AND CORRECT  
 TO THE BEST OF MY KNOWLEDGE.



EMERY COUNTY PUBLIC ROAD No. 303 (BURMA ROAD)

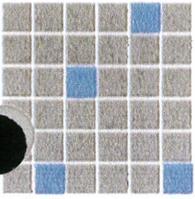
PERMIT AREA = 7.32 ACRES

EXISTING  
 GAS-WELL PAD  
 (XTO ENERGY, BB 5-107)



ATTACHMENT 2

SITLA SPECIAL USE LEASE 1708



State of Utah  
School & Institutional  
Trust Lands Administration

675 East 500 South, Suite 500  
Salt Lake City, UT 84102-2818  
801-538-5100  
801-355-0922 (Fax)  
www.trustlands.com

Gary R. Herbert  
Governor

Greg Bell  
Lieutenant Governor

Kevin S. Carter  
Director

January 5, 2012

Dave Shaver  
Genwal Resources, Inc.  
P.O. Box 910  
East Carbon, UT 84520

**RE: Special Use Lease No. 1708 – Mine Discharge Water Settling Ponds**

Dear Mr. Shaver,

Enclosed please find a fully executed original of the above referenced lease agreement.

Sincerely,

Chris Fausett  
Trust Lands Resource Specialist

Enclosure

SPECIAL USE LEASE AGREEMENT NO. 1708

(Industrial)

Fund: School

THIS SPECIAL USE LEASE AGREEMENT (the "Lease") is made and entered into this 4<sup>th</sup> day of January, 201~~1~~<sup>2</sup>, by and between THE STATE OF UTAH, ACTING BY AND THROUGH THE SCHOOL AND INSTITUTIONAL TRUST LANDS ADMINISTRATION, 675 East 500 South, Suite 500, Salt Lake City, Utah 84102 ("Lessor"), and Genwal Resources, Inc., a Utah corporation, 794 North "C" Canyon Rd., East Carbon, Utah, 84520, with a mailing address of P.O. Box 910, East Carbon, Utah, 84520 ("Lessee").

RECITALS

A. Lessor owns certain state trust lands located in Emery County, Utah, more specifically described in **Exhibit A** attached hereto and incorporated herein by reference.

B. Lessee desires to lease the lands described in **Exhibit A**, for the purpose of constructing, operating, repairing, and maintaining a coal mine discharge water evaporation basin.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, and for other good and valuable consideration, receipt and sufficiency of which are hereby acknowledged, Lessor and Lessee agree as follows:

ARTICLE 1  
LEASE OF PREMISES

1.1. Lease. In consideration of the covenants of Lessee contained in this Lease, Lessor leases to Lessee, effective as of the Commencement Date set forth in **Section 2.1**, the parcel of land situated in Emery County, State of Utah, which is described on **Exhibit A** to this Lease (the "**Premises**"), in "AS-IS" condition, subject to (a) current taxes and assessments, reservations in patents and all rights-of-way, easements, covenants, conditions, restrictions, obligations, liens, encumbrances, and liabilities of record as of the date hereof; (b) all matters which an accurate survey or physical inspection of the Premises would disclose; and (c) all applicable zoning and building requirements and other governmental laws, rules, and regulations now or hereafter in effect, including without limitation all rules and regulations enacted by Lessor with respect to use and management of state trust lands.

1.2. Execution Bonus. Not applicable.

1.3. Permitted Uses. Lessee may use the Premises for all purposes reasonably necessary and useful for constructing, operating, repairing and maintaining a coal mine discharge water evaporation basin (the "**Facility**"), subject to the terms of the Lease. The Facility shall be used to evaporate water discharged from the Crandall Canyon Coal Mine, which after the water is evaporated, shall leave a thin fine grain iron precipitate material ("**Permitted Use**"). Lessee agrees not to conduct or permit to be conducted any industrial or commercial activities not related to the operation of the Facility, or any public or private nuisance, on or from the Premises. Lessee agrees not to permit or commit any waste of the Premises.

1.4. Reservations to Lessor. Subject to the rights and privileges granted to Lessee under this Lease, Lessor hereby excepts and reserves from the operation of this Lease the following rights and privileges:

- (a) Rights-of-Way and Easements. Lessor reserves the right, following consultation with the Lessee, to establish rights-of-way and easements upon, through or over the Premises for roads, pipelines, electric transmission lines, transportation and utility corridors, mineral access, and any other purpose deemed reasonably necessary by Lessor, if Lessor determines in good faith that such grants will not unreasonably interfere with operations under this Lease.
- (b) Minerals. Lessor reserves all oil, natural gas, coal, geothermal resources, metalliferous minerals, sand, gravel and other common varieties, and any other minerals, and the right to lease the same to third parties, as well as the right to utilize the surface estate of the Premises for exploration, development and extraction of the same under terms and conditions that Lessor determines in good faith will not unreasonably interfere with operations under this Lease.
- (c) Use and Disposal of Surface. Subject to the rights granted to the Lessee pursuant to this Lease, Lessor reserves the right, following consultation with the Lessee, to use, lease, sell, or otherwise dispose of the surface estate or any part thereof if Lessor determines in good faith such use or disposal will not unreasonably interfere with operations under this Lease.
- (d) Other Rights and Privileges. Lessor reserves all other rights and privileges of any kind or nature, except as herein granted, provided that any actions under such reservation will not, in Lessor's good faith determination, unreasonably interfere with operations under this Lease.

1.5. Lessee's Inspection of the Premises. Lessee has inspected and investigated the Premises to Lessee's complete satisfaction, observed its physical characteristics and existing conditions, the operations thereon and on adjacent areas, and Lessee hereby waives any and all objections to, complaints about, or claims regarding (including, but not limited to, federal, state or common law based actions and any private right of action under state and federal law, including, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act, and any state or local equivalent, to which the Premises is or may be subject) the Premises and its physical characteristics and existing conditions, including, without limitation, subsurface soil and

water conditions and solid and hazardous waste and hazardous substances on, under or adjacent to the Premises. Lessee further hereby assumes the risk of changes in applicable laws and regulations relating to past, present and future environmental conditions on the Premises and the risk that adverse physical characteristics and conditions, including, without limitation, the presence of hazardous substances or other contaminants, may not have been revealed by its investigation. Lessor is hereby released from all responsibility and liability regarding the operation, condition (including the presence in the soil, air, structures, and surface and subsurface waters, of materials or substances that have been or may in the future be determined to be toxic, hazardous, undesirable or subject to regulation and that may need to be specially treated, handled and/or removed from the Premises under current or future federal, state and local laws and regulations), valuation or utility of the Premises, or its suitability for any purpose whatsoever. Lessee expressly acknowledges that Lessee has not relied on any warranties, promises, understandings or representatives, express or implied oral or written, of Lessor or of any agent of Lessor, relating to the Premises, except as specifically set forth in this Lease.

1.6. Covenant of Quiet Enjoyment. Lessor covenants that so long as Lessee shall perform the obligations of Lessee contained in this Lease and shall not be in default in the performance of any of such obligations, Lessor shall take no action or fail to take any action that would deny Lessee and its permitted sublessees, licensees, successors and assigns the right to freely, peaceably, and quietly have, hold and enjoy full use and enjoyment of the Premises for the purposes for which this Lease is granted.

1.7. Lessor's Access to Premises. Lessor and its agents, at all reasonable times and upon prior notice to Lessee, shall have free and full access to the Premises for the purpose of examining or inspecting the condition thereof, for the purpose of determining if Lessee is performing the covenants and agreements of this Lease, and for the purpose of posting such notices as Lessor may desire to protect the rights of Lessor.

## ARTICLE 2 TERM

2.1. Commencement Date and Original Term. The original term of this Lease (the "**Lease Term**") shall be for a period of thirty (30) years, commencing November 1, 2011, (the "**Commencement Date**") at 12:01 a.m., and continuing to October 31, 2041, subject to the terms and conditions set forth in this Lease which may permit or provide for earlier termination of the Lease.

2.2. Options to Extend Lease Term. Not applicable.

2.3. Termination for Failure to Build. In the event that Lessee has not commenced construction of the Facility, as set forth in the Development Plan described in **Section 4.1(a)**, within three (3) years of the Commencement Date, Lessor may terminate this Lease by giving written notice thereof to Lessee. Such termination shall be effective one year after the giving of such notice if Lessee has not commenced, and is not diligently pursuing to completion, construction of such improvements.

2.4. Holding Over. If Lessee or any successor in interest of Lessee should remain in possession of the Premises after termination of the Lease term without executing a new lease, then such holding over shall be construed as a tenancy from month-to-month, subject to all the covenants, terms, provisions and obligations of this Lease except for the provisions relating to the Minimum Rent payable hereunder, which Minimum Rent, during any holdover period shall be equal to two (2) times the amount of Minimum Rent otherwise calculated to be paid during the holdover period, together with all other sums owing to Lessor hereunder. Nothing contained herein shall be construed as Lessor's permission for Lessee to hold over or as limiting Lessor's remedies against a holdover Lessee, and if the Premises are not surrendered at the end of the Lease term, Lessee shall indemnify Lessor for, from and against any loss or liability resulting from delay by Lessee in so surrendering the Premises, including without limitation, any claims made by any succeeding Lessee based on such delay.

### ARTICLE 3 RENT

#### 3.1. Minimum Rent.

(a) Obligation to Pay Rent. Lessee shall pay to Lessor annually in advance during the Lease Term, the amount set forth in this **Section 3.1**, such amount, as adjusted from time to time as provided in **Section 3.1(c)** being referred to as the "**Minimum Rent**". Rent shall be paid annually on or before November 1 of each year of the Lease Term, without any deduction or offset.

(b) Initial Minimum Rent. The Minimum Rent for the first three years of the Lease Term shall be Three Thousand Dollars (\$3,000.00) per annum. Lessor acknowledges the receipt of \$4,202.00, from Lessee, representing payment of the Minimum Rent for the first year of the Lease Term of \$3,000.00, the \$250.00 application fee, the \$252.00 advertising fee, and the \$700.00 lease processing charge.

(c) Rental Adjustments. Lessor may, but is not obligated to, adjust the Minimum Rent every three years. In no event shall the Minimum Rent for any three (3) year period be less than the Minimum Rent for the immediately preceding three (3) year period. Lessor, in its sole discretion, may elect to utilize either of the following methods to calculate the adjusted Minimum Rent:

(i) The Minimum Rent shall multiplied by a fraction, the numerator of which is the Consumer Price Index, published by the U.S. Bureau of Labor Statistics, All Urban Consumers, Western Region Average, All Items (1982-84 = 100) (the "CPI Index") for the most recent month available as of the date of adjustment, and the denominator of which is the CPI Index for the month in which the Commencement Date occurred, or for the month that was the most recent available when the most recent adjustment was made hereunder, as applicable. If, on an adjustment date, the CPI Index does not exist in the format described above, the Lessor may substitute any official index published by a governmental agency which is then in existence and which is then most comparable to the CPI Index.

or

(ii) Lessor may obtain an independent appraisal of the Premises as of the adjustment date. The adjusted Minimum Rent shall be calculated by multiplying the appraised value of the Premises by the then current prime rate, as published by Zion's First National Bank or other statewide financial institution.

3.2. Percentage Rental. Not Applicable

3.3. Net Lease. This is a net lease and it is the intention of the parties that, except as otherwise provided or limited by the specific provisions of this Lease, Lessee shall be responsible for all costs and expenses of the ownership, maintenance, repair and operation of the Premises incurred or accrued during the Lease Term, specifically including real estate taxes payable on account of Lessee's use of the Premises. Any present or future law to the contrary notwithstanding, this Lease shall not terminate, nor shall Lessee be entitled to any abatement, reduction, set-off, counterclaim, defense or deduction with respect to any Rent or other sum payable hereunder, nor shall the obligations of Lessee hereunder be affected, by reason of any damage to or destruction of the Premises or by any taking of the Premises or any part thereof by condemnation, except as provided in this Lease.

3.4. Interest and Penalty on Past Due Obligations. Any amount due to Lessor which is not paid when due and within any applicable notice and cure period shall incur interest at a rate (the "Default Rate") equal to the lesser of: (a) one and one half per cent (1½ %) per month, or (b) the maximum rate of interest permissible under Utah law from the due date until paid. Lessee is also subject to penalties as provided by Utah Administrative Code R850-5-200 (2008) or by any replacement rule that shall be then in effect.

3.5. Audit. Lessor may from time to time cause an audit of Lessee's business to be made for the purpose of verifying the accuracy of the fees paid for any period within the Lease Term. Lessee agrees to make all records available for the audit at offices located within the State of Utah, unless Lessor agrees to a different location. If the results of the audit show that Lessee's payments for any period have been understated, then, within thirty (30) days of the determination of such deficiency, Lessee shall pay any applicable deficiency to Lessor, together with interest thereon at the Default Rate from the date such payment should originally been made until the date actually paid. If the results of the audit show that Lessee's payments for any period have been understated by four percent (4%) or more, then, within thirty (30) days of the determination of such deficiency, Lessee shall also pay Lessor the cost of the audit. If the results of the audit show that Lessee's payment of royalties and all fees for any period have been overstated, then within thirty (30) days of the determination of the overstatement, Lessor shall pay any such applicable overpayment to Lessee.

**ARTICLE 4  
DEVELOPMENT OF THE PREMISES AND  
CONSTRUCTION OF IMPROVEMENTS**

4.1. Construction.

(a) Development Plan. The Facility shall be constructed and operated in accordance with the following:

- i. the site plan, architectural renderings and environmental controls attached hereto as **Exhibit B** (collectively, the "**Site Plan**"); and
- ii. the Crandall Canyon Mining and Reclamation Plan (MRP) C/015/032, as amended to include the Premises (the "**Mining Plan**"); and
- iii. any approvals and/or restrictions or guidelines that may be required by the Utah Division of Oil, Gas and Mining or the Utah Department of Environmental Quality (collectively, the "**UDOGM Approvals**"). The Site Plan, the Mining Plan, and the UDOGM Approvals shall collectively be referred to as the "**Development Plan**".

Lessee shall construct and operate the Facility pursuant to the Development Plan. No material modifications shall be made to the Development Plan without the prior written consent of Lessor, such consent not to be unreasonably withheld or delayed. In the event Lessor fails to consent or object to a proposed modification(s) within thirty (30) days after receiving notice thereof, Lessor's consent shall be deemed approved. In the event Lessee receives a notice of violation from any governmental agency or authority, including the Utah Division of Oil, Gas and Mining ("**UDOGM**"), Lessee shall give Lessor a copy of such notice within twenty (20) days following receipt. Failure to timely give Lessor such notice shall be default under this Lease.

(b) Construction. No construction may occur on the Premises until such time as: (1) all amendments to the Mining Plan to incorporate the Facility have been completed, and (2) all UDOGM Approvals have been issued. Prior to commencing construction of the Facility, Lessee shall provide copies of all UDOGM Approvals to Lessor. Lessee's construction of the Facility shall be prosecuted diligently to completion and in accordance with the Development Plan. All improvements shall be constructed in a good workmanlike manner, and in accordance with the requirements of any and all laws, ordinances and regulations applicable thereto, including zoning and building code requirements of any municipal or other governmental agency having jurisdiction over the Premises at time said improvements are constructed.

(c) Construction Bonding. Not applicable.

(d) As-Built Drawings. Upon completion of the Facility, or from time to time as Lessor may reasonably request, Lessee shall provide Lessor with an as-built survey showing

the location of all physical improvements constructed on the Premises. The as-built survey shall be prepared by a licensed engineer.

4.2. Development at Lessee's Expense. Lessee shall bear all expenses in connection with the development, improvement, construction, alteration and repair of the Premises and all improvements thereon and shall indemnify, defend and hold Lessor and the Premises harmless from any and all claims arising therefrom.

4.3. Mechanics' Liens.

(a) Lessee is Not Lessor's Agent. The parties agree, and notice is hereby given, that Lessee is not the agent of Lessor for the construction, alteration or repair of any Improvements, the same being done at the sole direction and expense of Lessee. All contractors, materialmen, mechanics, and laborers are hereby charged with notice that they must look only to Lessee for the payment of any charge for work done or material furnished on the Premises during the Lease Term. Lessee shall have no right, authority or power to bind Lessor or any interest of Lessor for the payment of any claim for labor or material, or for any charge or expense, incurred by Lessee as to improvements, alterations or repairs on or to the Premises, and Lessee shall post notices on the Premises during all construction work of any nature whatsoever that Lessor is not responsible for any material and labor used on the Premises.

(b) Covenant Against Mechanic's Liens. Lessee shall not suffer or permit to be enforced against the Premises, or any part thereof, and shall indemnify and hold Lessor and the Premises harmless for, from, and against (i) any mechanic's, material men's, contractor's or subcontractor's liens arising from, and (ii) any claim for damage growing out of the work of, any construction, repair, restoration, replacement, or improvement done by or on behalf of Lessee. Lessee shall pay or cause to be paid all of such liens, claims, or demands before any action is brought to enforce the same against the Premises. If Lessee shall in good faith contest the validity of any such lien, claim, or demand, then Lessee shall, at its expense, defend itself and Lessor against the same and shall pay and satisfy any adverse judgment that may be rendered thereon prior to execution thereof and in the event of any such contest Lessee shall at the request of Lessor provide such security and take such steps as may be required by law to release the Premises from the effect of such lien.

## ARTICLE 5 REGULATORY COMPLIANCE

5.1. Observance of Governmental Regulations. In Lessee's use and occupancy of the Premises and the performance by Lessee of its rights and obligations under this Lease, Lessee shall fully comply with all laws, orders, rules, regulations, directives, ordinances and requirements of all governmental authorities having jurisdiction over Premises, or any part thereof, and Lessee shall pay all costs, expenses, liabilities, losses, fines, penalties, claims and demands including, without limitation, attorney's fees as defined in **Section 13.1**, that may in any

way arise out of or be imposed because of the failure of Lessee to comply with such laws, orders, rules, regulations, directives, ordinances and requirements.

5.2. Right of Contest. Lessee shall have the right to contest the validity of any laws, orders, rules, regulations, directives, ordinances and requirements in the manner and under the conditions provided in this Lease with respect to contesting the validity of taxes, assessments or other liens. During such contest, Lessee may refrain from complying therewith, provided that, (a) Lessor is not subjected to criminal prosecution as a result thereof, (b) Lessor's title to the Premises is not subject to lien or forfeiture as a result thereof, and (c) neither the Premises nor any rights or interest of Lessor are otherwise prejudiced or jeopardized thereby.

5.3. Hazardous Materials.

(a) Restrictions on Hazardous Substances; Remedial Work. Lessee shall not cause or permit any Hazardous Substance (as hereinafter defined) to be brought, kept or used in or about the Premises by Lessee, its officers, directors, owners, agents, sublessees, assignees, contractors, subcontractors, invitees, or concessionaires except in commercial quantities not in violation of Applicable Environmental Law and similar to those quantities usually kept on similar premises by others in the same business or profession. Lessee, its officers, directors, owners, agents, employees, sublessees, assignees, contractors, subcontractors, invitees, or concessionaires shall store, use and dispose of such materials in compliance with all applicable federal, state and local laws, including, without limitation, Applicable Environmental Law (as hereinafter defined). If the presence of any Hazardous Substance on, in or under the Premises caused or permitted by Lessee, its officers, directors, owners, agents, employees, sublessees, assignees, contractors, subcontractors, invitees, or concessionaires results in any contamination of the Premises, Lessee shall promptly take all actions, at its sole expense, as are necessary to return the affected area to the condition existing prior to the introduction of any such Hazardous Substance, including, without limitation, any investigation or monitoring of site conditions or any clean up, remediation, response, removal, encapsulation, containment or restoration work required because of the presence of any such Hazardous Substance on, in or under the Premises or any release or suspected release or threat of release of any such Hazardous Substance in the air, soil, surface water or ground water (collectively, the "**Remedial Work**"). Lessee shall obtain all necessary licenses, manifests, permits and approvals to perform the Remedial Work. Lessee shall promptly perform all Remedial Work and the disposal of all waste generated by the Remedial Work in accordance with all Applicable Environmental Law.

(b) Compliance with Applicable Environmental Law. Without limiting the generality of the foregoing or any other provision of this Lease, Lessee shall be solely and completely responsible for insuring that the Premises and all activities thereon (including activities of Lessee, its officers, directors, owners, employees, agents, contractors, subcontractors, sublessees, assignees, licensees, and concessionaires) comply fully with Applicable Environmental Law and for responding to, defending against and/or complying with administrative order, request or demand relating to potential or actual contamination on the Premises, or third party claims (including the claims of current or

future sublessees in the Premises, for Remedial Work or for the costs of any such Remedial Work or for the costs of any such Remedial Work which the third-party claimant has undertaken, whether such order, request, demand or claim names Lessor, Lessee or both, or refers to the Premises in any way, except where the contamination or other violation of Applicable Environmental Law occurred prior to the date of execution of the Lease or was caused solely by Lessor or any prior owner or Lessee (other than sublessees of Lessee) of the Premises. Lessee's responsibility under this Section includes but is not limited to promptly responding to such orders, requests, demands and claims on behalf of Lessor and defending against any assertion of Lessor's financial responsibility or individual duty to perform thereunder.

(c) Definitions. As used herein, the term "**Hazardous Substance**" means any hazardous or toxic substance, material, or waste which is or becomes regulated by any local governmental authority, the State in which the Premises are located, or the United States Government, including, without limitation, (i) any substance, chemical or waste that is or shall be listed or defined as hazardous, toxic or dangerous under Applicable Environmental Law, (ii) any other chemical, material or substance, exposure to which is prohibited, limited or regulated by any federal, state or local governmental authority pursuant to any environmental, health and safety or similar law, code, ordinance, rule, regulation, order or decree and which may or could pose a hazard to the health and safety of occupants or users of the Premises or any part thereof, any adjoining property or cause damage to the environment, (iii) any petroleum products, (iv) PCB's, (v) leaded paint, and (vi) asbestos. As used in this Lease, the term "**Applicable Environmental Law**" shall include the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§ 9601 *et seq.*, the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et seq.*, the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251 *et seq.*, the Clean Air Act, 42 U.S.C. §§ 7401 *et seq.*, the Hazardous Materials Transportation Act, 49 U.S.C. §§ 1801 *et seq.*, the Toxic Substances Control Act, 15 U.S.C. §§ 2601 *et seq.*, and the Safe Drinking Water Act, 42 U.S.C. §§ 300f through 300j-26, as such Acts have been or are hereafter amended from time to time; any so called Superfund or Superlien law; and any other federal, state and local statute, law, ordinance, code, rule, regulation, order or decree regulating, relating to or imposing liability or standards of conduct concerning any hazardous, toxic or dangerous waste, substance or material as now or any time hereafter in effect.

(d) Environmental Indemnity. Lessee shall indemnify, save harmless and defend each of the Lessor Indemnitees (as defined in **Section 6.1**) for, from and against any and all Claims incurred by, sought from or asserted directly or indirectly against any Lessor Indemnitee during or after the term of this Lease as a result of the presence of any Hazardous Substance on, in or under the Premises or any release of any Hazardous Substance into the air, soil, surface water or ground water, which Hazardous Substance was brought, kept or used in or about the Premises by Lessee, its officers, directors, owners, employees, agents, contractors or subcontractors, or as a result of a breach by Lessee of its obligations under this **Section 5.4**. Lessee shall assume, pursuant to the foregoing indemnity, any liabilities or responsibilities which are assessed against any Lessor Indemnitee in any action described under this **Section 5.4**. Lessee shall promptly

provide to Lessor copies of all communications, filings or other writings, photographs or materials given to or received from any Person or Governmental Authority in connection with any cleanup or Remedial Work conducted by Lessee, and shall notify Lessor of, and permit Lessor's representative to attend any meetings or oral communications relating thereto.

5.4. Endangered Species; Migratory Birds. In its use of the Premises Lessee shall take all actions reasonably necessary for the protection of endangered, threatened and sensitive species, as the same may be defined by federal or state law; migratory birds as defined by the Migratory Bird Treaty Act, 16 U.S.C. § 703 *et seq*; and eagles as defined in the Bald and Golden Eagle Protection Act, 16 U.S.C. § 668a *et seq*.

5.5. Antiquities. All articles of antiquity, cultural resources, paleontological resources, and treasure-trove in or upon the Premises are and shall remain the property of Lessor. Prior to surface disturbance of the Premises, Lessee shall obtain cultural resources clearances from Lessor and the State Historic Preservation Officer in accordance with Utah Administrative Code R850-60 and applicable state historic preservation law. All costs associated with archaeological and paleontological investigations on the Premises will be borne by Lessee. In the event that Lessee discovers ancient human remains or a "site" or "specimen," as defined in Section 9-8-302 or 63-73-1 Utah Code Annotated (1953), as amended, on the Premises, Lessee shall cease all construction until such time as such items have been treated in accordance with state law.

5.6. Wildfire. Lessee shall at all times take reasonable precautions to prevent wildfires from starting or spreading on the Premises, and shall comply with all applicable laws, regulations and directives of any governmental agency having jurisdiction with respect to fire prevention and control. In the event that Lessee or its employees, contractors or licensees cause a wildfire that necessitates suppression action, Lessee agrees to reimburse the State of Utah and local fire authorities for the costs of any necessary fire suppression activities incurred as a result of the wildfire.

5.7. Fill Materials and Waste. Lessee shall not allow any deposit of rock, earth, ballast, refuse, garbage, waste matter, chemical, biological or other wastes, hydrocarbons, any other pollutants, or other matter within or upon the Premises, except as specifically authorized by this Lease. If the Lessee fails to remove all non-approved fill material, wastes or materials described above from the Premises, Lessor may at its option remove such materials and charge the Lessee for the cost of removal and disposal.

## ARTICLE 6 INSURANCE AND INDEMNITY

6.1. Indemnification of State.

(a) General Indemnity. Lessee shall indemnify, save harmless and defend Lessor, its officers, directors, trustees, employees, agents, successors, and assigns (collectively the "**Lessor Indemnitees**") for, from and against any and all claims (including, without limitation, third party claims for death or personal injury, environmental contamination,

natural resources damages, or real or personal property damage), actions, administrative proceedings (including informal proceedings), judgments, damages, punitive damages, penalties, fines, costs, liabilities, interest or losses, and sums paid in settlement of claims, attorney's fees, consultant fees, expert fees, and any fees and expenses incurred in enforcing this indemnity incurred by, sought from or asserted directly or indirectly against any of the Lessor Indemnitees during or after the term of this Lease arising out of or in any way related to the use of the Premises under this Lease by Lessee, its employees, contractors, licensees, successors and assigns. Lessee shall assume, pursuant to the foregoing indemnity, any liabilities or responsibilities which are assessed against any Lessor Indemnitee in any action described under this **Section 6.1(a)**. Lessee shall promptly provide to Lessor copies of all communications, filings or materials given to or received from any person, entity or agency in connection with any such claim, and shall notify Lessee of, and permit Lessee's representative to attend any meetings or oral communications relating thereto.

(b) Breach of Lease. Lessee shall indemnify, save harmless and defend the Lessor Indemnitees for, from and against any and all claims (including, without limitation, third party claims for death or personal injury, environmental contamination, natural resources damages, or real or personal property damage), actions, administrative proceedings (including informal proceedings), judgments, damages, punitive damages, penalties, fines, costs, liabilities, interest or losses, and sums paid in settlement of claims, attorney's fees, consultant fees, expert fees, and any fees and expenses incurred in enforcing this indemnity incurred by, sought from or asserted directly or indirectly against any of the Lessor Indemnitees during or after the term of this Lease arising out of or in any way related to any failure of Lessee to comply with any of Lessee's obligations under this Lease.

(c) Survival. The obligations of Lessee and the foregoing indemnities by Lessee set forth in **Section 5.4(d)** and this **Section 6.1** shall survive the termination or expiration of this Lease.

(d) Provisions Relating to All Indemnities. Each provision of this Lease imposing an indemnification obligation on Lessee is in addition to all other indemnification provisions and shall not be construed in a manner that modifies or limits any other indemnification provision in this Lease. All indemnification provisions in this Lease shall survive the expiration or earlier termination of this Lease as to Claims arising or accruing prior to the expiration or earlier termination of this Lease. The indemnification provided by Lessee in this **Section 6.1** and elsewhere in this Lease shall not be construed or interpreted as in any way restricting, limiting or modifying Lessee's insurance or other obligations under this Lease, and such indemnification provisions are independent of Lessee's insurance and other obligations. Lessee's compliance with the insurance requirements and other obligations under this Lease does not in any way restrict, limit or modify Lessee's indemnification obligations under this Lease.

6.2. Casualty Insurance. Not applicable.

6.3. Liability Insurance. Lessee, at the sole cost and expense of Lessee, shall at all times during the Lease Term, maintain in force an insurance policy or policies which will name Lessor and Lessee as insureds against all liability resulting from property damage, injury or death occurring to persons in or about the Premises, with limits for each occurrence of not less than \$2,500,000, combined single limit, with respect to personal injury, death and property damage. The original of such policy or policies shall remain in possession of Lessee; provided, however, that Lessee shall provide Lessor, without necessity of written demand, a duplicate policy or policies of any such insurance.

6.4. Other Insurance. Lessee shall, at all times during the Lease Term and at the sole cost and expense of Lessee, maintain and keep in force:

(a) Workmen's Compensation Insurance. All workmen's compensation insurance on its employees, if any, required under the applicable workmen's compensation laws of the State of Utah;

(b) Environmental Impairment Insurance. Not applicable.

(c) Other Coverages. Such other and additional insurance policies as a prudent ground lessee in the position of Lessee would maintain or as is required from time to time by applicable law, consistent with industry standards applicable to Lessee's business. Lessor shall be an additional insured on all such policies.

6.5. Policy Requirements. All insurance policies required or otherwise provided and maintained under this **Article 6** shall contain provisions to the effect that the insurance shall not be canceled or modified without thirty (30) day's prior written notice to Lessor and that no modification shall be effective unless approved in writing by Lessor. All such policies shall be issued by a company or companies rated "A" or better by the then most current edition of Best's Insurance Guide (or if such guide is no longer published, then having a comparable rating as specified by Lessor from time to time), responsible and authorized to do business in the state in which the Premises are located, as Lessee shall determine, and shall be approved by Lessor.

6.6. Mutual Release of Subrogation Rights. Without in any way limiting the applicability of **Section 6.1**, Lessee and Lessor each hereby release and relieve the other and the officers, directors, owners, shareholders, employees, agents and representatives of the other, and waive their entire right of recovery against the other and the officers, directors, owners, shareholders, employees, agents and representatives of the other, for loss or damage arising out of or incident to the perils insured against under this **Article 6**, which perils occur in, on or about the Premises, whether due to the negligence of Lessor or Lessees or their agents, employees, contractors, concessionaires and/or invitees, but only to the extent of insurance proceeds actually paid. Lessee shall, upon obtaining the policies of insurance required hereunder, give notice to and obtain waiver of subrogation agreements or endorsements from the insurance carrier or carriers concerning the foregoing mutual waiver of subrogation contained in this Lease.

**ARTICLE 7  
ASSIGNMENT AND SUBLETTING**

7.1. Assignments.

- (a) Prohibition against Assignment. Lessee shall not assign all or part of this Lease without Lessor's prior written consent, which consent shall not be unreasonably withheld, and any attempted assignment without such consent shall be null and void, and shall constitute a default under this Lease.
- (b) Indirect Transfers. The sale, issuance or transfer of any voting capital stock of Lessee, if Lessee is a corporate entity, or of any ownership interests, if Lessee is a noncorporate entity, or any voting capital stock of any corporate entity which directly or indirectly controls Lessee, or any interests in any noncorporate entity with directly or indirectly controls Lessee which results in a change in the direct or indirect voting control (or a change in the identity of any person, persons, entity or entities with the power to vote or control at least fifty percent (50%) of the voting shares of any class of stock or other interests in Lessee) of Lessee or any corporate or noncorporate entity which directly or indirectly controls Lessee shall be deemed to be an assignment of this Lease within the meaning of this **Section 7.1.**

7.2. Subleases. Lessee shall not sublease all or any part of this Lease without Lessor's prior written consent, which consent may be withheld in Lessor's sole discretion, and any attempted sublease without such consent shall be null and void, and shall constitute a default under this Lease.

7.3. Subleases Subject to this Lease. Any approved sublease shall be subject to all of the terms and conditions of this Lease and each sublessee, by accepting any sublease and entering into possession of any portion of the Premises shall be deemed to have covenanted directly with the Lessor to observe and perform all of the provisions of this Lease as they relate to the portion of the Premises subject to the sublease.

7.4. No Release. No assignment or sublease shall release Lessee from any of Lessee's obligations under this Lease.

**ARTICLE 8  
LESSEE FINANCING**

8.1. Lessee's Right to Mortgage. Not applicable.

**ARTICLE 9  
CONDEMNATION**

9.1. Eminent Domain; Cancellation. If the Premises are taken by any entity with the power of eminent domain (a "**Condemning Authority**") or if the Premises are conveyed to a

Condemning Authority by a negotiated sale, or if part of the Premises is so taken or conveyed such that the use of the remaining Premises is materially interfered with, or such that the improvements cannot be rebuilt so that upon completion Lessee may again use the Premises without substantial interference, Lessee may terminate this Lease by giving Lessor written notice at any time after the occurrence of any of the foregoing and such termination shall be effective as of the date of the transfer to the Condemning Authority. If this Lease is terminated pursuant to this **Section 9.1**, Lessor shall refund to Lessee any rent prepaid beyond the effective date of termination.

9.2. Partial Taking. If part of the Premises or any of the Improvements are taken or conveyed without substantially interfering with the use of the Premises, this Lease shall not terminate and rent shall not abate. In such event, Lessor shall receive the portion of the award attributed to the value of the fee title estate taken, and Lessee shall receive all remaining awards and other compensation or sums.

9.3. Basis of Awards. All payments made for any taking or conveyance of the land as described in this **Article 9** shall be paid to Lessor and Lessee hereby agrees that it shall have no claim to any such awards paid to Lessor for the taking of Lessor's fee simple estate. Damages, if any, authorized for the loss of Lessee's leasehold estate shall be determined by the laws of Utah. Lessee shall have the right to full recovery of the costs of improvements located on the Premises. Lessee shall have the right to full recovery of the costs of improvements located on the Premises.

## ARTICLE 10 ADDITIONAL COVENANTS

### 10.1. Water Rights.

(a) Water Rights in Name of Lessor. Any new appropriation of water rights for use in association with this lease or operations upon the Premises shall be made in the name of Lessor and shall be considered an appurtenance to the Premises. Lessee shall have the right to use such water right at no cost during the term of this Lease. Upon termination of the Lease, Lessee shall make all necessary filings to confirm Lessor's ownership of such rights.

(b) Option to Purchase. If Lessee purchases or acquires an existing water right for use in association with this lease or operations upon the Premises, Lessor shall have the option to acquire that portion of such water right as was used on the Premises upon expiration or termination of this Lease. The option price for such water right shall be the fair market value of the water right as of the date of expiration or termination of this Lease. Upon expiration or termination of this Lease, Lessee shall notify Lessor in writing of all water rights purchased or acquired by Lessee for operations on the Premises and its estimate of the fair market value of such water right. Lessor shall then have forty-five (45) days to exercise its option to acquire the water by payment to Lessee of the estimated fair market value. If Lessor disagrees with Lessee's estimate of fair market value, Lessor shall notify Lessee of its disagreement within the 45 day option exercise period. The fair market value of the water right shall then be appraised by a single

appraiser mutually acceptable to both parties, which appraisal shall be final and not subject to review or appeal. If the parties cannot agree upon the choice of an appraiser, the fair market value of the water right shall be determined by a court of competent jurisdiction. Conveyance of any water right pursuant to this paragraph shall be by quit claim deed.

