C/025/005 Incoming

Alton Coal Development, LLC
463 North 100 West, Suite 1
Cedar City, Utah 84720
Phone (435) 867-5311 Fax (435) 867-1192

#5565

December 4, 2017

RECEIVED
FEB 12 2018
DIV. OF OIL, GAS & MINING

Daron R. Haddock
Coal Program Manager
Oil, Gas & Mining
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

Re: **Modification of Coal Hollow Mine (CHM) Pit 10 Drainage Controls on Drawings 5-3B & 5-3C, Alton Coal Development, LLC, Coal Hollow Mine, Kane County, Utah, C/025/0005**

Dear Mr. Haddock:

Alton Coal Development, LLC (ACD) is submitting an amendment to the MRP to update and modify the maintenance protocols for several drainage controls in Pit 10 shown on Drawings 5-3B and 5-3C. These modifications are necessary to ensure the safety of mine workers and to eliminate the potential for employees or equipment to be in an area where rockfall or slough hazards exist.

Following the issuance of NOV #21167, the division has required in the CHM permit that the highwall and spoil slopes above the Burton #1 Mine be maintained with berms and drainage channels as well as a pit-bottom sump for the collection of stormwater runoff. The drainage channels are intended to minimize the velocity of runoff and therefore the amount of sediments carried to the pit-bottom sump, while the sump is constructed with a gravel dike that filters sediments from the inlet cell so cleaner water can be pumped from the outlet cell to sediment pond #3. The ultimate aim of these controls as stated in the NOV is to "limit contributions of suspended solids to pond #3."

Surface mining activities at the CHM have been halted on several occasions in several different pits by the Mine Safety and Health Administration (MSHA) due to highwall instability related to thick and water saturated alluvium deposits that overlay shale and coal strata. The alluvium has shown a tendency for small bench-scale failure, especially when heavily saturated by runoff and/or groundwater. Unconsolidated spoil slopes would be expected to react in a similar manner under normal maintenance routines where the spoil slope at the angle of repose would be undercut to maintain drainage channels. This undercutting would induce localized failure, placing personnel and equipment in a hazardous situation. Additionally, the highwall directly above and adjacent to the Burton #1 Mine portals shows sloughage and deterioration due to the weathering of the shale stratum. Maintaining the drainage channel running along the highwall bench would require personnel and heavy equipment to work directly above the area of potential failure and in the line of fire for any failure event.

ACD asserts that the sediment load transported to sediment pond #3 (which in itself is a UPDES permitted sediment control and discharge structure) can continue to be sufficiently minimized by ongoing maintenance of the pit-bottom sump without having to place equipment and personnel in hazardous areas by performing maintenance of the channels on the highwall or spoil slopes. Therefore, Drawings 5-3B and 5-3C have been modified to show drainage channels located on the highwall, highwall bench and spoil slopes as being unmaintained. Drawing 5-3C also shows the modified configuration of the pit-bottom sump to allow room for sloughed material while maintaining the required capacity.

Additionally, Appendix 5-2 has been resubmitted to correct an inadvertent deletion that occurred in the clean copy submission on June 2, 2017. This deletion removed all of the text and tables associated with the Pit 10 drainage controls provided in earlier submissions.

Changes to the MRP associated with this amendment have been uploaded to the DOGM's server for review. PDF versions of the drawings are not certified. Upon approval, 2 (two) clean hard copies of the text and certified drawings for insertion into the MRP will be submitted. Please do not hesitate to contact me if you have any questions 435-691-1551.

Very truly yours,

B. Kirk Nicholes
Environmental Specialist
Alton Coal Development

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Alton Coal Development, LLC
Mine: Coal Hollow Mine **Permit Number:** C/025/0005
Title: Pit 10 Drainage Controls

Description, Include reason for application and timing required to implement:
Pit 10 Drainage Control modifications

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

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

Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) 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.

B. Kirk Nicholes	Environmental Specialist	11/10/2017	B. Kirk Nicholes
Print Name	Position	Date	Signature (Right-click above choose certify then have notary sign below)

Subscribed and sworn to before me this 10 day of November, 2017

Notary Public: Marty G Nicholes, state of Utah.

My commission Expires: 9-11-2021 }
Commission Number: 696219 } ss:
Address: 1670 E Millstone Cir }
City: Enoch State: UT Zip: 84721 }

MARTY G. NICHOLES
Notary Public, State of Utah
My Commission Expires
September 11, 2021
Commission # 696219

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
		RECEIVED FEB 12 2018 DIV. OF OIL, GAS & MINING

Form DOGM- C1 (Revised December 10, 2007)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Alton Coal Development, LLC
Mine: Coal Hollow Mine
Permit Number: C/025/0005
Title: Pit 10 Drainage Controls

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	Chapter 5, Appendix 5-2
☐ Add	☒ Replace	☐ Remove	Chapter 5, Drawing 5-3B
☐ Add	☒ Replace	☐ Remove	Chapter 5, Drawing 5-3B
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	Received by Oil, Gas & Mining RECEIVED FEB 12 2018 DIV. OF OIL, GAS & MINING

Form DOGM - C2 (Revised December 10, 2007)

APPENDIX 5-2

Sediment Impoundment and
Diversion Structure Analysis

By: Alton Coal Development, LLC
Chris McCourt, P.E.

