

0015

Incoming  
C0150025  
X

## Hiawatha Coal Company

P.O. Box 1240  
Huntington, UT 84528

(435) 687-5777  
FAX (435) 687-5724

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

February 11, 2009

**Re: Bond Release, Bear Canyon Mine, C/015/025.**

We are requesting a Phase I bond release on the work already complete at the Bear Canyon Mine.

A substantial amount of reclamation work has been done on the Tank Seam Portal areas and access roads. As shown from the attached calculations, the bond amount on the area reclaimed is \$479,000. We are requesting the full 60% allowed under phase one bond release on these areas.

The total direct cost for this work is \$322,417. The total indirect cost and the escalation to 2013 dollars is \$242,549.

The total Bond Release that we are requesting in 2013 dollars rounded to the nearest \$1,000 is \$287,000.

The bond release calculations are included in the attached amendment and will be included in Appendix 8-B of the Bear Canyon MRP.

If you have any questions, please call me at (435) 687-5777.

Thank You,



Cliff Baker,  
Environmental Coordinator

File in:  
C0150025, 2009, Incoming  
Refer to:  
 Confidential  
 Shelf  
 Expandable  
Date: 2/11/09 For additional information

RECEIVED

FEB 17 2009

DIV. OF OIL, GAS & MINING

# Requirements for Bond Release

## I. Administrative Requirements

- A. A notarized signature of a responsible official is attached, and is to be included in Ch. 8, Appendix 8-B.
- B. A copy of the notification letter mailed out to all parties with valid interest in the release is attached and to be included in Ch. 8, Appendix 8-B.
- C. A copy of the Affidavit of Publication of Public Notice is attached, however Hiawatha Coal has not yet received the notarized copy.
- D. There are no outstanding permit conditions that have not been satisfied.

## II. Technical Requirements

### A. Bond Release Request

- 1. A legal description of the permit area can be found in Chapter 1, Page 1-6.
- 2. Maps are included with this submittal, all maps will be certified upon approval.
- 3. N/A
- 4. These are located in Chapter 2, Appendix 2-A and 2-E
- 5. These are located in Chapter 2, Appendix 2-A, 2-C, 2-D and 2-E

# APPLICATION FOR COAL PERMIT PROCESSING

Permit Change  New Permit  Renewal  Exploration  Bond Release  Transfer

**Permittee:** HIAWATHA COAL CO.

**Mine:** BEAR CANYON MINE

**Permit Number:** ACT/015/025

**Title:** Phase I Bond Release

**Description,** Include reason for application and timing required to implement:

Bond Release on reclamation areas TS-1, 8, 10, 11, and portion of 7

**Instructions:** If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

- Yes  No 1. Change in the size of the Permit Area? Acres: Disturbed Area:  increase  decrease.
- Yes  No 2. Is the application submitted as a result of a Division Order? DO#
- Yes  No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
- Yes  No 4. Does the application include operations in hydrologic basins other than as currently approved?
- Yes  No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
- Yes  No 6. Does the application require or include public notice publication?
- Yes  No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
- Yes  No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
- Yes  No 9. Is the application submitted as a result of a Violation? NOV #
- Yes  No 10. Is the application submitted as a result of other laws or regulations or policies?

Explain: \_\_\_\_\_

- Yes  No 11. Does the application affect the surface landowner or change the post mining land use?
- Yes  No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
- Yes  No 13. Does the application require or include collection and reporting of any baseline information?
- Yes  No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
- Yes  No 15. Does the application require or include soil removal, storage or placement?
- Yes  No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
- Yes  No 17. Does the application require or include construction, modification, or removal of surface facilities?
- Yes  No 18. Does the application require or include water monitoring, sediment or drainage control measures?
- Yes  No 19. Does the application require or include certified designs, maps or calculation?
- Yes  No 20. Does the application require or include subsidence control or monitoring?
- Yes  No 21. Have reclamation costs for bonding been provided?
- Yes  No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
- Yes  No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

**Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you.** (These numbers include a copy for the Price Field Office)

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.

N Finley  
Print Name

N Finley 2-11-09  
Sign Name, Position, Date

Subscribed and sworn to before me this 11 day of February, 2009

Mark Reynolds  
Notary Public



My commission Expires: 6-4, 2010  
Attest: State of Utah ) ss:  
County of Emery

<b>For Office Use Only:</b>   	<b>Assigned Tracking Number:</b>  	<b>Received by Oil, Gas &amp; Mining</b>  <div style="font-size: 2em; color: red; font-weight: bold;">RECEIVED</div> <div style="font-size: 1.5em; color: red; font-weight: bold;">FEB 17 2009</div> <div style="color: red; font-weight: bold;">DIV. OF OIL, GAS &amp; MINING</div>
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# Hiawatha Coal Company

P.O. Box 1240  
Huntington, UT 84528

(435) 687-5777  
FAX (435) 687-5724

February 11, 2009

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

**Re: Tank Seam Phase I Bond Release, Bear Canyon Mine, C/015/0025**

The Information contained in the request is true and correct to the best of my knowledge; and all applicable reclamation activities have been accomplished in accordance with the requirements of the Surface Mining Control and Reclamation Act., the State of Utah R645-Coal Mining Rules, and the approved Bear Canyon Mining and Reclamation Plan.

If you have any questions, please call me at (435) 687-5777.

Thank You,



Nate Finley  
Hiawatha Coal, Vice President

Subscribed and sworn to before me this 11 day of February, 2009

  
\_\_\_\_\_  
Notary Public

My Commission Expires 6-4, 2010

Attest: State of Utah ) ss:  
County of Emery

File in:

- Confidential
- Shelf
- Expandable

Refer to Record No. 0015 Date 02/11/09  
In C 0150025 2007 Incoming  
For additional information



# Hiawatha Coal Company

P.O. Box 1240  
Huntington, UT 84528

(435) 687-5777  
FAX (435) 687-5724

David O. Kingston  
ANR Company Inc.  
1657 W Indiana Ave.  
Salt Lake City, Utah 84104

February 11, 2009

**Re: Notification of Application for Phase I Bond Release for Tank Seam Portal Pad, Tank Seam Access Road, Upper Storage Pad, Portions of Blind Canyon Seam Portal Area, Ball Park, Bear Canyon Mine, C/015/025.**

Dear Mr. Kingston:

Hiawatha Coal Company, P.O. Box 1240, Huntington, UT 84528, has completed Phase I of the approved reclamation plan for approximately 7.0 acres of land related to Tank Seam Portal Pad, Tank Seam Access Road, Upper Storage Pad, Portions of Blind Canyon Seam Portal Area, and the Ball Park. Additionally the demolition of several mining related structures located throughout the mining site has been completed. The Phase I portion of the bond release application is based on completing the demolition, backfilling, grading, and drainage control requirements in accordance with the approved reclamation plan. The reclamation work applicable to this bond release application was completed in the fall of 2007.

In accordance with the requirements of R645-301-880, of the State of Utah R645-Coal Mining Rules, notice is hereby given to the general public and all affected land owners that Hiawatha Coal Company is applying for partial release of the performance bond posted for this operation.

The current bond amount for this site is \$1,413,000. The total bond release application is for \$479,000. Hiawatha Coal Company is seeking Phase I release of \$287,000 for reclamation activities completed in and around the Bear Canyon Mine.

The Tank Seam Access roads and pads, Storage area, Ball Park and demolished structures are located on the Utah, U.S. Geological Survey 7.5 minute quadrangle maps. This reclamation land is located in and around the Bear Canyon Mine on the following described lands:

Township 16 South, Range 7 East, SLB&M, Utah  
Section 23: Portions of the SE  $\frac{1}{4}$  SE  $\frac{1}{4}$   
Section 24: Portions of the SW  $\frac{1}{4}$  SW  $\frac{1}{4}$   
Section 25: Portions of the NW  $\frac{1}{4}$  NW  $\frac{1}{4}$   
Section 26: Portions of the NE  $\frac{1}{4}$  NE  $\frac{1}{4}$

Comments concerning bond release from the legal or equitable owner of record of the surface areas to be affected and from the Federal, Utah, and local government agencies or any interested parties should be mailed to Hiawatha Coal Company, Attention Mark Reynolds, P.O. Box 1202 Huntington, Utah 84528.

If you have any questions, please call me at (435) 687-5777, X-2501.

Thank You,

A handwritten signature in black ink, appearing to read "Cliff Baker", written in a cursive style.

Cliff Baker,  
Environmental Coordinator

Mailed to :

Mr. Mike McCandless  
Emery County Planning and Zoning

Emery County Commissioners

Mr. Jay Humphrey  
Water Conservancy District

Mr Patrick Gubbins  
Bureau of Land Management

Mr. David Kingston  
ANR Company

Hiawatha Coal Company  
Bear Canyon Mine Complex  
Permit C/015/025, renewed April 3, 2007  
Emery County, Utah

Hiawatha Coal Company, P.O. Box 1240, Hunting, Utah 84528, has completed Phase I of the approved reclamation plan for approximately 6.25 acres of land related to the Tank Seam portals, Blind Seam portals and access roads. The Phase I bond release application is based on completing the demolition, backfilling, grading, and drainage control requirements in accordance with the approved reclamation plan. The reclamation work applicable to this bond release was completed in the fall of 2007.

In accordance with the requirements of R645-301-880, of the State of Utah R645-Coal Mining Rules, notice is hereby given to the general public and all affected land owners that Hiawatha Coal Company is applying for partial release of the performance bond posted for this operation.

The Letter of Credit posted for the Bear Canyon Mine Complex is \$1,825,000. Hiawatha Coal Company is seeking Phase I release of approximately \$578,000 from the calculated bond amount for reclamation activities completed in and around the Bear Canyon Mine site.

The Tank Seam portals, Blind Seam portals, access roads, and demolished structures are located on Utah, U.S. Geological Survey 7.5 minute quadrangle maps. The reclamation land is located in and around the Bear Canyon Mine on the following described lands:

Township 16 South, Range 7 East, SLB&M, Utah  
Section 23: Portions of the SE  $\frac{1}{4}$  SE  $\frac{1}{4}$   
Section 24: Portions of the SW  $\frac{1}{4}$  SW  $\frac{1}{4}$   
Section 25: Portions of the NW  $\frac{1}{4}$  NW  $\frac{1}{4}$   
Section 26: Portions of the NE  $\frac{1}{4}$  NE  $\frac{1}{4}$

The Utah Division of Oil, Gas and Mining will now evaluate the proposal to determine whether it meets all the criteria of the Permanent Program Performance Standards according to the requirements of the Utah Coal Mining Rules.

Written comments, objections and requests for public hearing or informal conference on this proposal may be addressed to:

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

Closing dates for submission of such documents, objections and requests for public hearing or informal conference on this proposal must be submitted by (2/23/2009, 30 days after final publication).

Published in the Emery County Progress (12/30/2008, 1/7/2009, 1/14/2009, and 1/21/2009)

<b>Table 1-4 Surface Disturbance Summary</b>			
<b>DESCRIPTION</b>	<b>Total acres</b>	<b>Pre-1977 acres</b>	<b>New acres</b>
Ball Park Topsoil Pile	<del>1.27</del> 0	-0-	<del>1.27</del> 0
Lower Haul Road	1.60	1.60	-0-
Sed Pond B & Scale Office Pad	2.60	1.23	1.37
Sed Pond A	0.75	-0-	0.75
Main Pad Area	12.32	8.89	3.43
Portal Access Road	3.25	0.02	3.23
Blind Canyon Seam Portal Area	<del>1.81</del> 0.52	0.51	<del>1.30</del> 0.52
Upper Storage Pad	<del>0.87</del> 0	-0-	<del>0.87</del> 0
Shower House Pad	<del>1.83</del> 2.19	-0-	<del>1.83</del> 2.19
Tank Seam Access Road	<del>2.91</del> 0	-0-	<del>2.91</del> 0
Tank Seam Portal Pad	<del>0.66</del> 0	-0-	<del>0.66</del> 0
No. 3 Mine Access Road	3.26	-0-	3.26
Conveyor belt Access/Topsoil Stockpile	1.50	-0-	1.50
Upper Conveyor belt Access Road No. 2	0.96	-0-	.96
WHR Blind Canyon Seam Portal Area	1.58	-0-	1.58
<del>1</del> No. 4 Mine Access Road WHR Lower Access Road	<del>2.74</del> 0.89	-0-	<del>2.74</del> 0.89
<del>2</del> WHR Tank Seam Portal Pad Area WHR Upper Access Road and Pad	<del>0.55</del> 2.22	-0-	<del>0.55</del> 2.22
<b>TOTAL</b>	<del>40.46</del> 33.64	12.25	<del>28.21</del> 21.90

**116.200 No Response is needed**

### 222.300 Soil description

A description of each soil-mapping unit is contained in the reports in [Appendix 2-E](#) and [2-F](#). [Table 2-2](#) lists the Acreage of each soil unit found in the disturbed area. Following is a summary of each map unit.