(c) Proration in the Event of Unitization. Not Applicable

10.2. Intermediate Reclamation. Upon completion of construction of individual cells or other facilities on the Premises, Lessee shall reclaim disturbed areas not required for continuing operations by leveling, seeding and other reasonably necessary steps to prevent soil erosion, ensure the establishment of suitable vegetation, and control noxious weeds and pests.

10.3. Waste Certification. The Lessee shall provide upon any transfer of operation, assignment of rights, permanent cessation of operations, or lease termination, certification to the Lessor that, based upon a complete search of all the operator's records for the Lease, and upon its knowledge of past operations, there have been no reportable quantities of hazardous substances as defined in 40 Code of Federal Regulations §302.4, or used oil as defined in Utah Administrative Code R315-15, discharged (as defined at 33 U.S.C. §1321(a)(2)), deposited or released within the Premises, either on the surface or underground, and that all remedial actions necessary have been taken to protect human health and the environment with respect to such substances. Lessee shall additionally provide to Lessor a complete list of all hazardous substances, hazardous materials, and their respective Chemical Abstracts Service Registry Numbers, used or stored on, or delivered to, the Premises. Such disclosure will be in addition to any other disclosure required by law or agreement.

10.4. Bonding. Lessee shall comply with all bonding requirements established for the Facility by the UDOGM in conjunction with the Mine Permit. Upon notice to Lessee, the Lessor may, in its reasonable discretion, determine that any bond on file is insufficient to protect Lessor's interests. In such an event the Lessor shall enter written findings as to the basis for calculation of the perceived insufficiency and enter an order requiring Lessee to execute and file with the Lessor a good and sufficient bond or other financial guarantee acceptable to Lessor in order to guarantee Lessee's performance of all covenants and obligations under this Lease, including reclamation pursuant to Section 12.2. The bond shall remain in full force and effect until liability thereunder is released by Lessor. Lessee shall file any required additional bond with Lessor within thirty (30) days after demand by Lessor. Lessor may increase or decrease the amount of any additional bond from time to time in accordance with the same procedure.

10.5. Survey Monuments. Lessee shall take reasonable precautions to protect, in place, all public land survey monuments and private property corners.

10.6. Fencing. Lessee may fence any portion of the Premises at its own expense. In the event Lessee erects any fencing, Lessee agrees to provide gated access at reasonable locations to Lessor and to any lessees or permittees granted rights or access to or across the Subject Property, or any part thereof, by Lessor pursuant to **Section 1.4**. Lessee shall take appropriate steps,

including fencing, to secure such ponds, structures and facilities from unauthorized access and prevent loss of wildlife.

10.7. Prior Improvements. If existing fences, range improvement projects, or other prior improvements currently exist on the Premises by authority of the Lessor, Lessee shall allow the owner of such improvements to remove them within ninety (90) days of notice from Lessee, with a copy of such notice to Lessor.

## ARTICLE 11 DEFAULT

11.1. Events of Default. Any of the following occurrences or acts shall constitute an event of default ("**Events of Default**") under this Lease:

- (a) Breach of Obligations. If Lessee shall fail to:
  - (i) Pay any Minimum Rent, Additional Rent or other sum, within ten (10) days of the date such payment is due; or
  - (ii) Provide any insurance coverage as required by this Lease, within ten (10) days of written request, or
  - (iii) Observe or perform any other provision hereof and such failure shall continue for thirty (30) days after notice to Lessee of such failure or such longer period as reasonably may be required to cure such default if the same cannot be cured within such 30 day period and Lessee commences to effect the cure within such 30 day period and diligently pursue such cure thereafter.
  
- (b) Bankruptcy. If Lessee shall file a petition in bankruptcy or for reorganization or for an arrangement pursuant to any federal or state bankruptcy law or any similar federal or state law, or shall be adjudicated a bankrupt or shall make an assignment for the benefit of creditors or shall admit in writing its inability to pay its debts generally as they become due, or if a petition or answer proposing the adjudication of Lessee as a bankrupt or its reorganization pursuant to any federal or state bankruptcy law or any similar federal or state law shall be filed in any court and Lessee shall consent to or acquiesce in the filing thereof or such petition or answer shall not be discharged or denied within sixty (60) days after the occurrence of any of the foregoing;
  
- (c) Other Insolvency Events. If a receiver, trustee or liquidator of Lessee or of all or substantially all of the assets of Lessee or of the Premises or Lessee's leasehold interest therein shall be appointed in any proceeding brought by Lessee, or if any such receiver, trustee or liquidator shall be appointed in any proceeding brought against Lessee and shall not be discharged within sixty (60) days after the occurrence thereof, or if Lessee shall consent to or acquiesce in such appointment; or

(d) Abandonment. If, following commencement of development of the Premises and at any time thereafter during the Lease Term, Lessee shall abandon the Premises, with Lessee's cessation of operations for a period of ninety (90) consecutive days to be conclusive evidence that the Premises have been abandoned.

11.2. Remedies. If an Event of Default shall have happened and be continuing, Lessor shall have the following rights and remedies, to the maximum extent available or permitted under applicable law:

(a) Right to Terminate. Lessor shall have the right to give Lessee notice of Lessor's termination of the Lease. Upon the giving of such notice, the term of this Lease and the estate hereby granted shall expire and terminate on the date set forth in such notice as fully and completely and with the same effect as if such date were the date herein fixed for the expiration of the Lease Term, and all rights of Lessee hereunder shall expire and terminate, but Lessee shall remain liable as hereinafter provided.

(b) Right to Re-enter. Lessor shall have the immediate right, whether or not the term of this Lease shall have been terminated pursuant to **Section 11.2(a)**, to re-enter and repossess the Premises by summary proceedings, ejectment, any other legal action or in any lawful manner Lessor determines to be necessary or desirable and to remove all persons and property therefrom. No such re-entry or repossession of the Premises shall be construed as an election by Lessor to terminate the term of this Lease unless a notice of such termination is given to Lessee pursuant to **Section 11.2(a)**.

(c) Reletting of the Premises. At any time or from time to time after the re-entry or repossession of the Premises pursuant to **Section 11.2(b)**, whether or not the term of this Lease shall have been terminated pursuant to **Section 11.2(a)**, Lessor shall use reasonable efforts to relet the Premises for the account of Lessee at a rent which is reasonable in light of the then existing market conditions in the community, in the name of Lessee or Lessor or otherwise, without notice to Lessee, for such term or terms and on such other conditions and for such uses as Lessor, in its absolute discretion, may determine. Lessor may collect and receive any rents payable by reason of such reletting.

(d) No Release. No expiration or termination of the term of this Lease pursuant to **Section 11.2(a)**, by operation of law or otherwise, and no re-entry or repossession of the Premises pursuant to **Section 11.2(b)** or otherwise, and no reletting of the Premises pursuant to **Section 11.2(c)** or otherwise, shall relieve Lessee of its liabilities and obligations hereunder, all of which shall survive such expiration, termination, re-entry, repossession or reletting.

11.3. Remedies Not Exclusive. No right or remedy herein conferred upon or reserved to Lessor is intended to be exclusive of any other right or remedy, and each and every right and remedy shall be cumulative and in addition to any other right or remedy given hereunder, or now or hereafter existing by law, in equity or by statute.

11.4. Lessor Breach. Should Lessor be in default of its obligations under this Lease, Lessee shall notify Lessor of such default in writing. Should such default continue for more than thirty (30) days after Lessor's receipt of such notice, or if such default cannot be cured within thirty (30) days should Lessor have failed to commence and be diligently prosecuting the cure of such default, Lessee shall have, as its sole and exclusive remedy under this Lease, the right to file suit against Lessor in a court of competent jurisdiction for specific performance or damages, as the case may be. Notwithstanding the foregoing, in no event shall Lessee be allowed to any offset or abatement of any rental amounts hereunder, nor shall Lessee be allowed to terminate this Lease, except as specifically provided herein. Notwithstanding anything contained herein to the contrary, Lessee agrees to look solely to the estate and property of the Lessor in the Premises, and subject to the prior rights of any mortgage or beneficiary of any trust deed or any security interest on the same, for the collection of any judgment (or other judicial process) requiring the payment of money by Lessor in the event of any default or breach by Lessor with respect to any of the terms, conditions and covenants of this Lease to be observed and/or performed by Lessor, and no other assets of Lessor shall be subject to levy, execution or other procedures for the satisfaction of Lessee's remedies.

11.5. Force Majeure. If either Party, without fault or negligence by such Party, is rendered unable by Force Majeure, as defined herein, to perform any obligation of under this Lease, other than Lessee's obligation to pay Minimum Rent, Additional Rent, or other consideration, including late fees, then upon such Party promptly giving written notice to the other Party, the performance of such obligation shall be suspended during the period of time the inability to perform continues as a result of an event of Force Majeure, and such Party shall be relieved of liability for its failure to perform during such period of time; provided that the Party asserting an inability to perform shall use its best efforts to correct such inability and to resume promptly its performance as required under the Lease. The term Force Majeure shall mean causes or events such as an act of God, act of civil or military authority, fire, epidemic, flood, earthquake, riot, war, terrorism, sabotage, or other similar cause or event not within such Party's reasonable control, but not including generalized economic conditions, recession, or depression. The written notice provided under this Paragraph shall set forth the particular nature and circumstances of the Force Majeure, the expected effect of the Force Majeure on the Party's performance under the Lease, and the expected date the Party will resume performance.

## ARTICLE 12 OBLIGATIONS ON LEASE TERMINATION

12.1. Improvements. Upon the termination of this Lease for any cause whatsoever, Lessee shall upon request of Lessor immediately surrender peaceable possession of the Premises, including all buildings, structures, fixtures and other improvements (collectively, the "**Improvements**") then located thereon, but not including personal property, in a good, clean and useable condition (ordinary depreciation, reasonable wear and tear, casualty loss, and condemnation loss excepted). In the event Lessor chooses not to retain the Improvements upon the termination or early expiration of the Lease, Lessee shall remove the Improvements within ninety (90) days of notice from the Lessor requiring such, and reclaim the Premises in accordance with **Section 12.2**. Removal of the Improvements and restoration of the Premises shall be at Lessee's sole cost and expense. In the event that Lessee fails to remove the



13.3. Attorney's Fees. If any action is brought by any party to this Lease in respect of its rights under this Lease, the prevailing party shall be entitled to reasonable attorney's fees and court costs as determined by the court. In the event that any person who shall not be a party to this Lease shall institute an action against a party to this Lease in which the other party to this Lease shall be involuntarily and without cause joined as a party, the party against whom said action is instituted shall reimburse the other party to this Lease for all attorney's fees incurred by such party in connection therewith.

13.4. Severability. The invalidity of any provision of this Lease, as determined by a court of competent jurisdiction, shall in no way affect the validity of any other provision hereof.

13.5. Recording. A Memorandum of this Lease may be recorded after execution of this Lease.

13.6. Cumulative Remedies. No remedy or election hereunder shall be deemed exclusive but shall, wherever possible, be cumulative with all other remedies hereunder or at law or in equity.

13.7. Construction. The titles which are used following the number of each Section are so used only for convenience in locating various provisions of this Lease and shall not be deemed to affect the interpretation or construction of such provisions. The parties acknowledge that each party and its counsel have reviewed and revised this Lease. This Lease shall not be construed for or against Lessor or Lessee. References in this Lease to "**Sections**" and "**Articles**" refer to the Sections and Articles of this Lease unless otherwise noted.

13.8. Lessor's Consent. Whenever this Lease provides for or requires the consent or approval of Lessor, such consent or approval may be given or withheld in the sole and absolute discretion of Lessor, unless a standard of reasonableness is expressly stated.

13.9. Successors. Subject to the restrictions contained in **Article 7**, this Lease and all of provisions hereof shall be binding upon and inure to the benefit of the successors and assigns of Lessor and Lessee.

13.10. Governing Law; Venue. The terms, conditions, covenants, and agreements herein contained shall be governed, construed, and controlled according to the laws of the state of Utah. Any action brought in connection with this Lease shall be brought in the Third District Court for Salt Lake County, Utah, subject, however, to any legal requirement for prior exhaustion of administrative remedies.

13.11. Broker's Commission. Lessee and Lessor represent and warrant to each other that there are no claims for brokerage commissions or finder's fees in connection with this Lease and each agrees to indemnify the other for, from and against all liabilities arising from any claims, including any attorney's fees connected therewith, relating to claims arising out of the other's actions.

13.12. Time is of the Essence. Time is of the essence of this Lease and in the performance of all of the covenants and conditions hereof.

13.13. Relationship of the Parties. The relationship of the parties hereto is that of Lessor and Lessee, and it is expressly understood and agreed that Lessor does not in any way, nor for any purpose, become a partner of Lessee or a joint venturer with Lessee in the conduct of Lessee's business, or otherwise, and that the provisions of any agreement between Lessor and Lessee relating to rent are made solely for the purpose of providing a method whereby rental payments are to be measured and ascertained.

13.14. Time Periods. In the event the time for the performance of any obligation or the taking of any action hereunder expires on a Saturday, Sunday or legal holiday, the time for performance or taking such action shall be extended to the next succeeding day which is not a Saturday, Sunday or legal holiday.

13.15. Quitclaim. At the expiration or earlier termination of this Lease, Lessee shall execute, acknowledge and deliver to Lessor, within five (5) days after written demand, from Lessor to Lessee, any quitclaim deed or other document deemed necessary or desirable by Lessor's counsel to remove the cloud of this Lease and the limited right of first refusal granted hereunder from the real property subject to this Lease.

13.16. Tax and Zoning Immunity. Nothing contained in this Lease shall be deemed to constitute a waiver of applicable laws providing tax and zoning immunity to state property or any interest therein or income therefrom.

13.17. No Waiver of Sovereign Immunity. By this Lease, Lessor does not waive, limit, or modify any sovereign immunity from suit except as specifically provided herein.

13.18. Entire Agreement. This Lease sets forth all the promises, inducements, agreements, conditions, and understandings between Lessor and Lessee relative to the Premises, and there are no promises, agreements, conditions, or understandings, either oral or written, express or implied, between them other than are set forth therein. No subsequent alteration, amendment, change, or addition to this Lease shall be binding upon Lessor or Lessee unless in writing and signed by each of them.

IN WITNESS WHEREOF, the parties hereto have executed this Lease on the day and year first written above.

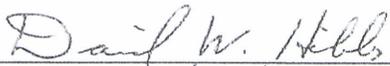
**LESSOR:**

STATE OF UTAH, SCHOOL AND  
INSTITUTIONAL TRUST LANDS  
ADMINISTRATION

By:   
Kevin S. Carter, Director

**LESSEE:**

GENWAL RESOURCES, INC.

By:   
Its: President

APPROVED AS TO FORM:  
MARK L. SHURTLEFF  
ATTORNEY GENERAL

By:   
Special Assistant Attorney General

STATE OF UTAH )  
 : ss.  
COUNTY OF SALT LAKE )

On the 4<sup>th</sup> day of January, 201<sup>2</sup>, appeared before me **Kevin S. Carter**, the Director of the School and Institutional Trust Lands Administration of the State of Utah (SITLA), who, his identity and position having been satisfactorily established to me, affirmed to me upon oath that the governing body of SITLA, has authorized him to execute the foregoing Special Use Lease Agreement No. 1708, and did duly acknowledged in my presence having executed the same for the purpose stated therein.

Seal:

Linda Bianchi  
Notary Public

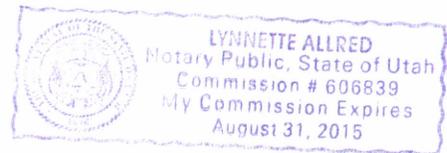


STATE OF Utah )  
 : ss.  
COUNTY OF Carbon )

On this 20<sup>th</sup> day of December, 2011, appeared before me (name) David W. Hibbs, the (title) President of Genwal Resources, Inc., a Utah corporation, who, his/her identity and position having been satisfactorily established to me, affirmed to me upon oath that the governing body of Genwal Resources, Inc. has authorized him/her to execute the foregoing Special Use Lease Agreement No. 1708, and did duly acknowledged in my presence having executed the same for the purpose stated therein.

Seal:

Lynette Allred  
Notary Public



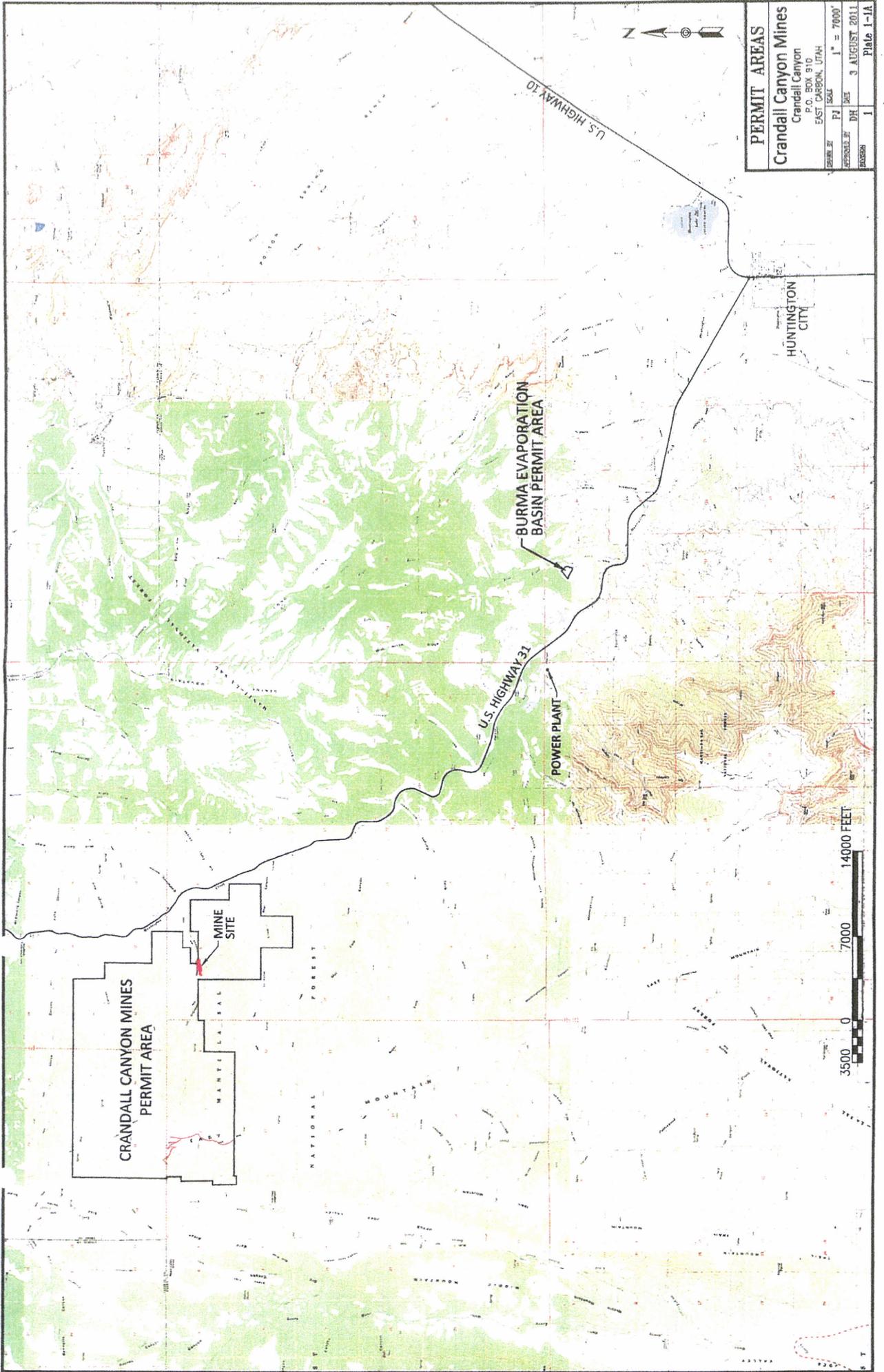
**EXHIBIT A**

**LEGAL DESCRIPTION**

Township 17 South, Range 8 East, SLB&M  
Section 5: Lot 6 (within)

Beginning at a point located S89°55'W a distance of 348.68 feet from the northeast corner of Lot 6 within Section 5, Township 17 South, Range 8 East, of the SLB&M to the east edge of the Old Construction Road; thence S61°55'04"E a distance of 24.47 feet; thence S72°25'21"E a distance of 23.90 feet; thence S64°24'35"E a distance of 21.03 feet; thence S50°52'27"E a distance of 20.76 feet; thence S35°44'44"E a distance of 55.91 feet; thence S02°28'53"W a distance of 44.51 feet; thence S73°13'55"E a distance of 89.66 feet; thence S60°15'20"E a distance of 43.41 feet; thence S41°13'26"E a distance of 32.53 feet; thence S31°03'49"E a distance of 59.87 feet; thence S10°41'32"E a distance 66.67 feet; thence S01°55'27"E a distance of 79.97 feet; thence S11°15'16"E a distance of 60.90 feet; thence S18°48'58"W a distance of 28.67 feet; thence S41°35'52"W a distance of 29.99 feet; thence S53°54'34"W a distance of 28.12 feet; thence S47°10'44"W a distance of 6.91 feet; thence West a distance of 601.02 feet; thence N52°12'01"W a distance of 270.05 feet; thence N49°44'24"E a distance of 101.47 feet; thence N50°04'42"E a distance of 95.86 feet; thence N49°46'07"E a distance of 88.53 feet; thence N52°15'08"E a distance of 91.68 feet; thence N53°24'39"E a distance of 73.72 feet; thence N53°38'00"E a distance of 134.79 feet; thence East a distance of 99.89 feet to the point of beginning. Containing 7.32 acres, more or less.

**EXHIBIT B**  
**DEVELOPMENT PLAN**



PERMIT AREAS	
<b>Crandall Canyon Mines</b>	
Crandall Canyon P.O. BOX 910 EAST CARBON, UTAH	
SCALE	1" = 7000'
DATE	3 AUGUST 2011
REVISION	1
Plate 1-1A	

**EVAPORATION BASIN  
PLAN**

**Crandall Canyon Mines**  
Crandall Canyon  
P.O. BOX 910  
EAST CARBON, UTAH

SCALE: P2 SCALE 1" = 100'  
APPROVED BY: DH CAS 7 SEPT. 2011  
SHEET: 1



**EVAPORATION BASIN PLAN**  
**Crandall Canyon Mines**  
 Crandall Canyon  
 P.O. BOX #10  
 EAST CANYON, UTAH

DATE	BY	SCALE	1" = 100'
22 SEPT. 2011			

AREA LOCATED IN SECTION 5, TOWNSHIP 17 SOUTH, RANGE 8 EAST, SLBM

UTAH POWER AND LIGHT COMPANY  
 SITLA

EAST QUARTER CORNER OF SECTION 5, T.17S., R.8E., SLBM

PERMIT LINE P.O.B.

UNDISTURBED DRAINAGE DITCH

18" CMP

ACCESS ROAD

EVAPORATION BASIN

CONTAINMENT BERM

OLD CONSTRUCTION ROAD (PREVIOUS CHAINING OPERATIONS)

NATURAL DRAINAGE CHANNEL

TYPICAL SEDIMENT CONTROL STRUCTURE

PERMIT LINE

PERMIT LINE

PERMIT LINE

EMERY COUNTY PUBLIC ROAD (BURMA ROAD)

EXISTING GAS-WELL PAD (XTO ENERGY, BB 5-107)

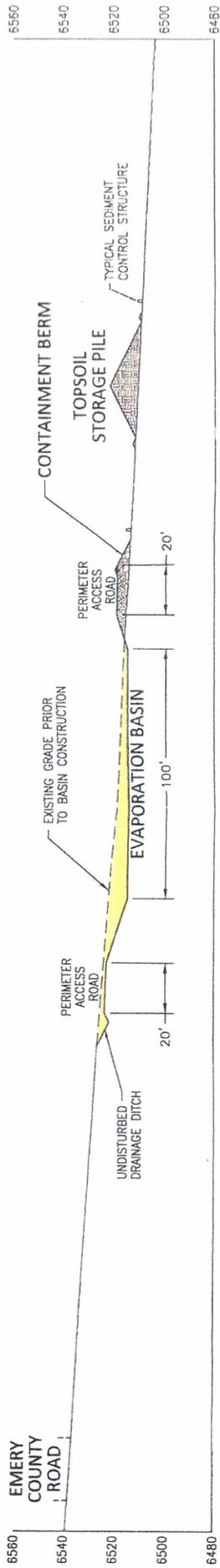
- NOTES:**
1. ALL DIMENSIONS ARE APPROXIMATE. FINAL LOCATIONS AND CONFIGURATIONS OF THE FACILITY STRUCTURES MAY VARY DEPENDING UPON CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
  2. ALL INTERIOR EVAPORATION BASIN SLOPES SHALL BE A MAXIMUM OF 3:1. ALL OTHER CUT/FILL SLOPES SHALL BE A MAXIMUM OF 2:1 UNLESS OTHERWISE NOTED.
  3. MINIMUM INTERIOR RADIUS OF PERIMETER ACCESS ROAD SHALL BE 40'.
  4. BOTTOM OF EVAPORATION BASIN ELEVATION = 6514.5'

**KEY**

(Solid line)	EXISTING MAJOR CONTOURS (10' INTERVALS)
(Dashed line)	EXISTING MINOR CONTOURS (2' INTERVALS)
(Dotted line)	EXISTING DISTURBED MAJOR CONTOURS (10' INTERVALS)
(Dash-dot line)	EXISTING DISTURBED MINOR CONTOURS (2' INTERVALS)
(Thick solid line)	NEW MAJOR CONSTRUCTION CONTOURS (5' INTERVALS)
(Thin solid line)	NEW MINOR CONSTRUCTION CONTOURS (1' INTERVALS)

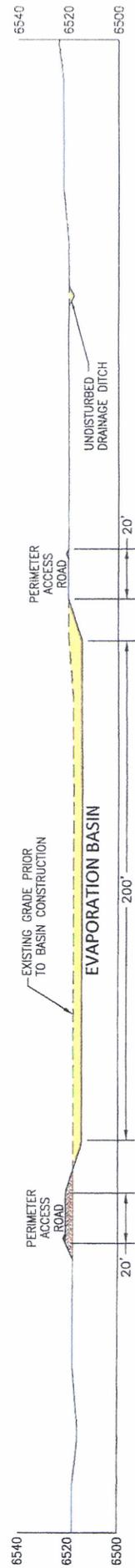
CUT/FILL VOLUME: APPROX. 3,500 c.y.



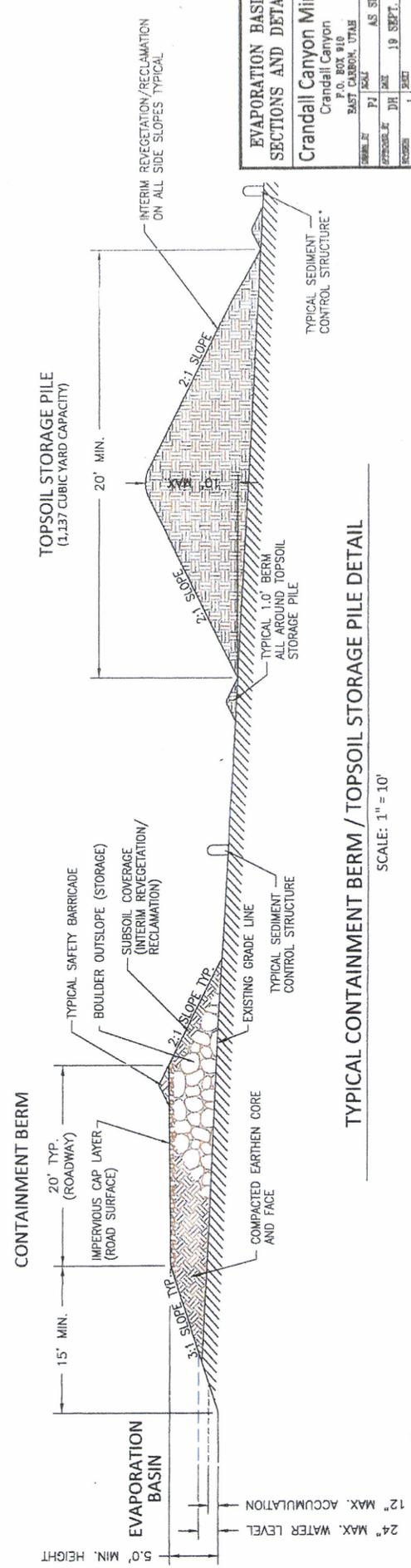


SECTION A-A'  
NORTH-TO-SOUTH SECTION  
SCALE: 1" = 40'

GENERAL NOTE:  
SOLID HATCH DENOTES CUT AREAS. CROSS-  
HATCH DENOTES FILL AREAS.



SECTION B-B'  
WEST-TO-EAST SECTION  
SCALE: 1" = 40'



TYPICAL CONTAINMENT BERM / TOPSOIL STORAGE PILE DETAIL  
SCALE: 1" = 10'

EVAPORATION BASIN SECTIONS AND DETAILS	
Crandall Canyon Mines	
Crandall Canyon P.O. BOX 814 EAST CARBON, UTAH	
DESIGNED BY	AS SHOWN
APPROVED BY	DATE
PROJECT NO.	19 SEPT. 2011
SHEET	1

**ATTACHMENT 3**

**LEGAL DESCRIPTION OF LEASE/PERMIT AREA**

**Crandall Canyon Evaporation Basin Permit Area Legal Description**

September 22, 2011

Beginning at a point located S 89°55'W a distance of 348.68' from the East Quarter Corner of Section 5, Township 17 South, Range 8 East of the SLBM to the East edge of the Old Construction Road; thence S 61°55'04" E a distance of 24.47'; thence S 72°25'21" E a distance of 23.90'; thence S 64°24'35" E a distance of 21.03'; thence S 50°52'27" E a distance of 20.76'; thence S 35°44'44" E a distance of 55.91'; thence S 02°28'53" W a distance of 44.51'; thence S 73°13'55" E a distance of 89.66'; thence S 60°15'20" E a distance of 43.41'; thence S 41°13'26" E a distance of 32.53'; thence S 31°03'49" E a distance of 59.87'; thence S 10°41'32" E a distance of 66.67'; thence S 01°55'27" E a distance of 79.97'; thence S 11°15'16" E a distance of 60.90'; thence S 18°48'58" W a distance of 28.67'; thence S 41°35'52" W a distance of 29.99'; thence S 53°54'34" W a distance of 28.12'; thence S 47°10'44" W a distance of 6.91'; thence West a distance of 601.02'; thence N 52°12'01" W a distance of 270.05'; thence N 49°44'24" E a distance of 101.47'; thence N 50°04'42" E a distance of 95.86'; thence N 49°46'07" E a distance of 88.53'; thence N 52°15'08" E a distance of 91.68'; thence N 53°24'39" E a distance of 73.72'; thence N 53°38'00" E a distance of 134.79'; thence East a distance of 99.89' to the point of beginning.

Permit area equals approximately 7.32 acres.

**ATTACHMENT 4**

**ARCHEOLOGY REPORT  
SENCO-PHENIX ARCHEOLOGICAL CONSULTANTS**

**An Intensive Cultural Resource Survey and Inventory of the  
Proposed Iron Evaporation Pond for the Crandall Canyon Mine  
(SULA 1708)**

**Emery County, Utah  
(SITLA Land)**

PERFORMED FOR  
**Crandall Canyon Mine of  
Genwal Resources Inc.**

In Accordance with SITLA and  
Utah State Guidelines  
Antiquities Permit #U11SC099s

SPUT-609  
March 17, 2011

**John A. Senulis**  
Principal Investigator

## Abstract

SENCO-PHENIX performed an intensive cultural resource survey on the proposed **Iron Evaporation Pond for the Crandall Canyon Mine**. The proposed pond is located on land managed by the School and Institutional Trust Lands Administration (SITLA). The purpose of the survey was to identify and evaluate cultural resources that may exist within the project area.

No cultural resources were located and the potential for undetected remains is remote. A finding of **No Effect** is appropriate and **Archeological Clearance** is recommended.

## Project Location

The survey area for proposed ca. 10 acre pond is in the SE/NW ¼ of Section 5, Township 17 South, Range 8 East, Emery County, Utah. The access to the proposed pond will be an existing, upgraded oilfield road. The project area is shown on the enclosed copy of U.S.G.S. 7.5' Composite Quad: Hiawatha, Utah (1978) & Red Point, Utah (1979). The proposed pond area was not staked but GIS measurements were taken prior to the fieldwork and the previously chained area easily delineated the project area.

## Specific Environment

The project is within the rising foothills of the Wasatch Plateau to the west. The project is on the west bench of the perennial Fish Creek drainage of Huntington Creek. The Huntington Creek Valley has been deeply cut out of Mancos shale resulting in low benches above the perennial Creek. The project area has been chained in the somewhat distant past. The vegetation in the project area is regrowth Pinyon-juniper with sparse understory grading into Pinyon-juniper with medium sagebrush and various grasses and forbs. There is a riparian community along the banks of Huntington and Fish Creeks with cottonwood, Russian olive and tamarisk. Lower Huntington Creek near the current project area is a meandering stream with many old channels evident. Soils on the benches are tan clay gravelly loams mixed, in some areas, with shallow residual sandy loams. The foothills of the Wasatch Plateau are extremely rugged with isolated benches separated by deep, intermittent drainages.

## Previous Research

A file search of the SENCO-PHENIX reports and online at the UDSH site on March 14, 2011, indicated that the following projects had been performed:

- 1980-1984, Several seismic line projects were performed in the general project area. No cultural resources were located in the current project area.
- 2002, Montgomery Archeological Consultants performed several archeological surveys in Section 5. No significant cultural resources were located in proximity to the current project. (02-236)
- 2004, Montgomery Archeological Consultants surveyed a block for a gravel pit extending into Section 5. No cultural resources were located. (04-132)
- 2002, SENCO-PHENIX surveyed 30 well pads and access corridors in the vicinity of the current project, including the original Utah 32-559 and alternate. No significant cultural resource was located near the current project area. (02-332)
- 2005, Montgomery Archeological Consultants surveyed two pipeline corridors near the current project area. No cultural resources were located. (05-573)
- 2007, SENCO-PHENIX surveyed a pipeline corridor, partially in Section 5. No cultural resources were located. (07-924)

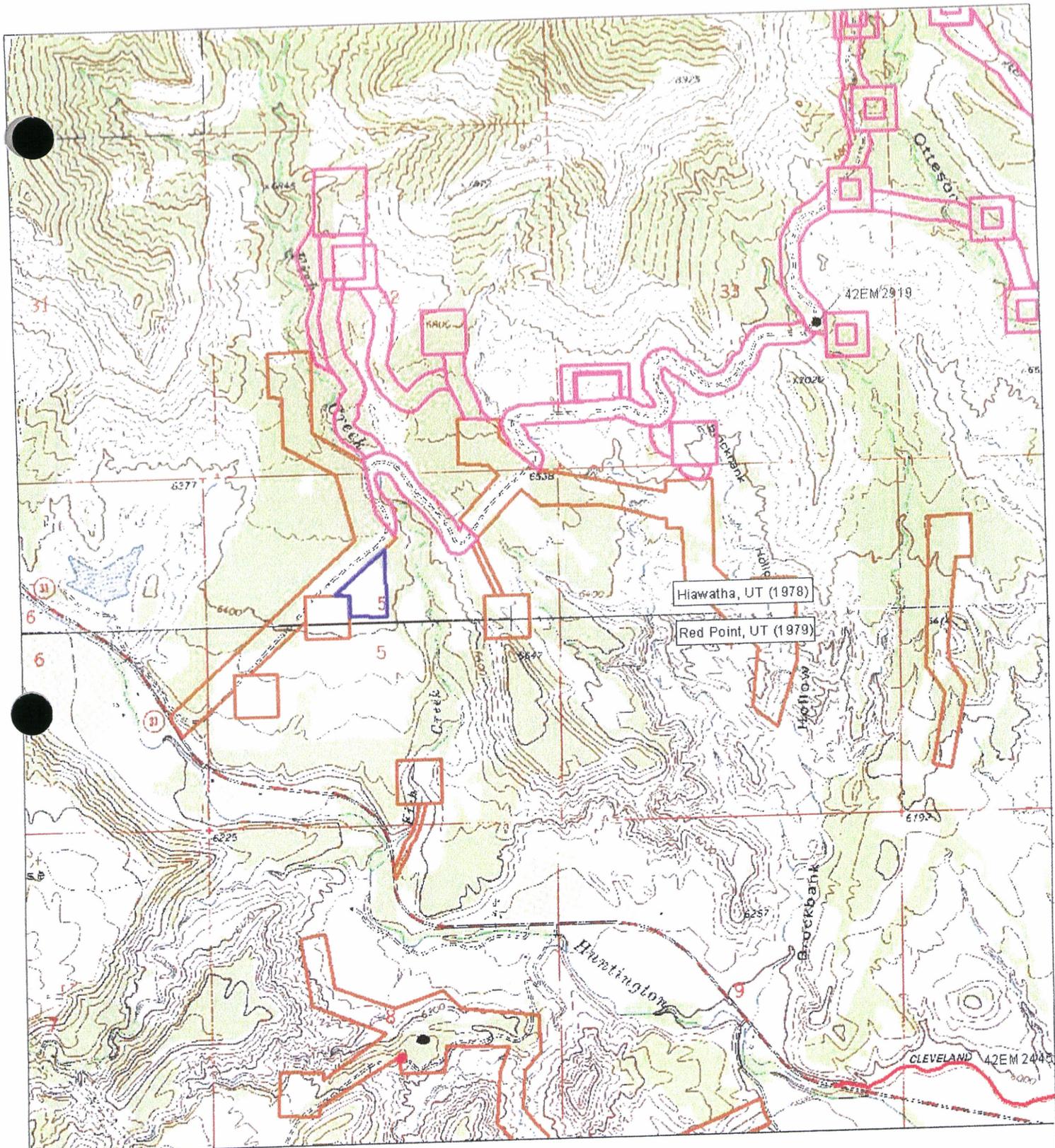
## Methodology

John & Jeanne Senulis of SENCO-PHENIX performed a Class III intensive walkover survey of the proposed ca. 10 acre, pond area on March 15, 2011. Meandering parallel transects no further spaced than 15 meters were employed. Special attention was given to areas of subsurface soil exposure from animal burrowing, chaining, and erosion. All field notes are on file at the offices of SENCO-PHENIX in Price, Utah.