Revised December 2017
Andrew R. Christensen

PROFESSIONAL ENGINEER
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ANDREW R.
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2/9/2018
STATE OF UTAH

Coal Hollow Mine – Sedimentation Structure Sizing

Introduction

Protection of surface water quality at the Coal Hollow Mine is an important part of the mining process. By utilizing sedimentation structures for diversion and sediment impoundment, Alton Coal Development, LLC (ACD) will minimize the sediment that could potentially flow from active disturbance areas into drainages that are in and surrounding the proposed project area. Appropriate sizing of these structures is a necessary step toward ensuring that these controls function properly and serve the purpose of protecting the surrounding environment.

Therefore, ACD has completed a watershed analysis for appropriate sizing of four proposed sedimentation impoundments and four diversion ditches. This report will outline the methods used and results of this analysis.

Sediment Impoundments

Summary

The watersheds for the four proposed sedimentation impoundments have been evaluated mainly using the TR-55 method. This method of analysis was first issued by the Soil Conservation Service (SCS) in 1975. It has since been revised and updated numerous times. This method is applicable for evaluating small watersheds.

To assist with the calculations and mapping, Carlson 2007 Hydrology software has been utilized for this evaluation. A watershed analysis for this project includes: runoff flow paths, watershed boundaries, length and average grade for longest flow lines, runoff curve number classification, time of concentration and peak discharge. Information from this analysis was then used for sedimentation structure sizing. For the specifics associated with each of these parameters refer to the details section of this report.

The sedimentation structures were sized to impound the runoff associated with a 100-year frequency, 24-hour duration storm event. Using the Carlson rainfall map (assembled using TP-40 and TP-47 data), the rainfall intensity associated with this size of event for the Alton area is 3.1 inches. The following table summarizes the final results for each sedimentation structure:

Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage* (ac/ft)	Percent above requirement	Additional Storage (ac/ft)
1	2.6	3.1	119	0.5
2	1.7	2.3	135	0.6
3	6.3	12.6	200	6.3
3 PM**	10.4	12.6	121	2.2
4	3.8	5.5	224	1.7
1B	0.5	0.8	160	0.3

*Design capacities include a minimum of 2 feet free board (spillway to top of embankment)
**Required pond size after completion of mining and addition of 103 acres for backfill material.

Two 4" HDPE drainage pipes have been installed from the underground mining sump to the inlet end of Pond 3. Only one pipe is used, with the second in place as a backup. The pipe is expected to carry up to 100 gpm or 0.22 cfs. A 6" decant pipe has been installed in Pond 3, which will allow controlled decanting of the water in the event of a continuous mine water discharge. The pond can be decanted to an elevation of 6808, which is 3 feet below the spillway. At this elevation, the pond can still contain approximately 4.98 ac. ft. of runoff, which is slightly greater than the 4.95 ac. ft. of runoff from a 10-year / 24-hour event of 2.39"; therefore, the pond will still meet the requirement of treating a 10-year / 24-hour runoff event.

Upon completion of the underground mining, the portals will be sealed and the pit will be backfilled. Since it is expected that there will be a deficit of backfill material for this final pit, borrow material will be extracted from a total area of approximately 66.1 acres encompassing the current long term spoil pile and the hillsides directly adjacent to pond 3 to the northeast and southwest. Removing these hillsides will result in additional disturbance (and watershed area) of 30.9 acres. Removal of the borrow material will also result in the re-establishment of pre-mining drainage paths that will increase the watershed for Sediment Pond 3 by an additional 72 acres of undisturbed ground located outside of the permit boundary, as shown on Drawings 5-19, 5-26 and 5-37. Runoff from the additional area of 102.9 acres for a Watershed 3 total of 387.9 acres will all flow to Pond 3. Calculations show that an additional 4.1 acre feet of runoff is expected from this area for the 100 year – 24 hour storm. Since the mining will be completed at this time, the additional capacity presently required for the possible mine water discharge will no longer be required; therefore, the additional 4.1 ac. ft. for the extra area has been added to the required 6.3 ac. ft. for Pond 3, resulting in a required size of 10.4 ac. ft. for the post-mining pond, as shown in the previous table "Sediment Impoundment Capacities". The runoff details and calculations for the additional 103 acre area is shown as "3 PM" in the following tables.

The enclosed maps and cross sections detail the design and location for each structure (Drawings 5-25 through 5-34). These drawings also show proposed spillways, diversion ditches and watersheds associated with each structure.

Details

Determining storage capacity requirements using the TR-55 method requires several steps. This section of the report will provide the details and assumptions associated with each step. These steps are: watershed boundaries/flow paths, runoff curve number classification, time of concentration, peak discharge and structure sizing.

- **Watershed Boundaries/Flow Paths**
  The watershed boundaries were determined by first identifying the runoff flow paths for the entire project area. This was completed by creating a three dimensional model of the surface topography. This model was then used to draw flow paths for all the watersheds. Based on these flow paths, boundaries for each watershed are easily determined based on flow direction in combination with proposed control structures (ponds, diversion ditches, etc..).

Using this process, the project area (in conjunction with diversion ditch locations and berms) was found to be separated into seven distinct watersheds. The natural separations of watersheds in this area are Lower Robinson Creek to the north and Sink Valley Wash at the south end. In addition to these natural separations, the proposed diversion ditches and berms also provide definite boundaries as shown on Drawings 5-26 and 5-27. The following summarizes the watersheds:

Sediment Impoundment Watersheds		
Watershed	**Area (acres)**	**Description**
1	27	North end of project area where facilities are proposed.
2	74	Borders south edge of Lower Robinson Creek.
3 3 PM	285 103	Main watershed through the center of permit area. Watershed expansion after completion of mining.
4	96	Southern most watershed bordered by Sink Valley Wash
*5	28	Isolated area between watersheds 3 and 4
*6	19	Area northwest of Lower Robinson Creek Reconstruction
7	5	Southwest end of facilities area, entrance/exit road

* These watersheds will have silt fence or other appropriate control measures installed.

