Lila Canyon Extension

Chapter 1
Legal

Volume 1 of 7

Belmont Coal, Inc.
UMCO Energy, Inc.
Maple Creek Mining, Inc.
Onieda Coal, Inc.
Spring Church Coal Company

Permit numbers, regulatory authority and issuance dates are found in Appendix 1-2.

112.350. There are no pending coal mine permit applications in any State in the United States.

112.400. Miscellaneous information for coal mining and reclamation operations owned or controlled by the applicant or by any person who owns or controls the applicant follows.

112.410. The name, address, identifying numbers, including employer identification number, Federal or State permit numbers and MSHA number, with date of issuance and the regulatory authority issuing the permit can be found in Appendix 1-2.

112.420. Ownership or control relationship to the applicant is presented in Appendix 1-1.

112.500. The name and address of each legal owner of the surface and mineral property to be mined is shown on Plate 4-1 for surface ownership and Plate 5-4 for coal ownership, and is as follows:

Surface Owners:

Josiah K Eardley:
2433 S HWY 10
Route 1, Box 119
Price, Utah 84501

~~Robert K. Peper~~Bronco Coal Company:
~~975 W 600 S~~P.O. Box 217
~~Orem~~ Cleveland, Ut~~84058~~ah 84518

UTAHAMERICAN ENERGY, INC.:
~~Box 187~~ 153 Highway 7 South
St. Clairsville Powhatan Point, ~~Ohio~~ OH 43950 42

UNITED STATES DEPARTMENT OF THE INTERIOR:
Bureau of Land Management
Utah State Office
324 South State
Salt Lake City, Utah 84111

STATE OF UTAH:
Utah School and Institutional Trust Lands Administration (SITLA)
675 East 500 South Suite 500
Salt Lake City, Utah 84114-5703

COLLEGE OF EASTERN UTAH FOUNDATION:
451 East 400 North
Price, Utah 84501

Subsurface Owners:

UTAHAMERICAN ENERGY, INC.:
153 Highway 7 South
Powhatan Point, OH 43942

~~Robert K. Peper~~Bronco Coal Company:
~~975 W 600 South~~
~~Orem~~P.O. Box 217
Cleveland, Utah ~~84058~~84518

STATE OF UTAH:
Utah School and Institutional Trust Lands Administration (SITLA)
675 East 500 South Suite 500
Salt Lake City, Utah 84114-5703

UNITED STATES DEPARTMENT OF THE INTERIOR:

Bureau of Land Management
Utah State Office
324 South State
Salt Lake City, Utah 84111

COLLEGE OF EASTERN UTAH FOUNDATION:
451 East 400 North
Price, Utah 84501

112.600. The name and address of each owner (surface and subsurface) of all property contiguous to the proposed permit area is shown on Plate 4-1 for surface, and Plate 5-4 for subsurface. Plate 1-1 is the official boundary map and it will be used to clarify any questions about the permit boundaries. Plate 1-2 shows the disturbed area.

Contiguous Surface Owners:

UNITED STATES DEPARTMENT OF THE INTERIOR:
Bureau of Land Management
Utah State Office
324 South State
Salt Lake City, Utah 84111

STATE OF UTAH:
Utah School and Institutional Trust Lands Administration (SITLA)
675 East 500 South Suite 500
Salt Lake City, Utah 84114-5703

Josiah K Eardley:
2433 S HWY 10
Route 1, Box 119
Price, Utah 84501

~~Robert K. Peper~~Bronco Coal Company:
~~975 W 600 S~~P.O. Box 217
~~Orem~~ Cleveland, Ut~~84058~~ah 84518

UTAHAMERICAN ENERGY, INC.:
153 Highway 7 South

Powhatan Point, OH 43942

WILLIAM MARSING LIVESTOCK INC.:
4330 E 8900 N
Price, Utah 84501
COLLEGE OF EASTERN UTAH FOUNDATION:
451 East 400 North
Price, Utah 84501

Contiguous Subsurface Owners:

UNITED STATES DEPARTMENT OF THE INTERIOR:
Bureau of Land Management
Utah State Office
324 South State
Salt Lake city, Utah 84111