## Findings and Recommendations

No cultural resources were located and the potential for undetected remains is remote. A finding of **no effect** is appropriate and **archeological clearance is recommended**.

These recommendations are subject to approval by the SITLA Land Manager and the Utah SHPO.



**SENCO-PHENIX**



Scale 1:24,000  
1" = 2,000'

- Current Survey
- Previous Survey
- Montgomery Survey
- Eligible Sites
- Ineligible Sites

Evaporation Ponds  
Crandall Canyon Mine  
Genwal Resources, Inc.  
Section 5, T17S, R8E  
Emery County, Utah  
March 2011  
SPUT-609  
SULA 1708

ATTACHMENT 5

VEGETATION AND WILDLIFE REPORT  
MT. NEBO SCIENTIFIC

Vegetation, Wildlife Habitat  
& Sensitive Species  
at the  
Evaporation Pond Area

for the  
Crandall Canyon Mine

in  
Emery County, Utah



Prepared by

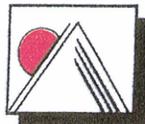
MT. NEBO SCIENTIFIC, INC.  
330 East 400 South, Suite 6  
P.O. Box 337  
Springville, Utah 84663  
(801) 489-6937

Patrick D. Collins, Ph.D.

for

UTAH AMERICAN ENERGY  
West Ridge Mine  
P.O. Box 902  
Price, UT 84501

July 2011



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# Introduction

Utah American Energy (UAE) has proposed to create evaporation ponds to dry slurry material brought in from a nearby mine called the Crandall Canyon Mine. The Crandall Canyon Mine is located in Huntington Canyon of the Wasatch Plateau in Emery County, Utah, about 16 miles northwest of the town of Huntington. The evaporation pond site is roughly 12 acres in size and is located approximately 10 miles from the mine site (Map 1).

## *Disturbance to the Existing Plant Communities*

Construction of the evaporation ponds will necessitate disturbance to the resident plant community of the area. Although the native Pinyon-Juniper plant community here has been chained in the past, presumably as a rangeland enhancement technique, the trees have returned and the area supports many native plant species as well as some that were probably seeded following the chaining operations. This document provides baseline information from the current existing plant community including vegetative structure, species presence, total cover, cover by species and woody species density. The data were recorded by quantitatively sampling the area in the growing season and prior to commencement of any construction activities.

## *Revegetation Success Standards*

A Pinyon-Juniper Reference Area was also chosen and sampled during the same time period mentioned above. The reference area was chosen with respect to its similarities in geology, soils, slope, aspect, plant community composition and historical range treatments (i.e. the aforementioned chaining operations) as the area that has been proposed for new disturbance. The reference area could be used to represent future standards for final revegetation success for the evaporation pond area once it is reclaimed and re-seeded.

## Methods

Methodologies used for this study were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM). Quantitative and qualitative data were recorded within the plant communities proposed for disturbance and reference area June 8-9, 2011.

The proposed Evaporation Pond Area was mapped by representatives of UAE prior to the vegetation sampling. The reference area chosen is approximately one acre in size and was marked in the field using a GPS instrument. The coordinates for the proposed disturbed Pinyon-Juniper Community in the Evaporation Pond Area and the Pinyon-Juniper Reference Area are provided below.

<b>GPS Coordinates for Crandall Canyon Mine Evaporation Pond &amp; Reference Areas (UTM, ZONE 12S, NAD 27)</b>		
<b>Waypoint Name</b>	<b>Coordinates (m)</b>	<b>Area</b>
AndCCEvap	0495718 E 4358370 N	Approx. center of the Proposed Disturbed Pinyon-Juniper Community in the Evaporation Pond Area
AndCCEvRef	0495707 E 4358171 N	Approx. center of the Pinyon-Juniper Reference Area

### *Sampling Design and Transect/Quadrat Placement*

Transect lines for vegetation sampling in the study sites were placed randomly within the boundaries of the proposed disturbed and reference areas (see Map I). The transect placement technique was employed with the goal to adequately sample a representative subset of the entire site. Once the transects were established, quadrat locations for sampling were chosen using random numbers from the transect lines with the objective to record data without preconceived bias.

### *Cover and Composition*

Cover estimates were made using ocular methods with meter square quadrats. Species composition, cover by species, and relative frequencies were also assessed from the quadrats. Additional information recorded on the raw data sheets were notes such as: slope, exposure, grazing use, disturbance and/or other appropriate notes. Plant nomenclature follows *A Utah Flora* (Welsh et al., 2008).

### *Woody Species Density*

Density of woody plant species for the proposed disturbed and reference areas were estimated using the point-quarter method. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual. The number of individuals per acre was the end results of the calculations.

### *Sample Size & Adequacy*

Sampling adequacy for cover and density was attempted by using the formula given below.

$$nMIN = \frac{t^2 s^2}{(dx)^2}$$

where,

*nMIN* = minimum adequate sample  
t = appropriate confidence t-value  
s = standard deviation  
x = sample mean  
d = desired change from mean

With the values used for “t” and “d” above, the goal was to meet sample adequacy with 80% confidence within a 10% deviation from the true mean.

### *Statistical Analyses*

Student’s t-tests were employed to compare the total living cover and total woody species density of the proposed disturbed area with the reference area.

### *Photographs*

Color photographs of the sample areas were taken at the time of sampling and have been submitted with this report.

### *Wildlife Habitat*

The State of Utah, Division of Wildlife Resources (DWR), Utah Conservation Data Center (UCDC), Geographic Information System (GIS) maps and databases were consulted to review sensitive species as well as important wildlife habitat in and adjacent to the study areas.

### Threatened, Endangered & Sensitive Species

In May 2011, and prior to recording quantitative data on the plant communities, a sensitive plant species survey was conducted. To initiate the studies in the area, appropriate resources were consulted (i.e. *State of Utah, Division of Wildlife Resources, Utah Conservation Data Center*) and other sources reviewed (sensitive species files at *Mt. Nebo Scientific, Inc.*) for potential species that are known to be rare, endemic, threatened, endangered or otherwise sensitive in the study area. Additionally, current lists of federally protected species – plant and animal – for Carbon County, Utah were reviewed and potential habitats for these species in the areas proposed for disturbance were addressed.

### Raw Data

The raw data have been summarized on spreadsheets which are available upon request by UAE or DOGM.

## Results

### Proposed Disturbed Pinyon-Juniper Community

As mentioned earlier in this report, the native pinyon-juniper community that once existed here had been previously chained as a rangeland improvement technique. This activity must have been conducted several years ago because the trees have re-established themselves and are once again fairly sizable (see Figure 1).

The most common understory and overstory species in the study area was pinyon-pine (*Pinus*

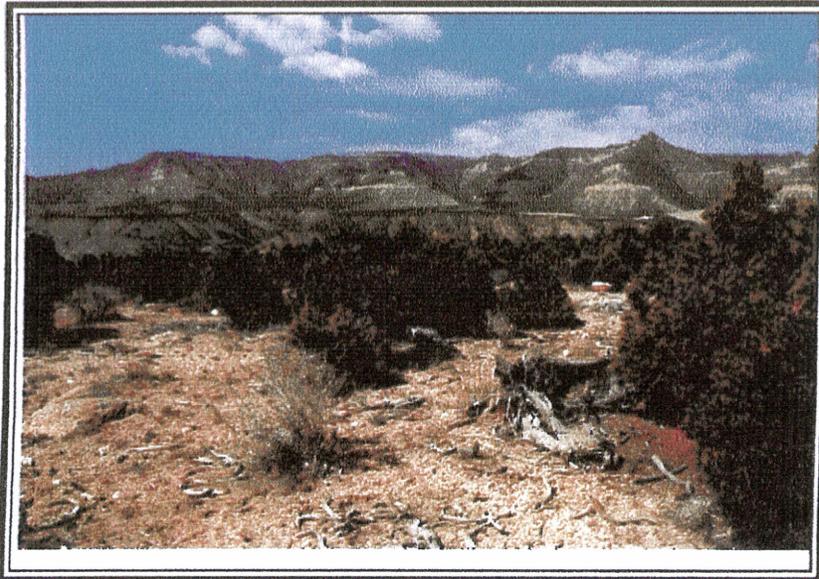


Figure 1: Proposed Disturbed Evaporation Pond Area

*edulis*). The only other overstory species present in the sample quadrats was Utah juniper (*Juniperus osteosperma*). Most of the plant species in the understory cover were native plants, but the most common plant was probably seeded following the chaining activities. This introduced grass species,

crested wheatgrass (*Agropyron cristatum*), had a cover and frequency of 6.36% and 60.00%, respectively (Table 1). Other grasses present in the quadrats included Russian wildrye (*Elymus junceus*), galleta (*Hilaria jamesii*) and Indian ricegrass (*Stipa hymenoides*). Common species by cover and frequency in the proposed disturbed area were the woody plants, Utah juniper and fourwing saltbush (*Atriplex canescens*). The most common forbs were yellow cryptanth (*Cryptantha flava*) and gumweed aster (*Machaeranthera grindelioides*).

The total overstory in the study area was 5.40%, whereas the total living understory was estimated at 29.30% (Table 2-A). Woody plant species dominated the lifeform composition comprising 46.40%; forbs and grasses were nearly equally represented at 28.33% and 25.26%, respectively (Table 2-B).

The total woody species density in the proposed disturbed evaporation pond area was 1,095 plants per acre (Table 3). The dominate species here were pinyon-pine, Utah juniper, fourwing saltbush and rubber rabbitbrush (*Chrysothamnus nauseosus*). As can also be noted in Table 3, however, woody species density was represented by several plants.

#### Pinyon-Juniper Reference Area

Like the proposed disturbed area, pinyon-pine dominated the overstory cover in the Pinyon-Juniper Reference Area

(Figure 2); the understory cover was dominated by pinyon-pine and crested wheatgrass (Table 4). Other more common understory species were Utah juniper, gumweed aster and pinnate tansy-mustard (*Descurainia pinnata*).

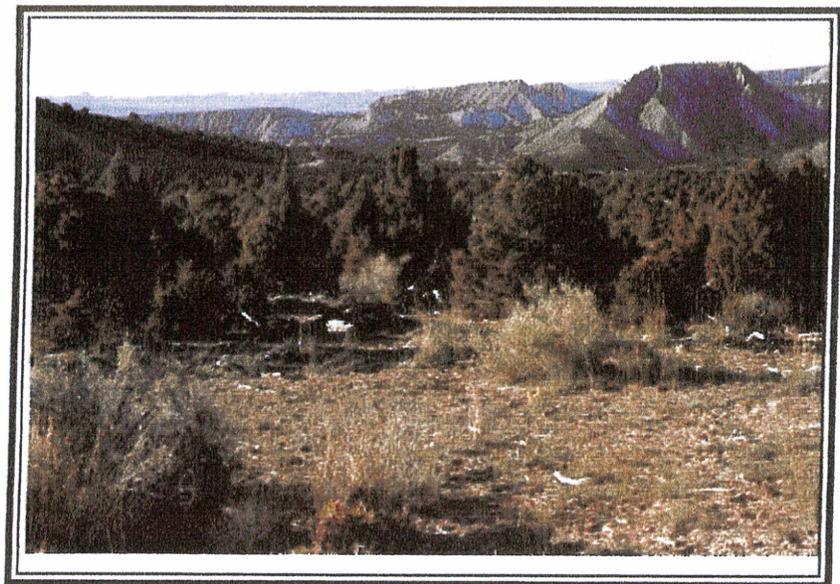


Figure 2: Pinyon-Juniper Reference Area

Understory cover in this area was estimated at 23.45%, whereas overstory cover was estimated at 3.50% (Table 5-A). Trees and shrubs at 43.79% of the composition in this area were nearly equally represented as the grass species at 30.71%; forbs were not far behind them at

25.50% (Table 5-B).

For the density measurements, the total number of woody plants per acre was estimated at 957 with the dominants here comprised of pinyon-pine, Utah juniper and fourwing saltbush (Table 6).

**Table 1: Crandall Canyon Mine Evaporation Pond Area. Total cover, standard deviation and frequency by species (2011).**

			n=50
<b>Proposed Disturbed Pinyon-Juniper (chained)</b>	<b>Mean Percent</b>	<b>Standard Deviation</b>	<b>Percent Frequency</b>
<b>OVERSTORY</b>			
<i>Juniperus osteosperma</i>	0.90	4.44	4.00
<i>Pinus edulis</i>	4.50	9.18	24.00
<b>UNDERSTORY</b>			
<b>TREES &amp; SHRUBS</b>			
<i>Artemisia nova</i>	0.10	0.70	2.00
<i>Atriplex canescens</i>	2.50	7.37	14.00
<i>Chrysothamnus nauseosus</i>	1.40	4.80	8.00
<i>Ephedra viridis</i>	0.50	3.50	2.00
<i>Gutierrezia sarothrae</i>	0.20	0.98	4.00
<i>Juniperus osteosperma</i>	2.80	6.94	18.00
<i>Pinus edulis</i>	6.50	10.16	38.00
<i>Yucca harmonize</i>	0.70	3.00	8.00
<b>FORBS</b>			
<i>Antennaria dimorpha</i>	0.10	0.70	2.00
<i>Cryptantha flava</i>	2.80	5.41	32.00
<i>Cryptantha paradoxa</i>	0.10	0.70	2.00
<i>Descurainia pinnata</i>	0.60	1.55	14.00
<i>Eriogonum ovalifolium</i>	0.10	0.70	2.00
<i>Euphorbia fendleri</i>	0.20	0.98	4.00
<i>Lappula occidentalis</i>	0.20	1.40	2.00
<i>Machaeranthera grindelioides</i>	2.76	4.70	38.00
<i>Malcomia africana</i>	0.30	1.55	4.00
<i>Penstemon sp.</i>	0.04	0.28	2.00
<i>Sisymbrium altissimum</i>	0.24	1.01	6.00
<b>GRASSES</b>			
<i>Agropyron cristatum</i>	6.36	8.34	60.00
<i>Elymus junceus</i>	0.40	1.69	6.00
<i>Hilaria jamesii</i>	0.20	0.98	4.00
<i>Stipa hymenoides</i>	0.20	1.40	2.00

**Table 2: Crandall Canyon Mine Evaporation Pond Area. Total Cover and composition (2011).**

n=50		
Proposed Disturbed Pinyon-Juniper (chained)	Mean Percent	Standard Deviation
<b>A. TOTAL COVER</b>		
Overstory (O)	5.40	9.79
Understory (U)	29.30	10.44
Litter	18.60	12.49
Bareground	32.20	14.87
Rock	19.90	12.47
O + U	34.70	14.91
<b>B. % COMPOSITION</b>		
Trees & Shrubs	46.40	31.51
Forbs	28.33	25.57
Grasses	25.26	27.35

**Table 3: Crandall Canyon Mine Evaporation Pond Area. Woody Species Density (2011).**

n=50	
SPECIES	Number/Acre
<i>Atriplex canescens</i>	131.42
<i>Cercocarpus montanus</i>	21.90
<i>Chrysothamnus nauseosus</i>	131.42
<i>Ephedra viridis</i>	5.48
<i>Gutierrezia sarothrae</i>	21.90
<i>Juniperus osteosperma</i>	284.74
<i>Opuntia sp.</i>	16.43
<i>Pinus edulis</i>	399.73
<i>Rhus aromatica</i>	5.48
<i>Yucca harrimaniae</i>	76.66
<b>TOTAL</b>	<b>1095.15</b>

**Table 4: Crandall Canyon Mine Reference Area. Total cover, standard deviation and frequency by species (2011).**

			n=40
Pinyon-Juniper (chained) Reference Area	Mean Percent	Standard Deviation	Percent Frequency
<b>OVERSTORY</b>			
<i>Juniperus osteosperma</i>	0.88	4.17	5.00
<i>Pinus edulis</i>	2.63	6.61	15.00
<b>UNDERSTORY</b>			
<b>TREES &amp; SHRUBS</b>			
<i>Artemisia tridentata wyomingensis</i>	0.25	1.56	2.50
<i>Atriplex canescens</i>	0.88	4.17	5.00
<i>Chrysothamnus nauseosus</i>	0.75	4.68	2.50
<i>Juniperus osteosperma</i>	3.53	7.43	22.50
<i>Pinus edulis</i>	6.38	11.11	35.00
<i>Yucca harrimaniae</i>	0.25	1.56	2.50
<b>FORBS</b>			
<i>Cryptantha flava</i>	0.98	3.10	10.00
<i>Descurainia pinnata</i>	1.20	2.63	20.00
<i>Eriogonum ovalifolium</i>	0.25	1.56	2.50
<i>Euphorbia fendleri</i>	0.88	2.71	10.00
<i>Machaeranthera grindelioides</i>	1.68	3.76	22.50
<i>Penstemon sp.</i>	0.13	0.78	2.50
<i>Sisymbrium altissimum</i>	0.13	0.78	2.50
<b>GRASSES</b>			
<i>Agropyron cristatum</i>	5.95	6.92	57.50
<i>Stipa hymenoides</i>	0.25	1.09	5.00

**Table 5: Crandall Canyon Mine Reference Area. Total Cover and composition (2011).**

n=40		
Pinyon-Juniper (chained) Reference Area	Mean Percent	Standard Deviation
<b>A. TOTAL COVER</b>		
Overstory (O)	3.50	7.52
Understory (U)	23.45	10.05
Litter	23.88	19.54
Bareground	33.18	15.57
Rock	19.50	14.61
O + U	26.96	13.45
<b>B. % COMPOSITION</b>		
Trees & Shrubs	43.79	36.52
Forbs	25.50	28.63
Grasses	30.71	33.31

**Table 6: Crandall Canyon Mine Reference Area. Woody Species Density (2011).**

n=40	
Pinyon-Juniper (chained) Reference Area	
SPECIES	Number/Acre
<i>Artemisia nova</i>	5.98
<i>Artemisia tridentata wyomingensis</i>	5.98
<i>Atriplex canescens</i>	113.64
<i>Cercocarpus montanus</i>	23.92
<i>Chrysothamnus nauseosus</i>	23.92
<i>Ephedra viridis</i>	23.92
<i>Gutierrezia sarothrae</i>	5.98
<i>Juniperus osteosperma</i>	263.17
<i>Opuntia sp.</i>	17.94
<i>Pinus edulis</i>	406.71
<i>Yucca harrimaniae</i>	65.79
<b>TOTAL</b>	<b>956.97</b>

## High Value Wildlife Habitat

The DWR's UCDC database and GIS maps were consulted for high-value wildlife habitats. Of the species maintained on the database, important habitat of four species have been mapped by biologists from DWR within or adjacent to the study area. The species and habitat values are described below.

First, Rocky Mountain elk (*Cervus canadensis*) habitat was located in the area; "crucial" winter range was mapped throughout the entire area.

Next, mule deer (*Odocoileus hemionus*) habitat has also been mapped in the area by DWR. The habitat was also classified as "crucial" winter range throughout the study area.

Also, black bear (*Ursus americanus*) habitat was present in the study area. This habitat was listed as year-long and classified as "substantial" habitat by DWR.

Finally, the pinyon-juniper zone in the area could be used by ferruginous hawk (*Buteo regalis*) because they often nest in the trees of this community.

## Threatened, Endangered & Sensitive Species

A table of federally listed threatened, endangered and candidate species for Carbon County is provided below (Table 7). The table shows the status of the species, along with site-specific notes about the area proposed for disturbance and the probabilities of their occurrences in the study area.

**Table 7: Federally listed threatened, endangered & candidate species in Emery County, Utah and notes regarding potential impacts to them as a result of the proposed Evaporation Pond Study Area.**

NOTE: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS). This list includes both current and historic records. (Last updated on March 29, 2011).

Scientific Name	Common Name	Status*	Site-Specific Notes
<b>PLANTS</b>			
<i>Pediocactus winkleri</i>	Winkler Footcactus	T	A field survey was conducted for this species in May 2011. Neither the plant nor its habitat were found in the Evaporation Pond Area.  Therefore, construction of the ponds is not expected to impact this species.
<i>Pediocactus despainii</i>	Despain Footcactus	E	A field survey was conducted for this species in May 2011. Neither the plant nor its habitat were found in the Evaporation Pond Area.  Therefore, construction of the ponds is not expected to impact this species
<i>Schoenocrambe barnebyi</i>	Barneby's Schoenocrambe	E	This plant is usually found within the Chinle Formation, which is not found in the evaporation pond area.  A field survey was conducted for this species in May 2011. Neither the plant nor its habitat were found in the Evaporation Pond Area.  Therefore, construction of the ponds is not expected to impact this species
<i>Sclerocactus wrightiae</i>	Wright Fishhook Cactus	E	A field survey was conducted for this species in May 2011. Neither the plant nor its habitat were found in the Evaporation Pond Area.  Therefore, construction of the ponds is not expected to impact this species
<i>Townsendia aprica</i>	Last Chance Townsendia	T	A field survey was conducted for this species in May 2011. Neither the plant nor its habitat were found in the Evaporation Pond Area.  Therefore, construction of the ponds is not expected to impact this species

**Table 7: Federally listed threatened, endangered & candidate species in Emery County, Utah and notes regarding potential impacts to them as a result of the proposed Evaporation Pond Study Area.**

NOTE: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS). This list includes both current and historic records. (Last updated on March 29, 2011).

<i>Cycladenia humilis</i> var. <i>jonesii</i>	Jones Cycladenia	T	A field survey was conducted for this species in May 2011. Neither the plant nor its habitat were found in the Evaporation Pond Area.  Therefore, construction of the ponds is not expected to impact this species
<b>WILDLIFE</b>			
<i>Gila cypha</i>	Humpback Chub	E	Humpback chub in Utah are now confined to a few white-water areas in the Colorado, Green, and White Rivers.  These rivers do not occur in the study area. The drainage control measures of the site limit impacts to the downstream drainage of the Colorado River system.  Therefore, construction of the ponds is not expected to impact this species.
<i>Gila elegans</i>	Bonytail	E	The bonytail is a very rare minnow originally native to the Colorado River system.  These rivers do not occur in the study area. The drainage control measures of the site limit impacts to the downstream drainage of the Colorado River system.  Therefore, construction of the ponds is not expected to impact this species.
<i>Mustela nigripes</i>	Black-footed Ferret	Ex	Black-footed ferret habitat is primarily prairie grasslands. The ferret has a diet consisting of almost 90% prairie dogs. Prairie dog populations do not occur in the proposed evaporation pond area. It is very unlikely that ferrets occur in the immediate area.  Therefore, construction of the ponds is not expected to impact this species.
<i>Ptychocheilus lucius</i>	Colorado Pikeminnow	E	The Colorado pikeminnow is a fish that prefers medium to large rivers. With the loss of habitat they are now restricted to the upper Colorado River system.  These rivers do not occur in the study area. The drainage control measures of the site limit impacts to the downstream drainage of the Colorado River system.  Therefore, construction of the ponds is not expected to impact this species.

**Table 7: Federally listed threatened, endangered & candidate species in Emery County, Utah and notes regarding potential impacts to them as a result of the proposed Evaporation Pond Study Area.**

*NOTE: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS). This list includes both current and historic records. (Last updated on March 29, 2011).*

<i>Xyrauchen texanus</i>	Razorback Sucker	E	<p>This species prefers slow backwater habitats and impoundments in the Colorado River system. Utah Division of Wildlife Resources distribution maps of this species for Carbon County shows to occur near the Green River in extreme eastern portion of the county.</p> <p>These rivers do not occur in the study area. The drainage control measures of the site limit impacts to the downstream drainage of the Colorado River system.</p> <p>Therefore, construction of the ponds is not expected to impact this species.</p>
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	C	<p>DWR database information states that historically, cuckoos were probably common to uncommon summer residents in Utah and across the Great Basin. The current distribution of yellow-billed cuckoos in Utah is poorly understood, though they appear to be an extremely rare breeder in lowland riparian habitats statewide. DWR information also states that currently, the range of the cuckoo is limited to disjunct fragments of riparian habitats from northern Utah, western Colorado, southwestern Wyoming, and southeastern Idaho southward into northwestern Mexico and westward into southern Nevada and California.</p> <p>Although the possibility exists that historically this species could be seen in Emery County, it is highly unlikely that it occurs within the evaporation pond area due to the limited habitat for this species.</p> <p>Therefore, construction of the ponds is not expected to impact this species or its habitat.</p>
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl	T	<p>In Utah the Mexican spotted owl is rare, but when it occurs it is sometimes in various forest types, but more commonly in steep rocky canyons, nesting in caves or cliffs of steep walled canyons. This habitat does not exist in the immediate evaporation pond area. DWR distribution maps do not show the owl in the study area.</p> <p>Therefore, construction of the ponds is not expected to impact this species.</p>

**Table 7: Federally listed threatened, endangered & candidate species in Emery County, Utah and notes regarding potential impacts to them as a result of the proposed Evaporation Pond Study Area.**

NOTE: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS). This list includes both current and historic records. (Last updated on March 29, 2011).

Centrocercus urophasianus	Greater Sage-Grouse	C	<p>Greater sage-grouse inhabit sagebrush zone in Utah's mountain valleys and foothills. No brooding or winter habitat for this species is shown on the DWR database. The sagebrush zone is not present in the study area.</p> <p>There should be no impacts to this species as a result of construction and operation of the evaporation pond area.</p>
Canus lupus	Gray Wolf	E	<p>Although once common in Utah, the gray wolf was extirpated (exterminated) from the state by early settlers. Although they have been reintroduced in adjacent states, and may move into the state, reintroduction to Utah has been planned to-date.</p> <p>The gray wolf can live in many habitats, but there will be no impacts to this species as a result of construction and operation of the Settling Pond Area.</p>
Lynx canadensis	Canada Lynx	T	<p>Lynx usually occur in mature forests having dense undergrowth. They can also be found in more open forests, rocky areas or tundra.</p> <p>This habitat is not found within the Emery Mine permit area.</p> <p>Therefore, subsidence caused by underground mining is not expected to impact this species.</p>

\* Status

- C = Candidate
- E = Endangered
- T = Threatened
- Ex = Extirpated

## Discussion & Conclusions

### Statistical Comparisons

When the **total living cover** of the proposed disturbed area was compared with the reference area, the differences were statistically significant (Figure 3). The proposed disturbed cover was somewhat greater than that of the reference area.

**Figure 3.** A statistical comparison (Student's t-tests) of the **total living cover** between the proposed disturbed Evaporation Pond Area and Reference Area.

	$\bar{x}$	s	n	t	df	SL
<b>Evaporation Pond</b>						
Proposed Disturbed:	34.70	14.91	50			
Reference Area (P-J)	26.95	13.45	40			
t-test				2.5581	88	p<0.05

$\bar{x}$  = mean  
s = standard deviation  
n = sample size  
t = Student's t-value  
df = degrees of freedom

n/a = not applicable  
p = probability  
SL = Significance Level  
N.S. = Non-Significant  
P-J = Pinyon-Juniper

When, however, the proposed disturbed **woody species density** was compared to the reference area, the differences were not statistically significant (Figure 4).

**Figure 4.** A statistical comparison (Student's t-tests) of the **woody species density** between the proposed disturbed Evaporation Pond Area and Reference Area.

	$\bar{x}$	s	n	t	df	SL
<b>Evaporation Pond</b>						
Proposed Disturbed	1095.15	580.32	50			
Reference Area (P-J)	956.97	437.07	40			
t-test				1.2486	88	N.S.

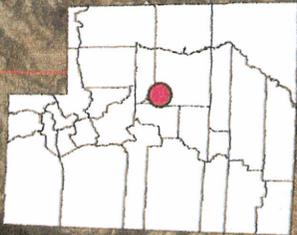
$\bar{x}$  = mean  
s = standard deviation  
n = sample size  
t = Student's t-value  
df = degrees of freedom  
n/a = not applicable

p = probability  
SL = Significance Level  
N.S. = Non-Significant  
P-J = Pinyon-Juniper

Obviously, there is no way of knowing whether or not the differences between two population means will be statistically significant until the researcher summarizes the datasets. In this case, the living covers were dissimilar enough to be statistically significant, but the woody species density were not enough dissimilar for that result. Nonetheless, reasons for accepting the reference area for revegetation success standards include: 1) both areas, the proposed disturbed area and the reference area, are very close in proximity and have nearly identical slope, exposure, soils and other environmental variables, 2) neither area exist in their native or natural condition – both areas have been disturbed in the past by chaining operations; the fact that one area has more cover than the other area may be merely because it may have received more seed when the areas were re-seeded following the chaining operations, and 3) the areas had very similar dominant plant species and 4) there was no significant difference in the woody species densities of the two areas.

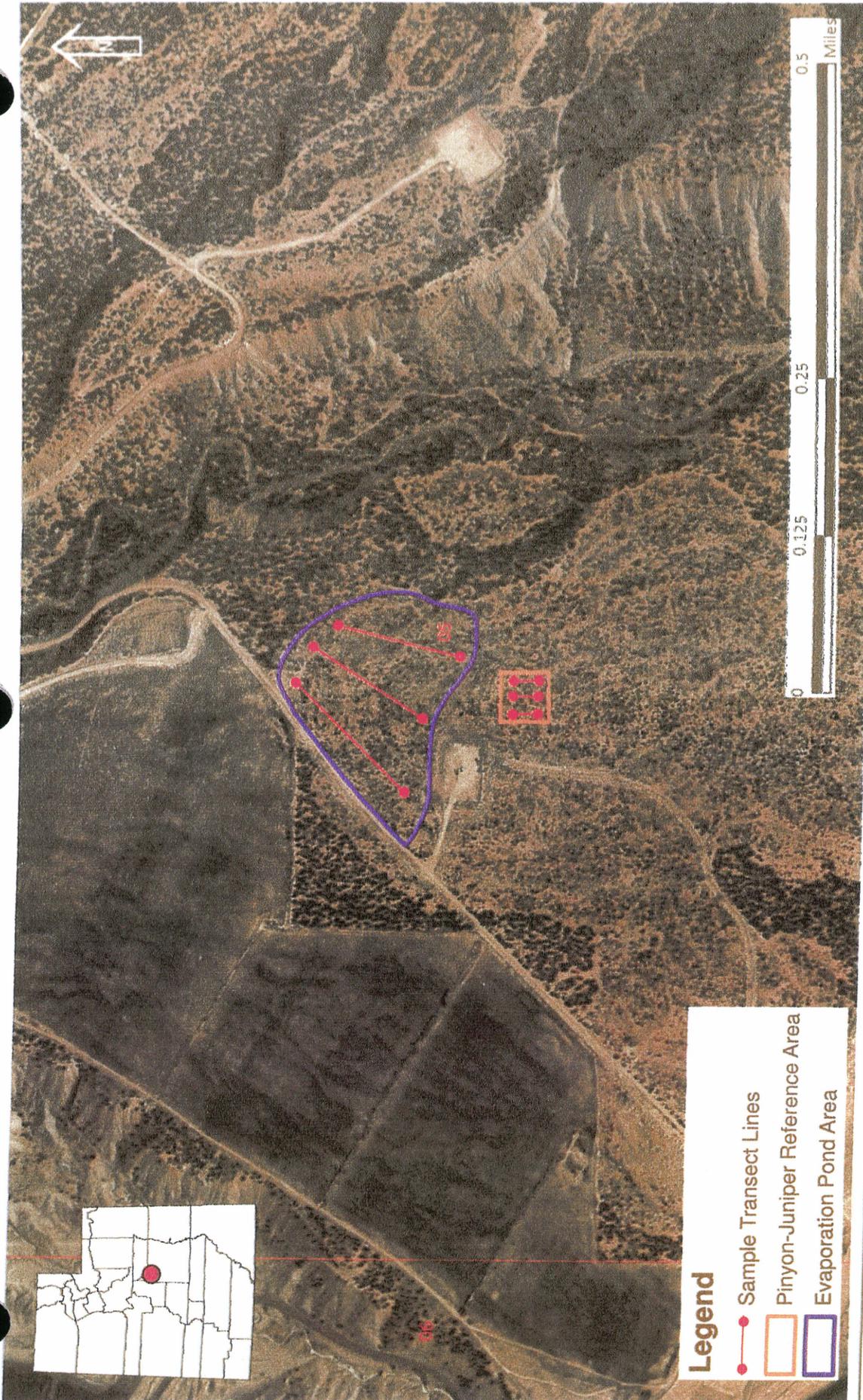
If accepting the proposed Pinyon-Juniper Reference Area for use of future revegetation success standards is unacceptable to the regulatory agency biologists, the issue could be resolved by one of several ways. First, a new reference area could be chosen and sampled anytime (this should not delay the project). Next, agreement could be made to use the current total living cover value (34.70%) for the success standard at the time of final reclamation, rather than the cover value of the reference area when it is sampled at the time of final reclamation. Finally, at the time of final revegetation sampling, the standard could be set that the reclaimed land would be 29% more than the Pinyon-Juniper Reference Area (in 2011, the total living cover of this reference area was 29% greater than the proposed disturbed area).

In conclusion, it is the opinion of this author that the Pinyon-Juniper Reference Area sampled and described in this report could be used for future revegetation success standards.