- **Rainfall Amount and Runoff Curve Number Classification**
  First data required to begin estimating runoff for the watersheds is the rainfall amount and the runoff curve number classification. The rainfall amount is the precipitation associated with a 100 year frequency, 24 hour duration storm event. The runoff curve number classification is a classification of the soil and vegetation cover conditions for the watersheds.

  In order to estimate runoff from rainfall, the rainfall amount for a 100 year frequency, 24 hour duration storm event was determined using the Carlson rainfall map. This map was assembled by Carlson software based on TP-40 and TP-47 data. The resulting rainfall amount for the Alton area using this map is 3.1 inches.

  The runoff curve number was determined by matching the ground cover description and estimated hydrologic soil group for the project area to the descriptions available in Table 2-2d of TR-55. Based on visual observations of the project area and soils the following classifications were estimated:

    1. Cover Description: The cover description that best fits watersheds 2, 3 and 4 is "Sagebrush with grass understory". The hydrologic condition for this cover was estimated at "fair" which is defined as 30% to 70% ground cover. This estimation was based off the knowledge of current conditions and future disturbance/reclamation. Plans for this operation include sequenced disturbance combined with concurrent reclamation.

This will minimize the area that will be disturbed at any one time. This will be combined with a general vegetation coverage improvement within one to two growing seasons for reclamation compared to current conditions. In addition, a significant amount of runoff from the active mining area for this magnitude of storm event will be temporarily controlled within the active pit area and will not immediately report to the designed impoundments.

Watershed 1 and 7 have been classified differently since they includes the mine facilities area. This watershed is classified as "Gravel roads" since most the area will be stripped of vegetation and gravel spread for parking areas and roads. This results in a much higher runoff than the classification for the other three watersheds.

2. Hydrologic Soil Group: This classification was estimated to be Group C for the five watersheds evaluated, as outlined in Appendix A in TR-55. This classification is for soils having low infiltration rates thus producing high amounts of runoff. The soils in this classification typically have infiltration rates of 0.05 to 0.15 inches per hour.

The resulting curve number for watersheds 2, 3 and 4 is 63. Watershed 1 and 7 were assigned a curve number of 89. These classifications are intended to be conservative estimates (producing higher than expected runoff) to ensure that the sedimentation structures have more than sufficient storage capacity.

These classifications are used in the next step for determining the time of concentration.

- **Time of Concentration (T_c)**
  T_c is the time for runoff to travel from the furthest point in the watershed to the point that it meets the sedimentation structure. This figure is essential for calculating the peak flow which is used to determine the required size for the sedimentation structure. The SCS method for calculating T_c is used in this analysis. The following table summarizes the inputs for calculating the T_c along with the resulting outputs:

Time of Concentration (T_c)				
Watershed	Curve Number	Flow Length (ft)	Average Slope (%)	T_c (hrs)
1	89	1,087	6.8	0.16
2	63	5,670	3.8	1.7
3	63	7,095	3.5	2.2
3 PM	63	2,900	2.3	0.8
4	63	3,805	2.9	1.8
7	89	750	3.9	0.08

The T_c for each watershed is used to calculate the peak discharge which is the final step leading to the structure sizing.

- **Peak Discharge**
  The peak discharge for each watershed was calculated using the Graphical method. The inputs required for this method include: T_c, drainage area, 100 year 24 hour rainfall and the runoff curve number (CN). The following table outlines these inputs and the peak discharge:

Peak Discharge (*Inflow)					
Watershed	CN	Tc (hr)	Rainfall (in)	Drainage Area (ac)	Peak Discharge (cfs)
1	89	0.16	3.1	27	74.7
2	63	1.7	3.1	74	9.9
3	63	2.2	3.1	285	31.8
3 PM	63	0.8	3.1	103	18.8
4	63	1.8	3.1	96	14.8
7	89	0.8	3.1	5	15.6

*The peak discharge from each watershed will also be the peak inflow to the sedimentation structures.

- **Sedimentation Impoundment Sizing**
  The method used for this step is again from the TR-55 program. A sedimentation structure is required for each one of the five watersheds analyzed. Therefore, a size has been evaluated for the five proposed structures. The inputs for this calculation are the following: drainage area, peak inflow, desired outflow, and runoff depth (Q). The desired outflow in this situation is zero since we do not intend any discharge from the structures. The spillways for these structures are proposed for emergency use only and are not intended for regular discharges. The following table summarizes these inputs and the required storage capacity for each watershed:

Sedimentation Impoundment Sizing				
Watershed	Drainage Area (ac)	Inflow (cfs)	Q (in)	Storage Required (ac/ft)
1	27	74.7	2.00	2.6
2	74	9.9	0.48	1.7
3	285	31.8	0.48	6.3
3 PM	103	18.8	0.48	4.1
4	96	14.8	0.48	3.8
1B	5	15.6	2.00	0.5

The enclosed maps show the proposed design and locations for each one these structures.