STATE OF UTAH:
Utah School and Institutional Trust Lands Administration (SITLA)
675 East 500 South Suite 500
Salt Lake City, Utah 84114-5703

UTAHAMERICAN ENERGY, INC.:
153 Highway 7 South
Powhatan Point, OH 43942

~~**Robert K. Peper:**~~
~~**975 West 600 South**~~
~~**Orem, Utah 84058**~~**Bronco Coal Company:**
P.O. Box 217
Cleveland, Utah 84518

COLLEGE OF EASTERN UTAH FOUNDATION:
451 East 400 North

Price, Utah 84501

112.700. The following is a list of MSHA numbers associated with the permit.

MSHA ID Number: 42-00100 (Horse Canyon)
MSHA ID Number 42-02241 (Lila Canyon)
Refuse Pile I.D. Number: 1211-UT-09-02241-01

United States Department of Labor
Mine, Safety and Health Administration
P.O. Box 25367
Denver, Colorado 80225

112.800. In February 2002, UEI submitted a lease by application to the BLM. Four thousand acres were identified as an area of interest to the south and east of current UEI reserves. The LBA delineation and recoverable reserves has yet to be determined by the BLM. If the area of interest is offered for lease, and If UEI bids on the LBA, and if UEI is the successful bidder, then it could be anticipated that mining in the leased area would occur once current Lila reserves are exhausted. (Approximately in the year 2020)

112.900. After **UtahAmerican Energy, Inc.,** is notified that the application is approved, but before the permit is issued, **UtahAmerican Energy, Inc.,** will update, correct or indicate that no change has occurred in the information previously submitted under R645-301-112.100 to R645-301-112.800.

113. Violation Information.

113.100. Neither **UtahAmerican Energy, Inc.,** or any subsidiary, affiliate, or persons controlled by or under common control with the applicant, has had any federal or state permit to

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consultation with DWR, cleared the two consecutive year requirement if the mine begins construction sometime between 2005 and February 2006. This clearance is because UEI already had eight years of data as well as data for spring 2005. The Operator will continue annual raptor surveys in 2006.

6. An active golden eagle nest, with young, was documented during the 1999 spring raptor survey. The nest is located in the left fork of Lila Canyon within the 1-mile buffer zone. (See Plate 3-1). A consultation with USF&W, BLM, and UDWR was held in the fall of 1999. Line of site and potential mitigation was addressed during this meeting. The results of this consultation are addressed in Sec 322.220 and the Lila Canyon EA. This nest was not active in 2000, 2001, 2002, or 2003. (See Appendix 3-5 for updated inventories)

7. The Operator will adhere to exclusionary periods when initiating construction and final reclamation projects. The exclusionary periods include: raptors (Feb 1 - July 1), Bighorn sheep lambing (May 1 - June 15), and Pronghorn (May15 - June 20).

The Applicant does not plan to monitor any wildlife species during the life of the operation with the exception of raptors. Helicopter spring raptor surveys will be conducted at a minimum of a 1-mile radius around any new or potentially disruptive mining activity, 2-years prior and annually after the proposed activity.

The mine will emphasize their commitment to legal requirements of firearm and off-road vehicle-use by employees. This type of program has been adopted by the operator and will continue throughout the operation. An education program aimed at minimizing potential negative impacts by employees will be presented during the Operators annual retaining programs.

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Table 4-1

ENTITY	OWNER	LAND USE
Federal Government	U.S. Bureau of Land Management	Range Valley Mountain Habitat Management Plan U-6-WHA-T4 Federal Coal Leases: U-0126947 U-014217 U-014218 SL-066145 SL-066490 SL-069291 *Federal Grazing Allotments*: Little Park Coon Spring Cove Icelander Range Creek *Areas of Wilderness Character* Turtle Canyon WSA
State Government	State of Utah	
County Government	Emery County*	
Private	Josiah and Etta Marie Eardley Intermountain Power Agency ~~Robert K. Peper~~Bronco Coal Company College of Eastern Utah Brent Davies* William Marsing Livestock, Inc.*	