Table 2-2 Soil Unit Acreages Within the Disturbed Area

Soil Symbol	Total Disturbed Acreage	Acreage with Topsoil Recovered	Est. Topsoil Depth (inches)
<b>Disturbed</b>	<b>23.70</b>	<b>2.56<sup>+</sup></b>	<b>In-place material<sup>2</sup></b>
DZE	<del>1.83</del> 19.46	<del>1.83</del> <sup>3</sup> 4.75 <sup>1 &amp; 2</sup>	6
PDR	<del>1.91</del> 0.00	<del>1.91</del> 0.00	0-6
TR	<del>1.66</del> 3.77	<del>1.66</del> 3.77	0-3
PC	<del>0.53</del> 0.47	0.41	12
WIN	<del>2.45</del> 2.21	0.52	15
WR	<del>0.72</del> 0.75	0.50	10
DON	<del>0.45</del> 0.43	0.43	40
DG	<del>3.96</del> 3.64	<del>2.22</del> 3.23	6-30
GP	<del>1.55</del> 2.22	0.23	6-10
DCP	<del>0.75</del> 0.71	<del>0.29</del> 0.22	6-15

- 1 Main Topsoil Pile, 1,480 cu yds recovered from Scalehouse Pad area.
- 2 See [Appendix 2-D](#): Shower House Topsoil material, 1,200 cu yds recovered.
- 3 ~~Shower House Topsoil material, 1,200 cu yds recovered.~~

Table 2-3 Available Substitute Topsoil Material

Location	Drill Hole	Drill Depth (in)	Area (acres)	Volume Available (cu. yd)	Minimum Cut Depth (in)
TS-3	SEDB-1	24	.09	296	13
TS-3	SEDB-2	48	.09	602	13
TS-3	SHP-1	60	1.34	10,797	13
TS-3	SHP-2	60	.81	6,533	13
<b>TS-3 Totals</b>			<b>2.33</b>	<b>18,228</b>	
TS-4	SEDA-1	24	.24	777	2.5
TS-4	SEDA-2	24	.20	641	2.5
<b>TS-4 Totals</b>			<b>.44</b>	<b>1,418</b>	
TS-5	SP-1	18	.69	1,680	18
TS-5	SP-2	24	.36	1,150	24
TS-5	CSP-1	96	.95	12,190	30
TS-5	CSP-2	84	1.32	14,863	27
TS-5	CSP-3	72	.25	1,931	27
TS-5	CSP-4	60	1.67	13,469	27
TS-5	CSP-5	72	3.03	29,325	27
<b>TS-5 Totals</b>			<b>8.28</b>	<b>74,608</b>	
TS-6	PAR-1	84	2.62	29,589	12
TS-7	LHP-1	96	<del>1.73</del> 0.52	<del>22,329</del> 10067	12
TS-8	USP-1	120	<del>.87</del> 0.00	<del>14,036</del> 0.00	12
TS-9	REF-1	36	.26	1,253	18
TS-9	REF-2	36	.71	3,413	18
TS-9	REF-3	36	.23	1,122	18
<b>TS-9 Totals</b>			<b>1.20</b>	<b>5,788</b>	

The following table summarizes the volumes of topsoil being stored.

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Table 2-5 Topsoil Summary Table

<u>Description</u>	<u>cu yd</u>
Main Topsoil Pile	1,480
Tank Seam Road Topsoil Storage Areas	<del>1,000</del> 0
Wild Horse Ridge Topsoil Pile	12,254
Wild Horse Ridge Tank Seam Topsoil Pile	<u>1,400</u>
Subtotal	16,134
On-site Material (Substitute Topsoil)	<del>36,452</del> 140,376
Total	<del>52,586</del> 155,510

### **Tank Seam Access Road and Portal Pad Topsoil Pile**

A survey of topsoil material was performed in the area of the Tank Seam access road and portal pad area in 1992. Four sites were sampled and the soil was analyzed. These sites are designated on [Plate 2-3E](#) as TSA-1, TSA-2, TSA-3 and TSA-4 (See [Appendix 2-A](#) for test results). Results indicated highest organic matter accumulations in the top 0-6 inches. Test results also indicate that the material tested is suitable for final reclamation material at all depths. See discussion in [Appendix 2-D](#). Soil depths were determined by the visible presence of organic matter and a distinct soil color change. The observations indicated a varying soil depth of 0 to 8 inches, the lesser depths being in the steep rocky areas. During construction, topsoil was stripped at depths varying from 0 to 8 inches by visually observing the depth at which organic material is found in the soil. The volume of topsoil which was recovered and placed in the designated storage area is 1,000 cubic yards.

Topsoil was recovered on the access road during construction and relocated to topsoil areas shown on [Plate 5-2C](#) and [5-2E](#). [Plates 2-2](#) show the details of the topsoil stockpiles. Upon completion of the topsoil recovery and storage, the topsoil was revegetated. A berm is maintained around the piles to totally contain runoff from the piles. Typical dimensions of the berms are shown on [Plates 2-2](#) and described in [Appendix 7-K](#), BTCA area "P".

This topsoil pile was utilized in the reclamation of the Tank Seam Access Road and Portal Pad.

### **Wild Horse Ridge Topsoil Stockpile**

A survey of topsoil material was performed in the area of the shower house pad and Sediment Pond "C". Three sites were sampled and the soil was analyzed. These sites are

designated on [Plate 2-3B](#) as [REF-1](#), [REF-2](#) and [REF-3](#) (See [Appendix 2-A](#) and [2-D](#) for test results). Results indicated organic matter accumulations in the [top 4 inches of REF-1](#) and [REF-3](#) and the [top 8 inches of REF-2](#). A field survey was conducted to verify the depths. Soil depths were determined by the visible presence of organic matter and a distinct soil color change. Field observations showed soil depths of [5 inches for REF-1](#), [8 inches for REF-2](#) and [7 inches for REF-3](#). Other sites were excavated and observed visually throughout the area. The observations indicated a varying soil depth of [6 to 8 inches](#), the lesser depths being in the vicinity of [REF-1](#). Soil depths averaged [8 inches in the vicinity of REF-2](#) (0.47 acres), [7 inches in the vicinity of REF-3](#) (0.69 acres) and [6 inches in the vicinity of REF-1](#) (0.68 acres).

Prior to construction on the shower house pad, topsoil material was salvaged at these approximate depths and stockpiled. Topsoil salvage consisted of confirming and staking out depths throughout the area to facilitate excavation activities, removing vegetation and large rocks which could interfere with topsoil salvage operations. Shrubs and herbaceous vegetation were salvaged along with the topsoil material to enhance the quality of the salvaged material. The final topsoil stockpile consisted of ~~1200~~ [1400](#) cu yds of material for reclamation, due to the extreme amount of boulders and rocks on the surface which were too large in volume to place in the pile.

In 2001, Co-Op relocated this topsoil material to the Wild Horse Ridge topsoil stockpile.

An Order I soil survey of topsoil material was performed in the Wild Horse Ridge area. The results of this survey are included in [Appendix 2-F](#) and [Appendix 2-G](#).

Topsoil salvage depths for each unit are shown on [page 13 of Appendix 2-F](#), and [page 7 of Appendix 2-G](#). Soil map units are shown on [Plate 2-1](#). Co-Op proposes to salvage topsoil in

Table 2-7 Reclamation Area Summary					
MARK <sup>1</sup>	DESCRIPTION	Total ac. <sup>1,2,3</sup>	Re-contour acres <sup>1&amp;3</sup>	Pre-1977 acres <sup>2</sup>	New acres
TS-1	Ball Park Topsoil Pile	<del>1.27</del> 0.0	0.0	-0-	<del>1.27</del> 0.0
TS-2	Lower Haul Road	1.6	0.0	1.6	-0-
TS-3	Sed Pond B & Scale Office Pad	2.60	1.41	1.23	1.37
TS-4	Sed Pond A	0.75	0.75	-0-	0.75
TS-5	Main Pad Area	12.32	9.41	8.89	3.43
TS-6	Portal Access Road	3.25	3.25	0.02	3.23
TS-7	Blind Canyon Seam Portal Area	<del>1.81</del> 0.52	<del>1.81</del> 0.52	0.51	<del>1.30</del> 0.52
TS-8	Upper Storage Pad	<del>0.87</del> 0.0	<del>0.83</del> 0.0	-0-	<del>0.87</del> 0.0
TS-9	Shower House Pad	<del>1.83</del> 2.19	<del>1.83</del> 2.19	-0-	<del>1.83</del> 2.19
TS-10	Tank Seam Access Road	<del>2.91</del> 0.0	<del>2.91</del> 0.0	-0-	<del>2.91</del> 0.0
TS-11	Tank Seam Portal Pad	<del>0.66</del> 0.0	<del>0.59</del> 0.0	-0-	<del>0.66</del> 0.0
TS-12	Wild Horse Ridge Access Road	3.26	0.22	-0-	3.26
TS-13	Conveyor belt Access/Topsoil	1.50	1.14	-0-	1.50
TS-14	Upper Conveyor belt Access Road	.96	0.66	-0-	0.96
TS-15	WHR Blind Canyon Seam Portal Area	1.58	1.58	-0-	1.58
TS-16	WHR TS Lower Portal Access Road	0.89	0.0	-0-	0.89
TS-17	WHR TS Upper Access Road and Pad	2.22	1.74	-0-	2.22
TOTAL		<del>40.28</del> 33.64	<del>28.13</del> 22.87	12.25	<del>28.03</del> 21.90

Notes:

1. See [Plates 2-3](#).
2. See [Plates 5-2](#).
3. The total acres represent acreage which will be reclaimed. Some of the acres will not require re-contouring or regrading during reclamation. The "Re-contour acres" represent the total acres which will require regrading. The "Total acres" shown will be reclaimed in accordance with the reclamation plan.

The proposed substitute topsoil material will be re-tested in the final five years of operations according to [Table 50-1](#) and will include Total Petroleum Hydrocarbons by EPA Methods 8015 and 418.1. The location of these samples will correlate with the areas generating the most substitute topsoil material as described in [Appendix 5-I](#). Following regrading, soils remaining on the surface as substitute topsoil material will be sampled for pH, EC, and Total Hydrocarbons by EPA method 8015 for diesel fuel and 418.8 for waste oil.

Table 2-8 Substitute Topsoil Summary

Location	Topsoil Amounts Required			Substitute Topsoil Generated from Cuts (cu. yd.)			
	Area (acres)	Depth (in.)	Volume (cu. yd.)	Topsoil Stockpile	Sub. Topsoil Generated	Sub. Topsoil Not Regraded	Total Topsoil
TS-3	1.41	12	<b>2,275</b>	0	2,080	2,563	<b>4,643</b>
TS-4	.75	10	<b>1,008</b>	0	1,008	0	<b>1,008</b>
TS-5	9.41	12	<b>15,181</b>	0	20,814	4,537	<b>25,351</b>
TS-6	3.25	12	<b>5,243</b>	0	7,111	0	<b>7,111</b>
TS-7	<del>1.81</del> 0.52	12	<del>2,920</del> <b>839</b>	0	<del>4,170</del> <b>867</b>	0	<del>4,170</del> <b>867</b>
TS-8	<del>.83</del> 0.0	12	<del>1,339</del> <b>0</b>	0	<del>3,552</del> <b>0</b>	0	<del>3,552</del> <b>0</b>
TS-9	1.83	12	<b>2,952</b>	1,200	3,761	0	<b>4,961</b>
Total			<del>36,452</del> <b>25,223</b>				<del>50,796</del> <b>43,941</b>

reclaimed area more aesthetically compatible with the undisturbed surroundings. The detailed revegetation plan to be submitted in the last five year permit renewal prior to reclamation, will include maps showing the areas to receive matting.

TS-1 Ball Park Topsoil Pile. Reclamation plant growth material will come from in-place material. **This area has been reclaimed.**

TS-2 Lower Haul Road. Disturbance to this section is limited to the road impacts from added road base material, compaction and minor spills of coal material that occur from haul vehicles. This area is within the pre-1977 disturbance area and did not have topsoil recovered for reclamation purposes. With ripping, regrading and seedbed preparation as described in this plan additional plant growth material will not be required.

TS-3 Sediment Pond B and Scale House. Approx one half of this area is within the pre-1977 disturbed area. The embankment material from sed pond B is vegetated showing its suitability as substitute plant growth material. The material over the culverted creek is seeded as a back yard for the scale house also indicating good suitability. With removal of the culvert this material will be available for distribution. The road material can be treated as in area TS-2. A total 18,228 cu. yd. of substitute topsoil material is available in the recovered area. 0.32 acres will not be regraded but will simply be ripped to a depth of 12 inches and used in place giving a volume of

2,563 cu. yd. non-regraded substitute topsoil material. 2,080 cu. yd. of the available substitute topsoil will be used in the remaining area giving a depth of at least 12 inches of substitute topsoil material over the entire area. **Approximately 1480 cu.yd. of topsoil was recovered and stored in the main topsoil pile.**

TS-4 Sediment Pond A. The embankment material from sed pond A is vegetated indicating good suitability as substitute plant growth material. 1,418 cu. yd. of substitute topsoil material is available in the recovered area. 1,008 cu. yd. of this material will be used giving a minimum depth of 10 inches.

TS-5 Main Pad Area. Covering approx 12.32 acres, this is the largest of the disturbed areas. Approx one third of this area is covered with coal storage. All but approx two acres of this area are within the pre-1977 disturbed area and did not have topsoil recovered for reclamation purposes. Although the coal storage and traffic within this area will compact the fill material, testing shows that it is suitable as plant growth material. Fill used for the upper layer of recontouring material will come from the outer or eastern edge of the pad. This material was the topsoil prior to Mining. 75,286 cu. yd. of substitute topsoil material was tested in the recovered area. 15,181 cu. yd. of this material will be used giving a minimum depth of 12 inches over the entire area. 15,428 cu. yd. of fill material will be generated in this area for use in TS-7 and TS-8.

[TS-6 Portal Access Road](#). This area was disturbed prior to initiation of Mining by Co-Op Mining Co. and did not have topsoil recovered for reclamation purposes. This area has received special attention in the past and is discussed in [Appendix 2-C](#). This area will be treated the same as area [TS-2](#). 29,589 cu. yd. of substitute topsoil material is available in the recovered area. 7,111 cu. yd. of material will be used giving a minimum depth of 12 inches of substitute topsoil material over the entire area. 2,553 cu. yd. of fill material will be generated in this area for use in [TS-7](#) and [TS-8](#).

[TS-7 Portal Pad Area](#). Most of this area is within the pre-1977 disturbed area and did not have topsoil recovered for reclamation purposes. Downcast material will be recovered for reclamation. 22,329 cu. yd. of substitute topsoil material is available in the recovered area. 4,170 cu. yd. of this material will be used giving a minimum depth of 12 inches of substitute topsoil material over the entire area. 11,582 cu. yd. of fill material will come from [TS-5](#) and [TS-6](#). All but approximately 0.52 acres have been reclaimed.