**Legend**

- Sample Transect Lines
- Pinyon-Juniper Reference Area
- Evaporation Pond Area



**Map 1: Crandall  
Canyon Evaporation  
Pond Area**

Date: 7/1/2011

Scale: 1:7,000

Map by: P.D. Collins and J. Magrath



**MT NEBO SCIENTIFIC, INC.**  
*research & consulting*

330 E. 400 S. Suite 6  
P.O. Box 337  
Springville, Utah  
Phone (801) 489-6937

**Utah American Energy**

**Price, Utah**

Sec. 5 T17S R8E,  
S.L.B.&M.  
Emery County, Utah

ATTACHMENT 6

ORDER 2 SOILS SURVEY  
LONG RESOURCE CONSULTANTS

**Order 2 Soil Survey**  
*of*  
**Crandall Ponds Project**  
*for*  
**Crandall Canyon Mine**

*Prepared by*

Robert E. Long, CPSS  
**Long Resource Consultants, Inc.**  
1960 W Deep Creek Road  
Morgan, Utah 84050  
(801) 791-3447

*for*

**Utah American Energy.**  
Crandall Canyon Mine  
794 "C" Canyon Road  
East Carbon, Utah 84520

July 25, 2011

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## **Appendixes**

- A Soil Profile Descriptions
- B Field Data Sheets
- C Soil Box Photos
- D Map Unit and Soil Profile Photos
- E Laboratory Analysis Results and calculated Values for Available Water Capacity and K Factor

**Project Purpose**

The purpose of this soil survey was to determine the suitability of soil in the proposed Crandall Ponds project area for reclamation suitability. The purpose of the proposed ponds is to dry sediment taken from water treatment ponds located at the Crandall Canyon mine. This order 2 soil survey of the proposed project area was 12.23 acres.

**General Site Description**

The proposed Crandall Ponds project area is located near the mouth of Huntington Canyon in Emery County, Utah, figure 1. The proposed project area is approximately 5.4 miles northwest (302°) of Huntington, Emery County, Utah and approximately 1.4 miles east southeast of the Huntington power plant.

The project area is located in Lot 6, Section 5, Township 17 South, Range 8 East, Salt Lake base meridian.

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.

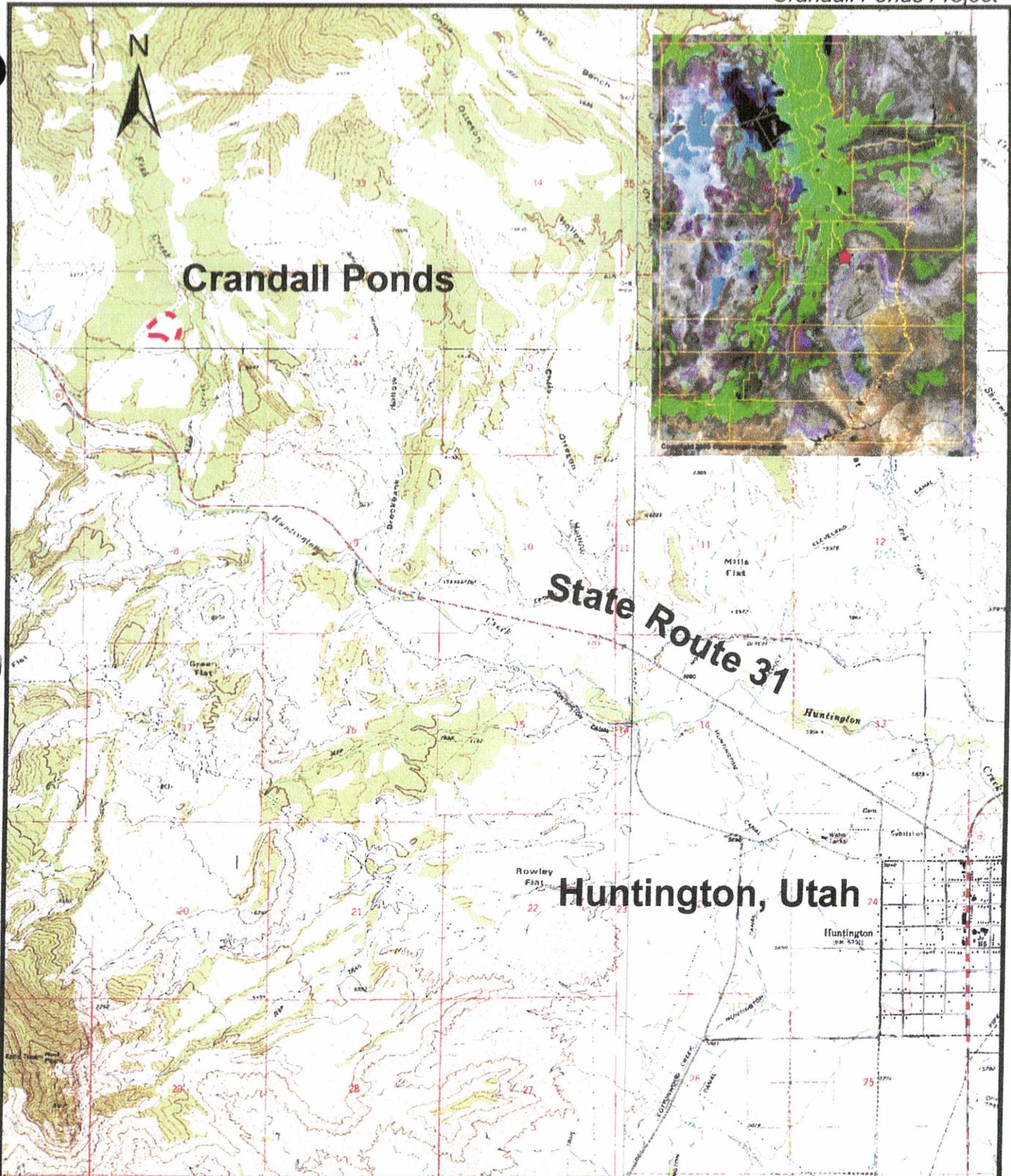
Shallow ephemeral drainages flow across the proposed project area from northwest to southeast.

**Climate**

The Emery Area Soil Survey, Parts of Emery, Carbon, Grand, and Sevier Counties, Utah (UT623) published by the Natural Resource Conservation Service (NRCS, 2007) determined that the project area has an aridic moisture regime and a mesic temperature regime. The soil survey indicates that average annual precipitation for proposed project location ranges from 9 to 12 inches, based on the BMD soil map unit.

The average annual precipitation GIS layer for Utah (Daly and Taylor, 1998) indicates that the estimated average annual precipitation for the proposed Crandall Ponds project location is 12 to 13 inches.

The closest weather station of record with similar climatic conditions is at Hiawatha, Utah. Average annual precipitation at Hiawatha, Utah is 13.71 inches (Western Regional Climate Center, 2011). Table 1 contains the monthly average precipitation data for Hiawatha, Utah. The period of record is 1916 to 1992.



### Crandall Ponds - Order 2 Soil Survey

Figure 1. Location of Crandall Ponds Study Area in Emery County, Utah. Inset shows general location in state of Utah.

July 25, 2011

1 inch = 4,000 feet

C37

C113

Access Road

11UTCR03

11UTCR01

11UTCR02

Twp 17.0S  
R 08.0E  
Sec 05

BMD

### Crandall Ponds - Soil Survey

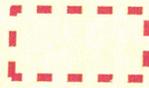
Figure 2.

Soil Profile Locations &  
NRCS Soil Map Units

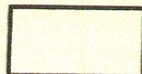
July 25, 2011 1 inch = 200 feet



Soil Profile Locations



Evap Ponds Perimeter



Emery Area Soil Survey

**Table 1. Climate data for Hiawatha, Utah.**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	32.7	36.8	43.9	54.5	64.2	74.8	81.4	78.7	71.0	58.8	43.3	34.7	56.2
Average Min. Temperature (F)	13.6	17.5	22.8	31.2	39.5	48.5	55.6	54.1	46.3	36.2	23.8	16.3	33.8
Average Total Precipitation (in.)	0.94	1.04	1.10	0.95	1.18	0.97	1.31	1.80	1.37	1.20	0.84	1.01	13.71
Average Total Snowfall (in.)	14.1	12.8	9.8	2.9	1.6	0.0	0.0	0.0	0.2	1.0	6.3	12.1	60.7
Average Snow Depth (in.)	4	4	1	0	0	0	0	0	0	0	1	2	1

**NRCS Soil Map Units**

The proposed project area is within the Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (NRCS 2007). Figure 2 shows the relationship between the proposed project area and the NRCS soil survey.

Soil map unit BMD, Strych very stony very fine sandy loam, 3 to 30 percent slopes, covers the entire proposed project area.

Strych soils are “very deep” (greater than 60 inches to bedrock), well drained, moderately permeable soils that formed in mixed alluvium and colluvium derived from sandstone, shale and conglomerate (NRCS 2011). They contain 35 to 75 percent rock fragments and have clay content ranging from 8 to 17 percent. They have an aridic moisture regime that borders on ustic. Strych soil profiles have cambic and calcic horizons.

The Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (NRCS 2007) rates the potential of using Strych soils in map unit BMD for impoundments as “Very Limited.” The primary limiting features are listed as slope and seepage.

Emery Area soil map units closely adjacent to the proposed project area include:

- C 37 Zigzag-Yatne-Badland complex, 25 to 70 percent slopes
- C113 Yatne very stony loam, 3 to 20 percent slopes
- NGG2 Gerst-Strych-Badland complex, 30 to 70 percent slopes

Gerst soils are shallow to weathered shale (NRCS 2011).

Yatne soils are similar to Strych soils but they have an ustic moisture regime that borders on aridic and contain 18 to 27 percent clay (NRCS 2011).

Zigzag soils are moderately deep to weathered shale and contain greater than 35 percent rock fragments (NRCS 2011).

### Soil Survey Methods

This soil survey was conducted by traversing the proposed project area. Representative soil profile descriptions were collected using the protocols outlined in the *Field Book for Describing and Sampling Soils* (Schoeneberger et. al., 2002). Three soil profiles were dug with a backhoe at the general locations where drying ponds may be constructed. Profile descriptions collected by Robert Long, Certified Professional Soil Scientist (ARPACS certification number 02346) are in appendix A. Field data sheets for the soil profiles are in appendix B.

Rock fragments were visually estimated during examination of the soil profiles. Estimated values are on a percent by weight basis.

Samples were collected from horizons in the three soil profiles and submitted for laboratory analysis. Table 2 lists the soil properties that were analyzed.

Table 2. Soil analysis parameters for topsoil and overburden (Utah DOGM, 2005).

Topsoil Suitability Parameters	
Paste pH	Available Phosphorus
Saturation percent	Particle Size Analysis (% very fine sand, sand, silt, and clay)
Electrical Conductivity (ECe)	Organic Matter Percent
Soluble Na, K, Mg, and Ca	CaCO <sub>3</sub> Percent
Sodium Adsorption Ratio	Extractable Potassium

Results of the laboratory analysis are contained in appendix E.

Suitability of the soil material for use as topsoil was determined using the evaluation parameters established by the Utah Division of Oil, Gas and Mining in *Guidelines for Management of Topsoil and Overburden* (Utah DOGM, 2005), Table 3.

Table 3. Soil suitability and unsuitability criteria (Utah DOGM, 2005).

Criteria	Good	Fair	Poor	
Saturation %	25 to 55	≥56 to 80	<25 or >80	
pH	6.5 to 8.2	6.0 to 6.4	5.5 to 6.0	<5.5
		8.2 to 8.5	8.6 to 9.0	>9.0
EC (mS/cm 25°C)	0 to 4	4 to 8	8 to 15	>15
SAR	0 to 4	5 to 10	10 to 14	>14
CaCO <sub>3</sub> %	<15	15 to 30	>30	
Texture	sl, l, sil, scl, vfsl, fsl	cl, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
Total Organic Carbon	<10%			≤10%
Available Water Capacity (in/in)	>0.10 moderate	0.05 to 0.10 low	<0.05 very low	
K factor	<0.37	0.37	>0.37	

### Soil Profiles

Locations of the three soil profiles examined, described, and sampled are shown in figure 2. The classification of each soil profile was determined using the *Keys to Soil Taxonomy, Eleventh Edition* (NRCS, 2010). Table 4 contains the taxonomic classification of the soil profiles.

Table 4. Taxonomic classification of soil profiles examined in the Crandall Ponds project area.

Soil Profile	Series	Taxonomic Classification
11UTCRO1	Strych	Ustic Haplocalcid, loamy-skeletal, mixed, superactive, mesic
11UTCRO2	Strych	Ustic Haplocalcid, loamy-skeletal, mixed, superactive, mesic
11UTCRO3	Strych Taxadjunct	Ustic Haplocalcid, loamy-skeletal, carbonatic, superactive, mesic

Soil profiles 11UTCRO1 and 11UTCRO2 fit within the range of characteristics for the Strych series. Profile 11UTCRO3 is similar to the Strych series except for the carbonates in the control section (weighted average 48 percent), which is high enough to make the mineralogy class carbonatic.

There is a significant amount of rock fragments ranging from gravels to boulders at each of the soil profile locations. The average amount and size of rock fragments was evaluated by conducting a twenty pace transect near each of the soil profile locations. The average amount

of rock fragments from the three transects was 12 percent gravels, 7 percent cobbles, 4 percent stones, and 24 percent boulders. The boulders ranged in size from two feet to ten feet or greater.

Soil profile descriptions are in appendix A and the field description sheets are in appendix B. Photos of the soil profile boxes are in appendix C. Photos of the soil profiles and project area are in appendix D.

### **Order 2 Soil Survey Map Units**

Since the proposed project area is small and the soils appeared uniform, no special soil map units were set up for this investigation. NRCS soil map unit BMD, Strych very stony very fine sandy loam, 3 to 30 percent slopes, is representative of soils in the project area.

### **Laboratory Analysis**

Results of the laboratory analysis of soil samples from the three soil profiles in the proposed project area are in appendix E. None of the test results were in the "Unacceptable" category based on the *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005).

Soil pH was in the "Poor" category (8.6 to 9.0) for 9 of the 20 soil horizons, based on the *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005). These elevated pH values are primarily the result of "Poor" calcium carbonate levels.

SAR values were in the "Fair" category (5 to 10) for four of the soil horizons, based on the *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005). These soil horizons are at the bottom of the soil profiles at depths of 120 to 170 cm (below 47 to 67 inches). This material should not be salvaged for use as topsoil, but will be suitable for use as subsoil.

Soil textures are generally sandy loam, sandy clay loam, and loam. The texture in one horizon near the bottom of 11UTCRO3 (140 to 170 cm) is loamy sand which is in the "Fair" category, based on the *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005).

Calcium carbonate percentages are in either the "Fair" or "Poor" category for all of the soil horizons, based on the *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005). These values can be expected for soils classified as Haplocalcids in soil taxonomy. Soils with elevated calcium carbonate levels can be limiting to soil reclamation, but successful revegetation can be achieved by limiting topsoil to materials with lower calcium carbonate values and using seed mixtures with native species that are adapted to calcareous soils.

Available Water Capacity (AWC) was calculated for each soil horizon using an empirical equation using laboratory data for sand, silt, clay, organic matter, electrical conductivity, and estimated rock fragments (Saxton and Willey, 2011). Calculated AWC values ranged from 0.02 to 0.10 inches of water per inch of soil. These values were all in the "Fair" category, except for

11UTCRO3 (140 to 170 cm) which was "Poor." The calculated 0.02 value for 11UTCRO3 (140 to 170 cm) corresponds with the loamy sand soil texture and an estimated 70 percent rock fragments. The calculated AWC values are in appendix E.

Soil K factors were calculated using the nomograph outlined in *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005). This method uses laboratory values for percent silt, sand, very fine sand, and organic matter along with values for soil structure and permeability to derive the soil erodibility (K) factor. All of the calculated K factors were in the "Good" category (less than 0.37) based on the *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005). The calculated K factors are in appendix E.

### **Topsoil Salvage**

The main limiting soil features in the proposed Crandall Ponds project area are calcareous soils and large amounts of rock fragments.

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.

Highly calcareous soils (calcium carbonate percent greater than 30) will be limiting to revegetation success, so it is recommended that these materials not be included with the salvaged topsoil, as much as possible.

It is recommended that an average 30 cm (1 foot) be salvaged for use as topsoil during the reclamation process. This depth is based on the depth of "Good" soil pH. The estimated salvage depth will vary across the project area and should be monitored to limit the amount of large stones, boulders, and highly calcareous soil that is incorporated into the topsoil stockpile.

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**Appendix A**

**Soil Profile Descriptions**

**PEDON 11UTCR01 DESCRIPTION**

**Pedon ID:** 11UTCR01  
**Description Date:** 5/4/2011 12:23:26 PM  
**Describer:** Robert Long

**Site Notes:** 1. Climate estimates based on vegetation are informational purposes. 2. Pinyon pine and Utah juniper were removed from area about 30 to 40 years ago. Both species have re-established with heights of 6 to 12 feet.

**Pedon Notes:** Soil classification was completed using eleventh edition of Keys to Soil Taxonomy.

**Soil Name As Described/Sampled:** Strych

**Soil Name As Correlated:** Strych

**Classification:** Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids

**Pedon Type:** Within range of series

**Pedon Purpose:** Full pedon description

**Taxon Kind:** Series

**SSURGO MU:** BMD

**MLRA:** 34B - Warm Central Desertic Basins and Plateaus

**County or Parish:** UT015 - Emery

**State or Territory:** UT - Utah

**7.5' Quad:** 39111-D1 - Hiawatha, Utah

**Lat/Long:** 39°22'37" north, 111°3'2" west

**UTM:** 495651.12E, 4358611.98N -- Datum NAD83, Zone 12

**Legal Description:** Lot 6 of Section 5, Township 17 South, Range 8 East of the Salt Lake Meridian

**Landscape:** tableland

**Landform:** alluvial fan and pediment

**Geomorphic Component:** Tread

**Profile Pos:** Backslope

**Slope:** 4 percent

**Elevation:** 1971 meters (6466.5 feet)

**Aspect:** 224°

**Shape: up/down:** Convex; **across:** Linear

**Complexity:** Simple

**Flooding:** None

**Ponding:** None

**Drainage:** Well drained

**Runoff:** Low  
**Permeability:** Moderate  
**Erosion:** Class 2

**Primary Earth Cover:** Tree cover; **Secondary Earth Cover:** Native shrubs  
**Existing Vegetation:** PIED - twoneedle pinyon (*Pinus edulis*); JUOS - Utah juniper (*Juniperus osteosperma*); ATCA2 - fourwing saltbush (*Atriplex canescens*); LESAS - Salina wildrye (*Leymus salinus ssp. salinus*); AGCR - crested wheatgrass (*Agropyron cristatum*); YUCCA - yucca (*Yucca*); CHRYS9 - rabbitbrush (*Chrysothamnus*)

**Parent Materials:** moderately weathered, gravelly alluvium derived from calcareous sandstone over loamy alluvium derived from calcareous shale

**Particle Size Control Section:** 25 to 100 centimeters (9.8 to 39.4 inches)  
**Diagnostic Features:** Cambic horizon: 12 to 26 centimeters (4.7 to 10.2 inches) and Calcic horizon: 26 to 212 centimeters (10.2 to 83.5 inches)

Slope	Elevation	Aspect	MAAT	MSAT	MWAT	MAP	Frost-Free Days	Drainage Class	Slope Length	Upslope Length
4 percent	1971 meters (6466.5 feet)	224°	8.4° C (47° F)			254 millimeters (10 inches)	125 days	well		

**A ---** 0 to 12 centimeters (0 to 4.7 inches); pale brown (10YR 6/3) dry, very cobbly sandy loam; brown (10YR 5/3) moist; 53 percent sand; 29 percent silt; 18 percent clay; weak medium subangular blocky parting to moderate fine granular structure; very friable, slightly hard, slightly sticky, slightly plastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and many very fine roots throughout; common very fine interstitial pores; 5 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.35 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.16; strongly effervescent by HCl, 1 normal; pH meter, saturated paste pH method; clear smooth boundary; CaCO<sub>3</sub> 34 Percent.

**Bw ---** 12 to 26 centimeters (4.7 to 10.2 inches); pale brown (10YR 6/3) dry, very cobbly sandy loam; brown (10YR 5/3) moist; 53 percent sand; 29 percent silt; 18 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; friable, hard, slightly sticky, slightly plastic; common coarse roots throughout, common

medium roots throughout, common fine roots throughout and many very fine roots throughout; common very fine interstitial and common very fine tubular pores; 30 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.35 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.24; strongly effervescent by HCl, 1 normal; pH meter, saturated paste pH method; clear smooth boundary; CaCO<sub>3</sub> (33.1 Percent).

**Bk1** --- 26 to 50 centimeters (10.2 to 19.7 inches); pale yellow (2.5Y 7/3) dry, very cobbly sandy loam; brown (10YR 5/3) moist; 60 percent sand; 28 percent silt; 12 percent clay; moderate medium subangular blocky structure; friable, hard, slightly sticky, slightly plastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and many very fine roots throughout; common very fine interstitial and common very fine tubular pores; 3 percent (common) fine spherical masses of carbonate in matrix and 3 percent (common) fine carbonate concretions on bottom of rock fragments; 2 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.32 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.28; strongly effervescent by HCl, 1 normal; pH meter, saturated paste pH method; clear wavy boundary; CaCO<sub>3</sub> 28.9 Percent.

**Bk2** --- 50 to 94 centimeters (19.7 to 37 inches); very pale brown (10YR 7/3) dry, extremely stony sandy loam; yellowish brown (10YR 5/4) moist; 64 percent sand; 24 percent silt; 12 percent clay; moderate fine subangular blocky structure; very friable, hard, slightly sticky, slightly plastic; common fine roots throughout and common very fine roots throughout; common very fine interstitial pores; 3 percent (common) fine spherical masses of carbonate in matrix and 3 percent (common) fine carbonate concretions on bottom of rock fragments; 8 percent nonflat subrounded strongly cemented 600 to 2000 millimeters (24 to 79 inches) calcareous sandstone fragments, 16 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 20 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.38 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.39; strongly effervescent by HCl, 1 normal; pH meter, saturated paste pH method; violent effervescence on concretions in matrix; clear wavy boundary; CaCO<sub>3</sub> 31.9 Percent.

**2Bk1** --- 94 to 120 centimeters (37 to 47.2 inches); very pale brown (10YR 7/4) dry, gravelly sandy clay loam; light yellowish brown (10YR 6/4) moist; 58 percent sand; 21 percent silt; 21 percent clay; moderate medium subangular blocky and moderate fine

subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; common very fine interstitial pores; 5 percent (common) medium spherical masses of carbonate in matrix and 5 percent (common) fine carbonate concretions on bottom of rock fragments; 20 percent nonflat subangular strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 1.07 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 4.3; violently effervescent by HCl, 1 normal; pH meter, saturated paste pH method; gradual smooth boundary; CaCO<sub>3</sub> 22.1 Percent.

**2Bk2** --- 120 to 165 centimeters (47.2 to 65 inches); pale yellow (2.5Y 8/2) dry, gravelly loam; pale brown (10YR 6/3) moist; 51 percent sand; 28 percent silt; 21 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; common very fine interstitial pores; 10 percent (common) medium spherical masses of carbonate in matrix and 5 percent (common) fine carbonate concretions on bottom of rock fragments; 15 percent nonflat subangular strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 2.44 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 8.52; violently effervescent by HCl, 1 normal; pH meter, saturated paste pH method; clear smooth boundary; CaCO<sub>3</sub> 36.4 Percent.

**2Bk3** --- 165 to 216 centimeters (65 to 85 inches); very pale brown (10YR 7/3) dry, gravelly sandy loam; brown (10YR 5/3) moist; 56 percent sand; 26 percent silt; 18 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; common very fine interstitial pores; 12 percent (common) medium spherical masses of carbonate in matrix and 5 percent (common) fine carbonate concretions on bottom of rock fragments; 15 percent nonflat subangular strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 2.74 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 8.56; violently effervescent by HCl, 1 normal; pH meter, saturated paste pH method; CaCO<sub>3</sub> 33.1 Percent.

**PEDON 11UTCR02 DESCRIPTION**

**Pedon ID:** 11UTCR02  
**Description Date:** 5/4/2011 12:55:24 PM  
**Describer:** Robert Long

**Site Notes:** 1. Climate estimates based on vegetation are informational purposes.  
2. Pinyon pine and Utah juniper were removed 30 to 40 years ago. Both Species have become re-established with heights of 6 to 12 feet.

**Pedon Notes:** Soil classification accomplished by using Keys to Soil Taxonomy, eleventh edition.

**Soil Name As Described/Sampled:** Strych  
**Soil Name As Correlated:** Strych  
**Classification:** Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids  
**Pedon Type:** Within range of series  
**Pedon Purpose:** Full pedon description  
**Taxon Kind:** Series

**SSURGO MU:** BMD  
**MLRA:** 34B - Warm Central Desertic Basins and Plateaus  
**County or Parish:** UT015 - Emery  
**State or Territory:** UT - Utah  
**7.5' Quad:** 39111-D1 - Hiawatha, Utah

**Lat/Long:** 39°22'35" north, 111°3'0" west  
**UTM:** 495693.62E, 4358536.13N -- Datum NAD83, Zone 12  
**Legal Description:** Lot 6 of Section 5, Township 17 South, Range 8 East of the Salt Lake Meridian

**Landscape:** tableland  
**Landform:** alluvial fan and pediment  
**Geomorphic Component:** Tread  
**Profile Pos:** Backslope  
**Slope:** 3 percent  
**Elevation:** 1968 meters (6456.7 feet)  
**Aspect:** 153°

**Shape: up/down:** Linear; **across:** Convex  
**Complexity:** Simple

**Flooding:** None  
**Ponding:** None  
**Drainage:** Well drained  
**Runoff:** Medium  
**Permeability:** Moderate  
**Erosion:** Class 2

**Primary Earth Cover:** Tree cover; **Secondary Earth Cover:** Other shrub cover  
**Existing Vegetation:** PIED - twoneedle pinyon (*Pinus edulis*); JUOS - Utah juniper (*Juniperus osteosperma*); ATCA2 - fourwing saltbush (*Atriplex canescens*); LESAS - Salina wildrye (*Leymus salinus ssp. salinus*); OPUNT - pricklypear (*Opuntia*)

**Parent Materials:** alluvium derived from calcareous sandstone and/or alluvium derived from calcareous shale

**Particle Size Control Section:** 25 to 100 centimeters (9.8 to 39.4 inches)  
**Diagnostic Features:** Calcic horizon: 10 to 90 centimeters (3.9 to 35.4 inches)

Slope	Elevation	Aspect	MAAT	MSAT	MWAT	MAP	Frost-Free Days	Drainage Class	Slope Length	Upslope Length
3 percent	1968 meters (6456.7 feet)	153°	8.4° C (47° F)			254 millimeters (10 inches)	125 days	well		

**A** --- 0 to 10 centimeters (0 to 3.9 inches); pale brown (10YR 6/3) dry, very cobbly sandy loam; yellowish brown (10YR 5/4) moist; 66 percent sand; 16 percent silt; 18 percent clay; moderate medium subangular blocky parting to moderate fine granular structure; very friable, slightly hard, slightly sticky, slightly plastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and many very fine roots throughout; common very fine interstitial and common very fine tubular pores; 5 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 20 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) unspecified fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) unspecified fragments; electrical conductivity of 0.48 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.39; slightly effervescent by HCl, 1 normal; moderately alkaline, pH 8.1, pH meter, saturated paste; clear smooth boundary; CaCO<sub>3</sub> 27 Percent.

**Bk1** --- 10 to 30 centimeters (3.9 to 11.8 inches); pale brown (10YR 6/3) dry, very cobbly sandy clay loam; brown (10YR 5/3) moist; 53 percent sand; 27 percent silt; 20

percent clay; moderate medium subangular blocky structure; very friable, slightly hard, slightly sticky, slightly plastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and many very fine roots throughout; common fine tubular pores; 2 percent (common) fine spherical masses of carbonate in matrix and 1 percent (few) fine carbonate concretions on bottom of rock fragments; 5 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.44 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.18; strongly effervescent by HCl, 1 normal; moderately alkaline, pH 7.9, pH meter, saturated paste; clear wavy boundary; CaCO<sub>3</sub> 41.1 Percent.

**Bk2** --- 30 to 54 centimeters (11.8 to 21.3 inches); very pale brown (10YR 7/3) dry, very cobbly sandy loam; brown (10YR 5/3) moist; 56 percent sand; 26 percent silt; 18 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; friable, hard, slightly sticky, slightly plastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and common very fine roots throughout; common very fine tubular pores; 8 percent (common) fine spherical masses of carbonate in matrix and 2 percent (common) fine carbonate concretions on bottom of rock fragments; 5 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.34 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.18; strongly effervescent by HCl, 1 normal; moderately alkaline, pH 8.2, pH meter, saturated paste; gradual smooth boundary; CaCO<sub>3</sub> 40.7 Percent.

**Bk3** --- 54 to 90 centimeters (21.3 to 35.4 inches); pale brown (10YR 6/3) dry, very gravelly sandy loam; yellowish brown (10YR 5/4) moist; 74 percent sand; 19 percent silt; 7 percent clay; moderate medium subangular blocky structure; friable, hard, nonsticky, nonplastic; common fine roots throughout and common very fine roots throughout; common very fine tubular pores; 6 percent (common) fine spherical masses of carbonate in matrix and 2 percent (common) fine carbonate concretions on bottom of rock fragments; 5 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.35 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 0.27; violently effervescent by HCl, 1 normal; strongly alkaline, pH 8.5, pH meter, saturated paste; gradual smooth boundary; CaCO<sub>3</sub> 34.8 Percent.

**2Bk** --- 90 to 130 centimeters (35.4 to 51.2 inches); very pale brown (10YR 7/3) dry, gravelly sandy loam; brown (10YR 5/3) moist; 64 percent sand; 22 percent silt; 14 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; 10 percent (common) medium spherical masses of carbonate in matrix and 4 percent (common) fine carbonate concretions around rock fragments; 5 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 10 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 0.39 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 1.09; violently effervescent by HCl, 1 normal; strongly alkaline, pH 8.7, pH meter, saturated paste; gradual smooth boundary; CaCO<sub>3</sub> 17 Percent.

**3Bk** --- 130 to 185 centimeters (51.2 to 72.8 inches); very pale brown (10YR 8/2) dry, extremely bouldery sandy loam; brown (10YR 5/3) moist; 54 percent sand; 27 percent silt; 19 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; 10 percent (common) medium spherical masses of carbonate in matrix and 12 percent (common) medium carbonate concretions around rock fragments; 25 percent nonflat subrounded strongly cemented 600 to 1200 millimeters (24 to 47 inches) calcareous sandstone fragments, 25 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 10 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 10 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; electrical conductivity of 1.34 mmhos/cm by EC meter, saturated paste; sodium absorption ratio of 7.82; violently effervescent by HCl, 1 normal; strongly alkaline, pH 8.8, pH meter, saturated paste; CaCO<sub>3</sub> 38.4 Percent.

**PEDON 11UTCRO3 DESCRIPTION**

**Pedon ID:** 11UTCRO3  
**Description Date:** 5/4/2011 2:15:43 PM  
**Describer:** Robert Long

**Site Notes:** 1. Climate estimates based on vegetation are informational purposes.  
2. Pinyon pine and Utah juniper were removed from site 30 to 40 years ago. Both species have become re-established with heights of 6 to 10 feet.

**Soil Name As Described/Sampled:** Strych  
**Soil Name As Correlated:** Strych  
**Classification:** Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids  
**Pedon Type:** Within range of series  
**Pedon Purpose:** Full pedon description  
**Taxon Kind:** Series

**SSURGO MU:** BMD  
**MLRA:** 34B - Warm Central Desertic Basins and Plateaus  
**County or Parish:** UT015 - Emery  
**State or Territory:** UT - Utah  
**7.5' Quad:** 39111-D1 - Hiawatha, Utah

**Lat/Long:** 39°22'37" north, 111°3'4" west  
**UTM:** 495594.74E, 4358599N -- Datum NAD83, Zone 12  
**Location Description:** Pinyon juniper and Utah juniper were removed from the site about 30 years. Both species have become re-established with heights of 6 to 10 feet.  
**Legal Description:** Lot 6 of Section 5, Township 17 South, Range 8 East of the Salt Lake Meridian

**Landscape:** tableland  
**Landform:** alluvial fan and pediment  
**Geomorphic Component:** Tread  
**Profile Pos:** Backslope  
**Slope:** 5 percent  
**Elevation:** 1973 meters (6473.1 feet)  
**Aspect:** 182°

**Shape: up/down:** Linear; **across:** Convex  
**Complexity:** Simple  
**Flooding:** None  
**Ponding:** None

**Drainage:** Well drained  
**Runoff:** Low  
**Permeability:** Moderate  
**Erosion:** Class 1 - Sheet erosion

**Primary Earth Cover: ; Secondary Earth Cover:**

**Existing Vegetation:** PIED - twoneedle pinyon (*Pinus edulis*); JUOS - Utah juniper (*Juniperus osteosperma*); EPVI - Mormon tea (*Ephedra viridis*); ATCA2 - fourwing saltbush (*Atriplex canescens*); LESAS - Salina wildrye (*Leymus salinus ssp. salinus*); POA - bluegrass (*Poa*); OPUNT - pricklypear (*Opuntia*)

**Parent Materials:** slightly weathered, colluvium derived from calcareous sandstone

**Particle Size Control Section:** 25 to 100 centimeters (9.8 to 39.4 inches)

**Diagnostic Features:** Calcic horizon: 28 to 214 centimeters (11 to 84.3 inches)

Slope	Elevation	Aspect	MAAT	MSAT	MWAT	MAP	Frost-Free Days	Drainage Class	Slope Length	Upslope Length
5 percent	1973 meters (6473.1 feet)	182°	8.4° C (47° F)			254 millimeters (10 inches)	125 days	well		

**A** --- 0 to 10 centimeters (0 to 3.9 inches); light brown (7.5YR 6/4) dry, gravelly sandy loam; brown (7.5YR 5/4) moist; 70 percent sand; 18 percent silt; 12 percent clay; weak medium subangular blocky parting to moderate fine granular structure; very friable, slightly hard, slightly sticky, slightly plastic; common medium roots throughout, common fine roots throughout and common very fine roots throughout; common very fine interstitial and common very fine tubular pores; 5 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 0.22; strongly effervescent by HCl, 1 normal; moderately alkaline, pH 8, pH meter, saturated paste; clear smooth boundary; CaCO<sub>3</sub> 26.3 Percent.

**Bk1** --- 10 to 28 centimeters (3.9 to 11 inches); light brown (7.5YR 6/3) dry, very cobbly sandy loam; brown (7.5YR 5/3) moist; 66 percent sand; 21 percent silt; 13 percent clay; moderate medium subangular blocky structure; very friable, slightly hard, slightly sticky, slightly plastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and many very fine roots throughout; common very fine tubular pores; 3 percent (common) fine spherical masses of carbonate in matrix; 5 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subrounded strongly cemented 76

to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 0.25; strongly effervescent by HCl, 1 normal; slightly alkaline, pH 7.8, pH meter, saturated paste; clear smooth boundary; CaCO<sub>3</sub> 54.2 Percent.

**Bk2** --- 28 to 60 centimeters (11 to 23.6 inches); pinkish gray (7.5YR 7/2) dry, very stony sandy loam; light brown (7.5YR 6/3) moist; 64 percent sand; 22 percent silt; 14 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; friable, hard, slightly sticky, slightly plastic; common medium roots throughout, common fine roots throughout and common very fine roots throughout; common very fine tubular pores; 10 percent (common) medium spherical masses of carbonate in matrix and 5 percent (common) fine carbonate concretions around rock fragments; 10 percent nonflat subrounded strongly cemented 600 to 2000 millimeters (24 to 79 inches) calcareous sandstone fragments, 15 percent nonflat subangular strongly cemented 250 to 600 millimeters (10 to 24 inches) calcareous sandstone fragments, 15 percent nonflat subangular strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 20 percent nonflat subangular strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 0.29; violently effervescent by HCl, 1 normal; moderately alkaline, pH 8, pH meter, saturated paste; gradual wavy boundary; CaCO<sub>3</sub> 55.2 Percent.