*Close proximity to permit area

Table 4-2 Surface Ownership Permit Area Both Horse Canyon and Lila Canyon								
Township	Range	Section	State Acres		Federal Acres		Private Acres	
			A	B	A	B	A	B
15 S	14 E							
		33					60.70 (2)	
							49.90 (~~1~~4)	
		34					23.62 (2)	
							25.68 (~~1~~4)	
							25.20 (3)	
16 S	14 E							
		2	248.30	0.76				
		3			127.03		204.30 (~~1~~4)	
		4					189.00 (~~1~~4)	
		5					20.00 (1)	
		8					40.00 (1)	
		9					120.00 (~~1~~4)	
		10			28.20		30.85 (1)	76.00 (1)
		11			14.78	108.86	120.19 (2)	341.20 (2)
		12		40.00		600.00		
		13				640.00		
		14				640.00		
		15				157.50		120.00 (1)
		22				40.00		
		23				560.00		
		24				640.00		
		25				320.00		
		26				80		
16 S	15 E	19				110.00		
		30				190.00		
			State Acres		Federal Acres		Private Acres	
			A	B	A	B	A	B
SUB TOTAL			248.30	40.76	170.01	4086.36	909.44	537.20
Total "A" Horse Canyon			1327.75					
Total "B" Lila Canyon			4664.32					

GRAND TOTAL	5992.07

Table 4-2A
Coal Ownership Permit Area Both Horse Canyon and Lila Canyon
By Lease

Township	Range	Section	Federal Lease Number	State Acres		Federal Acres		Private Acres	
				A	B	A	B	A	B
15 S	14 E								
		33	SL-046512			60.70		49.90 (~~1~~3)	
		34	SL-046512			23.62		25.68 (~~1~~3)	
								25.20 (2)	
16 S	14 E								
		2		248.30	0.76				
		3	SL-066145			221.27		110.06 (~~1~~4)	
		4						189.00 (~~1~~4)	
		5						20.00 (1)	
		8						40.00 (1)	
		9						120.00 (1)	
		10	SL-066145			59.05	76.00		
		11	SL-066145			134.97	130.06		
			SL-066490				320.00		
		12	SL-066490				320.00		
			U-014218				320.00		
		13	U-0126947				320.00		
			SL-066490				320.00		
		14	SL-066145				160.00		
			SL-066490				480.00		
		15	SL-066490				80.00		
			SL-066145				120.00		
			BLM (No Coal)				77.50		
		22	SL-066490				40.00		
		23	SL-066490				560.00		
		24	SL-066490				240.00		
			SL-069291				80.00		

			U-0126947				320.00		
		25	SL-069291				160.00		
Table 4-2A Continued Coal Ownership Permit Area Both Horse Canyon and Lila Canyon									
			U-0126947				120.00		
			U-014217				40.00		
		26	SL-066490				40		
			SL-069291				40.00		
16 S	15 E	19	U-0126947				110.00		
		30	U-0126947				190.00		
				State Acres		Federal Acres		Private Acres	
				A	B	A	B	A	B
SUB TOTAL				248.30	0.76	499.61	4663.56	579.84	0.00
Total "A" Horse Canyon				1327.75					
Total "B" Lila Canyon				4664.32					
GRAND TOTAL				5992.07					

Please note:
(1) UEI
(2) Eardley
(3) ~~Peper~~Bronco Coal Company
(4) CEUF

Federal coal leases relative to the Lila Canyon Mine permit area are depicted on Plate 5-4. There are six federal coal leases comprising the permit area, all of which are assigned to Utah American Energy, Inc. The acreage for each lease is presented on Table 1-1.

Grazing allotments in the Lila Canyon Mine permit area are depicted on Plate 4-2. These grazing allotments have remained unchanged for the past 10 years. The permit area is located primarily within the Little Park Allotment and to a lesser extent within the Cove Allotment. Table 4-3 , along with Plate 4-2, describes the allotments, owners, acreage, and animal unit month (AUM's).

The boundary of the Turtle Canyon Wilderness Study Area (WSA) in relation to the permit area is shown on Plate 4-4.

420. Air Quality.

421. Compliance with the Clean Air Act: Mining and reclamation operations will be conducted in compliance with the requirements of the Clean Air Act and other applicable state, federal statues.