- **Portal Drainage and Sump Design**

  The existing sump in the portal area pit has been redesigned and expanded to reduce the possible sediment load being pumped to Pond 3 as described above. The area draining to the sump has been measured at 25.2 acres. Using the 100 year – 24 hour storm event of 3.1", the calculated total runoff from this area is 1.42 acre feet. In an effort to reduce sediment loading to the sump and Pond 3, the sump will be expanded and divided into 2 sections by installation of a gravel filter dike. The contaminated runoff from the ditches and portal area will flow to the eastern section. Sediment will be allowed to settle in this section as the water filters through the gravel to the western or "clean water" section. The western section will have a capacity of at least 1.00 acre foot. Mine water will continue to flow to the western section, and pumping to Pond 3 will continue as designed and approved. The expanded sump will be constructed with approximately 1H:1V internal slopes and incised as originally constructed.

  It should be noted that the runoff calculated for Pit 10 and the portal area has previously been included in the Sediment Pond 3 and Diversion Ditch 4 calculations in the respective, previously approved sections of this Appendix. As a result, all ditches and culverts described in this section are numbered specifically for Pit 10, to avoid any confusion with other on-site structures previously approved for the mining operation.

  All ditches and culverts conveying runoff to the sump area are sized to carry the runoff from the 100 year – 24 hour storm. The runoff from the ditches has been calculated using the OSM "Storm Program 6.20", based on the SCS TR-55 method of peak flow determination. Culvert sizing is based on the Haestad Methods, Flowmaster I, Version 3.43 Computer Program. The typical ditch will be unlined with a "V" shape with 2H:1V side slopes. Although the flow calculations were made on the typical "V" ditch to provide the most conservative sizing, the actual ditch configurations may vary as long as the minimum sizing is maintained. Ditches or culvert outlets with flow velocities in excess of 5 fps will be provided with erosion protection. The erosion protection will consist of placement of minimum 6" D50 rip-rap underlain by erosion control fabric. The rip-rap will be placed to a depth of at least 6" above the maximum calculated flow depth. This protection will be placed in ditch R04 and at the culvert outlets of P10-08, P10-09 and P10-10. Erosion control on bare slopes will be provided by seeding/vegetation with the approved "Interim Seed Mix". If erosion becomes evident in any other safely accessible area, protection will be provided with rip-rap, check dams or other approved erosion control methods.

  The flow for each ditch has been calculated based on the contributing watershed to each ditch, plus runoff from any adjoining ditches or culverts. Using the total runoff to each ditch, along with the slope, the calculated flow depth and velocity was determined.

  The maximum flow to each of the culverts was also determined based on the flow from the contributing ditches and watersheds. This flow, along with the slope, was then used to determine the minimum required size of each culvert, along with expected exit velocities. As indicated above, if cutting or erosion becomes evident, rip-rap or other approved erosion protection will be provided in safely accessible areas.

The following tables will summarize the expected flows and runoff characteristics for each of the individual ditches and culverts in Pit 10:

Watershed	CN	Area ac.	Length ft.	El. Chg. ft.	Flow cfs	Volume ac. ft.
W-R01	63	2.4	200	40	0.74	0.10
W-R02	63	2.1	400	44	0.87	0.08
W-R03	63	0.4	150	30	0.11	0.02
W-R04	63	1.6	200	80	0.46	0.06
W-R05	63	0.5	250	20	0.19	0.02
W-R06	63	0.1	170	24	0.03	0.01
W-S01	63	2.4	300	30	0.94	0.10
W-S02	63	1.7	200	50	0.51	0.07
W-S03	63	1.6	360	40	0.64	0.06
W-S04	63	1.0	400	76	0.39	0.04
W-N01	63	3.3	490	42	1.47	0.13
W-N02	63	4.3	300	90	1.42	0.17
W-F01	89	0.9	90	65	0.75	0.15
W-F02	89	1.3	170	44	1.44	0.22
W-F03	89	0.6	350	54	0.91	0.10
W-F04	89	0.5	100	75	0.42	0.08

Ditch	Flow cfs	Depth ft.	Slope %	Velocity fps	Flow From:	Flow To:
P10-R01	0.74	0.31	8.69	3.90	W-R01	R03
P10-R02	0.87	0.33	8.04	3.95	W-R02	R04
P10-R03	2.30	0.61	2.25	3.12	W-R03, S02	P10-08
P10-R04	5.75	0.68	7.90	6.29	W-R04, R02, P10-08	Basin
P10-R05	0.19	0.18	10.77	3.01	W-R05	R06
P10-R06	0.61	0.25	17.91	4.88	W-R06, R05, S04	P10-07
P10-S01	0.94	0.34	8.45	4.10	W-S01	S02
P10-S02	1.45	0.40	8.33	4.55	W-S02, S01	R03
P10-S03	2.11	0.47	7.69	4.85	W-S03, N01	P10-08
P10-S04	0.39	0.26	5.58	2.82	W-S04	R06
P10-N01	1.47	0.49	2.99	3.11	W-N01	P10-10
P10-N02	1.42	0.57	1.16	2.16	W-N02	P10-09
P10-F01	2.17	0.60	2.08	2.99	W-F01, P10-09	P10-05
P10-F02	1.44	0.54	1.60	2.45	W-F02	P10-07
P10-F03	3.08	0.63	3.33	3.89	W-F03, P10-03	Basin
P10-F04	0.42	0.31	2.50	2.12	W-F04	Basin

*Manning's n = 0.030 for Ditches.