**Bk3** --- 60 to 110 centimeters (23.6 to 43.3 inches); very pale brown (10YR 8/2) dry, extremely stony sandy loam; pale brown (10YR 6/3) moist; 63 percent sand; 36 percent silt; 11 percent clay; moderate fine subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; 10 percent (common) medium spherical masses of carbonate in matrix and 4 percent (common) fine carbonate concretions around rock fragments; 15 percent nonflat subrounded strongly cemented 600 to 2000 millimeters (24 to 79 inches) unspecified fragments, 25 percent nonflat subrounded strongly cemented 250 to 600 millimeters (10 to 24 inches) unspecified fragments, 15 percent subangular strongly cemented 76 to 250 millimeters (3 to 10 inches) unspecified fragments and 20 percent nonflat subangular strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 1.37; violently effervescent by HCl, 1 normal; moderately alkaline, pH 8.4, pH meter, saturated paste; gradual wavy boundary; CaCO<sub>3</sub> 42.3 Percent.

**2Bk** --- 110 to 140 centimeters (43.3 to 55.1 inches); pale yellow (2.5Y 7/3) dry, extremely cobbly sandy loam; brown (10YR 5/3) moist; 60 percent sand; 25 percent silt; 15 percent clay; moderate medium subangular blocky structure; friable, very hard, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; 10 percent (common) medium spherical masses of carbonate in matrix and 5 percent (common) fine carbonate concretions around rock fragments; 10 percent flat subangular strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments, 25 percent nonflat subrounded strongly cemented 76 to 250

millimeters (3 to 10 inches) calcareous sandstone fragments, 30 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments and 10 percent flat angular 150 to 380 millimeters (6 to 15 inches) unspecified fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 3.78; violently effervescent by HCl, 1 normal; strongly alkaline, pH 8.6, pH meter, saturated paste; gradual wavy boundary; CaCO<sub>3</sub> 42.5 Percent.

**3Bk** --- 140 to 170 centimeters (55.1 to 66.9 inches); very pale brown (10YR 7/3) dry, extremely cobbly loamy sand; yellowish brown (10YR 5/4) moist; 85 percent sand; 8 percent silt; 7 percent clay; single grain; loose, loose, nonsticky, nonplastic; common very fine interstitial pores; 5 percent (common) fine spherical masses of carbonate in matrix and 10 percent (common) medium carbonate concretions on bottom of rock fragments; 5 percent nonflat subrounded strongly cemented 76 to 250 millimeters (3 to 10 inches) calcareous sandstone fragments and 10 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 4.71; violently effervescent by HCl, 1 normal; strongly alkaline, pH 8.7, pH meter, saturated paste; clear smooth boundary; CaCO<sub>3</sub> 28.4 Percent.

**4Bk** --- 170 to 214 centimeters (66.9 to 84.3 inches); pale yellow (2.5Y 7/4) dry, sandy loam; yellowish brown (10YR 5/4) moist; 70 percent sand; 18 percent silt; 12 percent clay; moderate medium subangular blocky structure; friable, hard, slightly sticky, slightly plastic; common very fine interstitial pores; 2 percent (common) fine spherical masses of carbonate in matrix; 5 percent nonflat subrounded strongly cemented 2 to 76 millimeters (0.1 to 3 inches) calcareous sandstone fragments; EC meter, saturated paste electric conductivity method; sodium absorption ratio of 8.9; violently effervescent by HCl, 1 normal; strongly alkaline, pH 8.6, pH meter, saturated paste; CaCO<sub>3</sub> 30.8 Percent.

**Appendix B**

**Field Data Sheets**

**USDA** **USDA-NRCS** **PEDON DESCRIPTION FORM** **MO6, LAKEWOOD, CO** **USDA**  
 Draft 5/97

Series or Comp Name: \_\_\_\_\_ Date: 5-4-2011 State: UT County: Emery SSA: \_\_\_\_\_ Unit: BMD MLRA: 34B  
 MU Sym: \_\_\_\_\_ Pedon Type: Backhoe Pit Lab #: 11UTCRO1 Photo #: \_\_\_\_\_ Land Use: Range  
 Surface Frag %: CR: 15 CB: 5 ST: 2 BD: 25 CN: \_\_\_\_\_ FL: \_\_\_\_\_ Permeability: Ksat: mod Drainage: well Elevation: 6968  
 Major Landform: \_\_\_\_\_ Local Landform: Alluvial Fan Moisture Regime: Aridic Percent Slope: 4 (3-10%) Aspect: 225  
 Up Shape: convex Across Shape: smooth Geomorphic: \_\_\_\_\_ Hillslope: 25  
 Erosion: Knd: water Deg: 2 Runoff: med Classification: Ustic Haplocalcid  
 Location: \_\_\_\_\_ Latitude: \_\_\_\_\_ N UTM: Zone: mE: mN: 13/495650/4350613  
 Parent Material/Bedrock: colluvium Diagnostic: cambic 12-26 cm calcic 26-212 cm Describer(s): R Long  
 Moisture depth(s): \_\_\_\_\_ Control Section Ave: Clay %: 17.8 Rock Frag %: 48 Precipitation: 9-12 Temperature @ 50 cm: \_\_\_\_\_

**VEGETATION:**

SYMBOL	COMMON NAME	% GD COVER
	Pinon Pine	
	Utah Juniper	
	Shrubby Saltgrass	
	Saline wildrye	
	cracked willow	
	Yucca	
	Basswood	

**NOTES:**

Area was cleared 30-40 years ago. Pinon Juniper regularly is 6-10' height.

Depth cm	Horizon	Matrix Color		Texture	Structure	Rupture Resist				Mottles % Sz Con Col Shp Loc	Ped Surface Features Knd % Con Dst Loc Col Mst	Effer
		Dry	Moist			Dry	Mst	Stk	Pis			
0-12	A	10YR 6/3	10YR 5/7	CBV L	1 m sbr 2-3	3h	vfa	55	5P	---	---	ST
12-26	Bw	10YR 6/3	10YR 5/3	CBV SCL	2.5 m sbr	h	fv	55	5P	---	---	ST
26-50	Bk1	2.5Y 7/3	10YR 5/3	CBV SCL	2 m sbr	h	fv	55	5P	---	---	ST
50-94	Bk2	10YR 7/3	10YR 5/3	STK SCL	2.5 sbr	h	fv	55	5P	---	---	ST/NE
94-120	ZBK1	10YR 7/4	10YR 6/1	GR SCL	2.5 m sbr	vh	fv	55	5P	---	---	VE
120-165	ZBK2	2.5Y 8/2	10YR 6/3	GR SCL	2.5 m sbr	vh	fv	55	5P	---	---	VE
165-216	ZBK3	10YR 7/3	10YR 5/3	GR SCL	2.5 m sbr	h	fv	55	5P	---	---	VE

Roots Qty Sz Loc	Pores Shp Qty Sz	Concentrations Knd % shp Sz Loc Col	Rock Frag Knd % Rnd Sz	Wet	pH	Clay %	OCE	Bnd	Notes (e.g. Diagnostic)
4vf T 2.5 2m LC	IR 4.5	---	55 GR 20 ST 5 CB 15	M	---	22	---	CS	
6vf T 4.5 3m LC	IR 4.5	---	55 GR 20 ST 5 CB 15 BD	M	---	24	---	CS	
5vf T 2m	2R 4.5 7.1 v	CAC 3.5 BRF SAC 3.5 3p	55 GR 20 ST 2 CB 15	SM	---	22	---	CW	
2vf T	IR 3.5	CAC 3.5 BRF CAM 3.5 10mm	55 GR 20 ST 10 CB 20 BD 8	SM	---	20	---	CW	
2vf T	IR 3.5	CAC 3.5 BRF CAM 3.5 H 2mm	55 GR 20	DRY	---	23	---	9.5	
1vf T	IR 3.5	CAC 3.5 BRF fine CAM 10 1.5mm	55 GR 15	DRY	---	23	---	CS	
1vf Tot	IR 2.5	CAC 5 BRF fine CAM 12 M 5p	55 GR 15	---	---	---	---	---	

**USDA** **USDA-NRCS** **PEDON DESCRIPTION FORM** **MO6, LAKEWOOD, CO** **USD**  
 Draft 5/97

Series or Comp Name: \_\_\_\_\_ Date: 5-4-2011 State: \_\_\_\_\_ County: *El Paso* SSA: \_\_\_\_\_ Unit: \_\_\_\_\_ MLRA: 31B

MU Sym: \_\_\_\_\_ Pedon Type: *Backhoe Pit* Lab #: \_\_\_\_\_ Photo #: \_\_\_\_\_ Land Use: *Range*

Surface Frag %: GR: *12* CB: *10* ST: *5* BD: *20* CN: \_\_\_\_\_ FL: \_\_\_\_\_ Permeability: \_\_\_\_\_ Drainage: *Upr* Elevation: *6956*

Major Landform: *Fediment* Local Landform: *Alluvial fan* Moisture Regime: *Aridic* Percent Slope: *3* Aspect: *159*

Up Shape: *Smooth* Across Shape: *Convex* Geomorphic: *TR* Hillslope: *BS*

Erosion: Knd: *Water* Deg: *2* Runoff: *Med* Classification: *Ustic Mollisol*  
*Lo-shel. mix, super. mesic*

Location: Sec. T. R. Latitude: \_\_\_\_\_ N Longitude: \_\_\_\_\_ W UTM: Zone: \_\_\_\_\_ mE: \_\_\_\_\_ mN: *12/495693/4359537*

Parent Material/Bedrock: *colluvium* Diagnostic: *calcic 10-10* Descriptor(s): *R 6000*

Moisture depth(s): \_\_\_\_\_ Control Section Ave: Clay %: \_\_\_\_\_ Rock Frag %: *35.7* Precipitation: *9-12"* Temperature @ 50 cm: \_\_\_\_\_

**VEGETATION:**

SYMBOL	COMMON NAME	% GD COVER
	<i>Bryson Pine</i>	
	<i>Utah Juniper</i>	
	<i>Fourwing saltbush</i>	
	<i>Salina wild rose</i>	
	<i>Prickly Pear</i>	

**NOTES:**

*Salvage 0-30cm*

Appendix B - Crandall Ponds Project

Depth cm	Horizon	Matrix Color		Texture	Structure	Rupture Resist				Mottles % Sz Con Col Shp Loc	Ped Surface Features Knd % Con Dst Loc Col Mst			Effc
		Dry	Moist			Dry	Mst	Stk	Pis					
0-10	A	10YR 6/3	10YR 5/4	CBV SCL	2m sbk 2fgv	sh	vf	ss	sp	—	—	—	—	SL
10-30	BK1	10YR 6/3	10YR 5/3	CBV L	2m sbk	sh	vf	ss	sp	—	—	—	—	ST
30-51	BK2	10YR 7/3	10YR 5/3	CBV SCL	2.5m sbk	h	fr	ss	sp	—	—	—	—	ST
51-55	BK3	10YR 6/3	10YR 5/3	GRV SL	2w sbk	h	fr	so	pd	—	—	—	—	VE
55-130	2BK	10YR 7/3	10YR 5/3	GR SCL	2fm sbk	vh	fr	ss	sp	—	—	—	—	VE
130-135	3BK	10YR 8/2	10YR 5/3	BDX SCL	2fm sbk	vh	fr	ss	sp	—	—	—	—	VE

Roots Qty Sz Loc	Pores Shp Qty Sz	Concentrations Knd % shp Sz Loc Col	Rock Frag Knd % R nd Sz	Wet	pH	Clay %	OCE	Bnd	Notes (e.g., Diagnostic)
7VF 2m T 3F 1c	IR 4VF TR 2VF	—	55GR0573 CB 20	M		22		CS	
5VF 2m T 3F 1c	T 2VF	CAC 1 F BRF CAM 2 F sph	55GR0575 CB 15	SM		24		GW	
1VF 1m T 1F 1c	T 3VF	CAC 2 F BRF CAM 4 F sph	55GR0575 CB 15	SM		24		GW	
1VF T	T 2VF	CAC 2 F BRF CAM 6 F sph	55GR0575 CB 15	SM		16		GS	
2VF T	T 1VF	CAC 4 F BRF CAM 10 M sph	55GR0575 CB 15	SM		24		GS	
1VF T	—	CAC 12 2 m ARF CAM 10 M sph	55GR0575 CB 10 BR 25	Dry		23			



**Appendix C**

**Soil Profile Box Photos**



Photo 1. Soil profile 11UTCRO1, Strych soil, loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcid.



Photo 2. Soil profile 11UTCRO2, Strych soil, loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcid.



Photo 3. Soil profile 11UTCRO1, Strych soil, loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcid.

**Appendix D**

**Photographs of Soil Profiles and Project Area**



Photo 1. Soil profile of 11UTCRO1. Large boulder is in center of profile.

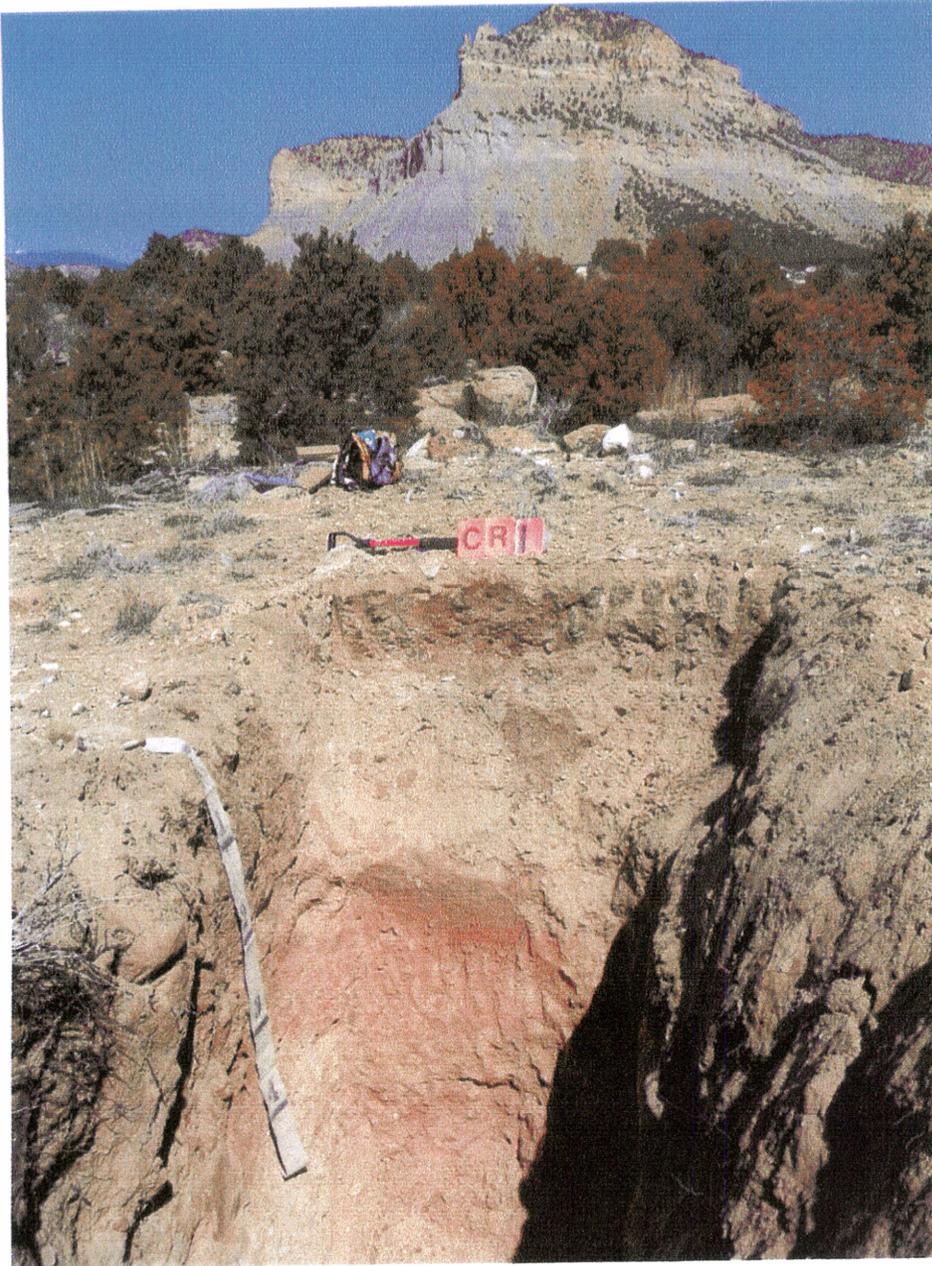


Photo 2. Soil profile 11UTCR01, Strych soil, looking north. Large boulder in center of profile is typical of project area soils.



Photo 3. Profile 11UTCRO2, Strych soil, location, Strych soil, looking east southeast from pit. Numbers are on face of pit. Large stones and boulders cover the surface.



Photo 4. Soil profile 11UTCRO2, Strych soil. Base of pit contained stones and boulders that backhoe was unable to dig through. Description was done on side of pit where cut extended down between large rocks.



Photo 5. Soil profile 11UTCRO3, Strych taxadjunct, soil, location looking north.

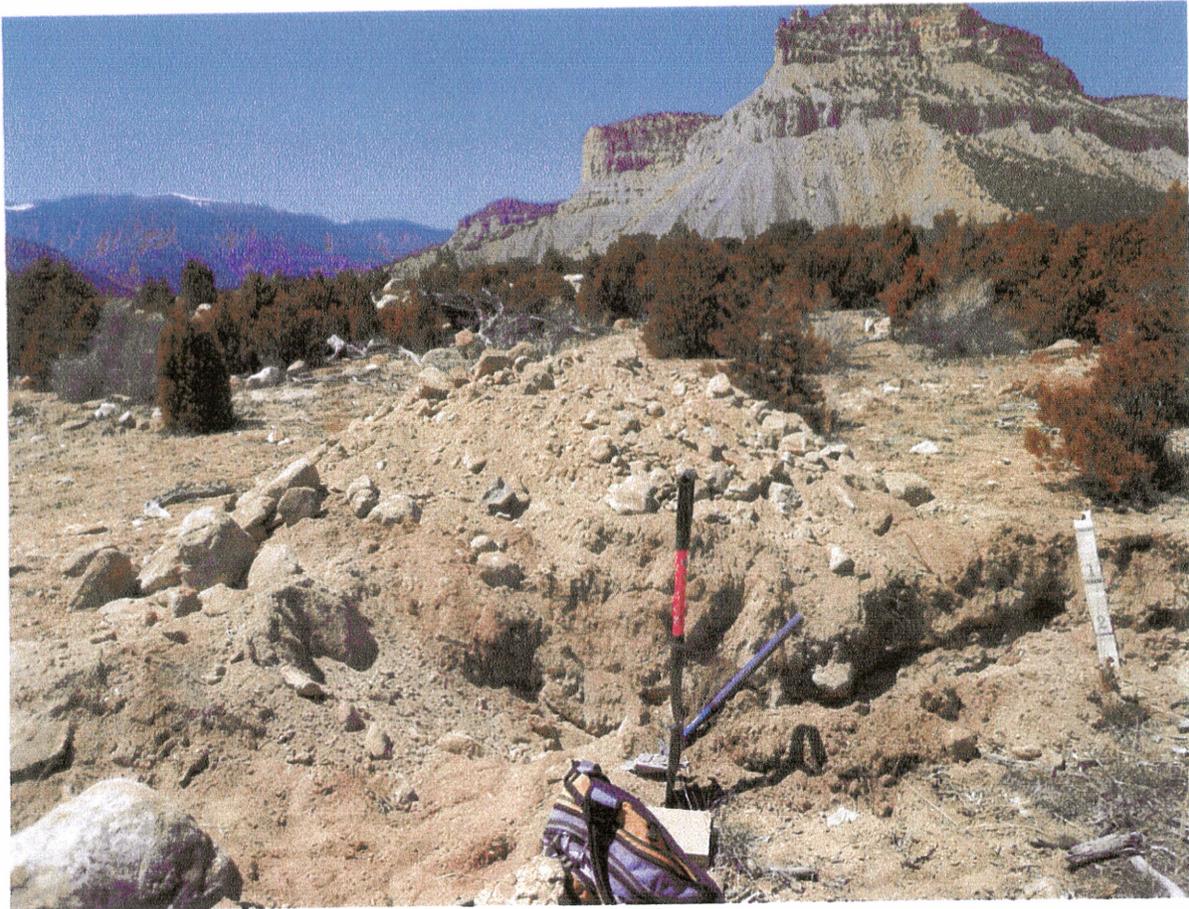


Photo 6. Soil profile 11UTCRO3, Strych taxadjunct, looking west across soil-rock pile and top of cut.



Photo 7. Soil profile 11UTCR03, Strych Taxadjunct soil, contains large amount of sandstone cobbles, stones, and a few boulders.

**Appendix E**  
**Laboratory Analysis Results**  
**and**  
**Calculated Values**  
**for**  
**Available Water Capacity**  
**and**  
**K Factor**

Suitability of soil materials on crandall Ponds Project, using lab analysis results and based on Guidelines for Management of Topsoil and Overburden (Utah DOGM, 2005).

SampleID	Begin Depth	End Depth	pH	Saturation %	Electrical Conductivity dS/m	Organic Matter %	PE Calcium meq/L	PE Magnesium meq/L	PE Potassium meq/L	PE Sodium meq/L	SAR
11UTCR01	0	12	7.7	42.0	0.35	2.8	2.77	0.72	0.18	0.21	0.16
11UTCR01	12	26	7.9	35.0	0.35	2.6	2.70	1.09	0.06	0.33	0.24
11UTCR01	26	50	8.3	32.7	0.32	2.1	1.57	1.08	0.05	0.32	0.28
11UTCR01	50	94	8.6	30.4	0.38	1.4	1.33	2.32	0.05	0.53	0.39
11UTCR01	94	120	8.8	33.0	1.07	1.7	0.92	3.78	0.05	6.59	4.30
11UTCR01	120	165	8.9	31.0	2.44	1.4	1.63	9.30	0.11	19.9	8.52
11UTCR01	165	216	8.8	27.1	2.74	1.3	2.99	9.70	0.19	21.5	8.56
11UTCR02	0	10	8.1	31.6	0.48	3.1	2.79	0.69	1.16	0.51	0.39
11UTCR02	10	30	7.9	44.1	0.44	3.1	3.67	0.94	0.13	0.28	0.18
11UTCR02	30	54	8.2	36.5	0.34	2.2	2.86	1.11	0.07	0.25	0.18
11UTCR02	54	90	8.5	33.8	0.35	1.8	1.92	1.87	0.04	0.38	0.27
11UTCR02	90	130	8.7	32.0	0.39	1.0	0.68	2.18	0.04	1.31	1.09
11UTCR02	130	185	8.8	30.4	1.34	1.1	0.89	2.82	0.07	10.6	7.82
11UTCR03	0	10	8.0	30.5	0.45	3.2	4.18	0.69	0.29	0.34	0.22
11UTCR03	10	28	7.8	56.1	0.44	3.2	3.87	1.08	0.06	0.39	0.25
11UTCR03	28	60	8.0	45.6	0.46	3.4	3.25	1.46	0.06	0.45	0.29
11UTCR03	60	110	8.4	41.9	0.71	1.4	3.04	3.43	0.07	2.46	1.37
11UTCR03	110	140	8.6	30.4	1.55	1.1	2.14	10.0	0.08	9.33	3.78
11UTCR03	140	170	8.7	27.4	1.33	0.6	1.81	6.06	0.06	9.34	4.71
11UTCR03	170	214	8.6	25.3	2.15	1.1	1.79	6.34	0.07	17.9	8.90

Good Fair Poor Unacceptable

Suitability of soil materials on c Suitability of soil materials on crandall Ponds Project, using lab analysis results and based on Guidelines for Management of Overburden (Utah DOGM, 200:Topsoil and Overburden (Utah DOGM, 2005), continued.

SampleID	Begin Depth	End Depth	Sand %	Silt %	Clay %	Texture	Fine Sand %	CaCO3 %	Nitrate (as N) ppm	Phosphorus ppm	Available Potassium meq/100g	Total Carbon %	TOC %	Neutral. Potential
11UTCR01	0	12	53.0	29.0	18.0	Sandy Loam	9.8	34.0	0.2	5.82	0.18	5.2	1.2	340
11UTCR01	12	26	53.0	29.0	18.0	Sandy Loam	11.6	33.1	0.2	4.40	0.10	4.7	0.8	331
11UTCR01	26	50	60.0	28.0	12.0	Sandy Loam	12.2	28.9	<0.1	3.73	0.09	4.1	0.7	289
11UTCR01	50	94	64.0	24.0	12.0	Sandy Loam	14.1	31.9	<0.1	2.76	0.09	3.9	<0.1	319
11UTCR01	94	120	58.0	21.0	21.0	Sandy Clay Loam	13.7	22.1	<0.1	3.37	0.18	2.9	0.2	221
11UTCR01	120	165	51.0	28.0	21.0	Loam	10.3	36.4	<0.1	3.06	0.07	4.9	0.5	364
11UTCR01	165	216	56.0	26.0	18.0	Sandy Loam	10.3	33.1	<0.1	1.99	0.07	4.3	0.3	331
11UTCR02	0	10	66.0	16.0	18.0	Sandy Loam	15.4	27.0	0.4	13.8	0.84	4.2	1.0	270
11UTCR02	10	30	53.0	27.0	20.0	Sandy Clay Loam	10.2	41.1	<0.1	6.19	0.14	6.5	1.5	411
11UTCR02	30	54	56.0	26.0	18.0	Sandy Loam	15.1	40.7	0.2	4.25	0.08	5.7	0.8	407
11UTCR02	54	90	74.0	19.0	7.0	Sandy Loam	12.2	34.8	<0.1	2.66	0.08	4.6	0.4	348
11UTCR02	90	130	64.0	22.0	14.0	Sandy Loam	21.9	17.0	<0.1	2.38	0.15	2.2	0.2	170
11UTCR02	130	185	54.0	27.0	19.0	Sandy Loam	10.8	38.4	<0.1	5.47	0.07	4.9	0.3	384
11UTCR03	0	10	70.0	18.0	12.0	Sandy Loam	14.1	26.3	2.6	13.6	0.46	4.1	1.0	263
11UTCR03	10	28	66.0	21.0	13.0	Sandy Loam	8.6	54.2	1.9	8.56	0.09	8.7	2.2	542
11UTCR03	28	60	64.0	22.0	14.0	Sandy Loam	9.0	55.2	2.9	5.94	0.07	7.5	0.9	552
11UTCR03	60	110	63.0	26.0	11.0	Sandy Loam	10.2	42.3	4.5	5.06	0.07	5.8	0.7	423
11UTCR03	110	140	60.0	25.0	15.0	Sandy Loam	9.9	42.5	4.9	3.14	0.06	5.5	0.4	425
11UTCR03	140	170	85.0	8.0	7.0	Loamy Sand	4.9	28.4	1.2	4.14	0.03	3.4	<0.1	284
11UTCR03	170	214	70.0	18.0	12.0	Sandy Loam	12.3	30.8	<0.1	3.46	0.06	3.9	0.2	308

Good Fair Poor Unacceptable

Appendix E - Laboratory Analysis  
 Table E-2 - Available Water Capacity

Table E-2. Calculated available water capacity (AWC) for soils on Crandall Ponds project area using empirical equation using laboratory data for sand, silt, clay, organic matter, electrical conductivity, and estimated rock fragments (Saxton and Willey, 2011)

Sample ID	Top Depth cm	Bottom Depth cm	AWC in/foot	AWC in/in
11UTCR01	0	12	0.86	0.07
11UTCR01	12	26	0.84	0.07
11UTCR01	26	50	0.79	0.07
11UTCR01	50	94	0.56	0.05
11UTCR01	94	120	0.97	0.08
11UTCR01	120	165	1.14	0.10
11UTCR01	165	216	1.04	0.09
11UTCR02	0	10	0.62	0.05
11UTCR02	10	30	0.85	0.07
11UTCR02	30	54	0.79	0.07
11UTCR02	54	90	0.60	0.05
11UTCR02	90	130	0.92	0.08
11UTCR02	130	185	0.64	0.05
11UTCR03	0	10	0.80	0.07
11UTCR03	10	28	0.70	0.06
11UTCR03	28	60	0.61	0.05
11UTCR03	60	110	0.57	0.05
11UTCR03	110	140	0.57	0.05
11UTCR03	140	170	0.29	0.02
11UTCR03	170	214	0.86	0.07

Good	Fair	Poor
------	------	------

Table E-3. Calculated soil K factors based on lab analysis data and field descriptions of soil profiles using the nomograph outlined in Guidelines for Management of Topsoil and Overburden (Utah DOGM 2005).

SampleID	Begin Depth	End Depth	Organic		Structural Code (b)	Texture	Permeability Code (c)		Very Fine			M	M <sup>1.14</sup>	K factor
			Matter (a)	%			Silt %	Sand %	Clay %					
11UTCR01	0	12	2.8		2	Sandy Loam	2	29.0	9.8	18.0	3,181.6	9840.473	0.17	
11UTCR01	12	26	2.6		4	Sandy Loam	2	29.0	11.6	18.0	3,329.2	10362.57	0.24	
11UTCR01	26	50	2.1		4	Sandy Loam	2	28.0	12.2	12.0	3,537.6	11105.24	0.27	
11UTCR01	50	94	1.4		4	Sandy Loam	2	24.0	14.1	12.0	3,352.8	10446.35	0.27	
11UTCR01	94	120	1.7		4	Sandy Clay Loam	4	21.0	13.7	21.0	2,741.3	8303.678	0.27	
11UTCR01	120	165	1.4		4	Loam	3	28.0	10.3	21.0	3,025.7	9292.691	0.27	
11UTCR01	165	216	1.3		4	Sandy Loam	2	26.0	10.3	18.0	2,976.6	9120.977	0.24	
11UTCR02	0	10	3.1		2	Sandy Loam	2	16.0	15.4	18.0	2,574.8	7731.212	0.12	
11UTCR02	10	30	3.1		4	Sandy Loam	4	27.0	10.2	20.0	2,976.0	9118.881	0.26	
11UTCR02	30	54	2.2		4	Sandy Clay Loam	2	26.0	15.1	18.0	3,370.2	10508.18	0.26	
11UTCR02	54	90	1.8		4	Sandy Loam	2	19.0	12.2	7.0	2,901.6	8859.451	0.23	
11UTCR02	90	130	1.0		4	Sandy Loam	2	22.0	21.9	14.0	3,775.4	11960.18	0.32	
11UTCR02	130	185	1.1		4	Sandy Loam	2	27.0	10.8	19.0	3,061.8	9419.19	0.26	
11UTCR03	0	10	3.2		2	Sandy Loam	2	18.0	14.1	12.0	2,824.8	8592.627	0.13	
11UTCR03	10	28	3.2		4	Sandy Loam	2	21.0	8.6	13.0	2,575.2	7732.581	0.18	
11UTCR03	28	60	3.4		4	Sandy Loam	2	22.0	9.0	14.0	2,666.0	8044.158	0.19	
11UTCR03	60	110	1.4		4	Sandy Loam	2	26.0	10.2	11.0	3,221.8	9982.34	0.26	
11UTCR03	110	140	1.1		4	Sandy Loam	2	25.0	9.9	15.0	2,966.5	9085.704	0.25	
11UTCR03	140	170	0.6		1	Loamy Sand	2	8.0	4.9	7.0	1,199.7	3237.001	0.02	
11UTCR03	170	214	1.1		4	Sandy Loam	2	18.0	12.3	12.0	2,666.4	8045.533	0.22	

Good Fair Poor



Inter-Mountain Labs

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Soil Analysis Report

Long Resource Consultants, Inc.

1960 West Deep Creek Road  
Morgan, UT 84050

Report ID: S1105143002  
(Replaces S1105143001)

Project: Utah American Energy Crandall Ponds

Date Reported: 7/1/2011

Date Received: 5/9/2011

Work Order: S1105143

Lab ID	Sample ID	Depths cm	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	SAR
S1105143-001	11UTCR01	0-12	7.7	42.0	0.35	2.8	2.77	0.72	0.18	0.21	0.16
S1105143-002	11UTCR01	12-26	7.9	35.0	0.35	2.6	2.70	1.09	0.06	0.33	0.24
S1105143-003	11UTCR01	26-50	8.3	32.7	0.32	2.1	1.57	1.08	0.05	0.32	0.28
S1105143-004	11UTCR01	50-94	8.6	30.4	0.38	1.4	1.33	2.32	0.05	0.53	0.39
S1105143-005	11UTCR01	94-120	8.8	33.0	1.07	1.7	0.92	3.78	0.05	6.59	4.30
S1105143-006	11UTCR01	120-165	8.9	31.0	2.44	1.4	1.63	9.30	0.11	19.9	8.52
S1105143-007	11UTCR01	165-216	8.8	27.1	2.74	1.3	2.99	9.70	0.19	21.5	8.56
S1105143-008	11UTCR02	0-10	8.1	31.6	0.48	3.1	2.79	0.69	1.16	0.51	0.39
S1105143-009	11UTCR02	10-30	7.9	44.1	0.44	3.1	3.67	0.94	0.13	0.28	0.18
S1105143-010	11UTCR02	30-54	8.2	36.5	0.34	2.2	2.86	1.11	0.07	0.25	0.18
S1105143-011	11UTCR02	54-90	8.5	33.8	0.35	1.8	1.92	1.87	0.04	0.38	0.27
S1105143-012	11UTCR02	90-130	8.7	32.0	0.39	1.0	0.68	2.18	0.04	1.31	1.09
S1105143-013	11UTCR02	130-185	8.8	30.4	1.34	1.1	0.89	2.82	0.07	10.6	7.82
S1105143-014	11UTCR03	0-10	8.0	30.5	0.45	3.2	4.18	0.69	0.29	0.34	0.22
S1105143-015	11UTCR03	10-28	7.8	56.1	0.44	3.2	3.87	1.08	0.06	0.39	0.25
S1105143-016	11UTCR03	28-60	8.0	45.6	0.46	3.4	3.25	1.46	0.06	0.45	0.29
S1105143-017	11UTCR03	60-110	8.4	41.9	0.71	1.4	3.04	3.43	0.07	2.46	1.37
S1105143-018	11UTCR03	110-140	8.6	30.4	1.55	1.1	2.14	10.0	0.08	9.33	3.78
S1105143-019	11UTCR03	140-170	8.7	27.4	1.33	0.6	1.81	6.06	0.06	9.34	4.71
S1105143-020	11UTCR03	170-214	8.6	25.3	2.15	1.1	1.79	6.34	0.07	17.9	8.90

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate  
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential  
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: *Karen A Secor*

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Long Resource Consultants, Inc.

1960 West Deep Creek Road
Morgan, UT 84050

Report ID: S1105143002
(Replaces S1105143001)

Project: Utah American Energy Crandall Ponds

Date Received: 5/9/2011

Date Reported: 7/1/2011

Work Order: S1105143

Table with columns: Lab ID, Sample ID, Depths cm, Sand %, Silt %, Clay %, Texture, Very Fine Sand %, CaCO3 %, Nitrate (as N) ppm, Phosphorus ppm, Available Potassium meq/100g. Rows include sample IDs S1105143-001 through S1105143-020.

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report  
Long Resource Consultants, Inc.