422. Compliance Efforts: Appendix 4-3 contains the "Intent to Approve" and the actual "Approval Order" for the air quality permit obtained from the Utah Bureau of Air Quality. The initial air quality permit is for 1.5 million tons. Revisions to the air quality permit will be made to accommodate future increases in production.

423. Since Lila Canyon Mine is an underground operation this section is not applicable.

423.100 Since Lila Canyon Mine is an underground operation this section is not applicable.

423.200 Since Lila Canyon Mine is an underground operation this section is not applicable.

424. Since Lila Canyon Mine is an underground operation this section is not applicable.

425. Since Lila Canyon Mine is an underground operation this section is not applicable.

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Horse Canyon Extension
Lila Canyon Mine

Chapter 5
Engineering

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is not applicable.

521.140 Mine maps and permit area maps and or cross-sections will clearly indicate the following:

521.141 Plate 5-1 shows the permit boundary and Plate 5-2 shows the disturbed area boundary. Additional subareas ~~requiring~~that might require additional permits are addressed in Section 112.800 and 4-1B.

521.142 The underground workings are shown on Plate 5-5.

521.143 The proposed disposal site for placing the slope rock is shown on Plate 5-2 as well as other appropriate plates.

521.150 Plates 6-2, 6-3, and 6-4, show surface contours that represent the existing land surface configuration of the proposed permit area.

521.151 The Plates show the surface contours for all areas to be disturbed as well as over the total permit area. The Plates showing the surface contours has been prepared by or under the supervision of a registered engineer.

521.152 No previously mined areas are included within Part "B". Therefore this section does not apply.

521.160 The maps, plates, and cross sections associated with this chapter clearly show:

521.161 Proposed buildings, utility corridors, and facilities are shown on Plate 5-2 as well as others.

521.162 Area of land affected according to the sequence of mining and reclamation is shown on the appropriate plates.

521.163 Land for which a performance bond will be posted is shown on the appropriate plate. Plate 5-2 as and will be modified as needed.

Ventilation of the mine will be by an exhaust type system. It has been estimated that 900,000 cfm will be required at full production. Intake air will be supplied by slopes and entries from the surface.

A water supply system will be installed. Potable water from an approved source will be hauled by truck and stored in a mine site storage tank located near the man and coal slope portals. Alternative sources for potable water are being considered. A treatment plant may be indicated. Process water will be hauled from the Price River or other approved source by truck and stored in another mine site storage tank. It is anticipated that once the old two entry development panel is encountered that adequate process water may be obtained from the old works. This process water will provide for dust control, water to the mine and fire suppression. Mine water will be used with the process water. See Appendix 7-3 (PHC) for water usage calculations.

Dust suppression will be accomplished by the use of sprays on all underground equipment as required. Sprays will also be used along sections of the conveyors and at transfer points.

No major de-watering concerns are anticipated at this property. The workings are expected to produce some water with more water being produced as the depth of mining increases. Part of this water will be used for dust suppression. The remainder will be collected in sumps and pumped to mined out sections of the mine or to the surface and treated when necessary.

Underground mining equipment to be used at Lila Canyon is typical of most room-and-pillar and longwall mine. A list of major equipment which may be used underground is listed below additional equipment not on the list may be used as needed.

Continuous Miners
Roof Bolters
Battery Shuttle Cars
Electric Shuttle Cars
Diesel Ram Cars
Feeder Breakers
Continuous Haulage Units
Battery Scoops
Diesel Scoops
Diesel Service Vehicles
Diesel Material Haulers

recorded on the blasting record.

524.748 The type and length of the stemming will be recorded on the blasting record.

524.749 Mats or other protections used will be recorded on the blasting record.

524.750 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area a record of seismographic and airblast information is not required.

524.760 Since a blasting schedule is not required this section does not apply.

524.800 The operator will comply with the various appropriate State and Federal laws and regulations in the use of explosives.

525. Subsidence: The permittee will comply with the appropriate R645-301-525 requirements.

525.100 Subsidence Control Plan

525.110 Plate 5-3 shows the location of State appropriated water and 5-3 (Confidential) shows the eagle nests that potentially could be diminished or interrupted by subsidence.