Culvert	Flow cfs	Slope %	Velocity fps	Min. Size ft.	Actual ft.	Flow From:	Flow To:
P10-03	2.17	2.08	3.82	0.85	2.00	F01	F03
P10-04	2.17	2.08	3.82	0.85	2.00	F01	P10-03
P10-05	2.17	2.08	3.82	0.85	2.00	F01	P10-04
P10-07	2.05	3.00	4.32	0.78	3.00	R06, F02	Basin
P10-08	4.43	4.00	5.83	0.98	2.00	R03, S03	R04
P10-09	1.42	64.44	12.44	0.38	2.00	N02	F01
P10-10	1.47	46.67	11.12	0.41	2.00	N01	S03

*Manning's n = 0.020 for Culverts.

Note: Drainage control details for the portal area are shown on Drawing 5-3C. Watersheds are shown on Drawing 5-3D.

Conclusions

This analysis provides estimates of sufficient storage capacities for each watershed to impound water from a 100 year frequency, 24 hour duration storm event at the proposed Coal Hollow Mine. In addition to the required storage capacities, a minimum 15% additional storage capacity has been added to each structure design to account for sediment and any standing water that may occur. Spillways have also been included in the structure designs to provide a non-destructive route for discharge should these capacities ever be exceeded.

The one exception to the above is Pond 3. Although the pond size is 200% greater than required for the 100-year / 24-hour event, the pond may also receive water pumped from the underground mine. If a continuous discharge from the mine should occur, the pond is equipped with a decant which would allow for a static level 3' below the spillway. At this elevation, the pond would still have a retention capacity of 4.98 ac. ft., which is slightly greater than the 4.95 ac. ft. calculated runoff from a 10-year / 24 hour event.

Due to the isolated characteristics and the inability to effectively divert water from Watershed 5 and 6, the method of using silt fence or other appropriate control measures for sediment have been chosen and is included on the Drawing 5-26.

The structure designs established from this analysis will minimize impacts from sediment to the surrounding environment at the Coal Hollow Mine.

Diversion Ditches

Summary

The channel sizing for the four proposed diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 100 year, 24 hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The final mining on this site will occur in conjunction with the removal of the borrow area described above. This will be Pit B-1, as shown on Drawing 5-3. A temporary diversion ditch will be constructed prior to the mining of Pit B-1, to direct runoff to Pond 3 as shown on Drawings 5-3 and 5-27. Because this ditch has 2 very different slope segments, the design has been based on the upper, less steep section designated B-1T-U, and the lower, steeper section designate B-1T-L. The upper 960' section will carry the design flow at a non-erosive velocity; however, the lower 537' section will have a potentially erosive flow and will be protected from erosion with a 12" D50 rip-rap underlain by erosion control fabric. The upper section will be mined out as Pit B-1 reaches pit extents. The lower section will remain in place to continue to direct runoff from the mining area to Pond 3. It will be removed during the final borrow operation.

As indicated above, upon completion of mining, additional backfill material will be extracted from a borrow area which includes the hillsides to the northeast and southwest of sediment pond 3. As a result of the removal of the hillside to the northeast of the pond, the lower end of existing diversion ditch 4 will be realigned, as shown on Drawing 5-34. That realignment results in a slight decrease of watershed area draining to Ditch 4, from 169 acres to 164.2 acres. Since this is a decrease in area and potential runoff, the previously approved Ditch 4 calculations represent a "worst-case" scenario, and have not been changed for this submittal.

The following table summarizes the inputs and results for each diversion based on flows during a 100 year, 24 hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	17.4	0.6	7.2	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.1	19.8	0.6	5.4	0.3
B-1T-U	0.0	0.020	1.0	11.42	1.1	4.7	0.5
B-1T-L	0.0	0.020	4.8	**32.45	1.2	10.9	0.5

*All side slopes are 2h:1v
**Total flow from both watersheds.

Details

- **Watersheds**
  The first step used for evaluating the diversions was to determine the peak flow during a 100 year, 24 hour storm event for each diversion. In order to determine this variable, the TR-55 method of watershed analysis was again utilized. This requires determining the watershed boundaries associated with each diversion. The following table summarizes these watersheds:

Diversion Watersheds		
Ditch	**Area (acres)**	**Description**
1	158	Diverts water around project area
2	48	Diverts water along Robinson Creek to Pond 2
3	72	Diverts water around facilities area
4	169	Diverts water from project area into Pond 3
B-1T-U	6.1	Diverts water from Pit B-1 to Pond 3 (Flows to B-1T-L)
B-1T-L	11.3	Diverts water from Pit B-1 to Pond 3

- **Rainfall Amount and Runoff Curve Number Classification**
  The rainfall amount for a 100 year, 24 hour storm event was developed utilizing the same method as previously discussed in the impoundments section of this report. This number is 3.1 inches of precipitation.

  The runoff curve number classification for all four watersheds was estimated to be 63. This classification is consistent with the classification and logic used for the impoundment analysis.

- **Time of Concentration (T_c)**
  T_c is the time for runoff to travel from the furthest point in the watershed to the point that it meets the sedimentation structure. This figure is essential for calculating the peak flow which is used to determine the required size for the diversion ditch. The SCS method for calculating T_c is used in this analysis. The

following table summarizes the inputs for calculating the T_c along with the resulting outputs:

Time of Concentration (T_c)				
Ditch	Curve Number	Flow Length (ft)	Average Slope (%)	T_c (hrs)
1	63	8,487	2.9	2.9
2	63	4,187	3.6	1.4
3	63	3,742	13.7	0.7
4	63	5,868	3.9	1.8
B-1T-U	89	960	1.0	0.1
B-1T-L	89	537	4.8	0.1

The T_c for each watershed is used to calculate the peak flow which is the final step leading to the diversion dimensions.