Report ID: S1105143002  
(Replaces S1105143001)

Project: Utah American Energy Grandall Ponds

Date Reported: 7/1/2011

Work Order: S1105143

Date Received: 5/9/2011

1960 West Deep Creek Road  
Morgan, UT 84050

Lab ID	Sample ID	Depths cm	Total Carbon		TOC %	Neutral Potential	
			%	%		%	µ/1000t
S1105143-001	11UTCR01	0-12	5.2		1.2		340
S1105143-002	11UTCR01	12-26	4.7		0.8		331
S1105143-003	11UTCR01	26-50	4.1		0.7		289
S1105143-004	11UTCR01	50-94	3.9		<0.1		319
S1105143-005	11UTCR01	94-120	2.9		0.2		221
S1105143-006	11UTCR01	120-165	4.9		0.5		364
S1105143-007	11UTCR01	165-216	4.3		0.3		331
S1105143-008	11UTCR02	0-10	4.2		1.0		270
S1105143-009	11UTCR02	10-30	6.5		1.5		411
S1105143-010	11UTCR02	30-54	5.7		0.8		407
S1105143-011	11UTCR02	54-90	4.6		0.4		348
S1105143-012	11UTCR02	90-130	2.2		0.2		170
S1105143-013	11UTCR02	130-185	4.9		0.3		384
S1105143-014	11UTCR03	0-10	4.1		1.0		263
S1105143-015	11UTCR03	10-28	8.7		2.2		542
S1105143-016	11UTCR03	28-60	7.5		0.9		552
S1105143-017	11UTCR03	60-110	5.8		0.7		423
S1105143-018	11UTCR03	110-140	5.5		0.4		425
S1105143-019	11UTCR03	140-170	3.4		<0.1		284
S1105143-020	11UTCR03	170-214	3.9		0.2		308

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor

**ATTACHMENT 7**

**SEDIMENTATION AND DRAINAGE CONTROL PLAN  
BLACKHAWK ENGINEERING**

GENWAL RESOURCES, INC.  
CRANDALL CANYON MINE  
PROPOSED EVAPORATION BASIN

DAN W. GUY, P.E.

November 2011



## **PROPOSED EVAPORATION BASIN CRANDALL CANYON MINE**

### **Introduction**

This evaporation basin will be constructed to contain the slurry being removed from the Mine Water Treatment Facility located at the Crandall Canyon Mine. The proposed site is located approximately 8 miles southeast of the Crandall Canyon Mine, along Emery County Public Road No. 303, also known as the Burma Road. The material is proposed to be hauled by truck from the Crandall Canyon Mine to U.S. Highway 31 in Huntington Canyon, then down Highway 31 to the Burma Road and into the evaporation basin. The basin will allow for total containment of the material and evaporation of the liquid.

### **General**

The proposed evaporation basin is shown in detail on Drawings 1 through 6 in this report. The basin is proposed to be constructed on slightly sloping ground; with the upper (northern) portion completely incised and the lower (southern) portion partially incised with a designed containment berm.

As shown on Drawings 4 and 5, the evaporation basin will be accessed from the Burma Road by an entrance road, which ties to a perimeter access road around the basin. Construction of the basin and roads will involve a cut/fill volume of approximately 3500 cubic yards of material. Approximately 1137 cubic yards of topsoil is expected to be salvaged and stored on site prior to construction of the basin.

The basin is proposed to be completely enclosed, with no outlet or discharge. It will have a depth of at least 5 feet below the top of the berm. Stored/dried material will not exceed 24" in depth, and the maximum water level will not exceed 36". This will provide for a minimum of 24" of freeboard to the top of the berm. The maximum water level includes not only fluid from the deposited material but also direct precipitation into the basin from a 10 year-24 hour precipitation event. The slurry to be placed in the basin is primarily water, with some chemicals and precipitated iron particles. After evaporation of the liquid, only a very small amount of solids are left behind. The slurry material is cleaned from the Mine Water Treatment Facility approximately every other month. Although the amount of cleaned material may vary, it is conservatively estimated that the total cleaning volume will not exceed over 15 truckloads per month.

Since the slurry material is primarily liquid, the 2' depth for the solid material in the basin will provide for an extremely long-term storage of the solids. There are no present plans for removal of this material; however, should it become necessary, it would be removed and disposed of in accordance with applicable laws at that time.

Drainage above the basin will be diverted by a constructed undisturbed drainage ditch, which will flow to the east into a natural drainage channel, and to the west into an 18" cmp beneath the entrance road and into a natural drainage. Sediment control structures will be placed in each of the natural drainage channels, as well as below the basin containment berm and the topsoil pile, as shown on Drawings 4 and 5.

The containment berm will be approximately 20' wide on top with a 3H:1V slope into the basin and a 2H:1V slope to the outside. It will be constructed of a compacted earthen core on the inside with excess boulder storage on the outer slope. The top, roadway portion will be surfaced with a layer of impervious material. The outslope will be covered with at least 6" of subsoil material and revegetated with the approved, interim seed mix. A stability analysis has been completed for the proposed containment berm, showing it will have a factor of safety well in excess of the required 1.3. This stability analysis is included in this report as Attachment 1.

The salvaged topsoil will be placed in a pile southeast of the containment berm. The pile will be approximately 10' high with 2H: 1V side slopes, and surrounded by a 1' or higher berm for runoff protection. The topsoil pile will also be seeded with the interim vegetation mix.

The undisturbed drainage ditch (B-UD1) will be at least 15" deep with approximately 1H:1V side slopes. This ditch will be armored with rip-rap, if necessary, to prevent erosion; however, calculations show the expected flow in this ditch to be less than 2 fps, which is not considered erosive. The culvert to be placed beneath the entrance road will be at least an 18" cmp. Inlet and/or outlet protection will be provided as necessary to prevent erosion; however, once again, the calculated flow and velocity are well below erosive levels.

All drainage control structures and the evaporation basin are designed to safely contain or carry runoff from a 10 year-24 hour precipitation event for the area. The following section will provide design calculations for each of the structures.

## Calculations

Hydrologic calculations have been performed for each of the structures in this proposal.

Peak flows, channel flow depths and velocities were calculated using the computer program "Office of Surface Mining Watershed Model", Storm Version 6.20 by Gary E. McIntosh. (Triangular Channel Flow). All flow is based on the SCS-TR55 method for Type II storms.

Culverts were sized using the "Haestad methods, Flowmaster I, Version 3.43" Computer Program.

## Design Parameters

The following parameters have been used in the hydrologic calculations:

1. 10 year-24 hour Precipitation Event      2.00"
2. Runoff CN for Undisturbed Area      80
  - a. Based on the most conservative undisturbed CN for the Crandall Canyon Minesite.
3. Manning's N for Undisturbed Ditch      0.035
4. Manning's N for Culverts      0.020
5. Channel Calculations Based on 1H:1V Side Slopes.

## Evaporation Basin

1. Surface Area      1.16 acres
2. Direct Precipitation      2.00"
3. Precipitation Volume      8427 cu.ft.
4. Depth in Basin      4.26"

Based on the above, the direct precipitation of a 10 year-24 hour event to the 1/16 acres of surface area of the basin and applicable portion of the entrance road would increase the water depth in the basin by approximately 4.26". This increase in depth is based on the accumulation being at the maximum depth of 24" per Drawing 5.

Runoff to Undisturbed Drainage Ditch B-UD-1

1.	Drainage Area	1.58 acres
2.	Hydraulic Length	225'
3.	Ground Slope	7.11%
4.	Runoff CN	80

Based on the above, the calculated flow to the ditch would be 0.30 cfs.

B-UD-1

1.	Flow	0.30 cfs
2.	Ditch Slope	2.25%
3.	Side Slopes	1H:1V
4.	Manning's N	0.035
5.	Flow Depth	0.41'
6.	Velocity	1.77 fps

Undisturbed drainage ditch B-UD1 will be constructed with a minimum depth of 15" and approximate 1H:1V side slopes. The calculated flow through this ditch will be 0.30 cfs at a depth of 0.41' and a velocity of 1.77 fps. The ditch will have a freeboard of approximately 0.84' and should not need to be armored based on expected velocity calculations.

Runoff to 18" cnp B-C1

1.	Drainage Area	0.71 acres
2.	Hydraulic Length	188'
3.	Ground Slope	6.38%
4.	Runoff CN	80

The calculated flow to the culvert B-C1 is 0.13 cfs.

## B-C1

1.	Flow	0.13 cfs
2.	Culvert Slope	3.0 %
3.	Manning's N	0.020
4.	Minimum Size Req'd	0.28'
5.	Velocity	2.17 fps

Culvert B-C1 will be an 18" cmp. Based on the calculations, the expected flow could be passed with a 4" diameter culvert. The proposed culvert is therefore more than adequate to carry the expected runoff. The calculated velocity of 2.17 fps is not expected to be erosive; however, armoring will be employed at the culvert outlet if it becomes necessary.

## Summary

The proposed evaporation basin as designed will safely contain the expected slurry material from the Crandall Canyon Mine, as well as the direct precipitation from a 10 year-24 hour rainfall event. The designed hydrologic structures are also shown to be adequate to safely carry the runoff from a 10 year-24 hour precipitation event.

A stability analysis has also been completed for the proposed berm on the basin, showing it to have a factor of safety well in excess of the required 1.3 for both dry and saturated conditions.

ADDENDUM

ADDITIONAL CALCULATIONS

# Age-Area-Storage for Pond 1P: Burma Pond

Elevation      Storage  
(feet) (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    Primary  
(feet)      (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



**Shaver, Dave**

**From:** Truman, Dana K [dtruman@blm.gov]  
**Sent:** Tuesday, January 10, 2012 9:12 AM  
**To:** Shaver, Dave  
**Subject:** Crandal  
**Attachments:** Seedmix for Crandal Canyon Evaporation pond suggestion.docx  
Seed mix

Dana

---

Dana Truman  
BLM Price Field Office  
125 South 600 West  
Price, UT 84501  
Field Manager: Patricia Clabaugh  
Phone: (435) 636-3628  
Fax (435) 636-3657

Seedmix for Crandal Canyon Evaporation pond suggestion.....

Based on the vegetation report, this area appears to be dominated by pinyon trees, crested wheatgrass, and several native forbs. Because of the current site conditions BLM would recommend using more native grasses to try to encourage a more natural ecosystem. Because crested wheatgrass is already in the system, crested wheatgrass is also recommended for its soil stabilization ability. If due to high seed costs or availability, grasses such as Needle and Thread grass could be substituted with sandburg bluegrass, etc. There are several ways to create a seed mix, so this is just a suggestion. If changing the seed mix, I would recommend keeping the seedmix simple and relatively similar to the surrounding vegetation.

The following table has suggested species and seeding rate for broadcast seeding.

Specie	Species/Variety	Scientific name	Seeding Rate
			(PLS lbs/ac)
1	Galleta	<i>Pleuraphis jamesii</i>	1.5
2	Ricegrass, Indian	<i>Achnatherum hymenoides</i>	4
3	Wheatgrass, Crest. (Nordan)	<i>Agropyron cristatum</i>	2.5
4	Needle and thread	<i>Hesperostipa comata</i>	1.5
5	Penstemon, Rocky Mtn.	<i>Penstemon palmeri</i>	0.5
6	Globemallow	<i>Sphaeralcea coccinea</i>	0.3
7	Fourwing Saltbush	<i>Atriplex canescens</i>	1.3
8	Winterfat	<i>Krascheninnikovia lanata</i>	0.7
	Total		12.3

**ATTACHMENT 9**

**EMERY COUNTY ROAD ENCROACHMENT PERMIT**



Road Department

ANNUAL PERMIT

Permit #201139

Application having been made by Genwal Resources, Inc. through David Shaver, its authorized agent, a fee of \$50.00 being paid, and the Application having been reviewed and accepted, permission is hereby granted Applicant to proceed with the installation of an access into the Crandall Canyon Mine water treatment pond located off the Burma Road #303.

Stipulations:

- 1. Dust control during construction period.
2. Proper signing while construction is in effect.
3. Posting for safety during construction and traffic control (if needed).
4. Road repairs in the event of damages.
5. Final inspection upon completion of installation.
6. Strict compliance with Ordinance 8-7-85A or as amended.
7. Permittee will be responsible to contact Blue Stakes (1-800-662-4111) before any construction begins.

DATED this 11th day of October, 2011.

Handwritten signature of Supervisor

EMERY COUNTY ROAD DEPARTMENT

By \_\_\_\_\_

INSPECTION AND RELEASE

The Emery County Road Department Supervisor inspected said site on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, finds the following:

\_\_\_ Deficiencies which must be corrected before release can be considered.

\_\_\_ Released

\_\_\_\_\_  
Supervisor

EMERY COUNTY ROAD DEPARTMENT

By \_\_\_\_\_

Person to Contact:

Name: David Shaver for Genwal Resources, inc.

Address: P O Box 109, East Carbon City, UT 84520

Phone #: (435) 888-4000

ROADWAY ENCROACHMENT APPLICATION

Date: October 11, 2011  
Applicant: Genwal Resources, Inc  
Address: P.O. Box 910  
City: East Carbon City State: UT Zip: 84520  
Phone: 435 888-4000

Purpose of application, explain in detail:

To provide access into the site of a proposed evaporation pond to be used as part of the Crandall Canyon Mine water treatment

Plan for restoration of road/right of way, explain in detail:

The facility will be constructed and operated under the Crandall Mine mining and reclamation plan approved by DDCM, and will be reclaimed under

Plans for safety, traffic and dust control, explain in detail: State and federal law

The general contractor (not yet chosen) will assume all responsibility for safety, traffic and dust control including warning signs, flagging and road watering as needed.

Location of encroachment (enclose a map/sketch): See enclosed drawings

County Road #: 303 Name of Road: Burma Road

Date beginning Project: Jan 2012 (est) Date of Project Completion: April 2012 (est)

Has Applicant acquired written permission from all agencies or property owners affected by this project?

Yes  No  SITLA lease 1708

The law requires that Blue Stakes be contacted (1-800-662-4111) before digging. Has Blue Stakes been

contacted? Yes  No  Date Contacted: There will be no digging required within the road encroachment

Applicant agrees to comply with all laws, ordinances and regulations of all governing agencies including but not limited to Emery County, as well as the instructions of the Emery County Road Supervisor or his indicated representative. It is the responsibility of the Applicant to contact and acquire written permission from the other agencies and property owners affected by Applicant's activities before commencing the project. All liability and restitution for damages will be the sole responsibility of the Applicant. A non refundable processing fee of \$50.00 is tendered with this application. **Additional impact fees maybe required on certain classes of Permit.**

David Shaver, for Genwal Resources, Inc.

Applicant's Name (Print)

David Shaver

Applicant's Signature

Oct 11, 2011

Date

**ATTACHMENT 10**

**LABORATORY ANALYSIS OF SLUDGE MATERIAL**



Analysis Report

Sediment

March 04, 2011

GENWAL RESOURCES INC
794 "C" CANYON ROAD
EAST CARBON UT 84520

Page 1 of 1

Client Sample ID: Genwal Resources Inc. Sample ID By: Genwal Resources Inc.
Date Sampled: Feb 11, 2011 Sample Taken At: Sludge site
Date Received: Feb 11, 2011 Sample Taken By: Dana
Product Description: WATER Time Received: 1545
Time Sampled: 1500
Mine: 8

Comments: Analyzed at American West Analytical Lab
Hex-Cr Matrix spike recovery indicates interference. The method is in control as indicated by the LCS
Hex-Cr was re-analyzed outside of the holding time. The results for the total chromium indicate no hexavalent chromium is present in the sample
The results for the total chromium and the hexavalent chromium indicate no trivalent chromium in the sample

SGS Minerals Sample ID: 782-1106539-001

Table with columns: TESTS, RESULT, UNIT, METHOD, REPORTING LIMIT, DATE, ANALYZED TIME, ANALYST. Rows include Cyanide, Hexavalent chromium, Mercury, Hg - Total, and various metals (Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Nickel, Selenium, Silver, Zinc).

Lab Supervisor

Domenic Ibanez
Lab Supervisor

SGS North America Inc. Minerals Services Division
2035 North Airport Road Huntington t (435) 653-2311 f (435)-653-2436 www.sgs.com/minerals

Member of the SGS Group (Société Générale de Surveillance)

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Analysis Report

Supernat

March 02, 2011

GENWAL RESOURCES INC
794 "C" CANYON ROAD
EAST CARBON UT 84520

Page 1 of 1

Client Sample ID: Genwal Resources Inc.
Date Sampled: Feb 23, 2011
Date Received: Feb 23, 2011
Product Description: WATER
Sample ID By: Genwal Resources Inc.
Sample Taken At: UPDES 002
Sample Taken By: Dana
Time Received: 1025
Time Sampled: 0845
Mine: 8
Site: 40
Field - pH: 7.6 pH
Field - Dis. Oxygen: 10.46 MG/L
Field - Conductivity: 828 UMHOS/CM
Field - Temperature: 9 DEG. C

Comments: Dissolved Metal Field Filtered

SGS Minerals Sample ID: 782-1106701-001

Table with columns: TESTS, RESULT, UNIT, METHOD, REPORTING LIMIT, DATE, ANALYZED TIME, ANALYST. Rows include tests like Oil and Grease, Sulfate, Total Dissolved Solids, etc.

Signature of Lab Supervisor
Lab Supervisor
Domenic Ibanez
Lab Supervisor

SGS North America Inc. Minerals Services Division
2035 North Airport Road Huntington t (435) 653-2311 f (435)-653-2436 www.sgs.com/minerals

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RERA



General Offices: P.O. Box 995 Price, UT. 84501 (435)637-8855  
Laboratory: 65 North 300 East Price, UT. 84501

Report Date  
4/15/2010

Client  
UtahAmerican Energy Inc.  
Genwal Resources, Inc.  
PO Box 1077  
Price, UT. 84501  
Dave Shaver  
(435)888-4017

Sample I.D.  
Flock  
Sampled By: D.M.  
Date: 4/8/2010 Time: 11:00  
Received  
Date: 4/8/2010 Time: 14:05

Field Measurements				
Cond. uS	Temp. C	pH	D.O. ppm	Turbidity NTU

Notes:

Lab I.D. #: 999 Mine Code 8 Site Code

### Certificate of Analysis

Analyte	Results	Units	MRL	Method	Date	Time	Analyst
<b>Metals by ICP</b>							
Arsenic, Total	<0.10	mg/L	0.10	EPA 200.7	4/13/2010	10:37	BLP
Barium, Total	0.825	mg/L	0.020	EPA 200.7	4/13/2010	10:37	BLP
Cadmium, Total	<0.02	mg/L	0.020	EPA 200.7	4/13/2010	10:37	BLP
Chromium, Total	<0.02	mg/L	0.020	EPA 200.7	4/13/2010	10:37	BLP
Lead, Total	<0.05	mg/L	0.050	EPA 200.7	4/13/2010	10:37	BLP
Selenium, Total	<0.10	mg/L	0.10	EPA 200.7	4/14/2010	10:35	BLP
Silver, Total	<0.02	mg/L	0.020	EPA 200.7	4/13/2010	10:37	BLP
<b>Manual Cold Vapor</b>							
Mercury, Total	<0.0005	mg/L	0.0005	EPA 245.1	4/14/2010	13:57	BLP

Brandon Pierce  
Technical Director

All reported results meet the requirements of NELAC, except for Balance and Hardness.  
Balance and Hardness are calculated from certified results.



ATTACHMENT 11

STABILITY ANALYSIS  
BLACKHAWK ENGINEERING



**ATTACHMENT A**  
**STABILITY ANALYSIS**  
**FOR**  
**PROPOSED EVAPORATION BASIN**  
  
**GENWAL MINE**



PREPARED BY: DAN W. GUY, P.E.  
NOVEMBER 2011

## **Introduction:**

This report is an evaluation of the expected factors of safety of the proposed embankment for the Evaporation Basin.

## **Procedure:**

Soil characteristics for the proposed embankment material have been tested by RB&G Engineering, Inc., to determine density, cohesion and internal friction angles. These parameters were then used in the safety factor calculations along with the maximum slope height and slope angles for the structure.

## **Calculations:**

Stability calculations were performed using the Hoek Method from Rock Slope Engineering. Under this method, stability projections can be made using soil characteristics such as density, cohesion, internal friction angle and proposed slope height. This information can then be plotted on the provided circular failure charts to determine factors of safety for both Dry and Saturated Conditions. The shear strength available to resist failure and the shear stress present along the possible failure surface are included in the analysis of the factor of safety. The shear strength is characterized by the cohesion and the friction angle. Failure would be assumed to occur on a circular failure slope, which is based on the angle of internal friction. These analyses have been address and verified using the Hoek Method (Hoek, Evert, and J.W. Bray, "Rock Slope Engineering" Spon Press, 270 Madison Ave, New York, NY, 1974).

Slope heights and angles were taken from Drawing 5 of the Proposed Evaporation Basin Report for the Crandall Canyon Mine. Calculations were run on the maximum expected slope height of 5' and maximum expected slope angle of 2H:1V.

**Results:**

Based on the soil characteristics and slope height and angle, a factor of safety of 12.03 for dry conditions and 10.53 for saturated conditions can be achieved for the proposed slope of 2H:1V (26.57°) at a height of 5'.

**Summary:**

Based on the parameters used in this report, expected factors of safety for the proposed embankment are 12.03 for dry conditions and 10.53 for saturated conditions. These results show the expected factor of safety to be well in excess of the required 1.30.

**TABLE 1**  
**CALCULATION SUMMARY**

---

Maximum Slope Height (H)	5'
Slope Angle	2H:1V (26.57°)
Safety Factor (Dry)	12.03
Safety Factor (Saturated)	10.53

*Density ( $\gamma$ )	=	118.1 pcf
*Cohesion ©	=	908 psf
*Internal Friction Angle ( $\phi$ )	=	40.1°

**Note:**

Based on most conservative results of laboratory tests.

**FIGURES**

$C$ =Cohesion-psf  
 $\gamma$ =Density-pcf  
 $H$ =Slope Height-ft.  
 $\phi$ =Internal Friction Angle

(DRY CONDITIONS)

### CIRCULAR FAILURE CHART NUMBER 1

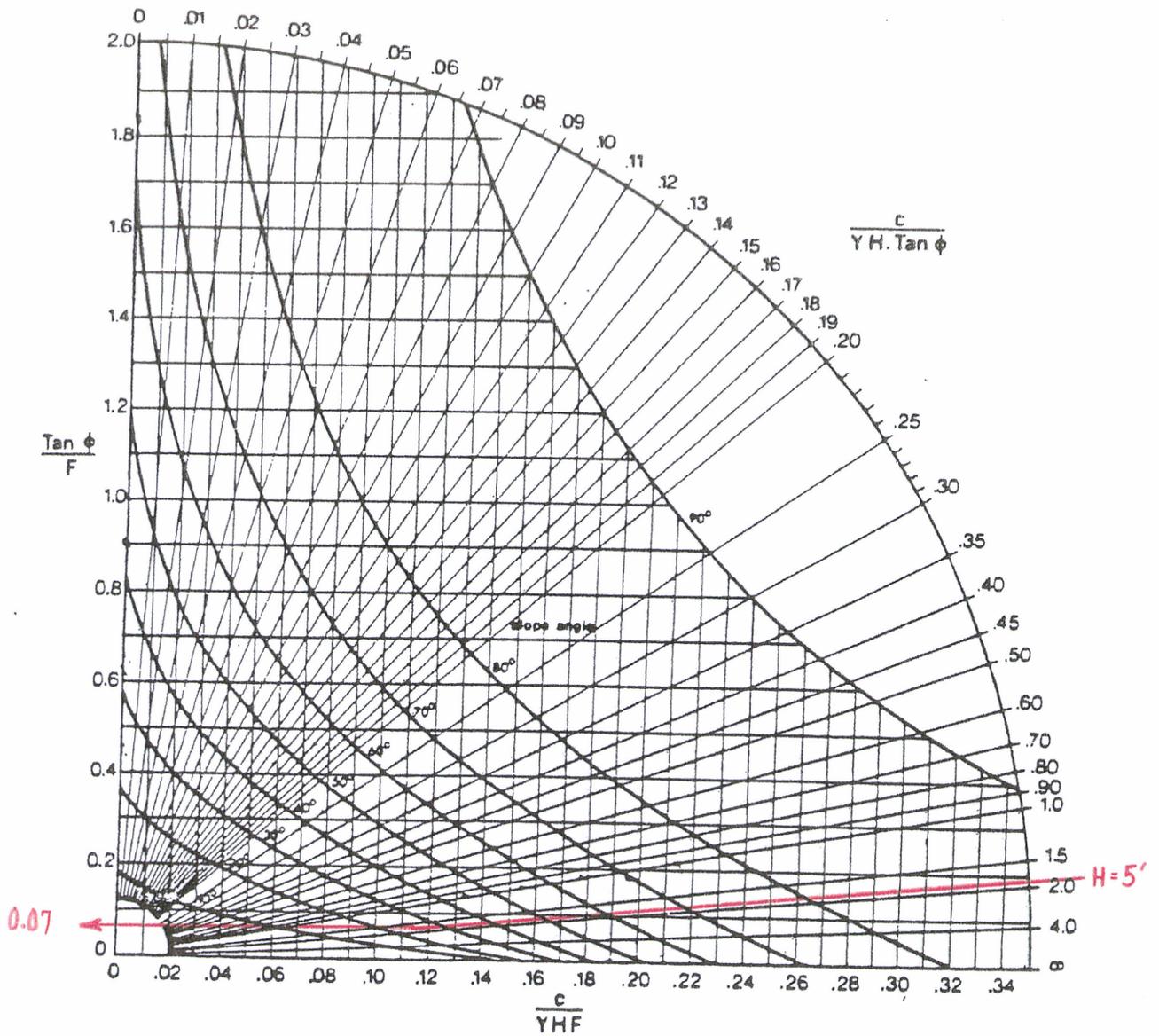


Figure 1

C=Cohesion-psf  
 Y=Density-pcf  
 H=Slope Height-ft.  
 $\phi$ =Internal Friction Angle

(SATURATED CONDITIONS)

CIRCULAR FAILURE CHART NUMBER 5

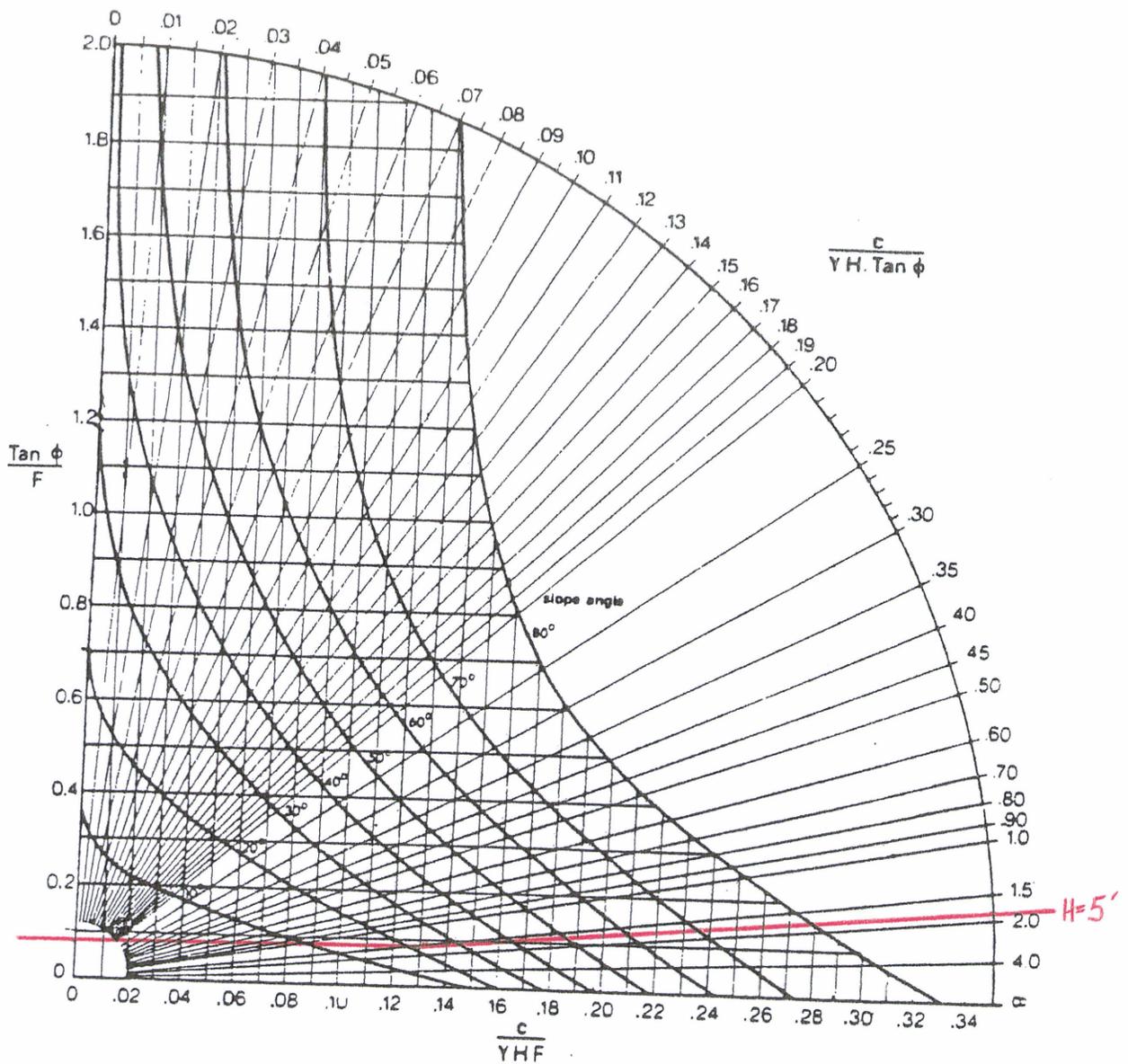


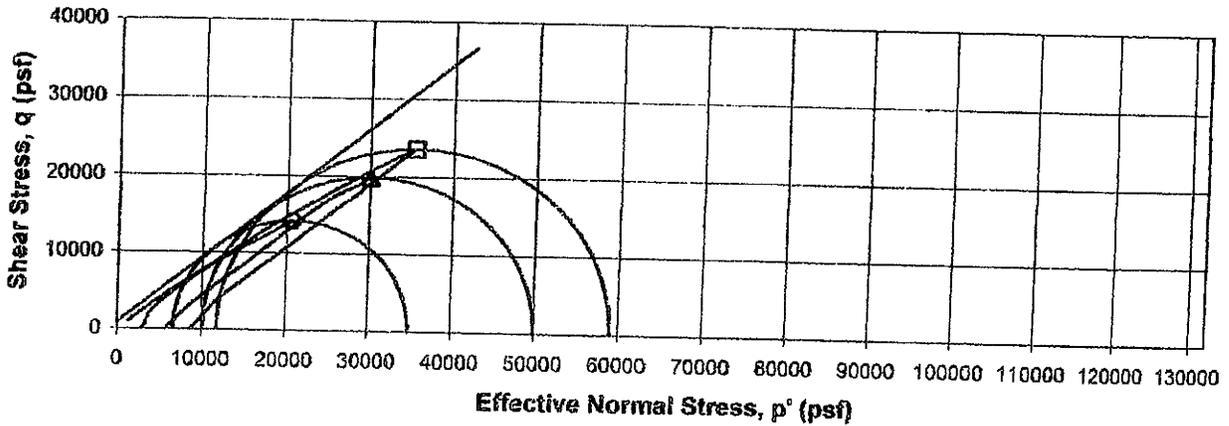
Figure 2

**APPENDIX 1**  
**SOIL ANALYSES**

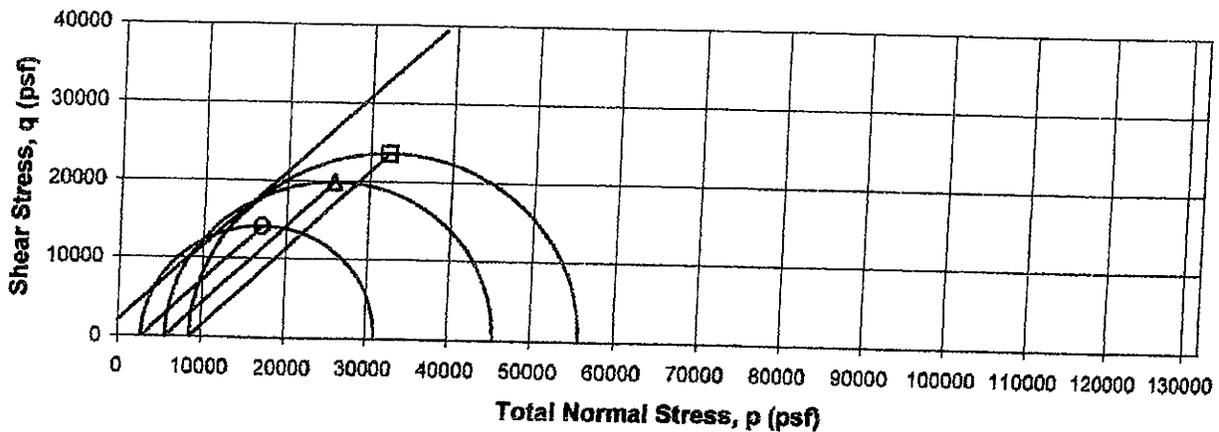
*Crawford Cyn*  
Project Westridge Mine  
Project No. 0 Boring No. 0  
Location 0 Depth / Elev. (ft)  
Date 11/5/09 Sample Type Remolded  
Tested By J Boone Failure Criteria Max deviator stress  
Sample Description Lt. Brown Silty Gravel w/ Sand GM: Non Plastic

Summary of Results	$\sigma_{p,consol}$ psf	$\sigma_{d,f}^*$ psf	$\epsilon_f$	$\sigma_{1,f}^*$ psf	$\sigma_{3,f}^*$ psf
Stage 1 ○	2880	28253	6.2%	34920	6667
Stage 2 △	5758	39866	12.0%	49987	10121
Stage 3 □	8639	47239	12.8%	59108	11869

Effective stress failure envelope  $c^* = 908 \text{ psf}$   $\phi^* = 40.1^\circ$



Total stress failure envelope  $c = 2000 \text{ psf}$   $\phi = 44^\circ$



See page two for plots of deviator stress and pore water pressure versus strain.