[TS-8 Upper Storage Pad](#). This area did not have topsoil recovered for reclamation purposes. Non-toxic and non-acid forming materials are stored on the pad. Sources for contamination are minimal. This area will be treated the same as [TS-7](#). Some material from the lower pad areas will be required to recover the highwalls. See [Appendix 5-I](#). 14,036 cu. yd. of substitute topsoil material is available in the recovered area. 3,552 cu. yd. of this material will be used giving a

minimum depth of 12 inches of substitute topsoil material over the entire area. 1,952 cu. yd. of fill material will come from [TS-5](#) and [TS-6](#). **This area has been reclaimed.**

[TS-9 Shower House Pad](#). This area will have topsoil recovered for reclamation purposes. Sources for contamination are minimal. Following recontouring at the time of final reclamation, the topsoil material recovered prior to construction will be spread over the surface to attain an approx depth of 7 inches. Additional in place material has been tested and is available in the recovered area for substitute topsoil. At least 2,952 cu. yd. of this material will be placed below the 7 inches of topsoil, giving a minimum depth of 12 inches of topsoil or substitute topsoil material over the entire area.

[TS-10 Tank Seam Access Road](#). Topsoil material recovered during construction will be placed in the topsoil storage piles located along the Tank Seam access road and is shown on [Plate 2-2E](#). Additional plant growth material will not be required. **This area has been reclaimed.**

[TS-11 Tank Seam Portal Pad](#). Topsoil material recovered during construction will be placed in the topsoil storage pile shown on [Plate 2-3E](#) and [2-2E](#). **This area has been reclaimed.**

## R645-301-527 Transportation Facilities

There are ~~eleven~~ **nine** primary roads in the permit area: Bear Canyon Haul Road, ~~Portal Access Road, Tank Seam Access Road,~~ Shower House Road, road to Sediment Pond A, Tipple Access Road, Shop Road, No. 3 Mine Access Road, No. 4 Mine Access Road, and the No.1 and No.2 Conveyor Access Roads. All roads are shown on Plates 5-2. Road profiles and typical cross sections are shown on Plates 5-4. A description of all roads is included in Appendix 5-F, along with maintenance procedures. Construction of the Tank Seam Access Road is discussed in Appendix 5-G. Construction of the Wild Horse Ridge road is discussed in Appendix 5-J. Construction of the Wild Horse Ridge Tank Seam Road is discussed in Appendix 5-K. Construction of the Mohrland Road is discussed in Appendix 5-L. Construction of the No. 4 Mine Access Road is discussed in Appendix 5-K.

The mine area is approached on the Bear Canyon Haul Road. ~~The #1 mine portal is reached on the Portal Access Road. The Tank Seam Portal is reached on the Tank Seam Access Road.~~ The Wild Horse Ridge area is accessed on the No. 3 Mine Access Road. The WHR Tank Seam is accessed on the No. 4 Mine Access Road. Six other primary roads provide access; to the Sediment Pond A, the coal preparation facility (tipple), the shop, the Wild Horse Ridge conveyor belts, and to the Shower House.

The Bear Canyon Haul Road, No. 3 Mine Access Road, and part of the No. 4 Mine Access Road are also used by customers of Sportsman's Hunting to access a hunting cabin, which exists in the right fork of Bear Canyon. This non-mining recreational use of the road occurs primarily from May until November, typically 2-3 times per week. A lease agreement

analyzed during the analysis of in-place plant growth material, presented in [Appendix 2-D](#). This material is represented by the soil samples identified as [SHP-1](#), [SHP-2](#) and [PAR-1](#) (Soil segment from 0-0.5 ft.). Sample locations are shown on [Plates 2-3B](#), [2-3C](#) and [2-3D](#). None of the investigations revealed any acid- or toxic- forming materials. Any coal waste material encountered during the portal face-up process will be treated as described in [R645-301-528](#), and will not be used in the fill or as road surface material.

Reclamation of roads and parking areas ~~is treated in the same manner as other working area~~ will be in accordance with the C.O.P. agreement located in [Appendix 1B](#). Any asphalt or treated surfaces will be removed prior to rehabilitation upon completion of mining. Roads which are permitted to remain in place will be fit with drainage control structures adequate for post-mining use. See [Plates 5-4](#), [5-5](#) and [5-6](#), and road agreements under [Appendix 5-F](#).

## **R645-301-528 Handling and Disposal of Coal, Overburden, Excess Spoil, and Coal Mine Waste**

### **528.100 Coal Removal, Handling, Storage, Cleaning and Transportation Areas and Structures**

Coal is carried from the mines by conveyor belt to surge bins, and then conveyed to the [sizing and crushing plant \(tipple\)](#), where the lump is removed and diverted to the [lump bin](#) or [seasonal storage area](#). The rest of the oversized is crushed, and then sized to meet the various requirements of different customers. It is then conveyed to the truck load-out bins or the stockpile area.

‡Coal will be transferred from the Tank Seam to the Blind Canyon Seam of the Bear Canyon No. 1 Mine through a 7 ft diameter borehole, which has been bored from the surface adjacent to the portal. The conveyor from the portal and the drop tube structure will be enclosed. Air cannons will be placed on the outside of the drop tube to prevent the wedging of coal in the tube. A 7 ft diameter borehole will be used in Wild Horse Ridge to transfer coal from the Tank Seam (#4 Mine) to the Blind Canyon Seam (#3 Mine). This borehole, ~~however, will be~~ **was** constructed underground.

Coal from the **#3 mine** will be transferred from the portal area to the tipple using an overland conveyor. This conveyor is shown on **Plates 5-2C, 5-2F and 5-2G**. The conveyor will either be suspended in the air from cables or set on stands on the ground. Because the Wild Horse Ridge area is an important migratory path for the deer and elk, restriction of this migration by the conveyor in areas where it sets on the ground is a concern. To mitigate this potential problem, the stands will be constructed to suspend the bottom of the conveyor belt a minimum of 36" above the ground. A typical cross-section of the conveyor is shown in **Appendix 7-K, Figure 1**. All moving parts are contained within the spill pan, so there will be no danger to wildlife passing under the conveyor.

## **R645-301-540 Reclamation Plan**

### **R645-301-541 General**

#### **541.100 Reclamation of All Areas**

Upon completion of mining on the permit area, C.W. Mining will reclaim all disturbed surface areas as diligently and rapidly as possible, to restore the property to pre-mining and/or alternative post-mining uses. All reclaimed areas will be maintained during the liability period for at least 10 years.

The initial step in the reclamation plan is to seal all large-diameter openings by backfilling these openings with non-combustible material (earth & small rock), adjacent to the portals. The seals will be designed such that mine drainage, if any, will not enter surface water bodies. For a more detailed description of the sealing of openings, see [R645-301-529](#), Sealing of mine Openings, Drill Holes, Wells, etc.

The next step in reclamation would be the removal of all surface structures, equipment and road blacktop. Once this has been accomplished, all solid waste generated in the abandonment operation will be collected and disposed of in an approved manner. Additional information concerning this aspect of the reclamation plan is present in [R645-301-541.300 \(Surface Structures\)](#), and [R645-301-542.600 \(Roads\)](#).

Proposed access roads to the mine portals will be reclaimed and revegetated **in accordance with the C.O.P. agreement located in Appendix 1B**. This will accomplish a dual purpose of controlling runoff and re-vegetating the hillsides with vegetation

As the lifts are placed and fill material retrieved, topsoil will be redistributed on the outslope and upper lifts and spread using a backhoe. Boulder sized rock fragments will be embedded into the surface in the upper lifts as described on [page 5H-27](#) in order to obtain, at a minimum, a surface rock cover of 32.75 percent, which equals the reference area cover shown on [page 5A-24](#).

Using the bucket of the backhoe, the surface will then be ripped and scarified, creating horizontal pockets approx. 8 to 12 inches deep to aid in water retention for revegetation. The bucket will also spread the topsoil at the top of the cut in a manner to blend the reclaimed slope with the natural slope above.

As backfilling progresses down the road, seed will be placed on the completed slopes behind backfilling by hand. Following seeding, erosion control matting similar to Excelsior S-2 or equivalent will be placed on the slopes by hand, and stapled to the reclaimed surfaces.

Reclamation will progress in this manner to the bottom of the Tank Seam Access Road.

The Tank Seam Portal Pad (TS-11), Tank Seam Access Road (TS-10), Upper Storage Pad (TS-8), and 1.29 acres of the Blind Canyon Seam Portal Area (TS-7) have been reclaimed.

## GENERAL COMMENTS

### **Construction**

All roads shall be constructed and maintained in such a manner that the approved design standards are met throughout the life of the entire transportation facility. This shall include maintenance of the surface, shoulders, parking, side areas, and erosion control structures for safe and efficient utilization of the road. Road are shown on [Plates 5-2](#). Cross sections and profiles are found on [Plates 5-4](#).

The horizontal alignment of each road is consistent with the existing topography and with the volume, speed, and weight of anticipated traffic. The highly traveled Primary Haul Road is surfaced with asphalt. The WHR Portal access roads and ~~Portal Access Road~~ are surfaced with 4 in. min of durable road base material. The high percentage of coarse granular material in the native soil provides for adequate surfacing of the remaining roads. Additional road base may be added to all roads as required. Damage to the roads from use or weather events shall be promptly repaired.

Ditches and culverts have been designed and installed to control and safely pass or contain run-off from a 10-yr, 24-hr precipitation event. Ditches are rip-rapped as required. Culverts are fitted with trash racks to prevent plugging and buried adequately to prevent crushing. Rock or concrete headwalls are provided at inlets to all culverts, and

## **RECLAMATION**

All roads shall be removed upon completion of the mining operation except those approved as part of the post-mining land use. The timing and procedure of removal and reclamation is discussed in detail under the Backfilling and Grading Plan in [R645-301-553](#) See [R645-301-540](#), and [Chapters 7, 2 and 3](#) for full reclamation procedures.

During reclamation road surfacing material will be removed and salvaged or buried as fill material in the reclamation of highwalls, see [Appendix 5-I](#). Reclamation will then be accomplished by ripping up the remaining base, and ensuring that suitable plant growth material is in place prior to planting the area with the approved seed mix. During this time, all culverts shall be removed and either salvaged or disposed of in an approved landfill, and the natural drainage patterns shall be restored.

## **PRIMARY ROADS**

There are ~~14~~ 9 Primary roads within the Permit Area. Each road is described below. Construction of the Tank Seam Access road is described in [Appendix 5-G](#). Construction of the Wild Horse Ridge Access road and Conveyor Access roads are described in [Appendix 5-J](#). Construction of the No. 4 Mine Access Road is described in [Appendix 5-K](#).

### **Tank Seam Access Road**

This road is approximately 3,150 ft long, and provides access to the Bear Canyon #2 Mine, located in the Tank Seam. The road has an overall slope of approximately 9 percent, and does not exceed 17 percent at any point. Construction of this road is discussed in [Appendix 5-G](#).

The Tank Seam Access Road will be maintained in accordance with the requirements of this Appendix. During snow storms, snow will be plowed to and stored against the cut slope of the road along the ditches, in order to prevent saturation of the fill outcrops along the road due to snow melt

**This road has been reclaimed.**

### **Wild Horse Ridge Access Road**

This road is approximately 4,850 ft long, and provides access to the Bear Canyon #3 Mine, located in the Blind Canyon Seam in Wild Horse Ridge. The road has an overall grade of 10.5 percent, and does not exceed 18 percent at any point. This road existed prior to mining and will remain in place to meet the post-mining land use. Construction of this road is discussed in [Appendix 5-J](#).

### TS-7 Blind Seam Portal Pad

TS-7 will be reclaimed as shown on the following cross-sections in order to match the contours shown on [plate 5-6C](#). 11,582 cu. yd. of material from either TS-5 or TS-6 will be used here for the reclamation. Three highwalls are located in this section and all of them will be completely covered with fill material. The highwall shown on [section 3+00](#) is the belt entry and passes under the road before it enters the coal seam. [Table 5I-6](#) show a summary of the cut and fill volumes. 678 cu. yd. of material generated during the load-out expansion is being stored in this area. This is not included in table 5I-6. [Portions of this area have been reclaimed.](#)

**Table 5I-6 - Area TS-7 Cut & Fill Summary**

Section	Fill (-) Volumes (cu. yd.)	Cut (+) Volumes (cu. yd.)			Volume Cumulative (cu. yd.)
	Total Fill Volume	Substitute Topsoil	Regular Soil	Total Cut Volume	
0+00	<b>2,881 0</b>	1,078 0	1,078 0	<b>1,078 0</b>	<b>-529 0</b>
1+00	<b>2,633 0</b>	867 0	718 0	<b>1,585 0</b>	<b>-1,577 0</b>
2+00	<b>1,630 0</b>	578 0	274 0	<b>852 0</b>	<b>-2,355 0</b>
3+00	<b>1,356 0</b>	248 0		<b>248 0</b>	<b>-3,463 0</b>
3+50	1,355	137		137	<b>-4,681 -1,218</b>
4+00	1,996	45		45	<b>-6,632 -3,169</b>
5+00	1,703	685		685	<b>-7,650 -4,187</b>
6+00	<b>696 0</b>	67 0		<b>696 0</b>	<b>-8,279 0</b>
7+00	<b>989 0</b>	420 0		<b>420 0</b>	<b>-8,848 0</b>
7+50	<b>443 0</b>	0		0	<b>-9,291 0</b>
8+00	<b>2,355 0</b>	45 0	19 0	<b>64 0</b>	<b>-11,582 0</b>
<b>Totals</b>	<b>18,037 5,054</b>	4,170 867	22,207 0	<b>6,455 687</b>	

### TS-8 Upper Storage Pad

TS-8 will be reclaimed as shown on the following cross-sections. The soil labeled as Tank Seam Access Road fill material was not included in the calculations since it will be used while reclaiming the Tank Seam Access Road (Appendix 5-G). 1,000 yds<sup>3</sup> of this material will remain in place as described on page 5G-10. A volume of 1,952 cu. yd. of fill material will come from TS-5 or TS-6. A summary of the cut and fill volumes is shown in Table 5I-7. This area has been reclaimed.