- **Peak Flow**
  The peak flow for each diversion was calculated using the Graphical method. The inputs required for this method include: T_c, drainage area, 100 year 24 hour rainfall and the runoff curve number (CN). The following table outlines these inputs and the peak flow:

Diversion Peak Flow					
Ditch	CN	Tc (hr)	Rainfall (in)	Drainage Area (ac)	Peak Flow (cfs)
1	63	2.9	3.1	158	17.4
2	63	1.4	3.1	48	6.9
3	63	0.7	3.1	72	16.7
4	63	1.8	3.1	169	19.8
B-1T-U	89	0.1	3.1	6.1	11.42
B-1T-L	89	0.1	3.1	11.3	*32.45

*Total flow from upper (11.42 cfs) and lower (21.03 cfs)

- **Diversion Dimensions**
  The Manning's Equation (ME) equation was used to appropriately size the each diversion. Inputs into this equation are manning's coefficient, average diversion slope, peak flow and side slope angles. Outputs are the depth of flow, velocity and base dimension for applicable trapezoidal channel design. A base dimension of 0.0 ft. indicates a triangular channel. The following table summarizes the inputs and results:

Diversion Ditch Summary							
Ditch	**Base (ft)	*Manning n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	17.4	0.6	7.2	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.1	20.6	0.6	5.0	0.3
B-1T-U	0.0	0.020	1.0	11.42	1.1	4.7	0.5
B-1T-L	0.0	0.020	4.8	***32.45	1.2	10.9	0.5

*Manning n of 0.020 is for ordinary firm loam
**All side slopes are 2h:1v
***Total flow from upper and lower watersheds.

Temporary Diversion Ditches

Summary

Diverted drainage from the east and north sides above Pit 10 has previously flowed across reclaimed land to the west and into Diversion Ditch 4. In an effort to protect the reclaimed area and reduce the possibility of rilling and erosion, it is proposed to route the drainage along existing, established routes, as shown on Drawings 5-3 and 5-27. All of the runoff area is within the existing, approved Ditch 4 Watershed, as shown on Drawing 5-27. This entire watershed flows into Diversion Ditch 4 and finally into Sediment Pond 3, all of which are sized for the 100 year – 24 hour precipitation event. Since the proposed temporary diversion ditches herein described are entirely within this watershed and will only remain in place until Pit 10 is backfilled, their design is based on the 10 year – 6 hour precipitation event of 1.41", as required by law.

The proposed drainage routing is as follows: Ditch 4-A-U will intercept the undisturbed drainage from the west and northwest of Pit 10 and route it to the north and west to the existing haul road; Ditch 4-A-D will then carry the runoff from 4-A-U and contributing drainage to the haul road, across the haul road through existing culvert CR-1, then southward along the road to the point where it turns to the west; Ditch 4-A-R will then convey the drainage from 4-A-D and the contributing runoff from the reclaimed area to the west and into Diversion Ditch 4, as shown on Drawing 5-3. This proposed routing will eliminate concentrated flows across the reclaimed area and place those flows in existing ditches along the roads. It should be noted that the flow from Ditch 4-A-D to Culvert CR-1 has been evaluated and the culvert flow velocity was calculated at 4.21 fps. Although this velocity is considered non-erosive and additional protection is not considered necessary, it is proposed to install 6" D50 rip-rap over geotextile at both the inlet and outlet of that culvert. This same protection will also be placed at the outfall of Ditch 4-A-R into existing Ditch 4, as shown on Drawing 5-34A.

The following table summarizes the inputs and results for each temporary diversion based on flows during a 10 year- 6 hour storm event:

Temporary Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
4-A-U	0.0	0.020	1.4	0.16	0.21	1.82	0.3
4-A-D	0.0	0.020	2.9	3.23	0.58	5.10	0.3
4-A-R	0.0	0.020	1.2	3.53	0.69	3.70	0.3

*All side slopes are 2h:1v

Details

- **Watersheds**
  Since runoff to the Temporary Diversion Ditches comes from Undisturbed, Disturbed and Reclaimed Areas, each contributing watershed is calculated separately. The following table summarizes these watersheds:

Temporary Diversion Watersheds		
W. Shed	**Area (acres)**	**Description**
4-A-U	85.3	Runoff from Undisturbed Area to East of Pit 10
4-A-D	6.7	Runoff from Disturbed Area / Road North of Pit 10
4-A-R	19.9	Runoff from contributing Reclaimed Area

- **Rainfall Amount and Runoff Curve Number Classification**
  The rainfall amount for a 10 year - 6 hour storm event was developed utilizing the same method as previously discussed in this report. This number is 1.41 inches of precipitation.

  The runoff curve number classification of 63 was estimated for the undisturbed and reclaimed watersheds, and 89 for the disturbed area watershed. This is consistent with the numbers previously used in this report.