\*Values corrected for membrane effects

\*\* $A_c$  calculated according to ASTM D 4767 10.3.2.1 Method A

Project *Crandall Cyn*  
Westridge Mine

Project No. 0      Boring No. 0

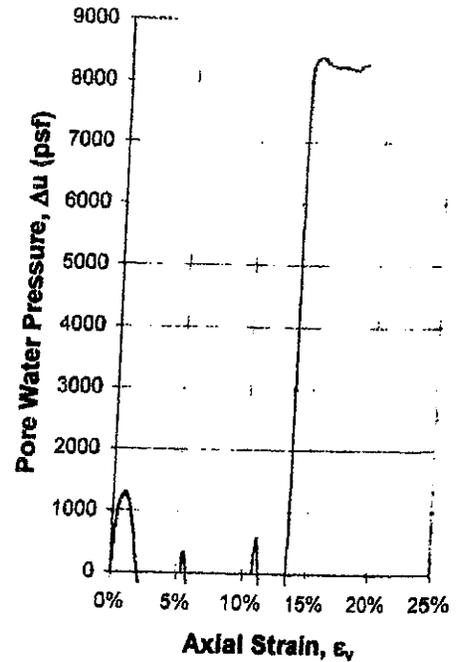
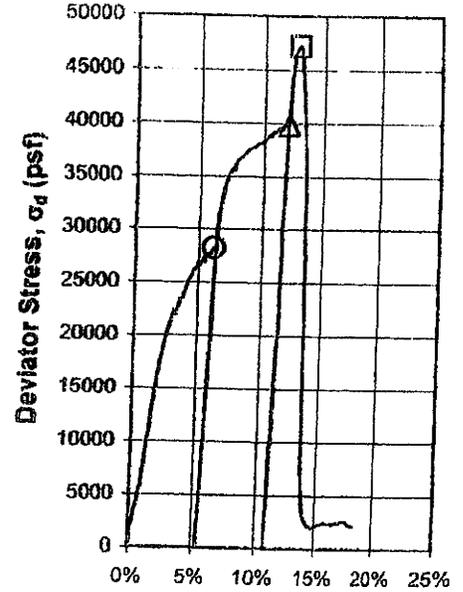
Location 0      Depth / Elev. (ft)

Date 11/5/09      Sample Type Remolded

Tested By J Boone      Failure Criteria Max deviator stress

Sample Description Lt Brown Silty Gravel w/ Sand GM: Non Plastic

Symbol		○	△	□		
Stage		1	2	3		
Initial	Vertical effective consolidation stress $\sigma'_c$	2880	5758	8639	(psf)	
	Height $L_o$	6.3	5.90	5.56	(in)	
	Diameter $D_o$	2.8	2.95	3.02	(in)	
	Moisture $w_o$	6.9%	15.5%	15.0%		
	Dry unit weight $\gamma_{do}$	122.5	118.1	119.2	(pcf)	
	Est. specific gravity $G_s$	2.68	2.68	2.68		
	Void ratio $e_o$	0.36	0.42	0.40		
	Saturation $S_o$	51%	100%	100%		
	After consolidation	Moisture $w$	15.5%	15.0%	14.6%	
		Dry unit weight $\gamma_d$	118.1	119.2	120.3	(pcf)
Void ratio $e$		0.416	0.403	0.390		
Saturation $S$		100%	100%	100%		
Area $A_c$		6.40	6.70	7.04	(in <sup>2</sup> )	
Time to 50% consolidation $t_{50}$		0.23	2.23	262.16	(min)	
B-value $B$		0.95	-	-		
Results at Failure	Total back pressure	14400	10914	12507	(psf)	
	Deviator stress $\sigma_{d,f}$	28253	39866	47239	(psf)	
	Major principal effective stress $\sigma'_1$	34920	49987	59108	(psf)	
	Minor principal effective stress $\sigma'_3$	6667	10121	11869	(psf)	
	Strain $\epsilon_f$	6.2%	12.0%	12.8%		
	Strain rate, /min	0.04%	0.04%	0.04%		
Sketch at Failure						



Remarks

Draft

\*Values corrected for membrane effects

\*\* $A_c$  calculated according to ASTM D 4767 10.3.2.1 Method A

*Crandall Co*  
**Project** Westridge Mine  
**Project No.** 0  
**Location** 0  
**Date** 11/5/09  
**Tested By** J Boone  
**Sample Description** Lt Brown Silty Gravel w/ Sand GM: Non Plastic

**Boring No** 0  
**Depth / Elev. (ft)**  
**Sample Type** Remolded  
**Failure Criteria** Max deviator stress

---

\*Values corrected for membrane effects

\*\* $A_c$  calculated according to ASTM D 4757 10.3.2.1 Method A

ATTACHMENT 12

MSDS SHEETS, COAGULANT AND FLOCCULANT



# SAFETY DATA SHEET

PRODUCT

**NALCLEAR® 7763**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **NALCLEAR® 7763**

COMPANY IDENTIFICATION: Naico Company  
1601 W. Diehl Road  
Naperville, Illinois  
60563-1198

EMERGENCY TELEPHONE NUMBER(S): (800) 424-9300 (24 Hours) CHEMTREC

### NFPA 704M/HMIS RATING

HEALTH: 0/1 FLAMMABILITY: 1/1 INSTABILITY: 0/0 OTHER:  
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme \* = Chronic Health Hazard

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

## 3. HAZARDS IDENTIFICATION

### \*\*EMERGENCY OVERVIEW\*\*

#### CAUTION

May cause irritation with prolonged contact. Toxic to aquatic organisms.  
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap and water. Protect product from freezing.  
Wear suitable protective clothing, gloves and eye/face protection.  
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.  
Water in contact with the product will cause slippery floor conditions.

PRIMARY ROUTES OF EXPOSURE :  
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :  
May cause irritation with prolonged contact.

SKIN CONTACT :  
May cause irritation with prolonged contact.

INGESTION :  
Not a likely route of exposure. If swallowed a jelly mass may form which in digestion may cause blockage.



## SAFETY DATA SHEET

### PRODUCT

**NALCLEAR® 7763**

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#### INHALATION :

Not a likely route of exposure. No adverse effects expected.

#### SYMPTOMS OF EXPOSURE :

##### Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

##### Chronic :

Frequent or prolonged contact with product may defat and dry the skin, leading to discomfort and dermatitis.

#### AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

#### EYE CONTACT :

Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get medical attention.

#### SKIN CONTACT :

Remove contaminated clothing. Wash off affected area immediately with soap and plenty of water. If symptoms develop, seek medical advice.

#### INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

#### INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

#### NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition. If swallowed a jelly mass may form which in digestion may cause blockage.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : Not flammable

LOWER EXPLOSION LIMIT : Not flammable

UPPER EXPLOSION LIMIT : Not flammable

#### EXTINGUISHING MEDIA :

Foam, Dry powder, Carbon dioxide, Other extinguishing agent suitable for Class B fires

#### UNSUITABLE EXTINGUISHING MEDIA :

Do not use water unless flooding amounts are available.



**SAFETY DATA SHEET**

**PRODUCT**

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**FIRE AND EXPLOSION HAZARD :**

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. Water in contact with the product will cause slippery floor conditions.

**SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :**

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

**6. ACCIDENTAL RELEASE MEASURES**

**PERSONAL PRECAUTIONS :**

Restrict access to area as appropriate until clean-up operations are complete. Notify appropriate government, occupational health and safety and environmental authorities. Ensure clean-up is conducted by trained personnel only. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Spill may be slippery.

**METHODS FOR CLEANING UP :**

**SMALL SPILLS:** Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Water in contact with the product will create a voluminous, slippery gel. Soak up as thoroughly as possible with inert absorbent material or sawdust. Do NOT hose down area until all possible traces of polymer are removed. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

**ENVIRONMENTAL PRECAUTIONS :**

This product is toxic to fish and other water organisms. Do not discharge directly into lakes, ponds, streams, waterways or public water supplies.

**7. HANDLING AND STORAGE**

**HANDLING :**

Do not take internally. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled. Do not get in eyes, on skin, on clothing. Use with adequate ventilation. Keep the containers closed when not in use.

**STORAGE CONDITIONS :**

Store in suitable labeled containers. Store the containers tightly closed. Store separately from oxidizers. Protect product from freezing.

**SUITABLE CONSTRUCTION MATERIAL :**

Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**OCCUPATIONAL EXPOSURE LIMITS :**

This product does not contain any substance that has an established exposure limit.

Substance(s)	Category:	ppm	mg/m3	Non-Standard Unit



# SAFETY DATA SHEET

PRODUCT

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### ENGINEERING MEASURES :

General ventilation is recommended.

### RESPIRATORY PROTECTION :

Due to its low volatility and toxicity, the hazard potential associated with this material is relatively low. Respiratory protection is not normally needed.

### HAND PROTECTION :

Nitrile gloves PVC gloves

### SKIN PROTECTION :

Wear standard protective clothing.

### EYE PROTECTION :

Wear chemical splash goggles.

### HYGIENE RECOMMENDATIONS :

Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

### HUMAN EXPOSURE CHARACTERIZATION :

Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

## 9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Emulsion
APPEARANCE	Opaque Off-white
ODOR	Hydrocarbon
SPECIFIC GRAVITY	1.03 - 1.07 @ 77 °F / 25 °C
DENSITY	8.6 - 9.0 lb/gal
SOLUBILITY IN WATER	Emulsifiable
pH (100 %)	8
VISCOSITY	400 - 1,200 cps @ 77 °F / 25 °C
FREEZING POINT	< -4 °F / < -20 °C
VOC CONTENT	27.4 % EPA Method 24

Note: These physical properties are typical values for this product and are subject to change.



# SAFETY DATA SHEET

## PRODUCT

**NALCLEAR® 7763**

## EMERGENCY TELEPHONE NUMBER(S)

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### 10. STABILITY AND REACTIVITY

#### STABILITY

Stable under normal conditions.

#### HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

#### CONDITIONS TO AVOID :

Freezing temperatures. Extremes of temperature

#### MATERIALS TO AVOID :

Addition of water results in gelling. Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

#### HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen

### 11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

#### SENSITIZATION :

This product is not expected to be a sensitizer.

#### CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

#### HUMAN HAZARD CHARACTERIZATION :

Based on our hazard characterization, the potential human hazard is: Low

### 12. ECOLOGICAL INFORMATION

#### ECOTOXICOLOGICAL EFFECTS :

The following results are for the product and a 1% aqueous solution of the product.

#### ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Sheepshead Minnow	96 hrs	> 1,000 mg/l	1% Aqueous Solution of a Similar Product
Rainbow Trout	96 hrs	> 1,000 mg/l	1% Aqueous Solution of a Similar Product
Fathead Minnow	96 hrs	34.3 mg/l	Product
Inland Silverside	96 hrs	52.5 mg/l	Product

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# SAFETY DATA SHEET

## PRODUCT

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### ACUTE INVERTEBRATE RESULTS

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	280 mg/l		1% Aqueous Solution of Product
Mysid Shrimp (Mysidopsis bahia)	96 hrs	400 mg/l		1% Aqueous Solution of Product

### MOBILITY :

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	10 - 30%	70 - 90%

### BIOACCUMULATION POTENTIAL

This preparation or material is not expected to bioaccumulate.

### ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION

Based on our hazard characterization, the potential environmental hazard is: Moderate

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Moderate

If released into the environment, see CERCLA/SUPERFUND in Section 15.

## 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

## 14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

### LAND TRANSPORT :

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING TRANSPORTATION**

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## SAFETY DATA SHEET

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### AIR TRANSPORT (ICAO/IATA)

Proper Shipping Name :

PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION

### MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :

PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION

## 15. REGULATORY INFORMATION

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

### NATIONAL REGULATIONS, USA :

#### OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

#### CERCLA/SUPERFUND, 40 CFR 302 :

Notification of spills of this product is not required.

#### SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

##### SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

##### SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

##### SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

##### TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

##### FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :

When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

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## SAFETY DATA SHEET

### PRODUCT

**NALCLEAR® 7763**

### EMERGENCY TELEPHONE NUMBER(S)

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Limitation. For use as an adjuvant in the manufacture of paper and paperboard in an amount not to exceed that necessary to accomplish the technical effect and not to exceed 2 percent (as polymer) by weight of the paper or paperboard.

#### NSF INTERNATIONAL :

This product has received NSF/International certification under NSF/ANSI Standard 60 in the coagulation and flocculation category. This product has received NSF/International certification under NSF/ANSI Standard 60 in the Filtration Aid category. The official name is "Polyacrylamide." Maximum product application dosage is : 1 mg/l.

#### FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

#### CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

#### CALIFORNIA PROPOSITION 65 :

Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product. Trace levels of listed components may be present.

#### MICHIGAN CRITICAL MATERIALS :

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

#### STATE RIGHT TO KNOW LAWS :

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

#### NATIONAL REGULATIONS, CANADA :

#### WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

#### WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.

#### CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

#### AUSTRALIA

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).



## SAFETY DATA SHEET

PRODUCT

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### CHINA

All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on the Inventory of Existing Chemical Substances China (IECSC).

### EUROPE

The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

### JAPAN

All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

### KOREA

All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL).

### NEW ZEALAND

All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996, and are listed on or are exempt from the New Zealand Inventory of Chemicals.

### PHILIPPINES

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

\* The human risk is: Low

\* The environmental risk is: Moderate

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

### REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight® CD-ROM Version), Ariel Research Corp., Bethesda, MD.

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**SAFETY DATA SHEET****PRODUCT****NALCLEAR® 7763****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC**

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS® CD-ROM Version), Micromedex, Inc., Englewood, CO

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS® CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight® CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS® CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight® (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight® CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS® CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 11/06/2009

Version Number : 1.20

**SAFETY DATA SHEET****PRODUCT****ULTRION® 8187****EMERGENCY TELEPHONE NUMBER(S)**  
**(800) 424-9300 (24 Hours) CHEMTREC****1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION****PRODUCT NAME :** ULTRION® 8187**APPLICATION :** WATER CLARIFICATION AID**COMPANY IDENTIFICATION :** Nalco Company  
1601 W. Diehl Road  
Naperville, Illinois  
60563-1198**EMERGENCY TELEPHONE NUMBER(S) :** (800) 424-9300 (24 Hours) CHEMTREC**NFPA 704M/HMIS RATING****HEALTH :** 2/2 **FLAMMABILITY :** 0/0 **INSTABILITY :** 0/0 **OTHER :**  
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme \* = Chronic Health Hazard**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Aluminum Chloride Hydroxide	12042-91-0	30.0 - 60.0

**3. HAZARDS IDENTIFICATION****\*\*EMERGENCY OVERVIEW\*\*****WARNING**

Irritating to eyes.

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.

Wear suitable protective clothing.

Not flammable or combustible. May evolve HCl under fire conditions.

**PRIMARY ROUTES OF EXPOSURE :**

Eye, Skin, Inhalation

**HUMAN HEALTH HAZARDS - ACUTE :****EYE CONTACT :**

Can cause moderate irritation.

**SKIN CONTACT :**

May cause irritation with prolonged contact.

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### INGESTION :

Not a likely route of exposure. May cause mucosal damage.

### INHALATION :

Not a likely route of exposure. May cause irritation of mucous membranes.

### SYMPTOMS OF EXPOSURE :

#### Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

#### Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

### AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

### HUMAN HEALTH HAZARDS - CHRONIC :

No adverse effects expected other than those mentioned above.

## 4. FIRST AID MEASURES

### EYE CONTACT :

Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get medical attention.

### SKIN CONTACT :

Remove contaminated clothing. Wash off affected area immediately with plenty of water. If symptoms develop, seek medical advice.

### INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. Get medical attention.

### INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

### NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

### FLASH POINT :

None

### EXTINGUISHING MEDIA :

Not expected to burn. Use extinguishing media appropriate for surrounding fire. Keep containers cool by spraying with water.



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### FIRE AND EXPLOSION HAZARD :

Not flammable or combustible. May evolve HCl under fire conditions.

### SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

### PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible. Ensure clean-up is conducted by trained personnel only. Do not touch spilled material. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Notify appropriate government, occupational health and safety and environmental authorities.

### METHODS FOR CLEANING UP :

**SMALL SPILLS:** Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

### ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

## 7. HANDLING AND STORAGE

### HANDLING :

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Do not breathe vapors/gases/dust. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

### STORAGE CONDITIONS :

Store the containers tightly closed. Store separately from bases.

### SUITABLE CONSTRUCTION MATERIAL :

PVC, Buna-N, Polyurethane, Polypropylene, Polyethylene, Viton, HDPE (high density polyethylene), 100% phenolic resin liner

### UNSUITABLE CONSTRUCTION MATERIAL :

Brass, Hypalon, Stainless Steel 304, EPDM, Mild steel, Stainless Steel 316L, Neoprene, Epoxy phenolic resin

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### OCCUPATIONAL EXPOSURE LIMITS :

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

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Country/Source	Substance(s)	Category:	ppm	mg/m <sup>3</sup>
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**ENGINEERING MEASURES :**  
General ventilation is recommended.

**RESPIRATORY PROTECTION :**  
Due to its low volatility and toxicity, the hazard potential associated with this material is relatively low. Respiratory protection is not normally needed.

**HAND PROTECTION :**  
When handling this product, the use of chemical gloves is recommended. The choice of work glove depends on work conditions and what chemicals are handled. Please contact the PPE manufacturer for advice on what type of glove material may be suitable. Gloves should be replaced immediately if signs of degradation are observed.

**SKIN PROTECTION :**  
Wear standard protective clothing.

**EYE PROTECTION :**  
Wear chemical splash goggles.

**HYGIENE RECOMMENDATIONS :**  
Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

**HUMAN EXPOSURE CHARACTERIZATION :**  
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

**9. PHYSICAL AND CHEMICAL PROPERTIES**

PHYSICAL STATE	Liquid
APPEARANCE	Colorless
ODOR	None
SPECIFIC GRAVITY	1.34 @ 77 °F / 25 °C
DENSITY	11.1 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	3.5
FREEZING POINT	32 °F / 0 °C
BOILING POINT	219.2 °F / 104 °C
VAPOR PRESSURE	Same as water
VOC CONTENT	0.00 % EPA Method 24



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Note: These physical properties are typical values for this product and are subject to change.

**10. STABILITY AND REACTIVITY**

**STABILITY :**  
Stable under normal conditions.

**HAZARDOUS POLYMERIZATION :**  
Hazardous polymerization will not occur.

**CONDITIONS TO AVOID :**  
Avoid extremes of temperature.

**MATERIALS TO AVOID :**  
Strong Bases

**HAZARDOUS DECOMPOSITION PRODUCTS :**  
Under fire conditions: HCl

**11. TOXICOLOGICAL INFORMATION**

No toxicity studies have been conducted on this product.

**SENSITIZATION :**  
This product is not expected to be a sensitizer.

**CARCINOGENICITY :**  
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

**HUMAN HAZARD CHARACTERIZATION :**  
Based on our hazard characterization, the potential human hazard is: Low

**12. ECOLOGICAL INFORMATION**

**ECOTOXICOLOGICAL EFFECTS :**

The following results are for the product.

**ACUTE FISH RESULTS :**

Species	Exposure	LC50	Test Descriptor
Inland Silverside	96 hrs	> 5,000 mg/l	Product
Rainbow Trout	96 hrs	590 mg/l	Product
Fathead Minnow	96 hrs	1,094 mg/l	Product

**SAFETY DATA SHEET****PRODUCT****ULTRION® 8187****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****ACUTE INVERTEBRATE RESULTS :**

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	> 5,000 mg/l		Product
Mysid Shrimp (Mysidopsis bahia)	96 hrs	4,773 mg/l		Product
Ceriodaphnia dubia	48 hrs	> 5,000 mg/l		Product

**CHRONIC INVERTEBRATE RESULTS :**

Species	Test Type	NOEC / LOEC	End Point	Test Descriptor
Ceriodaphnia dubia		15 mg/l / 30 mg/l	Reproduction	Product

**PERSISTENCY AND DEGRADATION :**

Total Organic Carbon (TOC) : 99 mg/l

Chemical Oxygen Demand (COD) : 490 mg/l

**Biological Oxygen Demand (BOD) :**

Incubation Period	Value	Test Descriptor
5 d	< 14 mg/l	Product

Greater than 95% of this product consists of inorganic substances for which a biodegradation value is not applicable.

**MOBILITY :**

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	30 - 50%	50 - 70%

The portion in water is expected to be soluble or dispersible.

**BIOACCUMULATION POTENTIAL**

This preparation or material is not expected to bioaccumulate.

**ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION**

Based on our hazard characterization, the potential environmental hazard is: Low

Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**SAFETY DATA SHEET****PRODUCT****ULTRION® 8187****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

**14. TRANSPORT INFORMATION**

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

**LAND TRANSPORT :**

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION****AIR TRANSPORT (ICAO/IATA) :**

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION****MARINE TRANSPORT (IMDG/IMO) :**

Proper Shipping Name :

**PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION****15. REGULATORY INFORMATION**

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

**NATIONAL REGULATIONS, USA :****OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :**

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Aluminum Chloride Hydroxide : Eye irritant

**CERCLA/SUPERFUND, 40 CFR 117, 302 :**

Notification of spills of this product is not required.

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SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

- X Immediate (Acute) Health Hazard
- Delayed (Chronic) Health Hazard
- Fire Hazard
- Sudden Release of Pressure Hazard
- Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :

When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

Product must be used at a pH above 5.5 to retain its FDA status. Limitations: no more than required to produce intended technical effect.

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

NSF INTERNATIONAL :

This product has received NSF/International certification under NSF/ANSI Standard 60 in the coagulation and flocculation category. The official name is "Polyaluminum Chloride." Maximum product application dosage is : 180 mg/l.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

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**CLEAN AIR ACT, Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 62, Class I and II Ozone Depleting Substances) :**

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

**CALIFORNIA PROPOSITION 65 :**

Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product.

**MICHIGAN CRITICAL MATERIALS :**

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

**STATE RIGHT TO KNOW LAWS :**

Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

**NATIONAL REGULATIONS, CANADA :**

**WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**WHMIS CLASSIFICATION :**

D2B - Materials Causing Other Toxic Effects - Toxic Material

**CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :**

The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

**AUSTRALIA**

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

**CHINA**

All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on the Inventory of Existing Chemical Substances China (IECSC).

**EUROPE**

The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

**JAPAN**

This product contains substance(s) which are not in compliance with the Law Regulating the Manufacture and Importation Of Chemical Substances and are not listed on the Existing and New Chemical Substances list (ENCS).

**KOREA**

All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

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### PHILIPPINES

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

\* The human risk is: Low

\* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

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The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS CD-ROM Version), Micromedex, Inc., Englewood, CO.

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Prepared By : Product Safety Department  
Date issued : 07/31/2009  
Version Number : 3.0

ATTACHMENT 13

WATER RIGHTS SUMMARY



Search all of Utah.gov »

## Utah Division of Water Rights



Search Radius: 5280 ft.

From the CT corner North 0 East 0 section 05 township 17S range 8E SLbm

WR Number	Diversion Type	Well Log	Location	Status	Priority	Uses	CFS	ACFT	Owner Name
<a href="#">0393003M00</a>	Underground		S0 W350 E4 06 17S 8E SL	A			0.000	0.000	WATER & ENVIRONMENTAL TECHNOLOGIES
<a href="#">93-928</a>	Rediversion		N760 0 SW 05 17S 8E SL	P	19160725	DIMOSP	0.000	600.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-928</a>	Rediversion		N100 E1270 SW 05 17S 8E SL	P	19160725	DIMOSP	0.000	600.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-928</a>	Rediversion		S1320 W300 N4 08 17S 8E SL	P	19160725	DIMOSP	0.000	600.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-928</a>	Rediversion		S840 E2480 NW 08 17S 8E SL	P	19160725	DIMOSP	0.000	600.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-950</a>	Rediversion		N760 0 SW 05 17S 8E SL	P	19210112	DIMOSP	0.000	465.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-950</a>	Rediversion		N100 E1270 SW 05 17S 8E SL	P	19210112	DIMOSP	0.000	465.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-950</a>	Rediversion		S1320 W300 N4 08 17S 8E SL	P	19210112	DIMOSP	0.000	465.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-950</a>	Rediversion		S840 E2480 NW 08 17S 8E SL	P	19210112	DIMOSP	0.000	465.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-951</a>	Rediversion		N760 0 SW 05 17S 8E	P	19220803	DIMOSP	0.000	9892.620	HUNTINGTON CLEVELAND IRRIGATION

<a href="#">93-951</a>	Rediversion	SL N100 E1270 SW 05 17S 8E SL	P	19220803 DIMOSP	0.000	9892.620	COMPANY HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-951</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	P	19220803 DIMOSP	0.000	9892.620	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-951</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	P	19220803 DIMOSP	0.000	9892.620	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-954</a>	Surface	N1565 W1430 SE 06 17S 8E SL	A	19620702 IS	75.000	0.000	USA BUREAU OF RECLAMATION -- PROVO AREA OFFICE
<a href="#">a14107</a>	Rediversion	N760 0 SW 05 17S 8E SL	A	19800228 DIMSPX	0.000	3000.000	STATE OF UTAH BOARD OF WATER RESOURCES
<a href="#">a14107</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	A	19800228 DIMSPX	0.000	3000.000	STATE OF UTAH BOARD OF WATER RESOURCES
<a href="#">a14107</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	A	19800228 DIMSPX	0.000	3000.000	STATE OF UTAH BOARD OF WATER RESOURCES
<a href="#">0393003M00</a>	Underground	S1700 E400 N4 06 17S 8E SL	A		0.000	0.000	WATER & ENVIRONMENTAL TECHNOLOGIES
<a href="#">0393003M00</a>	Underground	S1150 E700 N4 06 17S 8E SL	A		0.000	0.000	WATER & ENVIRONMENTAL TECHNOLOGIES
<a href="#">0393003M00</a>	Underground	S1900 E1000 N4 06 17S 8E SL	A		0.000	0.000	WATER & ENVIRONMENTAL TECHNOLOGIES
<a href="#">93-3370</a>	Point to Point	S660 W660 N4 08 17S 8E SL	P	18600000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-347</a>	Point to Point	N990 W300 E4 08 17S	P	18680000 S	0.000	0.000	CHARLES HOMER & RUTH L. ROWLEY

<a href="#">93-555</a>	Point to Point	8E SL N660 E1980 W4 08 P 17S 8E SL	18680000 S	0.000	0.000	SAMUEL HERBERT ROWLEY
<a href="#">93-152</a>	Point to Point	S660 W660 N4 P 08 17S 8E SL	19020000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-214</a>	Point to Point	N660 W660 SE P 06 17S 8E SL	19020000 S	0.000	0.000	PACIFICORP DBA UTAH POWER & LIGHT COMPANY
<a href="#">93-216</a>	Point to Point	N660 E660 SW P 05 17S 8E SL	19020000 S	0.000	0.000	EDWARD HARRISON
<a href="#">93-225</a>	Point to Point	S660 W660 N4 P 05 17S 8E SL	19020000 S	0.000	0.000	RUTH LARUE JOHNSON
<a href="#">93-227</a>	Point to Point	S660 W660 N4 P 08 17S 8E SL	19020000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-230</a>	Point to Point	N990 W300 E4 P 08 17S 8E SL	19020000 S	0.000	0.000	CHARLES HOMER & RUTH L. ROWLEY
<a href="#">93-231</a>	Point to Point	N990 W1150 E4 08 P 17S 8E SL	18750000 S	0.000	0.000	CHARLES HOMER & RUTH L. ROWLEY
<a href="#">93-3370</a>	Point to Point	S660 W660 N4 P 08 17S 8E SL	18600000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-347</a>	Point to Point	N660 W660 E4 P 08 17S 8E SL	18680000 S	0.000	0.000	CHARLES HOMER & RUTH L. ROWLEY
<a href="#">93-410</a>	Point to Point	S660 W660 N4 P 08 17S 8E SL	19020000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-555</a>	Point to Point	S1850 E250 N4 P 08 17S	18680000 S	0.000	0.000	SAMUEL HERBERT ROWLEY

<a href="#">93-564</a>	Point to Point	8E SL N660 W660 S4 32 16S 8E SL	P	19020000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-152</a>	Point to Point	S660 E660 N4 05 17S 8E SL	P	19020000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-216</a>	Point to Point	N660 E660 SW 05 17S 8E SL	P	19020000 S	0.000	0.000	EDWARD HARRISON
<a href="#">93-225</a>	Point to Point	S660 W660 N4 05 17S 8E SL	P	19020000 S	0.000	0.000	RUTH LARUE JOHNSON
<a href="#">93-227</a>	Point to Point	S660 W660 N4 08 17S 8E SL	P	19020000 S	0.000	0.000	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.
<a href="#">93-230</a>	Point to Point	N990 W1150 E4 08 17S 8E SL	P	19020000 S	0.000	0.000	CHARLES HOMER & RUTH L. ROWLEY
<a href="#">93-231</a>	Point to Point	S1850 E250 N4 08 17S 8E SL	P	18750000 S	0.000	0.000	CHARLES HOMER & RUTH L. ROWLEY
<a href="#">93-1063</a>	Surface	N165 W750 S4 05 17S 8E SL	U	19610330 DIS	0.000	130800.000	STATE OF UTAH BOARD OF WATER RESOURCES
<a href="#">93-1063</a>	Rediversion	S550 W400 N4 08 17S 8E SL	U	19610330 DIS	0.000	130800.000	STATE OF UTAH BOARD OF WATER RESOURCES
<a href="#">93-1136</a>	Rediversion	N760 0 SW 05 17S 8E SL	P	1892	DIMOSP 0.000	2025.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1136</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	P	1892	DIMOSP 0.000	2025.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1136</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	P	1892	DIMOSP 0.000	2025.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY

<a href="#">93-1136</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	P	1892	DIMOSP 0.000	2025.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1137</a>	Rediversion	N760 0 SW 05 17S 8E SL	P	1890	DIMOSP 0.000	3274.710	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1137</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	P	1890	DIMOSP 0.000	3274.710	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1137</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	P	1890	DIMOSP 0.000	3274.710	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1137</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	P	1890	DIMOSP 0.000	3274.710	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1138</a>	Rediversion	N760 0 SW 05 17S 8E SL	P	18900000	DIMOSP 0.000	50.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1138</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	P	18900000	DIMOSP 0.000	50.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1138</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	P	18900000	DIMOSP 0.000	50.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1138</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	P	18900000	DIMOSP 0.000	50.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1139</a>	Rediversion	N760 0 SW 05 17S 8E SL	P	18900000	DIMOSP 0.000	58.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1139</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	P	18900000	DIMOSP 0.000	58.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1139</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	P	18900000	DIMOSP 0.000	58.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY

<a href="#">93-1139</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	P	18900000	DIMOSP	0.000	58.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-1140</a>	Surface	N1572 W1466 SE 06 17S 8E SL	A	19220808	I	0.000	4000.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-221</a>	Surface	S840 E2480 NW 08 17S 8E SL	P	1875	DM	150.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2211</a>	Surface	S1320 W300 N4 08 17S 8E SL	P	1879	IS	45.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2212</a>	Surface	S1320 W300 N4 08 17S 8E SL	P	1884	IS	77.250	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2213</a>	Surface	S1320 W300 N4 08 17S 8E SL	P	1888	IS	80.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2226</a>	Surface	S840 E2480 NW 08 17S 8E SL	P	1879	DM	45.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2228</a>	Surface	S840 E2480 NW 08 17S 8E SL	P	1888	DM	80.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2229</a>	Surface	N760 0 SW 05 17S 8E SL	P	18790000	IS	45.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2230</a>	Surface	N760 0 SW 05 17S 8E SL	P	18840000	IS	77.250	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2231</a>	Surface	N760 0 SW 05 17S 8E SL	P	18880000	IS	80.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-2232</a>	Surface	N100 E1270 SW 05 17S 8E SL	P	18790000	IS	45.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY

<a href="#">93-2233</a>	Surface	N100 E1270 SW 05 17S 8E SL	P	18840000 IS	77.250	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">a14107</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	A	19800228 DIMSPX	0.000	3000.000	STATE OF UTAH BOARD OF WATER RESOURCES
<a href="#">a3812</a>	Rediversion	S550 W400 N4 08 17S 8E SL	A	19601102 I	0.000	10000.000	HUNTINGTON- CLEVELAND IRRIGATION COMPANY
<a href="#">E1708</a>	Surface	S700 W1220 E4 06 17S 8E SL	A	19800915 IS	0.000	10.800	PACIFICORP DBA UTAH POWER & LIGHT COMPANY
<a href="#">E2504</a>	Surface	S600 E2480 NW 08 17S 8E SL	A	19870326 M	0.000	325.000	CASTLE VALLEY SPECIAL SERVICE DISTRICT
<a href="#">9793004M00</a>	Underground	15588 N3300 W2400 SE 06 17S 8E SL	A		0.000	0.000	UTAH POWER
<a href="#">9793004M00</a>	Underground	15584 N300 W550 SE 06 17S 8E SL	A		0.000	0.000	UTAH POWER
<a href="#">9793004M00</a>	Underground	15585 N1050 W450 SE 06 17S 8E SL	A		0.000	0.000	UTAH POWER
<a href="#">9793004M00</a>	Underground	15583 N200 E150 SW 05 17S 8E SL	A		0.000	0.000	UTAH POWER
<a href="#">a15762</a>	Rediversion	N760 0 SW 05 17S 8E SL	A	19900730 IMP	0.000	31264.000	PACIFICORP DBA UTAH POWER & LIGHT COMPANY
<a href="#">a15762</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	A	19900730 IMP	0.000	31264.000	PACIFICORP DBA UTAH POWER & LIGHT COMPANY
<a href="#">a15762</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	A	19900730 IMP	0.000	31264.000	PACIFICORP DBA UTAH POWER & LIGHT COMPANY

<a href="#">a15762</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	A	19900730 IMP	0.000	31264.000	PACIFICORP DBA UTAH POWER & LIGHT COMPANY
<a href="#">a25346</a>	Surface	S662 E2449 NW 08 17S 8E SL	A	20010315 IS	0.000	344.800	HUNTINGTON- CLEVELAND IRRIGATION COMPANY
<a href="#">93-2234</a>	Surface	N100 E1270 SW 05 17S 8E SL	P	18880000 IS	80.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-224</a>	Surface	N760 0 SW 05 17S 8E SL	P	1875 IS	150.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-226</a>	Surface	N100 E1270 SW 05 17S 8E SL	P	18750000 IS	150.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-239</a>	Surface	S1320 W300 N4 08 17S 8E SL	P	1875 IS	150.000	0.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-3195</a>	Rediversion	N760 0 SW 05 17S 8E SL	P	19800228 DIMOSP	0.000	2000.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-3195</a>	Rediversion	N100 E1270 SW 05 17S 8E SL	P	19800228 DIMOSP	0.000	2000.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-3195</a>	Rediversion	S1320 W300 N4 08 17S 8E SL	P	19800228 DIMOSP	0.000	2000.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY
<a href="#">93-3195</a>	Rediversion	S840 E2480 NW 08 17S 8E SL	P	19800228 DIMOSP	0.000	2000.000	HUNTINGTON CLEVELAND IRRIGATION COMPANY



ATTACHMENT 14

PHC



**Attachment 14**

**Probable Hydrologic  
Consequences Determination**

June 2012



## Probable Hydrologic Consequences Determination

### General

The best available adjacent area data to assist in making a determination of probable hydrologic consequences of the proposed operation comes from the adjacent Bear Canyon Mine and from the USGS and Utah State Water Resources. The Bear Canyon Mine has been operating since the mid-1980's.

Data gathered from this mine and the surrounding hydrologic regime has been used in this determination, as well as data gathered in the area of the proposed Burma Pond.

Pertinent water monitoring data for the Fish Creek drainage are included in DOGM Water Database. Baseline geologic information is presented in Chapter 6 of Appendix 7-66. Baseline hydrologic information, descriptions of the function of the streams and groundwater systems, and discussions of various issues regarding the data are presented in Chapter 7 of Appendix 7-66. To ensure that this document addresses these issues, these data, descriptions, and discussions are referenced and should be considered a part of this document.

### Analysis of Data

Potential impacts of operation of the Burma Pond on the quality and quantity of surface and groundwater flow may include:

- Contamination by Sludge Materials;
- Increased sediment yield from disturbed areas;
- Increased sediment yield from disturbed areas;
- Increased total dissolved solids concentrations;
- Impacts to groundwater or surface water availability;
- Hydrocarbon contamination from trucks or from the use of hydrocarbons in the permit area;
- Contamination of surface and groundwater from road salting; and

- Contamination of surface water from sludge spillage due to hauling operations.

**Potential Impacts to the Hydrologic Balance.** Potential impacts of the Burma Pond on the hydrologic balance of the permit and adjacent areas are addressed in the following sections:

**Sludge Materials.** Information on the sludge materials proposed to be discharged to the pond are presented in Chapter 6. These data show that no acid- or toxic-forming materials are present in the sludge. Therefore, given that the sludge is suitable for disposal in a normal land fill once it is dried out, no impacts from Acid or Toxic forming materials are anticipated.

**Sediment Yield.** The potential impact of mining and reclamation on sediment yield is an increase in sediment in the surface waters downstream from disturbed areas. Sediment-control measures (such as sedimentation ponds, diversions, etc.) will be installed to minimize this impact. These facilities will be regularly inspected and maintained to ensure that they remain in proper operating condition.

The implementation of sediment control measures are mandated to minimize the erosion hazard associated with mining operations. Argument has been presented that reducing the sediment load, while the sediment carrying capacity of the stream remains the same, can result in increased stream bed and stream bank erosion. This would be true, if the flow rate released to the stream remained the same. However, the use of sediment control structures results in the peak flow released from the site being reduced to a controlled rate which is less than the natural peak flow. Therefore, the sediment carrying capacity of the stream is correspondingly reduced. Additionally, the duration of the lower rate controlled release from the sediment control structures aids in enhancing the development of vegetation along the stream banks which provides additional stabilization of the channel banks and bed. While the bed and bank impacts are not anticipated, the applicant has agreed to monitor the conditions of the channel downstream of the site for geomorphic and erosional change as a result of mine discharges.