**Table 5I-7 - Area TS-8 Cut & Fill Summary**

Section	Fill (-) Volumes (cu. yd.)	Cut (+) Volumes (cu. yd.)			Volume Cumulative (cu. yd.)
	Total Fill Volume	Substitute Topsoil	Regular Soil	Total Cut Volume	
0+00	<b>2,100 0</b>	552 0	0	<b>552 0</b>	<b>-574 0</b>
1+00	<b>1,300 0</b>	1,463 0	7 0	<b>1,470 0</b>	<b>-404 0</b>
2+00	<b>2,218 0</b>	1,537 0	107 0	<b>1,644 0</b>	<b>-1,952 0</b>
<b>Totals</b>	<b>5,618 0</b>	<b>3,552 0</b>	<b>114 0</b>	<b>3,666 0</b>	

Table 7-24 Summary of Division Ditch Calculations

Ditch	Bottom Width (Ft)	Top Width (Ft)	Depth (Ft)	Type Side Slope H:V	Measured Slope %	Contributing Watershed	REQ'D Av. Rip-Rap Size (In.)
D-1D	0	1.33	0.67	1:1	2 Min 11 Max	AD-3A RECLAIMED	Soil
D-2D	0	1.33	0.67	1:1	6 Min 20 Max	AD-3A, AD-5	Bedrock
D-3D	0	2	1	1:1	2 Min 6 Av. 18 Max	AD-3A, AD-5, AD-7	Soil Soil Grouted
D-4D	0	2	1	1:1	2 Min 6 Av. 17 Max	AD-14	Soil Soil D <sub>50</sub> 6"
D-5D	0	1.33	0.67	1:1	4 Min 10 Max	AD-9	Soil
D-6D	0	3	1.5	1:1	2 Min 4 Max	AD-3A, AD-5 AD-7, AD-9, AD-10 AD-12, AD-14	Soil
D-7D	2	3.5	0.75	1.5:1	2 Min 6 Av. 55 Max	AD-1A, AD-1B, AD-2A AD-2B, AD-2C, AD-3B AD-4, AD-6, AD-8	Soil Soil D <sub>50</sub> 6"
D-8D	0	2	1	1:1	2 Min 7 Max	AD-13	Soil
D-8D Water Bar	0	14	0.33	6:1	3 Av.	AD-13	Soil
D-9D	0	2	1	1:1	4 Min 10	AD-15	Soil
D-10D	1	3.33	0.67	1.5:1	7 Min 50	AD-6, AD-3B, (part) AD-2B, AD-2C	D <sub>50</sub> 4" Bedrock
D-11D	0	1	0.5	1:1	41 Min Near Vert.	Tipple Wash Hose	Grouted Rip-Rap
D-12D	0	1	0.5	1:1	81 Av.	Tipple Wash Hose	Soil
D-13D Water Shed	0	6	0.5	10:1 2:1	0.5 Av.	AD-6 Partial	Soil
<del>D-14D</del>	<del>0</del>	<del>1.33</del>	<del>0.67</del>	<del>1.5:1</del>	<del>0.06 Av.</del>	<del>AU 4A RECLAIMED</del>	<del>Soil</del>
D-15D	0	2.00	1.00	1:1	0.05 Av.	AD-16	Soil
D-16D	0	1.50	1.75	1:1	0.05 Av.	AD-18	Soil
D-17D	0	.96	1	1:1	0.08 Av.	AU-23, AD-20	Soil

- Notes: 1. Dimensions given indicate minimum requirements. Actual dimensions may vary. Minimum required cross-sections will be maintained.
2. The use of line drainage ditches is required when flow velocities exceed approximately 5 feet per second. Rip-rap may be installed where not required.

Table 7-24 Summary of Division Ditch Calculations (Cont)

Ditch	Bottom Width (Ft)	Top Width (Ft)	Depth (Ft)	Type Side Slope H:V	Measured Slope %	Contributing Watershed	REQ'D Av. Rip-Rap Size (In.)
D-1U	2	1.33	0.67	1:1	2 Min 8 Max	AU-5 RECLAIMED	Soil
D-2U	0 MIN	1.33 MIN	0.67 MIN	1:1	7 Min 10 Max	AU-6, AU-11, AD-3A, AD-3B, AD-6	Soil
D-3U	1 MIN	2 MIN	0.5 MIN	1:1	4 Min 18 Max	AU-8, AU-6, AU-11, AD-3A, AD-3B, AD-6	Soil
D-4U	1 MIN	4 MIN	1 MIN	1.5:1	1 Min 10 Av. 18 Max	AU-10, AU-8, AU-6, AU-11, AD-3A, AD-3B, AD-6	Soil Soil D <sub>50</sub> 6"
D-5U	0	1	0.5	1:1	4 Min 13 Max	AU-15	Soil
D-6U	0	1.33	0.67	1:1	3 Min 16 Max	AU-14	Soil
D-7U	0	1.33	0.67	1:1	1 Min 16 Max	AU-12	Soil
D-8U	2	4	0.67	1:1	2 Min 31 Max	AU-1, AU-1 <sup>a</sup> , AU-1B, AU-1C, AU-2, AU-2 <sup>a</sup> , AU-2B	Soil
D-9U	3	5	1	1:1	1 Min 6 Max	AU-16	Soil D <sub>50</sub> 4"
D-10U	3	4	0.5	1:1	3 Min 10 Max	AU-17	Soil
D-11U	0	2	1	1:1	3 Min 8 Max	Misc. road damage	Soil
D-12U	0	3	1	1.5:1	3 Min 9 Max	AU-18	Soil D <sub>50</sub> 4"
D-13U	0	2	1	1:1	2 Min 23 Max	Misc. road damage	Soil
D-14U	4	5.5	0.5	1.5:1	6 Min 66 Max	Sed Pond A Outlet	D <sub>50</sub> 4" D <sub>50</sub> 10"
D-15U	0	2	0.67	1.5:1	5 Min 16 Max	AU-3 RECLAIMED	Soil
D-16U	0	2	0.67	1.5:1	10 Av.	AU-1B RECLAIMED	Soil

Table 7-24 Summary of Division Ditch Calculations (Cont)

Ditch	Bottom Width (Ft)	Top Width (Ft)	Depth (Ft)	Type Side Slope H:V	Measured Slope %	Contributing Watershed	REQ'D Av. Rip-Rap Size (In.)
D-17U	0	2	0.67	1.5:1	13 Av.	AU-1 <sup>a</sup> RECLAIMED	Bedrock
D-18D	0	2	0.67	1.5:1	5 Min	AU-1 RECLAIMED	Soil
D-19U	0	2	0.67	1.5:1	6 Av.	AU-2 <sup>b</sup> RECLAIMED	Soil
D-20U	0	1.33	0.67	1:1	16 Av.	AU-42	Soil
D-21U	0	2	1.0	1:1	13 Av.	AU-43	D <sub>50</sub> =3"
D-22U	0	3	1.0	1.5:1	11 Av.	AU-19, AU-25	D <sub>50</sub> =6"
D-23U	0	1.16	0.58	1:1	19 Av.	AU-36	Soil
D-24U	0	1.16	0.58	1:1	14 Av.	AU-35	Soil
D-25U	0	1	0.5	1:1	16 Av.	AD-17	Soil
D-26U	0	1	0.5	1:1	24 Av.	AU-32	Soil
D-27U	0.50	2	0.5	1.5:1	13 Min, 30 Max	AU-31	Soil
D-28U	0	1	0.5	1:1	14 Av.	AU-33	Soil
D-29U	0	1.33	0.67	1:1	8 Av.	AU-34	Soil
D-30U	0	1.16	0.58	1:1	13 Av.	AU-25	Soil
D-31U	0	3	1.0	1.5:1	12 Av.	AU-20, AU-26	Bedrock
D-32U	0	1	0.5	1:1	17 Av.	AU-30	Soil
D-33U	0	1.16	0.58	1:1	18 Av.	AU-29	Soil
D-34U	1	2.74	0.58	1.5:1	11 Av.	AU-24	Soil
D-35U	0	2.0	1.0	1:1	10 Av.	AU-29	Soil
D-36	0	1.0	0.5	1:1	8 Av.	AU-27	Soil
D-37	0	1.4	0.7	1:1	8 Av.	AU-26, AU-21	Soil
D-38	0	1.33	0.67	1:1	12 Min, 20 Max	AU-21	D <sub>50</sub> =3"
D-39	0	1.0	0.5	1:1	10 Av.	AU-28	Soil

### CULVERT CHARACTERISTICS

Culvert	Dia (in.)	Type	Contributing Watersheds	Peak Q(cfs)	Slope (ft/ft)	Outlet Condition
C-1U	30	CMP Flexible	AU-3, AU-4, AU-4A, AU-5 RECLAIMED	4.40	0.12 0.73	Bedrock
C-2U	12	stl pipe	AU-11 ABANDONED IN PLACE	0.09	0.08	soil
C-3U	12	CMP	AU-6, AU-7, AU-11 ABANDONED IN PLACE	2.20	0.05	4" rip-rap
C-4U	12	CMP	AU-8, AU-9 ABANDONED IN PLACE	1.32	0.05	Soil
C-5U	12	CMP	AU-8, AU-9, AU-15	1.45	0.05	Soil
C-6U	12	CMP	AU-6, AU-7, AU-11 AU-13, AU-14	2.65	0.05	4" rip-rap
C-7U	12	CMP	AU-12	0.34	0.05	6" rip-rap
C-8U	18	Flexible CMP, RCP	AU-3, AU-3A AU-4, AU-4A, AU-5	4.45	0.13	12" rip-rap
C-9U	60	stl pipe	Bear Creek	108.18	0.06	48" rip-rap
C-10U	60	RCP	Bear Creek	108.18	0.06	48" rip-rap
C-11U	18	CMP	AU-16	4.92	0.10	6" rip-rap
C-12U	24	CMP	AU-17	3.29	0.04	6" rip-rap
C-13U C-13aU	15	CMP	misc. road drainage	1.00	0.06	Soil
C-14U	60	CMP	Bear Creek	108.18	0.06	48" rip-rap
C-15U	18	CMP flexible	AU-1B, AU-2 AU-2A, AU-2B	1.46	0.05 0.78	27" rip-rap
C-16U	15	CMP flexible	AU-1, AU-1A RECLAIMED	1.34	0.05 0.80	Bedrock
C-17U	12	CMP	AU-1 RECLAIMED	0.83	0.18	3" rip-rap
C-18U	15	CMP flexible	AU-2 RECLAIMED	0.30	0.05 0.75	10" rip-rap
C-19U	15	CMP flexible	AU-2A RECLAIMED	0.22	0.05 0.75	9" rip-rap
C-20U	15	CMP flexible	AU-2B RECLAIMED	0.50	0.05 0.75	15" rip-rap

TABLE 7-25 CULVERT CHARACTERISTICS (CONT.)

Culvert	Diameter (in.)	Type	Contributing Watersheds	Slope (ft/ft)	Outlet Condition
C-1D	15	<del>CMP flexible</del>	<del>AD-6, AD-3B</del> RECLAIMED	1.00	24" rip-rap
C-2D	15	CMP, RCP flexible	AD-2B, AD-2C, AD-3B, AD-4, AD-6	4.0	10" rip-rap
C-3D	20	<del>slt pipe</del>	<del>AD-3A</del> RECLAIMED	0.03	4" rip-rap
C-4D	21	CMP	AD-3A, AD-5, AD-7, AD-14, C-10D	0.18	9" rip-rap
C-5D	18	CMP	AD-9, <del>AD-3A, AD-5, AD-7</del>	<del>0.08</del> 0.07	Soil 3" rip-rap
C-6D	12	CMP	AD-10	0.48	9" rip-rap
C-7D	18	CMP	Abandoned In Place		
C-8D	18	<del>CMP</del>	<del>AD-3A, AD-5, AD-7</del> REPLACED WITH C-5D	0.05	3" rip-rap
C-9D	18	CMP	See C-8D	0.05	3" rip-rap
C-10D	18	CMP	Tipple Wash Hose	0.03	Soil
C-11D	<del>12</del>	<del>CMP flexible</del>	<del>AD-4A</del> RECLAIMED	<del>0.05</del> 0.25	3" rip-rap
C-12D	8	CMP	AD-18	0.05	Soil
C-13D	12	CMP	AU-23, AD-20	0.07	Soil

A splash basin and drainage channel will be established at the immediate impact area in the downcast material at the base of the cliff, to direct drainage to the original drainage path. Due to the inaccessible nature of the location all work will be performed by hand. This limits the size of rip-rap that can be placed so the construction will be reviewed by qualified personnel along with the division. See [Figure 7-8](#) for a profile of the cliff and downfall area. The remaining downcast material in the pile at the base of the cliff will be stabilized with erosion control matting and using interim reclamation procedures defined in [R545-301-331](#). This was reclaimed.

#### **Ditches D-2U, D-3U AND D-4U 2008**

As reclamation is on going in the area and the work is progressing down from the top. The drainage for TS-6 (Primary Portal Access Road) has been modified. Hiawatha Coal will temporarily show culverts C-2U, C-3U and C-4U as abandoned in place until the culverts are removed as reclamation activities progress through that area. As reclamation progresses, the flow to ditches D-2U, D-3U and D-4U will change as hydrologic structures are removed up stream. There will be no change to the outflow of D-4U which currently discharges into Bear Creek. Hiawatha Coal intends to utilize the existing roadway as the channel, which will add extensive width to the existing ditches. This will allow for the increased peak flows through the ditches. As these ditched are all considered undisturbed and the roadway drainage is also considered undisturbed, this should not have any adverse affects to the Bear Creek Drainage. See Appendix 7G for the Flow Characteristics.