525.120 **SUBSIDENCE POTENTIAL** (See also Section 5.4 of Part "A")

Subsidence from underground coal mines has been believed to affect overlying forest and grazing resource lands in the following ways:

- Formation of surface fissures which intercept near surface soil moisture thus draining the water away from the root zone with deleterious effects.

- Alterations in ground slope and destabilization of critical slopes and cliffs.

- Modification of surface hydrology due to the general downward migration of surface water through vertical fractures.

- Modification of groundwater hydrology including connection of previously separated aquifers and reduction in flows of seeps and springs which rely upon tight aquitards for their flow.

- Emissions of methane originating from the coal seam through open fissures to the surface or at least the base of the surficial soil which has been known to have deleterious effects on woody plants.

A great deal of baseline data is available from many mining settings to develop subsidence damage criteria for surface structures (Bhattacharya et al. 1984). The SME Mining Engineering Handbook suggests a limiting extension strain value of 5×10^{-3} for pasture, woodland, range or wildlife food and cover.

The formation of cracks and fissures can also have deleterious effects on groundwater resources without any fissuring to the surface. In the arid areas of Utah, impacts of modification of the groundwater regime can be disruption of flow from natural seeps and springs which rely on the permeability contrast of interbedded sandstones and shale for their flows. These water resources are essentially surface waters and subject to the same limiting damage criteria as surface water bodies. Subsidence damage to surface water bodies has been studied by a number of workers including Dunrud (1976), Wardell and Partners (1976), U.S. Bureau of Mines (1977), and Engineers International (1979). The results of the Wardell and Partners studies of subsidence effects in a number of countries indicates that the limiting strain for the onset of minor impacts to surface waters is approximately 5×10^{-3}.

Dr. Roy Sidle found in his study of Burnout Creek that subsidence impacts to streams are temporary and self healing. A Executive Summary of is study and published findings follows:

Title : Stream response to subsidence from underground coal mining in central Utah

2. Authors: Sidle-RC Kamil-I Sharma-A Yamashita-S

Short-term geomorphic and hydrologic effects of subsidence induced by longwall mining under Burnout Creek, Utah were evaluated. During the year after longwall mining, 0.3-1.5 m of subsidence was measured near impacted reaches of the mountain stream channel. The major channel changes that occurred in a 700-m reach of Burnout Creek that was subsided from 1992 to 1993 were: extent glides; (2) increases in pool length, numbers and volumes; (3) increase in median particle diameter of bed sediment in pools; and (4) some constriction in channel geometry. Most of the changes appeared short-lived, with channel recovery approaching pre-mining conditions by 1994. In a 300-m reach of the South Fork that was subsided from served, although any impacts an pool morphology may have been confounded by heavy grazing in the riparian reaches during the dry summer of 1994. Similar near-channel sedimentation and loss of pool volume between 1993 and 1994 were noted throughout Burnout Creek and in adjacent, unmined James Creek. Subsidence during the 3-year period had no effect on baseflows or near- channel landslides.

Engineers International (1979) concluded that the minimum safe cover required for total extraction of the coal resources under surface waters is approximately 60 times the seam thickness for coal beds at least 6 feet thick or approximately 450 feet. In their review of the foregoing, Singh and Bhattacharya (1984) recommended that the same limiting safe strain and cover thicknesses be used for protecting groundwater resources over coal mines.

The longwall panels will have dimensions of approximately 950 feet wide and up to 7,000 feet long and 2,000 feet deep. Using the methods described in the National Coal Board's *Subsidence Engineers' Handbook*, the S/m ratio for this geometry would be 0.38 where "S" is the maximum subsidence and "m" is the seam extraction thickness. For an average seam extraction thickness of 10.5 feet, the total subsidence would be 4.0 feet. However, as described above the major impacts of this subsidence are due to extension strains and not total vertical subsidence. The prediction of average extension strain is accomplished with the use of the formula:

$+E = 0.75\ S/h$ where S=subsidence and h=depth of cover

The solution of this equation for the Lila Canyon Mine configuration discussed above produces a predicted, average extension strain of 1.5×10^{-3} which is less than the limiting strain of 5×10^{-3} for protecting surface waters, groundwater sources, pasture, woodland, range or wildlife food and cover. Thus it is unlikely that the gradual compression expected over much of the subsidence area will have any deleterious effects on the overlying renewable surface resources. The cover thickness of over 2,000 feet is also much greater than the limiting thickness of 450 feet recommended by International Engineers Inc. (1979). The table below shows the expected subsidence amount and expected extension strain for longwall panels at various mining depths.