All construction and upgrading activities will be undertaken during periods of dry weather, commencing in late spring and lasting through fall. For both the mining and reclamation periods, it is expected that construction, upgrading, or regrading activities would cause an increase in sediment load to the stream. Temporary sediment controls will be used whenever possible to lessen the impact of construction activities.

Various sediment-control measures will be implemented during reclamation as the vegetation becomes established. As discussed in Chapter 7 of Appendix 7-66, these measures will include installation of excelsior logs, silt fences, and straw-bale dikes in appropriate locations to minimize potential contributions of sediment from the reclaimed drainage surface. These measures will reduce the amount of erosion from the reclaimed areas, thereby precluding adverse impacts to the environment.

**Acidity, Total Suspended Solids, and Total Dissolved Solids.** Probable impacts of mining and reclamation operations on the acidity and total suspended solids concentrations of surface and groundwater in the permit and adjacent areas were addressed previously in this section. Since the proposed Burma Pond occurs in an ephemeral area, no water quality data are available. However, the Pond is a total containment structure which is not expected to have any releases. Therefore, there is not expected to be any impact to acidity, TSS or TDS for the surrounding resources.

**Flooding or Streamflow Alteration.** Runoff from all disturbed areas will flow through a sediment-control device prior to discharge from the permit area. Three factors indicate that these sediment-control devices will minimize or preclude flooding impacts to downstream areas as a result of mining operations:

1. The flow routing that occurs through the sediment-control devices reduces peak flows from the disturbed areas. This precludes flooding impacts to downstream areas.
2. By retaining sediment on site in the sediment-control devices, the bottom elevations of Fish Creek downstream from the disturbed area will not be artificially raised. Thus, the hydraulic capacity of the stream channel will not be altered.

During operations of the pond, the volume of runoff contributed to Fish Creek will decrease slightly as the pond will be a total containment structure.

Following reclamation, pond will be closed and the site reclaimed re creating the natural drainage pattern that existed before the site was used. The reclamation surface and channels have been designed to safely pass the peak flow resulting from the 10-year, 6-hour or the 100-year, 6-hour precipitation event as appropriate for the channel and in accordance with the R645 regulations. Thus, flooding in the reclaimed areas will be minimized. Interim sediment-control measures and maintenance of the reclaimed areas during the post-mining period will preclude deposition of significant amounts of sediment in downstream channels following reclamation, thus maintaining the hydraulic capacity of the channels and precluding adverse, off-site flooding impacts.

**Groundwater and Surface Water Availability.** Potential impacts to the availability of surface and groundwater in the area of the Burma Pond operations include both decreased and increased stream flows and new spring discharges caused by pond operations. These potential impacts are discussed below.

The decrease in flow would be the result of the total containment of the evaporation pond. This will have little effect on the adjacent drainage due to the small nature of the pond.

The increase in flow and occurrence of new springs could result from leakage of leachate from the pond. Due to the limit quantity of materials and the limited amount of water included in the sludge, this is highly unlikely. Also, this will be controlled by the use of an engineered liner and the high evaporation rate for the site area.

Due to the total containment of the evaporation pond and the limited area of the proposed site, it is felt that there will not be any increase or decrease in the ground and surface water availability in the site area.

**Potential Hydrocarbon Contamination.** Diesel fuel, oils, greases, and other hydrocarbon products will be used on the trucks that transport the sludge to the site and for a variety of maintenance purposes. No diesel and/or oil are planned to be stored at the facilities. Some spillage or leakage onto the ground during filling of vehicle tanks. Similarly, greases and other oils may be spilled during use in surface operations.

The probable future extent of the contamination caused by diesel and oil spillage is expected to be small for three reasons. First, because no on-site tanks will be used. Second, spillage during filling of the storage or vehicle tanks will be minimized to avoid loss of an economically valuable product. Finally, the Spill Prevention Control and Countermeasure Plan which will be developed for the site will provide inspection, training, and operation measures to minimize the extent of contamination resulting from the use of hydrocarbons at the site. This plan is not required to be submitted. However, a copy will be maintained at the mine site as required by the Utah Division of Water Quality.

**Road Salting.** No salting of roads will occur within the permit area. Hence, this impact is not a significant concern.

**Sludge Haulage.** Sludge will be hauled over the county road from the mine site area to Utah Highway 31 and thence to the Burma Road Turnoff. Once the evaporation pond site is reached, the road will be about 250 to 300 feet long to the pond off-loading area. In the event of an accident which causes sludge to spill from

the trucks, residual sludge following cleanup of the spill may wash into local streams during a runoff event. Possible impacts to the surface water are increased total suspended solids concentrations and turbidity from the fine sludge particulates. The probability of a spill occurring in an area sufficiently close to a stream channel to introduce sludge to the stream bed is considered small.

In addition to spills, wind may carry dried sludge dust or small pieces of sludge from the open top of the coal trucks into drainages near the roads. The impact from fugitive sludge dust is considered to be insignificant due to the small amounts lost during haulage in the permit and adjacent areas.

### **Conclusion**

Based on available data and expected evaporation pond conditions, the proposed mining and reclamation activity is not expected to proximately result in contamination, diminution or interruption of an underground or surface source of water within the proposed permit or adjacent areas which is used for domestic, agricultural, industrial, wildlife or other legitimate purpose.

### References

- Croley, Thomas W. III, 1977. Hydrologic and hydraulic computations on small programmable calculators, Iowa Institute of Hydraulic Research, Univ. of Iowa, Iowa City, Iowa.
- Goldman, et.al., 1986. Erosion and Sediment Control Handbook, McGraw-Hill Book Company, N.Y.
- Lines, G. C., 1985. The groundwater system and possible effects of underground coal mining in the Trail Mountain area, central Utah. U.S. Geological Survey Water-Supply Paper 2259, 32 p.
- Lines, G. C. and others, 1984. Hydrology of Area 56, Northern Great Plains and Rocky Mountain coal provinces, Utah: U.S. Geological Survey Water-Resources Investigations Open-File Report 83-38, 69 p.
- Lines, G. C. and Plantz, G. G., 1981. Hydrologic monitoring in the coal fields of central Utah, August 1978- September 1979: U.S. Geological Water-Resources Investigations Open-File Report 81-138, 56 p.
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- Unites States Department of Agriculture Soil Conservation Service. Computer program for the project formulation - hydrology, technical release number 20, 1982.
- Waddell, K. M., Dodge, J. E., Darby, D. W., and Theobald, S. M., 1986. Hydrology of the Price River Basin, Utah, with emphasis on selected coal-field areas: U.S. Geological Survey Water-Supply Paper 2246, 51 p.

***BONDING.....***

Bonding Calculations  
Crandall Canyon Mine C/007/032  
Revised

June 5, 2012

## Bond Summary

## Direct Costs

Subtotal Demolition and Removal	\$772,145.67	
Subtotal Backfilling and Grading	\$552,982.72	
Subtotal Revegetation	\$62,735.00	
Direct Costs	\$1,387,863.39	

## Indirect Costs

Mob/Demob	\$138,786.00	10.0%
Contingency	\$69,393.00	5.0%
Engineering Redesign	\$34,697.00	2.5%
Main Office Expense	\$94,375.00	6.8%
Project Management Fee	\$34,697.00	2.5%
Subtotal Indirect Costs	\$371,948.00	26.8%

Total	\$1,759,811.39	
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Escalation factor		0.012
Number of years		5
Escalation	\$108,153.00	

Total Main Mine	\$1,867,964.39	
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East Mountain	\$404,619.00	
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Reclamation Cost 2015	\$2,272,583.39	
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Bond Amount (rounded to nearest \$1,000)	\$2,273,000.00	
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Bond Posted 2011	\$2,327,000.00	
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Difference Between Cost Estimate and Bond	\$54,000.00	
Percent Difference		2.38%

Ref.	Description	Materials	Means Reference Number	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Shop 01																			
	Ventilation Fan 02																			\$37,324.00
	Rock Dust Silo 03																			\$11,767.00
	Concrete Dump Pad 04																			\$1,960.00
	Power Center 05																			\$25,358.00
	Power Poles 06																			\$11,888.00
	Underground Bathhouse 07																			\$2,895.00
	Portals 08																			\$8,124.00
	Bed/Portals 09																			\$31,200.00
	Crusher Pad 10																			\$3,490.00
	Mine Belt 11																			\$1,845.00
	Silo 13																			\$41,918.00
	Weight Shed 14																			\$426.00
	Truck Pad 17																			\$11,511.00
	Bulk Oil 15																			\$825.00
	General Storage 18																			\$16,346.00
	Reclaim Hopper Belt 19																			\$3,075.00
	Visual Disconnect 20																			\$615.00
	New Shop 21																			\$14,575.00
	Shop Extension 22																			\$4,316.00
	Shop Gate Slopes 23																			\$1,368.00
	Fan Transformer 24																			\$178.00
	Chain Link Fence 25																			\$463.00
	Concrete Guard 26																			\$5,340.00
	Retaining Wall 27																			\$3,495.00
	Culverts 28																			\$77,965.00
	Guard Rail 29																			\$1,978.00
	Inlets 30																			\$1,620.00
	Sed Pond Culvert 31																			\$545.00
	Gabion Retaining Wall 32																			\$2,191.00
	Overhead Conveyor Supports 35																			\$773.00
	Reclaim Tunnel 36																			\$2,257.00
	Feeder Boxes 37																			\$3,965.00
	Reclaim Conveyor Supports 38																			\$89.00
	Crusher Platform Supports 39																			\$1,096.00
	Feeder Conveyor Supports 40																			\$89.00
	Scale Pads 41																			\$89.00
	New Scale House 42																			\$5,198.00
	Proposed Bathhouse 43																			\$2,141.00
	Coal Silo 44																			\$3,772.00
	Conveyors 45																			\$8,664.00
	Paving Lot 46																			\$62,128.00
	Rubber Liner 47																			\$20,295.00
	Culvert Bedding Removal 48																			\$173,049.00
	Off Site Dump Fee 49																			\$66,096.00
	Drainage Control 50																			\$81,720.00
	Water Treatment Area 51																			\$10,962.00
	Burma Basin 52																			\$198.67
																				\$77,417.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
01	Shop 01																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31/CF	CF	160	20	20									0.35	64000	CF	\$19,840.00	
	Structure's Vol. Demolished																				
	Structure's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck	12 CY (16 Ton) Dump Truck 5 mi. rd. trip	02315 490 0540	11.95/CY	CY																\$9,918.00
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight	Neilson Construction	Neilson Con.	7/TON	TON																\$5,810.00
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	11.03/CY	CY	160	20	0.5													\$651.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader, 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rd. trip	02315 490 0320	3.66/CY	CY																\$115.00
	Disposal Costs	On site disposal	02220 240 5550	5.13/CY	CY																\$284.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$705.00
																					\$7,396.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
02	Ventilation Fan 02																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31 /CF	CF	60	20	16.67										20004	CF	\$6,201.00	
	Structure's Vol. Demolished																	2599	CY		
	Rubble & Weight (exclude steel)																	0.35			
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. md. bhp	02315 490 0540	11.95 /CY	CY																\$3,085.00
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Structure's Weight	Nelson Con.		7	TON																\$1,813.00
	Street's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Street																				
	Equipment's Disposal Cost																				
	Remaining Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition	Concrete demolition	Concrete/Demol	11.03 /CY	CY	60	20	0.5													\$243.00
	Concrete's Vol. Demolished																	1.3			
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49 /CY	CY																\$43.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. bhp	02315 450 0350	3.89 /CY	CY																\$107.00
	Disposal Costs	On site disposal	02220 240 3350	9.15 /CY	CY																\$285.00
	Concrete Demolition																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolish Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Remaining Cost																				
																					\$1,767.00



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swall Factor	Quantity	Unit	Cost	
04	Concrete Dump Pad 04																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes 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																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Asphalt Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				

Ref.	Description	Materials	Meas. Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
05	Power Center 05																				
	Structure's Demolition Cost																				
	Rubble's Vol. Demolished																				
	Truck's Weight (exclude steel)																				
	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																				
	Mechanical Equipment																				
	Transformer		15055 300 3600	615	ton							5									\$3,075.00
	Underground Wire		15055 300 3600	615	ton							2									\$1,230.00
	Aerial Wire		43	LF		900															\$4,329.00
	Chain Link Fence		02220 220 1700	43	LF	900															\$2,405.00
				3.66	LF	120															\$463.00
	Concrete Demolition																				
	Demolition Cost		ConcreteDemo1	11.05	CY	25	21	0.67													\$143.00
	Concrete's Vol. Demolished																				
	Loading Cost		02315 424 1300	1.49	CY																\$25.00
	Transportation Cost		12 CY (16 Ton) Dump. Truck 1/2 ml. rd.	3.69	CY																\$63.00
	Disposal Costs		02220 240 5550	9.15	CY																\$156.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$11,869.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
06	Power Poles 06																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble'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																				
	Equipment's Disposal Cost																				
	Remove wire	Wire Removal		4.81 /LF	180																\$866.00
	Remove conduit (use wire)	Wire Removal		4.81 /LF	100																\$481.00
	Remove fixtures (use poles)	Powerpole		126 /EA	6																\$756.00
	Remove Poles	Powerpole		126 /EA	6																\$756.00
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$8,800.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
07	Underground Bathroom 07 Structure's Demolition Cost Structure's Vol. Demolished Rubble & Weight (exclude steel)	Masonry Bld. Large	02220 110 0080	0.28/CF	CF						14000						0.35	14000 CF 181 CY		\$3,920.00	
	Truck's Capacity	12 CY (16 Ton) Dump Truck 5 ml. md. tip	02315 490 0540	11.65/CY														181 CY		\$2,165.00	
	Transportation Cost Non Steel Truck Transportation Cost Non Steel Drive Disposal Cost Non Steel	Nelson Construction	Nelson Con.	7/TON														181 ton		\$1,287.00	
	Steel Weight Steel's Capacity																				
	Haulage Transportation Cost Steel Truck Transportation Cost Steel Truck Drive Disposal Cost Steel																				
	Equipment's Disposal Cost Demolition Cost Equipment's Vol. Demolished Loading Costs Transportation Costs Disposal Costs																				
	Concrete Demolition Demolition Cost Concrete's Vol. Demolished Loading Cost Transportation Cost Disposal Costs	Concrete demolition Front end loader 3 CY 12 CY (16 Ton) Dump Truck 12 ml. md. tip On site disposal	ConcreteDemo1 02315 424 1300 02315 460 0320 02220 240 5550	11.03/CY 1.49/CY 3.68/CY 9.15/CY		70	20	0.5									1.3	26 CY 34 CY 34 CY 34 CY		\$287.00 \$51.00 \$75.00 \$11.00	
	Concrete Demolition Demolition Cost Concrete's Vol. Demolished Loading Cost Transportation Cost Disposal Costs																				
	Concrete Demolition Demolition Cost Concrete's Vol. Demolished Loading Cost Transportation Cost Disposal Costs																				

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
08	Porobal 08																				
	Structure's Demolition Cost	Seal Porobal	AML1	5200 EA.												6 EA		6 EA			\$31,200.00
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Driv																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				\$37,500.00
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
10	Crusher Pad 10																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31 /CF	CF	36	20	1									0.35	720	CF	\$223.00	
	Structure's Vol. Demolished	Rubble's Weight (exclude steel)																			
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. md. trip	02315 490 0540	11.95 /CY	CY																\$108.00
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	Nelson Construction			TON			1													\$63.00
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost	Mechanical equipment heavy	15055 300 3600	615 /ton	ton							3									\$1,845.00
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	11.03 /CY	CY	36	20	1													\$286.00
	Concrete's Vol. Demolished																	1.3	27	CY	\$286.00
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49 /CY	CY																\$52.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69 /CY	CY																\$129.00
	Disposal Costs	On site disposal	02220 240 5550	9.15 /CY	CY																\$320.00
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	11.03 /CY	CY																\$165.00
	Concrete's Vol. Demolished																	1.3	15	CY	\$165.00
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49 /CY	CY																\$30.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69 /CY	CY																\$74.00
	Disposal Costs	On site disposal	02220 240 5550	9.15 /CY	CY																\$183.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
13	Silo 13																				
	Structure's Demolition Cost	Mixer Materials Bld. Large	02220 110 0100	0.28 /CF	CF				75	30							0.35	53014	CF	\$14,844.00	
	Structure's Vol. Demolished																	687	CY		
	Structure's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck, 5 mi. md. trip	02315 480 0540	1.95 /CY	CY																\$8,210.00
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	Nelson Con.		7 /TON	TON																\$4,809.00
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost	Mechanical equipment heavy	15055 300 3600	615 /ton	ton							20									\$12,300.00
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03 /CY	CY	160	20	0.5													\$651.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	03315 424 1300	1.49 /CY	CY																\$115.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	03315 480 0320	3.69 /CY	CY																\$284.00
	Disposal Costs	On site disposal	02220 240 5550	9.15 /CY	CY																\$795.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$13,388.00







Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
18	General Storage 18																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31	/CF	20	60	23								FT	0.35	27600	CF	\$8,586.00	
	Structure's Vol. Demolished																	398	CY		
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck 5 ml. md. btp	02315 480 0540	11.95	/CY																\$4,278.00
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	Nielsen Construction	Nielsen Con.	7	/TON																\$2,506.00
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	11.03	/CY	20	67.5	0.67								FT	1.3	34	CY	\$375.00	
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49	/CY																\$56.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 ml. md. btp	02315 480 0320	3.69	/CY																\$182.00
	Disposal Costs	On site disposal	02220 240 5550	8.15	/CY																\$493.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$18,248.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
19	Reclaim Hopper Belt 19																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes 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																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished		15055 300 3600	615 /ton	ton							5									\$5,075.00
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$5,075.00



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
21	New Shop 21																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31 /CF	CF	20	62.5	20									0.35	25000	CF	\$7,750.00	
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes steel)																				
	Truck's Capacity	12 CY (16 Ton) Dump Truck 5 ml. md. bhp	02315 490 0540	11.95 /CY	CY																\$3,872.00
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	Nelson Construction			TON																\$2,268.00
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition	Concrete demolition	ConcreteDemo1	11.03 /CY	CY	20	62.5	0.5													\$254.00
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.48 /CY	CY																\$45.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 ml. md. bhp	02315 490 0520	3.69 /CY	CY																\$111.00
	Disposal Costs	On site disposal	02220 240 5550	9.15 /CY	CY																\$275.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
22	Shop Extension 22 Structure's Demolition Cost Structure's Vol. Demolished Rubble's Weight (exclude steel) Truck's Capacity	Steel Bld. Large	02220 110 0012	0.31/CF	CF	20	30	12									0.35	7200 CF 93 CF	FT	\$2,232.00	
	Manhole Transportation Cost Non Steel Truck Disposal Cost Non Steel Drive Structure's Weight Truck's Capacity	12 CY (16 Ton) Dump Truck 5 mi. md. bhp. Nelson Construction	02315 490 0540 Nelson Con.	11.95/CY 7/TON	CY TON								1					93 CF 93 ton	FT TON	\$1,111.00 \$651.00	
	Manhole Transportation Cost Steel Truck Disposal Cost Steel Equipment's Disposal Cost Equipment's Cost Equipment's Vol. Demolished Loading Costs Transport Costs Disposal Costs																				
	Concrete Demolition Demolition Cost Concrete's Vol. Demolished Loading Cost Disposal Cost Disposal Costs	Concrete demolition Front end loader 3 CY 12 CY (16 Ton) Dump Truck 1/2 mi. md. bhp. On-site disposal	ConcreteDemo1 03115 424 1300 03115 490 0320 02220 740 5550	11.05/CY 1.49/CY 3.69/CY 3.19/CY	CY CY CY CY	20	30	0.5									1.3	11 CY 14 CY 14 CY 14 CY	FT	\$121.00 \$21.00 \$52.00 \$123.00	
	Concrete Demolition Demolition Cost Concrete's Vol. Demolished Loading Cost Disposal Costs																				
	Concrete Demolition Demolition Cost Concrete's Vol. Demolished Loading Cost Disposal Costs																				

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
23	Shotcrete Slopes 23																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes 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																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete/Demo	11.03	/CY						46					CY		46	CY	\$507.00	
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49	/CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 ml. rd.	02315 480 0320	3.69	/CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15	/CY																
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$7,399.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
24	Van Transformer 24																				
	Structure Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Sheet's Weight																				
	Truck's Capacity																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Demolition Cost	Mechanical equipment heavy	15055 300 3600	615/ton	ton								0.25			0.25 ton					\$154.00
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	11.03/CY		6	8	0.67													
	Concrete's Vol. Demolished																				
	Loading Cost	Front and loader 3 CY	02315 424 1300	1.43/CY																	
	Transportation Cost	12 CY (16 ton) Dump Truck 12 mi. md. br	02315 460 0320	3.69/CY																	
	Disposal Costs	On site disposal	02220 240 5560	3.18/CY																	
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$198.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
25	Chain Link Fence 25																				
	Structure's Demolition Cost	Chain link remove 8'-10"	02220 220 1700	3.86/LF	LF	120													120/LF	\$463.00	
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Truck Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$463.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
26	Concrete Guard 28																				
	Structure Demolition Cost																				
	Structure Vol. Demolished																				
	Rubble'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																				
	Equipment's Disposal Cost																				
	Remaining Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete/Demo1	11.03	CY	530	2	3													
	Concrete Vol. Demolished	Concrete demolition	Concrete/Demo1	11.03	CY	530	2	3													
	Loading Cost	Front end loader 3 CY	0315 424 1300	1.49	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. mtd. tr	03318 450 1320	3.98	CY																
	Disposal Cost	On site disposal	02230 210 1550	9.13	CY																
	Remaining Cost																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete/Demo1	11.03	CY	280	10	0.87													
	Concrete Vol. Demolished	Concrete demolition	Concrete/Demo1	11.03	CY	280	10	0.87													
	Loading Cost	Front end loader 3 CY	0315 424 1300	1.49	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. mtd. tr	03318 450 1320	3.98	CY																
	Disposal Cost	On site disposal	02230 210 1550	9.13	CY																
	Remaining Cost																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete/Demo1	11.03	CY																
	Concrete Vol. Demolished	Concrete demolition	Concrete/Demo1	11.03	CY																
	Loading Cost	Front end loader 3 CY	0315 424 1300	1.49	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. mtd. tr	03318 450 1320	3.98	CY																
	Disposal Cost	On site disposal	02230 210 1550	9.13	CY																
	Remaining Cost																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete/Demo1	11.03	CY																
	Concrete Vol. Demolished	Concrete demolition	Concrete/Demo1	11.03	CY																
	Loading Cost	Front end loader 3 CY	0315 424 1300	1.49	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. mtd. tr	03318 450 1320	3.98	CY																
	Disposal Cost	On site disposal	02230 210 1550	9.13	CY																
	Remaining Cost																				

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
27	Retaining Wall 27																				
	Structure & Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Trailer																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Trailer																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Demolition Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transportation Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete/Demo1	11.03	1CY	530	2	3								FT	1.3	118	CY	\$1,302.00	
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02115 424 1300	1.49	1CY																\$228.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. mt. hd	02115 430 0320	3.89	1CY																\$565.00
	Disposal Costs	On site disposal	02210 240 5550	3.15	1CY																\$1,400.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$1,400.00



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
29	Guard Rail 29																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes 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																				
	Equipment's Disposal Cost																				
	Remove Rails		02220 240 0800	15.05	LF	120															\$1,806.00
	Remove Posts		02220 240 0880	16.95	Ea																\$170.00
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$1,976.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
30	Items 30																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excl. 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																				
	Equipment's Disposal Cost		15055 300 3600	615	ton																\$615.00
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost		ConcreteDemo1	11.03	CY						11										\$364.00
	Concrete's Vol. Demolished																				
	Loading Cost		02315 424 1300	1.49	CY																\$64.00
	Transportation Cost		02315 490 0350	3.69	CY																\$159.00
	Disposal Costs		02220 240 5550	9.15	CY																\$393.00
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost		ConcreteDemo1	11.03	CY																\$11.00
	Concrete's Vol. Demolished																				
	Loading Cost		02315 424 1300	1.49	CY																\$1.00
	Transportation Cost		02315 490 0350	3.69	CY																\$4.00
	Disposal Costs		02220 240 5550	9.15	CY																\$9.00
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost		ConcreteDemo1	11.03	CY																\$11.00
	Concrete's Vol. Demolished																				
	Loading Cost		02315 424 1300	1.49	CY																\$1.00
	Transportation Cost		02315 490 0350	3.69	CY																\$4.00
	Disposal Costs		02220 240 5550	9.15	CY																\$9.00
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	On site disposal																				



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
32	Cabin Retaining Wall 32																				
	Structure & Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes steel)																				
	Truck's Capacity																				
	Trucks																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Trucks																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment & Disposal Cost																				
	Demolition Cost																				
	Equipment's Vol. Demolished																				
	Equipment's Weight																				
	Trucking Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemol	11.03 /CY	CF						2000										816.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49 /CY																	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rtd. trip	02315 430 0350	3.09 /CY																	
	Disposal Costs	Site Disposal	02220 240 5550	9.15 /CY																	
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					157.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
33	Water Wells 33																				
	Structure's Demolition Cost	Plug Well	AML3	5000	EA.										4	EA		4	EA	\$20,000.00	
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Truck Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					620,000.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
34	Headwalks 34																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes 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																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				













Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
41	Scale Pads 41																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubber's Weight (excludes steel)																				
	Truck's Capacity																				
	Handling																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Handling																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Estimating Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Costs																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Costs																				
	Transportation Cost																				
	Disposal Costs																				

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
42	New Scale House 42																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31/CF	CF	20	20	8										3200	CF	\$982.00	
	Structure's Vol. Demolished																	41	CY		
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. md. trip	02315 490 0540	11.95/CY	CY													41	CY	\$490.00	
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight	Nelson Construction		7/TON	TON																
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY	20	30	0.5													
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY													1.3		\$121.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY															\$21.00	
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY															\$52.00	
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY	3	8	1.5													
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY													1.3		\$11.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY															\$1.00	
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY															\$4.00	
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY	0.66	80	0.66													
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY													1.3		\$11.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY															\$1.00	
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY															\$4.00	
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	Concrete Demo1	11.03/CY	CY																
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02315 490 0320	3.69/CY	CY																
	Disposal Costs	On site disposal	02220 240 5550	9.15/CY	CY																

Ref.	Description	Materials	Meas Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
43	Proposed Bathroom 43																					
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31/CF	CF	80	100	18									0.35	108000	CF	\$33,480.00		
	Structure's Vol. Demolished																					
	Rubble's Weight (excludes steel)																					
	Truck's Capacity	12 CY (16 Ton) Dump Truck 5 m. md. trip	02315 490 0540	11.95/CY	CY																\$16,730.00	
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	Nelson Con.		7/TON	TON																\$9,800.00	
	Steel's Weight																					
	Truck's Capacity																					
	Heavies																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Concrete Demolition																					
	Demolition Cost	Concrete Demol		11.03/CY	CY	80	100	0.5													\$1,224.00	
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																\$216.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 m. md. trip	02315 490 0320	3.68/CY	CY																\$531.00	
	Disposal Costs	On site disposal	02220 240 5550	8.15/CY	CY																\$1,318.00	
	Concrete Demolition																					
	Demolition Cost	Concrete Demol		11.03/CY	CY	3	320	1.5													\$585.00	
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																\$103.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 m. md. trip	02315 490 0320	3.68/CY	CY																\$255.00	
	Disposal Costs	On site disposal	02220 240 5550	8.15/CY	CY																\$631.00	
	Concrete Demolition																					
	Demolition Cost	Concrete Demol		11.03/CY	CY	1	80	0.66													\$22.00	
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 424 1300	1.49/CY	CY																\$4.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 m. md. trip	02315 490 0320	3.68/CY	CY																\$11.00	
	Disposal Costs	On site disposal	02220 240 5550	8.15/CY	CY																	\$27.00
	Concrete Demolition																					
	Demolition Cost	Concrete Demol		11.03/CY	CY																\$60,000.00	

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volumes	Weight	Density	Time	Number	Unit	Swall Factor	Quantity	Unit	Cost	
44	Coat Sill 14																				
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.31/CF	CF			60	12								0.35	6786	CF	\$2,104.00	
	Structure's Vol. Demolished																	88	CY		
	Rubble's Weight (excludes steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck	12 CY (16 Ton) Dump Truck, 5 mt. md. trip	02315 490 0540	11.95/CY	CY														88	CY	\$1,052.00
	Transportation Cost Non Steel Truck																				
	Disposal Cost Non Steel	Nelson Construction	Nelson Con.	7/TON	TON																
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Equipment's Disposal Cost																				
	Planishing Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
																					\$3,728.00



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swall Factor	Quantity	Unit	Cost	
46	Paving Lot 46																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (excludes 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																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
47	Rubber-Liner 47																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)		15055 300 3600	615	ton							32.5				ton		33	ton	\$20,295.00	
	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																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	TOTAL																				









Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
31	Burma Basin 52																				
	CMP 24	Demolition of 18" CMP	02 41 13.40 0120	2.35	LF	20	20	1.5								FT		20	LF	\$47.00	
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity	Excavate 3/8 CY excavator	31 23 16.13 0050	9.10	LF	20	5	4.5								BCY		16.67	BCY	\$151.67	
	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																				\$198.67
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$198.67

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Granddell Canyon Mine Earthwork Costs															
Backfilling and Grading															438117.98
Topsoil Distribution															47740.74
Support Equipment and Labor															67124
<b>Total</b>															<b>552862.72</b>

Cranehill Canyon Mine Backfilling and Grading	Means Reference Number	Hourly Operating Costs	Rent Per Day	Operator's Hourly Inc. O&P	Total Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Ds.	Units	Cost
Rippling Fill Area (D9 Dozer)															
D9-400 HP Grader/Dozer Attachment (ripper/scarifier)	01 54 33.20 4360	117.20	2225	70.25	372.87	1	372.87\$/HR		57387 CY		1473 CY/HR		39 HR		\$14,542.00
Subtotal	01 54 33	8.95	0.1		28.41	1	28.41\$/HR						39 HR		\$1,108.00
Backfill On Site															\$15,650.00
Grading															
989G EROPS (9-37) (2nd2005) 2005		40.05	0.1	55.4	180	1	180\$/HR		70192 CY		498 CY/HR		140.9 HR		\$25,362.00
769D (2nd 11) (2nd2005)		46.35	0.1	43.3	175	2	350\$/HR		70192 CY		498 CY/HR		140.9 HR		\$49,315.00
Excavator															
CAT 385BL (10-23) (2nd2005) (2005)		115.15	0.1	55.4	341.35	1	341.35\$/HR		12805 CY		181.3 CY/HR		70.6 HR		\$24,095.00
Place with Dozer															
D9-350U EROPS (9-34) (2nd2005)		80.3	0.1	55.4	279.26	1	279.26\$/HR		57387 CY		215 CY/HR		266.9 HR		\$74,534.00
Subtotal															\$173,310.00
Backfill Off Site															
Logging															
989G EROPS (9-37) (2nd2005) 2005		40.05	0.1	55.4	180	1	180\$/HR		66096 CY		583 CY/HR		113.4 HR		\$20,412.00
Hoiler															
8X4 85,000lbs 15-18 CY (20-1) (2nd2005)		33.5	0.1	43.3	115	17	1955\$/HR		66096 CY		583 CY/HR		113.4 HR		\$221,697.00
Subtotal															\$242,109.00
Miscellaneous Removal/Excavate Stream Channels															
446D 4WD (9-26) (2nd2005)		22.4	0.1	55.4	120	1	120\$/HR		1560 CY		151.1 CY/HR		10.3 HR		\$1,236.00
Subtotal															\$1,236.00
Burns Basin															
Backfill and grading on Site From Lines 16 to 25 Above	\$173.31070192 CY = \$2.46/CY						2.46		236.3 CY						\$5,812.96
Subtotal															\$5,812.96
Total Backfilling and Grading															\$438,117.96

Crandell Canyon Mine Topsoil Distribution	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
<b>Load From Topsoil Stockpile</b>														
Load														
986G Series II EROPS (9-36) (2nd2005)	7170	32.65	0.1	55.4	136.13	1	136.13 \$/HR	10737 CY		298.8 CY/HR		35.9 HR		\$4,887.00
Haul														
6X4 50,000lbs 10-12 CY (20-15) (2nd2005)	3225	26.8	0.1	43.3	92.94	5	464.7 \$/HR	10737 CY		298.8 CY/HR		35.9 HR		\$16,683.00
Subtotal														\$21,570.00
<b>Place Topsoil</b>														
Place with Wheel Loader														
986G Series II EROPS (9-36) (2nd2005)	7170	32.65	0.1	55.4	136.13	1	136.13 \$/HR	7354 CY		160.1 CY/HR		45.9 HR		\$6,248.00
Grading														
D7R Series II (9-54) (2nd2005)	11230	46.65	0.1	55.4	176.9	1	176.9 \$/HR	7354 CY		145 CY/HR		50.7 HR		\$8,969.00
Excavator														
CAT 385BL (10-23)(2nd2005) (2005)	25485	115.15	0.1	55.4	341.35	1	341.35 \$/HR	3383 CY		181.3 CY/HR		18.7 HR		\$6,383.00
Subtotal														\$21,600.00
<b>Burma Basin</b>														\$43,170.00
<b>From Lines 7 to 23 above</b>							<b>4.02</b>	<b>1137</b>				<b>CY</b>		<b>\$4,570.74</b>
<b>Total</b>														<b>\$47,740.74</b>



Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Vegetation																				
	Non Riparian																				
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor) B-81	Reveg005	19.8/MSF																	
	Hydroseed Materials	Seed Non Riparian Area	Crndall15321	394.75\$/AC																	5175
	Hydromulch Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	19.8/MSF																	2369
	Hydromulch Material	Hay 1" material only 029105000250	Reveg001	69.85/MSF																	5175
	Transplant																				18256
	Non Riparian																				
	Transplant Labor 150/AC	Bare root seedlings, 11" to 16" med. soil	02915 400 0562	1.31/Ea																	884
	Transplant Material	Transplants Non Riparian	Crndall 15322	349\$/AC						4.5											1571
	Transplant North Slope																				
	Transplant Labor 150/AC	Bare root seedlings, 11" to 16" med. soil	02915 400 0562	1.31/Ea																	
	Transplant Material	Transplants North Slopes	Crndall 15323	1859\$/AC						1.8											3013
	Riparian																				3346
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor) B-81	Reveg005	19.8/MSF																	
	Hydroseed Materials	Seed Riparian Area	Crndall 15324	261.01\$/AC																	259
	Hydromulch Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	19.8/MSF																	78
	Hydromulch Material	Hay 1" material only 029105000250	Reveg001	129/MSF																	259
	Transplant																				1686
	Riparian																				
	Transplant Labor 150/AC	Bare root seedlings, 11" to 16" med. soil	02915 400 0562	1.31/Ea																	248
	Transplant Material	Transplants Riparian	Crndall 15325	1967.3\$/AC						0.3											590
	Burma Basin																				
		Burma Pond																			
		Hydro Spreader (equip. & labor) B-81	Reveg005	19.8/MSF																	1216
		Seed Non Riparian Area	Crndall 15321	394.75\$/AC																	557
		Hydro Spreader (equip. & labor) B-81	Reveg005	19.8/MSF																	1216
		Hay 1" material only 029105000250	Reveg001	69.85/MSF																	4290
	Subtotal																				50188
	Revegetation																				
	Assume 25% revegetation rate																				12547
	Subtotal																				12547
	Total																				62735