### **Tank Seam Portal Pad & Access Road**

Due to the remote location of the Tank Seam Portal Pad with respect to the sedimentation ponds, drainage from the portal area will be controlled using a silt fence as shown on [Plate 7-1E \(BTCA Area "U"\)](#). The area, approx. 0.25 acres, will be used only for mine access and portal structures, and will not be used for storage. [Ditch D-14D](#) will convey the drainage from [AU-4A](#), which includes the portal pad, to [culvert C-11D](#). A silt fence will be located prior to the inlet of [C-11D](#). **THIS AREA HAS BEEN RECLAIMED**

Runoff will be conveyed past the Tank Seam Access Road via ditches and culverts (See [Plates 7-1C and 7-1E](#)). Runoff from the disturbed slopes and cut faces along the access road, designated as BTCA areas "H" through "T", will be treated with silt fences and/or erosion control matting as described in [Appendix 7-K](#). **THIS AREA HAS BEEN RECLAIMED**

Culvert outlets will be located in places where the outlet conditions meet or exceed the minimum requirements, which are shown in [Appendix 7-G](#). [Table 7-25](#) shows the actual outlet conditions which will exist for each culvert. These conditions reflect existing conditions within the premining channels at the points where the culvert outlets will be located. The culverts along the road will not require any disturbance at the outlets, but will use the premining conditions, which exist. **THIS AREA HAS BEEN RECLAIMED**

The reclaimed channel designs for the Tank Seam Access Road are described in [Appendix 7-H](#), and reflect the pre-mining channel conditions. Pre-mining channels consisted of eroded channels passing over large boulders embedded into the soil and/or bedrock. Reclamation activities for the channels will involve excavating the channel back to the pre-mining configuration. The majority of the boulders in the pre-mining channels will remain as

markers, which can be excavated back to. Photographs of the pre-mining channels are contained in [Appendix 7-H](#), and the profiles on [Plate 7-8C](#) reflect the pre-mining profiles and descriptions.

**THESE AREAS HAVE BEEN RECLAIMED**

### **Wild Horse Ridge Access**

The portal pad for the Bear Canyon No. 3 Mine will drain into [Sediment Pond "D"](#). For the remaining disturbed areas associated with the Wild Horse Ridge access road and conveyor belt, runoff will be controlled using alternate (ASCA) treatments. See [Plates 7-1F](#) and [7-1G](#) for division structures and ASCA areas (BTCA Area "V", "W", "X" and "Y").

Runoff control for these ASCA areas are described in [Appendix 7-K](#), and will consist of silt fences, erosion control matting and/or catch basins as described in [Appendix 7-K](#) and shown on [Plates 7-1F](#) and [7-1G](#). ASCA areas under the conveyor belt will be protected by a pan structure on the conveyor belt is described in [Appendix 7-K](#).

Designs for the ditches and culverts associated with this area are included in [Appendix 7-G](#) and summarized in [Tables 7-24](#) and [7-28](#).

The reclaimed channel designs for the Wild Horse Ridge Area are described in [Appendix 7-H](#) and [Section 7.3](#).

●Table 7-26 Characteristics of Proposed Reclaimed Channels

Channel	Bottom Width (ft)	Side Slopes	Depth (ft)	Lining
RC-1 <sup>1</sup>	6	1.5:1	1.5	D50 = 6"
RC-2	3	2:1	1.5	D50 = 9"
RC-3	3	2:1	1.5	D50 = 9"
RC-4	4	2:1	1.5	D50 = 6"
RC-5	1.5	2:1	1.5	D50 = 6"
RC-6	2	2:1	1.5	D50 = 6"
RC-7	6	2:1	4	D50 = 24"
RC-8	8	2:1	2.5	D50 = 24"
RC-9	7	2:1	3	D50 = 24"
RC-10	6	1.5:1	6	D50 = 24"
RC-11	2	2:1	1.5	D50 = 6"
RC-12	1	2:1	2	D50 = 6"
RC-TS1 <sup>1</sup>				
RC-TS2 <sup>1</sup>	12' Avg.	1.5:1 Typ	4' Avg.	Bedrock 12"-72" Rock
RC-TS3 <sup>1</sup>	6' Avg.	1.5:1 Typ	4' Avg.	12"-60" Rock
RC-TS4 <sup>1</sup>	15' Avg.	1:1 Typ	4' Avg.	8"-36" Rock
RC-TS5 <sup>1</sup>	4'-6' Avg.	1.5:1 Typ	2'-6' Avg.	18"-48" Rock
RC-TS6 <sup>1</sup>	20' Avg.	1:1 Typ	2'-5' Avg.	Bedrock 18"-48" Rock

1. Have been reclaimed

### CULVERT CHARACTERISTICS

Culvert	Dia (in.)	Type	Contributing Watersheds	Peak Q(cfs)	Slope (ft/ft)	Outlet Condition
C-1U	30	CMP Flexible	AU-3, AU-4, AU-4A, AU-5 RECLAIMED	4.40	0.12 0.73	Bedrock
C-2U	42	stl pipe	AU-11 ABANDONED IN PLACE	0.09	0.08	soil
C-3U	42	CMP	AU-6, AU-7, AU-11 ABANDONED IN PLACE	2.20	0.05	4" rip-rap
C-4U	42	CMP	AU-8, AU-9 ABANDONED IN PLACE	1.32	0.05	Soil
C-5U	12	CMP	AU-8, AU-9, AU-15	1.45	0.05	Soil
C-6U	12	CMP	AU-6, AU-7, AU-11 AU-13, AU-14	2.65	0.05	4" rip-rap
C-7U	12	CMP	AU-12	0.34	0.05	6" rip-rap
C-8U	18	Flexible CMP, RCP	AU-3, AU-3A AU-4, AU-4A, AU-5	4.45	0.13	12" rip-rap
C-9U	60	stl pipe	Bear Creek	108.18	0.06	48" rip-rap
C-10U	60	RCP	Bear Creek	108.18	0.06	48" rip-rap
C-11U	18	CMP	AU-16	4.92	0.10	6" rip-rap
C-12U	24	CMP	AU-17	3.29	0.04	6" rip-rap
C-13U C-13aU	15	CMP	misc. road drainage	1.00	0.06	Soil
C-14U	60	CMP	Bear Creek	108.18	0.06	48" rip-rap
C-15U	18	CMP flexible	AU-1B, AU-2 AU-2A, AU-2B	1.46	0.05 0.78	27" rip-rap
C-16U	45	CMP flexible	AU-1, AU-1A RECLAIMED	1.34	0.05 0.80	Bedrock
C-17U	42	CMP	AU-1 RECLAIMED	0.83	0.18	3" rip-rap
C-18U	45	CMP flexible	AU-2 RECLAIMED	0.30	0.05 0.75	10" rip-rap
C-19U	45	CMP flexible	AU-2A RECLAIMED	0.22	0.05 0.75	9" rip-rap
C-20U	45	CMP flexible	AU-2B RECLAIMED	0.50	0.05 0.75	15" rip-rap

**CULVERT CHARACTERISTICS (con't)**

<b>Culvert</b>	<b>Dia (in.)</b>	<b>Type</b>	<b>Contributing Watersheds</b>	<b>Peak Q(cfs)</b>	<b>Slope (ft/ft)</b>	<b>Outlet Condition</b>
<del>C-1D</del>	15	<del>CMP, flexible</del>	<del>AD-6, AD-3B</del> <b>RECLAIMED</b>	0.93	1.00	24" rip-rap
C-2D	15	CMP, RCP, flexible	AD-2B, AD-2C, AD-3B, AD-4, AD-6	1.47	0.40	10" rip-rap
<del>C-3D</del>	20	<del>stl pipe</del>	<del>AD-3A</del> <b>RECLAIMED</b>	0.23	0.03	4" rip-rap
C-4D	21	CMP	AD-3A, AD-5 AD-7, AD14, C-10D	2.66	0.18	9" rip-rap
C-5D	18	CMP	<b>AD-3A, AD-5, AD-7,</b> AD-9	<b>2.59</b> 0.23	<b>0.07</b> 0.08	<b>3" rip-rap</b> soil
C-6D	12	CMP	AD-10	0.62	0.48	9" rip-rap
C-7D	18	CMP	Abandoned In Place			
<del>C-8D</del>	<del>18</del>	<del>CMP</del>	<del>Replaced with C-5D</del> <del>AD-3A, AD-5</del> <del>AD-7</del>	2.36	0.05	3" rip-rap
C-9D	18	CMP	See C-8D	2.36	0.05	3" rip-rap
C-10D	18	CMP	TIPPLE WASH HOSE	0.25	0.03	soil
<del>C-11D</del>	<del>12</del>	<del>CMP flexible</del>	<del>AU-4A</del> <b>RECLAIMED</b>	0.35	0.05 0.25	3" rip-rap
C-12D	8	CMP	AD-18	0.55	0.05	soil

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Project Description	
Worksheet	C-1U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning Coefficient	0.024
Slope	0.730 ft/ft
Diameter	30 in
Discharge	4.40 cfs

Results	
Depth	0.26 ft
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.65 ft
Top Width	1.53 ft
Critical Depth	0.69 ft
Percent Full	10.5 %
Critical Slope	0.014104 ft/ft
Velocity	16.01 ft/s
Velocity Head	3.98 ft
Specific Energy	4.24 ft
Froude Number	6.67
Maximum Discharge	204.19 cfs
Discharge Full	189.82 cfs
Slope Full	0.000392 ft/ft
Flow Type	Supercritical

Minimum required riprap condition = 30" m.d. riprap at outlet

At Slope = 0.12 ft/ft, flow depth = 0.41 ft

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Project Description

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Worksheet	C-2U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

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Input Data

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Mannings Coefficient	0.015
Slope	0.080 ft/ft
Diameter	12 in
Discharge	0.09 cfs

---

Results

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Depth	0.07 ft
Flow Area	2.5e-2 ft <sup>2</sup>
Wetted Perimeter	0.54 ft
Top Width	0.52 ft
Critical Depth	0.12 ft
Percent Full	7.2 %
Critical Slope	0.008424 ft/ft
Velocity	3.60 ft/s
Velocity Head	0.20 ft
Specific Energy	0.27 ft
Froude Number	2.89
Maximum Discharge	9.39 cfs
Discharge Full	8.73 cfs
Slope Full	0.000008 ft/ft
Flow Type	Supercritical

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Project Description	
Worksheet	C-3U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

---

Input Data	
Manninge Coefficient	0.024
Slope	0.050 ft/ft
Diameter	12 in
Discharge	2.20 cfs

---

Results	
Depth	0.51 ft
Flow Area	0.4 ft <sup>2</sup>
Wetted Perimeter	1.58 ft
Top Width	1.00 ft
Critical Depth	0.63 ft
Percent Full	50.6 %
Critical Slope	0.024382 ft/ft
Velocity	5.52 ft/s
Velocity Head	0.47 ft
Specific Energy	0.98 ft
Froude Number	1.54
Maximum Discharge	4.64 cfs
Discharge Full	4.32 cfs
Slope Full	0.012997 ft/ft
Flow Type	Supercritical

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Project Description

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Worksheet	C-4U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

---

Input Data

---

Mannings Coefficient	0.024
Slope	0.050 ft/ft
	000
Diameter	12 in
Discharge	1.32 cfs

---

Results

---

Depth	0.38 ft
Flow Area	0.3 ft <sup>2</sup>
Wetted Perimeter	1.33 ft
Top Width	0.97 ft
Critical Depth	0.49 ft
Percent Full	38.0 %
Critical Slope	0.020695 ft/ft
Velocity	4.83 ft/s
Velocity Head	0.36 ft
Specific Energy	0.74 ft
Froude Number	1.60
Maximum Discharge	4.64 cfs
Discharge Full	4.32 cfs
Slope Full	0.004679 ft/ft
Flow Type	Supercritical

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Project Description	
Worksheet	C-15U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.024
Slope	0.780 ft/ft 000
Diameter	18 in
Discharge	1.46 cfs

Results	
Depth	0.18 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	4.05 ft
Top Width	0.96 ft
Critical Depth	0.45 ft
Percent Full	11.7 %
Critical Slope	0.016703 ft/ft
Velocity	12.60 ft/s
Velocity Head	2.47 ft
Specific Energy	2.64 ft
Froude Number	6.41
Maximum Discharge	54.05 cfs
Discharge Full	50.25 cfs
Slope Full	0.000658 ft/ft
Flow Type	Supercriti cal

Minimum Required riprap conditions = 27" m.d. riprap at outlet

At slope = 0.05 ft/ft, flow depth = 0.34 ft

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Project Description	
Worksheet	C-16U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning Coefficient	0.024
Slope	0.800 ft/ft 000
Diameter	15 in
Discharge	1.34 cfs

Results	
Depth	0.18 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.96 ft
Top Width	0.87 ft
Critical Depth	0.46 ft
Percent Full	14.1 %
Critical Slope	0.017971 ft/ft
Velocity	12.60 ft/s
Velocity Head	2.50 ft
Specific Energy	2.68 ft
Froude Number	6.42
Maximum Discharge	33.66 cfs
Discharge Full	31.20 cfs
Slope Full	0.001467 ft/ft
Flow Type	Supercritical

Minimum required riprap conditions = 27" m.d. riprap at outlet

At slope = 0.05 ft/ft, flow depth = 0.35 ft.

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Project Description	
Worksheet	C-17U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.024
Slope	0.180 ft/ft 000
Diameter	42 in
Discharge	0.83 cfs

Results	
Depth	0.22 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.96 ft
Top Width	0.82 ft
Critical Depth	0.38 ft
Percent Full	21.5 %
Critical Slope	0.019427 ft/ft
Velocity	6.69 ft/s
Velocity Head	0.70 ft
Specific Energy	0.91 ft
Froude Number	3.04
Maximum Discharge	8.84 cfs
Discharge Full	8.19 cfs
Slope Full	0.001850 ft/ft
Flow Type	Supercritical

Minimum required riprap conditions = 3" m.d. riprap at outlet

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Project Description	
Worksheet	C-18U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.024
Slope	0.750 ft/ft 000
Diameter	15 in
Discharge	0.30 cfs

Results	
Depth	0.09 ft
Flow Area	3.8e-2 ft <sup>2</sup>
Wetted Perimeter	0.67 ft
Top Width	0.64 ft
Critical Depth	0.21 ft
Percent Full	7.0 %
Critical Slope	0.018728 ft/ft
Velocity	7.90 ft/s
Velocity Head	0.97 ft
Specific Energy	1.06 ft
Froude Number	5.72
Maximum Discharge	32.60 cfs
Discharge Full	30.30 cfs
Slope Full	0.000074 ft/ft
Flow Type	Supercritical

Minimum required riprap conditions = 10" m.d. riprap at outlet

At slope = 0.05 ft/ft, flow depth = 0.17 ft.