Maximum Subsidence & Expected Extensive Strain (NCB 1975)

	Feet	Meters
Panel Width =	900	274
Seam Height =	10.5	3

Depth of Cover		Width to Depth (a)	Maximum Subsidence(S)		Extension Strain (E)
Feet	Meters	Ratio	Feet	Meters	$\times 10^{-3}$
500	152	0.9	9.5	2.9	14.2
1000	305	0.75	7.9	2.4	5.9
1100	335	0.71	7.5	2.3	5.1
1200	366	0.68	7.1	2.2	4.5
1300	396	0.65	6.8	2.1	3.9
1400	427	0.59	6.2	1.9	3.3
1500	457	0.54	5.7	1.7	2.8
2000	610	0.38	4.0	1.2	1.5
2500	762	0.28	2.9	0.9	0.9

The pace at which subsidence occurs depends on many controls including the type and speed of coal extraction, the width, length and thickness of the coal removed, and the strength and thickness of the overburden. Observations of subsidence by Dunrud over the Geneva and Somerset Mines indicate that subsidence effects on the surface occurred within months after mining was completed, and the maximum subsidence was essentially completed within 2 years of the finishing of retreat mining.

No major impacts of subsidence to the surface caused by the underground mining methods proposed during the permit term are anticipated.

The coal seam is approximately 12.5 feet thick with only about 10.5 feet being extracted, and the depth of cover ranges from 0' to approximately 2,300'. The rocks overlaying the coal seam are sandstones and mudstones with some thin bands of coal. Due to the strength of the overburden, and depth of workings, even with full seam extraction, only minimal subsidence if any is anticipated.

Some surface expressions of tension cracks, fissures, or traffic on the County Road will be taken to protect the public from construction related hazzards.

526.116.1. A cooperative agreement with Emery County as stated in Appendix 1-4 requires a six foot chain link fence to be constructed adjacent to the Lila Canyon Road to provide safety to the general public in the proximity to the mine site and mine related structures and activities.

526.116.2. At the current time there are no plans to relocate any public road.

526.200 Utility Installation and Support Facilities.

526.210 All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction, or disruption of services provided by oil, gas, and water wells, oil, gas, and coal-slurry pipelines, railroads, electric and telephone lines, and water and sewage lines which may pass over, under, or through the permit area, unless otherwise approved by the owner of those facilities and the Division. Since no existing services are found within the projected disturbed area, no negative impact to any service is anticipated.

A BLM and State Lands Utility Right-of-Way has been applied for to contain an access road, rail from the existing main line near highway 10, electric power, phone lines, and gas service. ~~See ROW application in Appendix 1-4).~~ This ROW is not included within the MRP and will not fall under the R645 regulations.

App 5-7

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App 5.7

APPENDIX 5-7

LILA CANYON MINE

ROCK SLOPE MATERIAL
(Refuse Pile)

Some of the Information for Appendix 5-7 is hard copies. Electronic copies do not exist for all information contained within the Appendix.

Ground Preparation

Vegetation and topsoil will be removed from the proposed refuse site and stored in the topsoil pile as shown on Plate 5-2 and Figure 1, Appendix 5-7. Subsoil will then be removed from the area as shown on Figure1. The subsoil will be pushed to the side using the blade of a caterpillar. The hole that is made by pushing the subsoil to the side will be filled by refuse material, either from the rock slope development and or coal processing waste or underground development waste as per Figure 1.

Placement of Refuse

Refuse will be dumped into the hole created from the removal of the subsoil. The refuse will be placed in the hole as per Figure 1. The refuse will be placed in 12" lifts and compacted using a front end loader. Once the hole is filled to the level shown in Figure 1 the subsoil will then be placed over the top of the refuse in 12" lifts and compacted with a front end loader, then another hole will be constructed by removing subsoil adjacent to the previous hole. The topsoil removal and storage, subsoil removal, hole being filled with refuse, and subsoil replacement, procedure will be repeated as additional refuse disposal area is needed.