- **Watershed Parameters**
  The peak flow for each separate watershed and corresponding ditch was calculated using the OSM Storm 6.20 Computer Program. The parameters used are summarized below:

Watershed Parameters				
W. Shed	Curve Number	Flow Length (ft)	Average Slope (%)	T_c (hrs)
4-A-U	63	3,425	4.5	1.76
4-A-D	89	856	4.2	0.12
4-A-R	63	1,141	2.3	0.30

- **Peak Flow**
  The peak flow for each temporary diversion was calculated using the above parameters. The following table outlines these inputs and the peak flow:

Temporary Diversion Peak Flow					
Ditch	CN	Tc (hr)	Rainfall (in)	Drainage Area (ac)	Peak Flow (cfs)
4-A-U	63	1.76	1.41	85.26	0.16
4-A-D	89	0.12	1.41	6.65	3.23
4-A-R	63	0.30	1.41	19.90	0.14

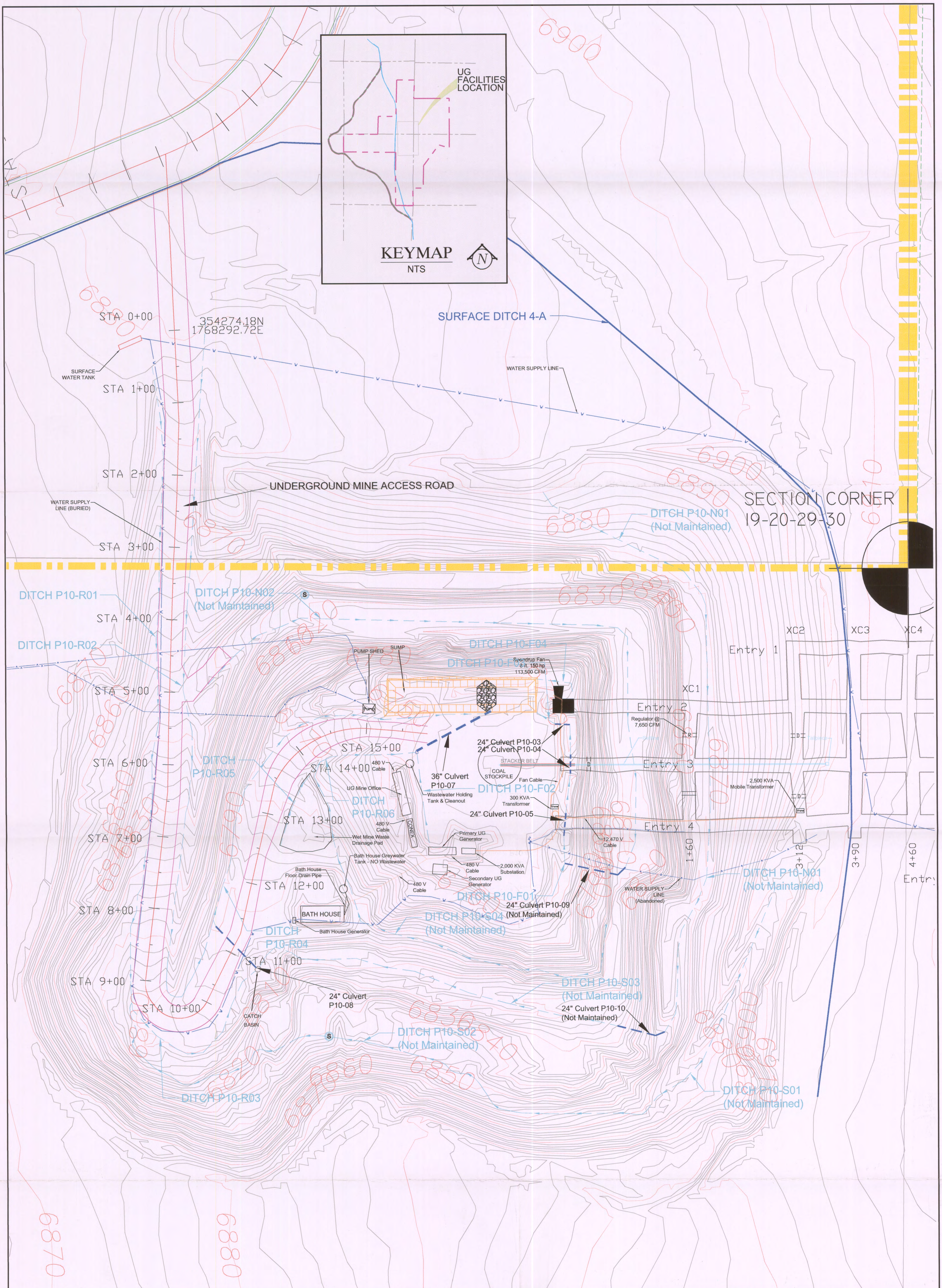
- **Temporary Diversion Ditch Summary**
  The Manning's Equation (ME) equation was used to appropriately size each diversion. Inputs into this equation are manning's coefficient, average diversion slope, peak flow and side slope angles. Outputs are the depth of flow, velocity and base dimesion for a trapezoidal channel design. A base dimension of 0.0 ft. indicates a triangular channel. The following table summarizes the inputs and results:

Temporary Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
4-A-U	0.0	0.020	1.4	0.16	0.21	1.82	0.3
4-A-D	0.0	0.020	2.9	3.23	0.58	5.10	0.3
4-A-R	0.0	0.020	1.2	3.53	0.69	3.70	0.3

*All side slopes are 2h:1v

Conclusions

These temporary diversions have been sized in manner that will transport the necessary flows and minimize erosion during a 10 year- 6 hour storm event. These diversions will prevent runoff from up gradient watersheds from entering the active mining areas and will also assist in directing water from disturbed areas to the sediment impoundments.