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Project Description	
Worksheet	C-19U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.024
Slope	0.750 ft/ft 000
Diameter	15 in
Discharge	0.22 cfs

Results	
Depth	0.08 ft
Flow Area	3.1e-2 ft <sup>2</sup>
Wetted Perimeter	0.62 ft
Top Width	0.60 ft
Critical Depth	0.18 ft
Percent Full	6.1 %
Critical Slope	0.019286 ft/ft
Velocity	7.20 ft/s
Velocity Head	0.80 ft
Specific Energy	0.88 ft
Froude Number	5.61
Maximum Discharge	32.60 cfs
Discharge Full	30.30 cfs
Slope Full	0.000040 ft/ft
Flow Type	Supercritical

Minimum required riprap conditions = 9" m.d. riprap at outlet

At slope = 0.05 ft/ft, flow depth = 0.14 ft.

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Project Description	
Worksheet	C-20U
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.024
Slope	0.750 ft/ft 000
Diameter	45 in
Discharge	0.54 cfs

Results	
Depth	0.11 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.76 ft
Top Width	0.72 ft
Critical Depth	0.28 ft
Percent Full	0.0 %
Critical Slope	0.018052 ft/ft
Velocity	0.28 ft/s
Velocity Head	1.34 ft
Specific Energy	1.45 ft
Froude Number	5.01
Maximum Discharge	32.60 cfs
Discharge Full	30.30 cfs
Slope Full	0.000212 ft/ft
Flow Type	Supercritical

Minimum required riprap conditions = 15" m.d. riprap at outlet

At slope = 0.05 ft/ft, flow depth = 0.22 ft.

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Project Description	
Worksheet	C-3D
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

---

Input Data	
Mannings Coefficient	0.015
Slope	0.030 ft/ft 000
Diameter	20 in
Discharge	0.23 cfs

---

Results	
Depth	0.12 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.92 ft
Top Width	0.87 ft
Critical Depth	0.17 ft
Percent Full	7.4 %
Critical Slope	0.007435 ft/ft
Velocity	3.16 ft/s
Velocity Head	0.16 ft
Specific Energy	0.28 ft
Froude Number	1.93
Maximum Discharge	22.46 cfs
Discharge Full	20.88 cfs
Slope Full	0.000004 ft/ft
Flow Type	Supercriti cal

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Project Description	
Worksheet	C-11D
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning Coefficient	0.024
Slope	0.250 ft/ft 000
Diameter	12 in
Discharge	0.35 cfs

Results	
Depth	0.13 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.74 ft
Top Width	0.67 ft
Critical Depth	0.24 ft
Percent Full	13.0 %
Critical Slope	0.019305 ft/ft
Velocity	5.82 ft/s
Velocity Head	0.53 ft
Specific Energy	0.66 ft
Froude Number	3.43
Maximum Discharge	10.38 cfs
Discharge Full	9.65 cfs
Slope Full	0.000329 ft/ft
Flow Type	Supercritical

~~Minimum required riprap conditions = 3" m.d. riprap at outlet~~

At slope = 0.05 ft/ft, Flow depth = **0.19 ft**

### DITCH CHARACTERISTICS

DITCH	CHANNEL SLOPE %	CONTRIBUTING WATERSHED	PEAK Q(cfs)	BANK AND BOTTOM DESC.	MANNING'S $\eta^{(a)}$
D-1D	<del>2 Min, 11 Max</del>	<del>AD-3A</del> RECLAIMED	<del>0.23</del>	<del>Rocky Soil</del>	<del>0.03</del>
D-2D	6 Min, 20 Max	AD-3A, AD-5	0.53	Rocky Soil, Bedrock	0.03
D-3D		Replaced with C-5D			
D-4D	2 Min, 7 Av 17 Max	AD-14	0.05	Soil	0.03
D-5D		Replaced with C-5D			
D-6D	2 Min, 4 Max	AD-3A, AD-5, AD-7 AD-9, AD-10, AD-12 AD-14	3.63	Rocky Soil	0.03
D-7D	2 Min, 6 Av 55 Max	AD-1A, AD-1B, AD-2A AD-2B, AD-2C, AD-3B AD-4, AD-6, AD-8	4.90	Soil D <sub>50</sub> .3"	0.03 0.033
D-8D	2 Min, 7 Max	AD-13	1.23	Soil	0.03
D-8D Water Bar	3 Av.	AD-13	1.23	Soil	0.013
D-9D	4 Min, 10 Max	AD-15	1.20	Soil	0.03
D-10D	7 Min, 50 Max	AD-6, AD-3B, AD-2C	1.03	D <sub>50</sub> .4"	0.033
D-11D	41 Min Near Vertical Max	TIPPLE WASH HOSE	0.25	Grouted rip-rap	0.035
D-12D	81 Av.	TIPPLE WASH HOSE	0.25	Grouted	0.03
D-13D Water Bar	0.5 Av.	AD-6 Partial	0.23	Soil	0.03
D-14D	<del>0.06 Av.</del>	<del>AU-4A</del> RECLAIMED	<del>0.35</del>	<del>Soil</del>	<del>0.03</del>
D-15D	0.05 Av.	AD-16	1.24	Soil	0.03
D-16D	0.05 Av.	AD-18	0.55	Soil	0.03
D-17D	0.08	AU-23, AD-20	0.99		

**DITCH CHARACTERISTICS (cont)**

DITCH	CHANNEL SLOPE %	CONTRIBUTING WATERSHED	PEAK Q (cfs)	BANK AND BOTTOM DESC.	MANNING'S $\eta^{(a)}$
D-1U	2 Min, 8 Max	AU-5	2.51	D <sub>50</sub> .2", D <sub>max</sub> .4"	0.03
D-2U	7 Min, 10 Max	AU-6, AU-11, AD-3A, AD-3B, AD-6	<del>0.48</del> 1.64	Rocky Soil	0.035
D-3U	4 Min, 18 Max	AU-8, AU-6, AU-11, AD-3A, AD-3B, AD-6	<del>0.72</del> 4.08	Rocky Soil	0.035
D-4U	1 Min, 10 Av, 18 Max	AU-10, AU-8, AU-6, AU-11, AD-3A, AD-3B, AD-6	4.05 8.73	Rocky Soil D <sub>50</sub> 6"	0.035
D-5U	4 Min, 13 Max	AU-15	0.13	Rocky Soil	0.03
D-6U	3 Min, 6 Max	AU-14	0.35	Rocky Soil	0.03
D-7U	1 Min, 16 Max	AU-12	0.34	Rocky Soil	0.03
D-8U	2 Min, 6 Av 31 Max	AU-1, AU-1A, AU-1B AU-1C, AU-2 AU-2A, AU-2B	4.75	Soil D <sub>50</sub> .6"	0.033
D-9U	1 Min, 6 Max	AU-16	4.92	D <sub>50</sub> .4"	0.03
D-10U	3 Min, 10 Max	AU-17	3.29	D <sub>50</sub> .4"	0.03
D-11U	3 Min, 8 Max	misc. road drainage	1.0 <sup>(b)</sup>	Soil	0.03
D-12U	3 Min 9 Max	AU-18	4.0	Soil D <sub>50</sub> .4"	0.03
D-13U	2 Min, 6 Av, 23 Max	misc. road drainage	1.0 <sup>(b)</sup>	Soil	0.03
D-14U	6 Min, 66 Max	Outlet of Sed Pond A	8.9	D <sub>50</sub> .4" , D <sub>Max</sub> .10"	0.03
D-15U	<del>5 Min, 11 Av, 16 Max</del>	<del>AU 3 RECLAIMED</del>	<del>0.52</del>	<del>soil</del>	<del>0.03</del>
D-16U	<del>10 Av</del>	<del>AU 1B RECLAIMED</del>	<del>0.44</del>	<del>soil</del>	<del>0.03</del>
D-17U	<del>13 Av</del>	<del>AU 1, AU 1A RECLAIMED</del>	<del>1.34</del>	<del>bedrock</del>	<del>0.03</del>
D-18U	<del>5 Min, 11 Av 17 Max</del>	<del>AU 1 RECLAIMED</del>	<del>0.83</del>	<del>soil, bedrock</del>	<del>0.03</del>
D-19U	<del>6 Av</del>	<del>AU 2B RECLAIMED</del>	<del>0.50</del>	<del>soil</del>	<del>0.03</del>
D-20U	16 Av	AU-42	0.67	soil	0.03
D-21U	13 Av	AU-43	1.75	D <sub>50</sub> =3"	0.03
D-22U	11 Av	AU-19, AU-25	4.33	D <sub>50</sub> =6"	0.03

# Worksheet Worksheet for Trapezoidal Channel

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### Project Description

Worksheet	DITCH D-1D
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Slope

### Input Data

Manning Coefficient	0.03
Depth	0.36 ft
Left Side Slope	1.00 V: H
Right Side Slope	1.00 V: H
Bottom Width	0.00 ft
Discharge	0.23 cfs

### Results

Slope	0.02005 ft/ft
Flow Area	0.4 ft <sup>2</sup>
Wetted Perimeter	1.02 ft
Top Width	0.72 ft
Critical Depth	0.32 ft
Critical Slope	0.03839 ft/ft
Velocity	1.77 ft/s
Velocity Head	0.05 ft
Specific Energy	0.41 ft
Froude Number	0.74
Flow Type	Subcritical

Use Minimum Depth = 0.67 ft Velocity < 5 fps	Minimum Freeboard = 0.30 ft No rip rap required
---	--

# Worksheet Worksheet for Trapezoidal Channel

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**Project Description**

---

Worksheet	DITCH D-1D (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Slope

---

**Input Data**

---

Mannings Coefficient	0.03
Depth	0.26 ft
Left Side Slope	1.00 V: H
Right Side Slope	1.00 V: H
Bottom Width	0.00 ft
Discharge	0.23 cfs

---

**Results**

---

Slope	0.113730 ft/ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.74 ft
Top Width	0.52 ft
Critical Depth	0.32 ft
Critical Slope	0.038309 ft/ft
Velocity	3.40 ft/s
Velocity Head	0.18 ft
Specific Energy	0.44 ft
Froude Number	1.66
Flow Type	Supercritical

# Worksheet Worksheet for Trapezoidal Channel

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Project Description	
Worksheet	D-14D
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning's Coefficient	0.030
Slope	0.060 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.35 cfs

Results	
Depth	0.28 ft
Flow Area	0.4 ft <sup>2</sup>
Wetted Perimeter	1.02 ft
Top Width	0.85 ft
Critical Depth	0.32 ft
Critical Slope	0.030894 ft/ft
Velocity	2.92 ft/s
Velocity	0.13 ft
Head Specific Energy	0.42 ft
Froude Number	1.36
Flow Type	Supercritical

Use Minimum Depth = 0.67 ft	Minimum Freeboard = 0.39 ft
Velocity < 5 fps	No riprap required

# Worksheet Worksheet for Trapezoidal Channel

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Project Description	
Worksheet	D-1U
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning Coefficient	0.030
Slope	0.020 ft/ft
Left Side Slope	1.00 V: H
Right Side Slope	1.00 V: H
Bottom Width	2.00 ft
Discharge	2.51 cfs

Results	
Depth	0.36 ft
Flow Area	0.8 ft <sup>2</sup>
Wetted Perimeter	3.04 ft
Top Width	2.74 ft
Critical Depth	0.34 ft
Critical Slope	0.02240 ft/ft
Velocity	2.99 ft/s
Velocity Head	0.14 ft
Specific Energy	0.50 ft
Froude Number	0.95
Flow Type	Subcritical

Use Minimum Depth = .67 ft	Minimum Freeboard = 0.31 ft
Velocity < 5 fps	No riprap required

# Worksheet Worksheet for Trapezoidal Channel

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**Project Description**

Worksheet	D-1U (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

---

**Input Data**

Manning Coefficient	0.030
Slope	0.080 ft/ft
Left Side Slope	1.00 V: H
Right Side Slope	1.00 V: H
Bottom Width	2.00 ft
Discharge	2.51 cfs

---

**Results**

Depth	0.24 ft
Flow Area	0.5 ft <sup>2</sup>
Wetted Perimeter	2.67 ft
Top Width	2.47 ft
Critical Depth	0.34 ft
Critical Slope	0.022403 ft/ft
Velocity	4.76 ft/s
Velocity Head	0.35 ft
Specific Energy	0.59 ft
Froude Number	1.81
Flow Type	Supercritical

## Worksheet Worksheet for Trapezoidal Channel

Project Description	
Worksheet	D-2U Ave
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	<del>0.030</del> 0.035
Slope	0.070 ft/ft
Left Side Slope	1.00 V : H
Right Side Slope	1.00 V : H
Bottom Width	<del>0.000</del> 10.00 ft
Discharge	0.48 cfs

Results	
Depth	<del>0.38</del> 0.08 ft
Flow Area	<del>0.1</del> 0.8 ft <sup>2</sup>
Wetted Perimeter	<del>1.06</del> 10.22 ft
Top Width	<del>0.75</del> 10.16 ft
Critical Depth	<del>0.43</del> 0.09 ft
Critical Slope	<del>0.034812</del> 0.039795 ft/ft
Velocity	<del>3.44</del> 2.05 ft/s
Velocity Head	<del>0.18</del> 0.07 ft
Specific Energy	<del>0.56</del> 0.14 ft
Froude Number	<del>1.39</del> 1.29
Flow Type	Supercritical

Use Minimum Depth = <del>.67 ft</del> 1.00 Velocity < 5 fps	Minimum Freeboard = <del>0.29 ft</del> 0.92 No riprap required
--	---

## Worksheet Worksheet for Trapezoidal Channel

Project Description	
Worksheet	D-2U (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030 0.035
Slope	0.100 ft/ft 000
Left Side Slope	1.00 V : H
Right Side Slope	1.00 V : H
Bottom Width	0.000 ft 10.00
Discharge	0.48 cfs 1.64

Results	
Depth	0.35 0.07 ft
Flow Area	0.4 0.7 ft <sup>2</sup>
Wetted Perimeter	0.99 ft 10.20
Top Width	0.70 ft 10.14
Critical Depth	0.43 ft 0.09
Critical Slope	0.034810 ft/ft 0.039797
Velocity	3.90 2.29 ft/s
Velocity Head	0.24 ft 0.08
Specific Energy	0.59 ft 0.15
Froude Number	4.64 1.52
Flow Type	Supercritical

## Worksheet Worksheet for Trapezoidal Channel

---

### Project Description

Worksheet	D-3U <span style="color: red;">Ave</span>
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

---

### Input Data

Mannings Coefficient	<del>0.030</del> <span style="color: red;">0.035</span>
Slope	0.040 ft/ft
Left Side Slope	1.00 V : H
Right Side Slope	1.00 V : H
Bottom Width	<del>4.00</del> <span style="color: red;">10.00</span> ft
Discharge	<del>0.72</del> <span style="color: red;">4.08</span> cfs

---

### Results

Depth	<del>0.24</del> <span style="color: red;">0.16</span> ft
Flow Area	<del>0.2</del> <span style="color: red;">1.6</span> ft <sup>2</sup>
Wetted Perimeter	<del>4.58</del> <span style="color: red;">10.46</span> ft
Top Width	<del>4.44</del> <span style="color: red;">10.32</span> ft
Critical Depth	<del>0.23</del> <span style="color: red;">0.17</span> ft
Critical Slope	<del>0.026633</del> <span style="color: red;">0.032874</span> ft/ft
Velocity	<del>2.89</del> <span style="color: red;">2.48</span> ft/s
Velocity Head	<del>0.43</del> <span style="color: red;">0.10</span> ft
Specific Energy	<del>0.34</del> <span style="color: red;">0.26</span> ft
Froude Number	<del>1.24</del> <span style="color: red;">1.09</span>
Flow Type	Supercritical

Use Minimum Depth = <del>.05 ft</del> <span style="color: red;">1.00</span> Velocity < 5 fps	Minimum Freeboard = <del>0.29 ft</del> <span style="color: red;">.84</span> No riprap required
---	---

# Worksheet Worksheet for Trapezoidal Channel

Project Description	
Worksheet	D-3U (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	<del>0.030</del> 0.035
Slope	<del>0.180</del> ft/ft 000
Left Side Slope	1.00 V : H
Right Side Slope	1.00 V : H
Bottom Width	<del>4.00</del> ft 10.00
Discharge	<del>0.72</del> cfs 4.08

Results	
Depth	<del>0.13</del> ft 0.10
Flow Area	<del>0.2</del> 1.0 ft <sup>2</sup>
Wetted Perimeter	<del>1.37</del> ft 10.29
Top Width	<del>1.26</del> ft 10.21
Critical Depth	<del>0.23</del> ft 0.17
Critical Slope	<del>0.026633</del> ft/ft 0.032876
Velocity	<del>4.80</del> ft/s 3.91
Velocity Head	<del>0.36</del> ft 0.24
Specific Energy	<del>0.49</del> ft 0.34
Froude Number	<del>2.46</del> 2.16
Flow Type	Supercritical

# Worksheet

## Worksheet for Trapezoidal Channel

Project Description	
Worksheet	D-4U Ave
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	<del>0.030</del> 0.035
Slope	0.100 ft/ft
Left Side Slope	<del>0.67</del> V : 1.00 H
Right Side Slope	<del>0.67</del> V : 1.00 H
Bottom Width	<del>4.00</del> ft 10.00
Discharge	<del>4.05</del> cfs 8.73

Results	
Depth	<del>0.40</del> ft 0.19
Flow Area	<del>0.6</del> ft <sup>2</sup> 2.0
Wetted Perimeter	<del>2.43</del> ft 10.55
Top Width	<del>2.49</del> ft 10.39
Critical Depth	<del>0.59</del> ft 0.28
Critical Slope	<del>0.020879</del> ft/ft 0.028208
Velocity	<del>6.39</del> ft/s 4.40
Velocity Head	<del>0.64</del> ft 0.30
Specific Energy	<del>4.03</del> ft 0.50
Froude Number	<del>2.09</del> 1.78
Flow Type	Supercritical

# Worksheet Worksheet for Trapezoidal Channel

Project Description	
Worksheet	D-4U (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030 0.035
Slope	0.180 ft/ft 0.00
Left Side Slope	0.67 V : 1.00 H
Right Side Slope	0.67 V : 1.00 H
Bottom Width	4.00 ft 10.00
Discharge	4.05 cfs 8.73

Results	
Depth	0.34 ft 0.16
Flow Area	0.52 ft <sup>2</sup> 1.7
Wetted Perimeter	2.22 ft 10.46
Top Width	2.04 ft 10.33
Critical Depth	0.59 ft 0.28
Critical Slope	0.020879 ft/ft 0.028280
Velocity	7.90 ft/s 5.27
Velocity Head	0.97 ft 0.43
Specific Energy	4.34 ft 0.59
Froude Number	2.76 2.32
Flow Type	Supercritical

# Worksheet

## Worksheet for Trapezoidal Channel

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Project Description	
Worksheet	D-15U
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030
Slope	0.050 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.52 cfs

Results	
Depth	0.34 ft
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.22 ft
Top Width	1.02 ft
Critical Depth	0.38 ft
Critical Slope	0.020269 ft/ft
Velocity	3.00 ft/s
Head	0.14 ft
Specific Energy	0.48 ft
Froude Number	1.29
Flow Type	Supercritical

Use Minimum Depth = 0.67 ft Velocity < 5 fps	Minimum Freeboard = 0.33 ft No riprap required
---	---

# Worksheet Worksheet for Trapezoidal Channel

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Project Description	
Worksheet	D-15 U (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030
Slope	0.160 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.52 cfs

Results	
Depth	0.27 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	0.98 ft
Top Width	0.82 ft
Critical Depth	0.38 ft
Critical Slope	0.020269 ft/ft
Velocity	4.65 ft/s
Head	0.34 ft
Specific Energy	0.61 ft
Froude Number	2.22
Flow Type	Supercritical

# Worksheet Worksheet for Trapezoidal Channel

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### Project Description

Worksheet	D-16U
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Manning's Coefficient	0.030
Slope	0.100 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.44 cfs

### Results

Depth	0.28 ft
Flow Area	0.1 ft <sup>2</sup>
Wetted Perimeter	1.04 ft
Top Width	0.84 ft
Critical Depth	0.35 ft
Critical Slope	0.020927 ft/ft
Velocity	3.74 ft/s
Velocity Head	0.22 ft
Specific Energy	0.50 ft
Froude Number	1.76
Flow Type	Supercritical

Use Minimum Depth = 0.67 ft Velocity < 5 fps	Minimum Freeboard = 0.39 ft No riprap required
---	---

# Worksheet Worksheet for Trapezoidal Channel

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**Project Description**

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Worksheet	D-17U
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

---

**Input Data**

---

Manning Coefficient	0.030
Slope	0.130 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	1.34 cfs

---

**Results**

---

Depth	0.40 ft
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.46 ft
Top Width	1.24 ft
Critical Depth	0.55 ft
Critical Slope	0.026795 ft/ft
Velocity	5.45 ft/s
Velocity	0.46 ft
Head	
Specific Energy	0.87 ft
Froude Number	2.13
Flow Type	Supercritical

Use Minimum Depth = 0.67 ft Velocity < 5 fps	Minimum Freeboard = 0.27 ft Use D <sub>50</sub> = 3"
---	---

# Worksheet Worksheet for Trapezoidal Channel

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Project Description	
Worksheet	D-18U
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030
Slope	0.050 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.83 cfs

Results	
Depth	0.40 ft
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.46 ft
Top Width	1.24 ft
Critical Depth	0.45 ft
Critical Slope	0.027496 ft/ft
Velocity	3.38 ft/s
Velocity	0.18 ft
Head	
Specific Energy	0.58 ft
Froude Number	1.32
Flow Type	Supercritical

Use Minimum Depth = 0.67 ft	Minimum Freeboard = 0.27 ft
Velocity < 5 fps	No riprap required typically
At maximum slope 17%	Use D <sub>50</sub> = 3"

# Worksheet Worksheet for Trapezoidal Channel

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**Project Description**

---

Worksheet	D-18U (Avg Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

---

**Input Data**

---

Mannings Coefficient	0.030
Slope	0.110 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.83 cfs

---

**Results**

---

Depth	0.35 ft
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.26 ft
Top Width	1.05 ft
Critical Depth	0.45 ft
Critical Slope	0.027496 ft/ft
Velocity	4.54 ft/s
Velocity Head	0.32 ft
Specific Energy	0.67 ft
Froude Number	1.92
Flow Type	Supercritical

# Worksheet Worksheet for Trapezoidal Channel

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### Project Description

Worksheet	D-18U (Max Slope)
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

---

### Input Data

Mannings Coefficient	0.030
Slope	0.170 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.83 cfs

---

### Results

Depth	0.32 ft
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.16 ft
Top Width	0.97 ft
Critical Depth	0.45 ft
Critical Slope	0.027496 ft/ft
Velocity	5.34 ft/s
Velocity Head	0.44 ft
Specific Energy	0.77 ft
Froude Number	2.35
Flow Type	Supercritical

# Worksheet Worksheet for Trapezoidal Channel

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Project Description	
Worksheet	D-19U
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030
Slope	0.060 ft/ft
Left Side Slope	0.67 V: H
Right Side Slope	0.67 V: H
Bottom Width	0.00 ft
Discharge	0.50 cfs

Results	
Depth	0.32 ft
Flow Area	0.2 ft <sup>2</sup>
Wetted Perimeter	1.17 ft
Top Width	0.97 ft
Critical Depth	0.37 ft
Critical Slope	0.020420 ft/ft
Velocity	3.19 ft/s
Velocity Head	0.16 ft
Specific Energy	0.48 ft
Froude Number	1.40
Flow Type	Supercritical

Use Minimum Depth = 0.67 ft Velocity < 5 fps	Minimum Freeboard = 0.34 ft No riprap required
---	---

## Reclaimed Tank Seam Access Road Channel Designs

Construction of the Tank Seam Access Road will require the disturbance of six channels, shown on [Plate 7-7](#) as RC-TS1 through RC-TS6. All six channels exist as naturally eroding channels. Due to the steep maximum slopes, as shown on page [7H-16](#), riprap designs will not be proposed for these channels. This sections characterizes and documents the pre-mining channels which exist prior to disturbance. Reclamation will consist of restoring these channels to this configuration and mimicking the pre-mining conditions, in order to obtain a naturally stable drainage and restore the approximate original configuration to the channels. **These channels have all been reclaimed and are currently in Phase I Bond Release.**

Disturbance of the channels will consist primarily of placing fill in the channels to provide access across the channels for the road. This will allow the channels to essential remain intact beneath the fill. Upon reclamation, the fill material will be excavated from the channels and fill areas, and the channels will be restored, with many of the large boulders shown in the photographs of each channel remaining in place for the post-mining channel. Profiles of the pre-mining, and subsequently the proposed post-mining, channels are shown [on Plate 7-8C](#). A description of each channel follows. As the channels are reclaimed, the reclaimed channel will be blended in with the natural channels above and below the reclaimed channel by attempting to duplicate the appearance of the natural channels as they appear in the following photographs.

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Appendix 8-B

Phase I Bond Release

BEAR CANYON MINE C/015/0025

TOTAL BOND AMOUNT FOR AREAS RECLAIMED  
(TS-11, TS-10, TS-8, PORTIONS OF TS-7)

BONDING CALCULATIONS

DIRECT COSTS	TOTAL BOND	TOTAL BOND RELEASE	PHASE I			PHASE II			PHASE III			FINAL BOND REMAINING	
			60%	\$37,687.00	40%	\$25,125.00	0%	\$0.00	0%	\$0.00	40%		\$67,074.00
SUBTOTAL DEMOLITION AND REMOVAL	\$305,564.00	\$62,812.00	60%	\$37,687.00	40%	\$25,125.00	0%	\$0.00	0%	\$0.00	0%	\$0.00	\$242,752.00
SUBTOTAL BACKFILLING AND GRADING	\$230,471.00	\$91,919.00	60%	\$55,151.00	40%	\$36,768.00	0%	\$0.00	0%	\$0.00	0%	\$0.00	\$138,552.00
SUBTOTAL REVEGETATION	\$416,174.00	\$167,686.00	60%	\$100,612.00	0%	\$0.00	0%	\$0.00	40%	\$67,074.00	40%	\$67,074.00	\$248,488.00
SUBTOTAL DIRECT COSTS	\$952,209.00	\$322,417.00		\$193,450.00		\$61,893.00		\$67,074.00		\$117,976.00		\$85,050.00	\$629,792.00
INDIRECT COSTS													
MOB/DEMOB	\$95,221.00	\$32,242.00	10.0%	\$19,345.00		\$6,189.00		\$6,707.00		\$6,707.00		\$6,707.00	\$62,979.00
CONTINGENCY	\$47,610.00	\$16,121.00	5.0%	\$9,673.00		\$3,095.00		\$3,354.00		\$3,354.00		\$3,354.00	\$31,490.00
ENGINEERING REDESIGN	\$23,805.00	\$8,060.00	2.5%	\$4,836.00		\$1,547.00		\$1,677.00		\$1,677.00		\$1,677.00	\$15,745.00
MAIN OFFICE EXPENSE	\$64,750.00	\$21,924.00	6.8%	\$13,155.00		\$4,209.00		\$4,561.00		\$4,561.00		\$4,561.00	\$42,826.00
PROJECT MANAGEMENT FEE	\$23,805.00	\$8,060.00	2.5%	\$4,836.00		\$1,547.00		\$1,677.00		\$1,677.00		\$1,677.00	\$15,745.00
SUBTOTAL INDIRECT COSTS	\$255,192.00	\$86,408.00	26.8%	\$51,845.00		\$16,587.00		\$17,976.00		\$17,976.00		\$17,976.00	\$168,784.00
TOTAL COSTS	\$1,207,401.00	\$408,825.00		\$245,295.00		\$78,480.00		\$85,050.00		\$85,050.00		\$85,050.00	\$798,576.00
ESCALATION FACTOR													
NUMBER OF YEARS ESCALATION	5	5	0.032	\$41,841.00		\$13,387.00		\$14,507.00		\$14,507.00		\$14,507.00	\$136,215.00
PHASE I BOND ESCALATED	\$1,413,351.00	\$478,559.00		\$287,136.00		\$91,867.00		\$99,557.00		\$99,557.00		\$99,557.00	\$934,791.00
PHASE I BOND AMOUNT 2013 DOLLARS (ROUNDED TO NEAREST \$1,000)	\$1,413,000.00	\$479,000.00		\$287,000.00		\$92,000.00		\$100,000.00		\$100,000.00		\$100,000.00	\$935,000.00