LEGEND:

- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- SECTION LINE
- EXISTING DRAINAGE PATH
- WATER SUPPLY/DISCHARGE LINE
- (S) OBSERVED INTERMITTENT SEEP LOCATION

DRAWN BY: K. NICHOLES	CHECKED BY: LWJ
DRAWING: 5-3B	DATE: 06/13/11
	SCALE: 1" = 60'
JOB NUMBER: 1400	SHEET

REVISIONS

DATE:	BY:
09/28/15	KN
01/31/16	KN
03/31/16	AC
04/20/16	AC
05/02/16	AC
06/02/16	AC
11/30/17	AC

UNDERGROUND FACILITIES & STRUCTURES

AS-BUILT LAYOUT

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-3B

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Alton Coal Development
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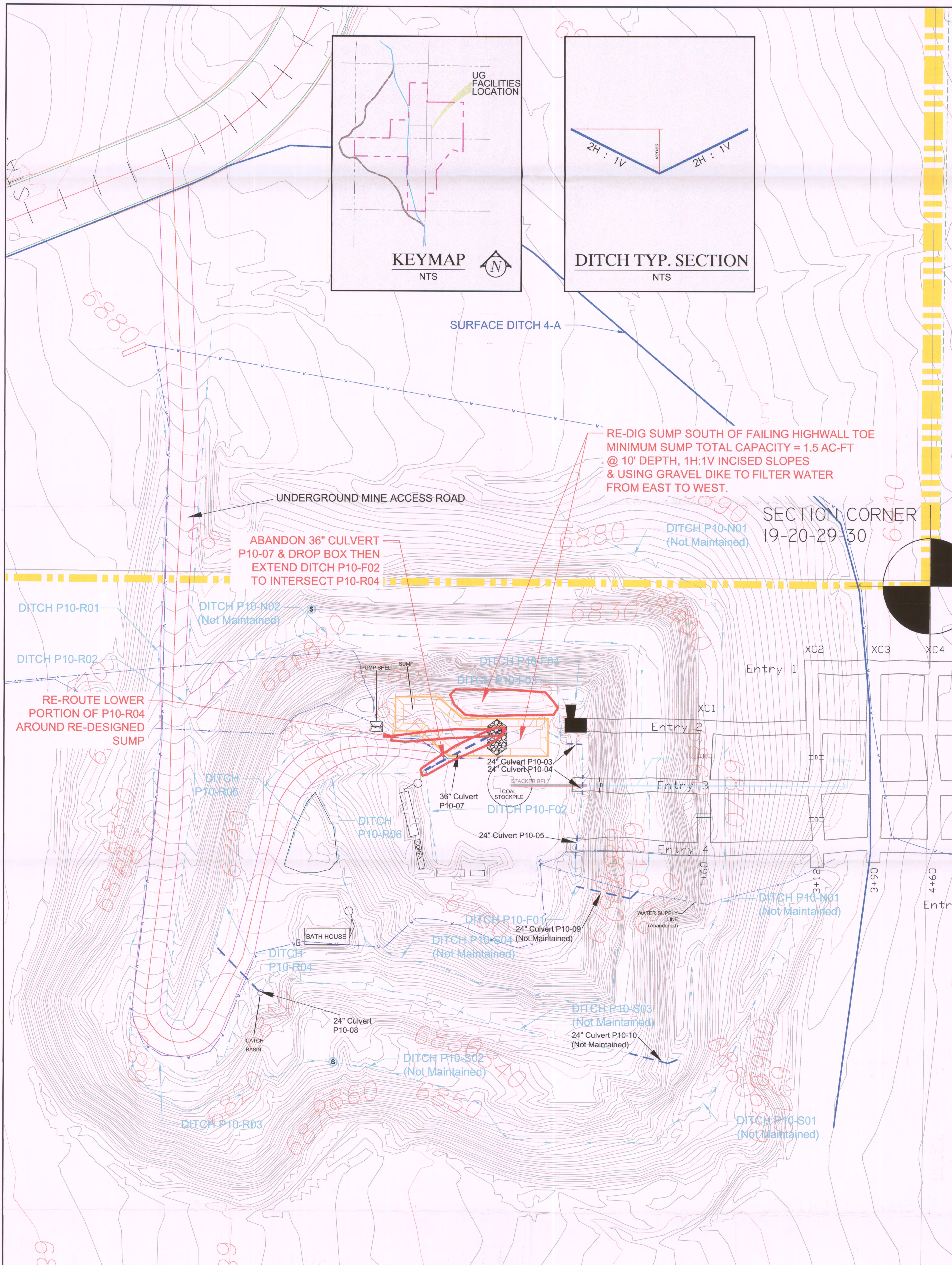

Note:
Ditch and Culvert sizing calculations shown in Appendix 5-2.

LEGEND:

- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- SECTION LINE
- EXISTING DRAINAGE PATH
- PROPOSED DRAINAGE PATH
- WATER SUPPLY/ DISCHARGE LINE
- (S) OBSERVED INTERMITTENT SEEP LOCATION

DRAWN BY: K. NICHOLES	CHECKED BY: LWJ
DRAWING: 5-3C	DATE: 04/20/2016
	SCALE: 1" = 60'
JOB NUMBER: 1400	SHEET

REVISIONS

DATE:	BY:
5/6/16	AC
6/29/16	AC
8/05/16	AC
4/12/17	AC
11/30/17	AC

UNDERGROUND FACILITIES & STRUCTURES

DESIGN LAYOUT

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-3C

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PROFESSIONAL ENGINEER
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2/9/2018
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