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	
	Seal Portals 30																				
	Structure's Demolition Cost	Seal Portals	AML1	52000/EA	EA										12	EA		12	EA	62400	
	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																				
	Subtotal																			62400	
	Total																			62400	



Reclaimed Areas	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
Bear Canyon Mine Grading															
Tank Seam No 01, TS-10 & TS-11															
Tank Seam Access Road and Portal Pad Area															
Direct Cut and Fill															
CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213	\$/HR	9649	CY	478	CY/HR	20.2	HR	4303
Load and Haul															
CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213	\$/HR	10661	CY	313.7	CY/HR	34	HR	7242
6X4 50,000lbs 10-12 CY (20-11) (2nd)	3210	40.35	0.1	22.2	86.65	4	347	\$/HR							11798
Place Hauled Material															
CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213	\$/HR	10661	CY	478	CY/HR	22.3	HR	4750
Volume									20310	CY					
<b>Total</b>															<b>28093</b>

	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
Bear Canyon Mine Grading															
Upper Storage Pad No 02 TS-8															
Direct Cut and Fill															
CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213 \$/HR		3666 CY		478 CY/HR		7.7 HR		1640
Place Hauled Material FROM TS-5 AND TS-6															
CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213 \$/HR		3356 CY		478 CY/HR		7 HR		1491
Volume									3666						
Total													7.7		3131

	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
Bear Canyon Mine Grading Portal Pad Area No 03 TS-7															
Direct Cut and Fill CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213 \$/HR	5578 CY	488 CY/HR	11.4 HR					2428
Place Hauled Material FROM TS-5 AND TS-6 CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213 \$/HR	7405 CY	488 CY/HR	15.2 HR					3238
Volume Total								12983					15.2		5666

TOTAL ACRES = 1.81  
TOTAL ACRES CLAIMED = 1.29

SEE TABLE 5I-6 FOR CUT/FILL BALANCE  
867 YDS TO CUT REMAINING  
4187 YDS TO HAUL REMAINING  
5054 YDS TO HANDLE REMAINING

	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
Bear Canyon Mine Grading Portal Access Road No 04 TS-6															
Direct Cut and Fill CAT 345BL II (10-24)(2nd2006) 2005	16330	75.7	0.1	28.1	213.43	1	213.53/HR	0 CY	0	488	CY/HR	0 HR			0
Load and Haul TO TS-8 980G Series II EROPS (9-34) (2nd2006)	10255	51.7	0.1	28.1	149.06	1	149.16/HR	2553 CY	2553	760	CY/HR	3.4 HR			507
6X4 50,000lbs 10-12 CY (20-15) (2nd2006)	3210	40.36	0.1	22.2	86.65	4	347.5/HR					3.4 HR			1180
Volume Total								2553							1687



	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
Bear Canyon Mine															
Grading															
Borehole No 12															
Load and Haul Material															
980G Series II EROPS (9-34) (2nd/2006)	10255	51.7	0.1	28.1	149.06	1	149.06	149.06\$/HR	10560	CY	480	CY/HR	22	HR	3278
6X4 50,000lbs 10-12 CY (20-15) (2nd/2006)	3210	40.35	0.1	22.2	86.65	8	693.00	86.65\$/HR					22	HR	15246
CAT 345BL II	16330	75.7	0.1	28.1	213.43	1	213.43	213.43\$/HR	10560	CY	488	CY/HR	22	HR	4686
Volume									10560						
<b>Total</b>															
															28210

	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
Bear Canyon Mine Erosion Control Riprap No 14															
Place Riprap CAT 330D L (10-24) (2nd2007)	15415	68.9	0.1	28.1	200.23	1	200 \$/HR		139 sy		53 sy/day		21 HR		4200
Volume															
Total															4200

FROM PAGE 8-26

AREA	TOTAL LENGTH	RECLAIMED LENGTH	% COMP.	TOTAL RIPRAP (CY)	TOTAL RIPRAP (SY)	RECLAIMED RIPRAP (SY)
RC-1	320	320	100.00%	376	125	125
RC-2	640	190	29.69%	806	269	80
RC-3	1030	140	13.59%	1297	432	59
					TOTAL	139

	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
Bear Canyon Mine Grading Support															
Foreman Average, Outside				29.06	29.06	1	29.06						79/HR		2291
5,000 gal H2O truck Diesel (20-17) (2nd2006)	5170	35.7	0.1	22.16	93.74	1	94.84						79/HR		7426
Pickup Truck Crew 4x4 1 ton (20-17) (2nd2006)	1060	14.5	0.1	0	22.58	1	23.68						79/HR		1817
<b>Total</b>															<b>11534</b>

	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/Disc.	Units	Cost
TankSeam No 01 (TS-10 & TS-11)															28093
Upper Storage Pad No 02 (TS-8)															3131
Portal Pad Area No 03 (TS-7)															5666
Portal Access Road No 04 (TS-6)															1687
Coal Storage Area No 07 (TS-5)															14398
Borehole No 12															23210
Support No 13															11534
RipRap No 14															4200
<b>Total</b>															<b>91919</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	
	Main Mine Site 01																				
	Revegetation																				
	Drill Shedding																				
	Seed Material	Tractor Spreader (equip. & labor) B-66	Reveg004	13.34 /MSF	MSF					0						AC		0	MSF		
	Seed Material	Bear Canyon Main Mine Shrubs	Bear Canyon 001	166 \$/AC	S/AC					0						AC		0	AC		
	Seed Material	Bear Canyon Main Mine Forbs	Bear Canyon 002	149.05 \$/AC	S/AC					0						AC		0	AC		
	Seed Material	Bear Canyon Main Mine Grass	Bear Canyon 003	158.9 \$/AC	S/AC					0						AC		0	AC		
	Mulch	Tractor Spreader (equip. & labor) B-66	Reveg004	13.34 /MSF	MSF											AC			MSF		
	Mulch	Hay 1" material only 32 91 13 16 0350	Reveg001	56.1 /MSF	MSF											AC			MSF		
	Stock Labor	Bare root seedlings 11" to 16" med. soil	32 93 43 10 0140	1.79 Ea	Ea					0					500	EA		0	EA		
	Stock Material	Bear Canyon Main Transplants	Bear Canyon 004	3.95 \$/AC	S/AC					0					500	AC		0	EA		
	Ripping	300 HP Dozer w/ Ripper	31 23 16 32 2830	0.42 /CY	CY											AC		0	CY		
	Subtotal																				
	Number 2 Mine Area																				
	Hydroseeding	Hydro Spreader (equip. & labor) B-81 80MSF/day	Reveg002	18.54 /MSF	MSF					5.62						AC		527	MSF		9771
	Seed Material	Bear Canyon Main Mine Shrubs	Bear Canyon 001	166 \$/AC	S/AC					5.62						AC		6	AC		996
	Seed Material	Bear Canyon Main Mine Forbs	Bear Canyon 002	149.05 \$/AC	S/AC					5.62						AC		6	AC		894
	Seed Material	Bear Canyon Main Mine Grass	Bear Canyon 003	158.9 \$/AC	S/AC					5.62						AC		6	AC		953
	Mulch	Hay 1" material only 32 91 13 16 0350	Reveg001	56.1 /MSF	MSF					5.62						AC		245	MSF		13745
	Stock Labor	Bare root seedlings 11" to 16" med. soil	32 93 43 10 0140	1.79 Ea	Ea					5.62					500	EA		2810	EA		5030
	Stock Material	Bear Canyon Main Transplants	Bear Canyon 004	3.95 \$/AC	S/AC					5.62					500	AC		2810	EA		11100
	Subtotal									5.62						AC		1911	CY		2843
	Packing 340 CY/AC	Excavation Bulk Bank 2 CY (322BL)	31 23 16 42 0260	1.54 /CY	CY											AC					4942
	Subtotal																				
	Riparian Planting Area																				
	Plant Stock	Bear Canyon Main Mine Grass	Bear Canyon 008	889 \$/AC	S/AC					0						AC		0	AC		0
	Plant Stock	Bare root seedlings 11" to 16" med. soil	32 93 43 10 0140	1.79 Ea	Ea					0					500	EA		0	EA		0
	Subtotal																				
	Matting																				
	Matting	Revegetation mat, webbed	31 25 13 10 0120	7.05 /SY	SY					2.6						AC		12584	SY		88717
	Subtotal																				88717
	Total																				167688
	Reseed																				
	Assume 25% reseeding																				
	Subtotal																				33537
	Subtotal																				33537
	Total																				167688

AREA RECLAIMED	
US10	0.69 ACRES
US10	2.84 ACRES
US7	0.83 ACRES
US7	1.38 ACRES
TOTAL	5.62 ACRES



0015

**COPY**

Incoming  
C0150025  
R

## Hiawatha Coal Company

P.O. Box 1240  
Huntington, UT 84528

(435) 687-5777  
FAX (435) 687-5724

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

February 11, 2009

**Re: Bond Release, Bear Canyon Mine , C/015/025.**

We are requesting a Phase I bond release on the work already complete at the Bear Canyon Mine.

A substantial amount of reclamation work has been done on the Tank Seam Portal areas and access roads. As shown from the attached calculations, the bond amount on the area reclaimed is \$479,000. We are requesting the full 60% allowed under phase one bond release on these areas.

The total direct cost for this work is \$322,417. The total indirect cost and the escalation to 2013 dollars is \$242,549.

The total Bond Release that we are requesting in 2013 dollars rounded to the nearest \$1,000 is \$287,000.

The bond release calculations are included in the attached amendment and will be included in Appendix 8-B of the Bear Canyon MRP.

If you have any questions, please call me at (435) 687-5777.

Thank You,



Cliff Baker,  
Environmental Coordinator

File in:  
C0150025, 2009, Incoming  
Refer to:  
 Confidential  
 Shelf  
 Expandable  
Date: 2/11/09 For additional information

**RECEIVED**

**FEB 17 2009**

DIV. OF OIL, GAS & MINING

# Requirements for Bond Release

**COPY**

## I. Administrative Requirements

- A. A notarized signature of a responsible official is attached, and is to be included in Ch. 8, Appendix 8-B.
- B. A copy of the notification letter mailed out to all parties with valid interest in the release is attached and to be included in Ch. 8, Appendix 8-B.
- C. A copy of the Affidavit of Publication of Public Notice is attached, however Hiawatha Coal has not yet received the notarized copy.
- D. There are no outstanding permit conditions that have not been satisfied.

## II. Technical Requirements

### A. Bond Release Request

- 1. A legal description of the permit area can be found in Chapter 1, Page 1-6.
- 2. Maps are included with this submittal, all maps will be certified upon approval.
- 3. N/A
- 4. These are located in Chapter 2, Appendix 2-A and 2-E
- 5. These are located in Chapter 2, Appendix 2-A, 2-C, 2-D and 2-E

APPLICATION FOR COAL PERMIT PROCESSING

**COPY**

Permit Change  New Permit  Renewal  Exploration  Bond Release  Transfer

Permittee: HIAWATHA COAL CO.

Mine: BEAR CANYON MINE

Permit Number: ACT/015/025

Title: Phase I Bond Release

Description, Include reason for application and timing required to implement:

Bond Release on reclamation areas TS-1, 8, 10, 11, and portion of 7

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

- Yes  No 1. Change in the size of the Permit Area? Acres: Disturbed Area:  increase  decrease.
- Yes  No 2. Is the application submitted as a result of a Division Order? DO#
- Yes  No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
- Yes  No 4. Does the application include operations in hydrologic basins other than as currently approved?
- Yes  No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
- Yes  No 6. Does the application require or include public notice publication?
- Yes  No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
- Yes  No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
- Yes  No 9. Is the application submitted as a result of a Violation? NOV #
- Yes  No 10. Is the application submitted as a result of other laws or regulations or policies?

Explain: \_\_\_\_\_

- Yes  No 11. Does the application affect the surface landowner or change the post mining land use?
- Yes  No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
- Yes  No 13. Does the application require or include collection and reporting of any baseline information?
- Yes  No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
- Yes  No 15. Does the application require or include soil removal, storage or placement?
- Yes  No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
- Yes  No 17. Does the application require or include construction, modification, or removal of surface facilities?
- Yes  No 18. Does the application require or include water monitoring, sediment or drainage control measures?
- Yes  No 19. Does the application require or include certified designs, maps or calculation?
- Yes  No 20. Does the application require or include subsidence control or monitoring?
- Yes  No 21. Have reclamation costs for bonding been provided?
- Yes  No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
- Yes  No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

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.

N Finley  
Print Name

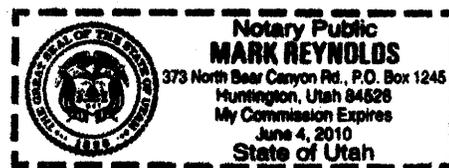
N Finley 2-11-09  
Sign Name, Position, Date

Subscribed and sworn to before me this 11 day of February, 2009

Mark Reynolds  
Notary Public

My commission Expires:

Attest: State of Utah } ss:  
County of Emery



For Office Use Only:

Assigned Tracking Number:

Received by Oil, Gas & Mining

**RECEIVED**  
**FEB 17 2009**

DIV. OF OIL, GAS & MINING