The dumping (placing) of refuse into a prepared hole is NOT the same as "end dumping". End Dumping is defined by the Bureau of Mines as "Process in which earth is pushed over the edge of a deep fill and allowed to roll down the slope."

Refuse Testing

Material from the rock slope portals will be tested five times during their development. The first test will be during the initial startup of the rock slopes. The second, third and fourth tests will be when the development reaches 1/4, ½, and 3/4 of the construction phase. The last test will be taken near the completion of the project.

Material placed in the refuse pile from normal mining operations will be tested approximately every 6,000 tons. Testing parameters for the rock slope material and normal mining refuse will be as per Table 2.

Spreading and Compaction

Compaction will take place using a wheeled loader during the filling operation. Upon final reclamation the topsoil will be redistributed over the refuse storage area and reclaimed as

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Horse Canyon Extension
Lila Canyon Mine

Chapter 6
Geology

that must be remove is disposed of in dry areas underground and will never reach the surface. A minor amount will be included with the mine-run coal as dilution rock.

Results of acid and toxic testing completed on drill holes S-24 and S-25 can be found in Appendix 6-2. Testing was completed for the strata immediately above and below the coal seam as well as for the rock slope material. These tests were run on drill holes and at the original projected slope location. The present proposed slope location is approximately three miles to north but located in the same strata. Except that the present projected slopes will start at the top of the Mancos shale and will be driven up to the coal seam but not beyond as was originally proposed by Kaiser.

Analysis of the strata immediately above and below the seam being mined at the Lila Canyon fan portal, collected by BXG, and an analysis of the Horse Canyon refuse pile have been included in Appendix 6-2. None of the analysis have an acid-base potential that would indicate an acid-toxic problem.

Kaiser Steel's Sunnyside Mine mined coal in the same horizons as those in the Lila Extension. With over 100 years of mining experience at the Sunnyside Mine operation, there has been no proven problems with acid-forming alkaline or toxic materials in production or waste disposal. The above statement is made based on history, data substantiating this assertion is beyond the scope of this MRP and is not included.

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Horse Canyon Extension
Lila Canyon Mine

Chapter 7
Hydrology

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———The qualified, registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. (See Appendix 5-2 for the inspection form).

———A copy of the report will be retained at or near the mine site.

———There are no impoundments at this site subject to MSHA, 30 CFR 77.216; therefore, weekly inspections are not required.

———Impoundments not subject to MSHA, 30 CFR 77.216 will be examined at least quarterly by a qualified person designated by the operator for appearance of structural weakness and other hazardous conditions.

720. Environmental Description

~~721. G~~eneral. The following information will present a description of the existing, pre-mining hydrologic resources within the proposed permit and adjacent areas. This information will be used to aid in determining if these areas will be affected or impacted by the proposed coal mining activities.

———The proposed Lila Canyon Mine is located, in the southwestern portion of the Book Cliffs in Emery County, Utah, approximately 2 miles south of the old Horse Canyon Mine, formerly operated by Geneva Steel Company. The proposed mining will be in the Upper (and possibly Lower) Sunnyside Seam of the Blackhawk Formation.

———Existing hydrologic resources of the area consist of: Surface water resources - intermittent by rule with ephemeral ~~acting~~flow streams; and Groundwater resources - springs and seeps and perched, isolated aquifers. These resources have been evaluated using hydrologic data from the Horse Canyon Mine, water piezometers, and seep/spring inventory data of the proposed mine and adjacent areas.

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Water rights for the mine and adjacent areas are addressed in Section 722.200 of this P.A.P.

Mine Inflow Information. Based on the historic record, water was encountered underground in the Horse Canyon Mine, resulting in outflows from portal areas of approximately 0.2 cfs or 90 gpm. The size of the flows from pumping or from old portal discharges is more the result of the large size of the mine (approx. 1500 ac), rather than the result of intercepting a localized high flowing aquifer. If the flow is distributed over the mine area, the average inflow is about 0.6 gpm per acre. The water encountered was likely discharge from perched aquifers or saturated sandstone lenses encountered during mining, not uncommon in mines in the Blackhawk Formation.

According to mining records of U.S. Steel (previous owner), groundwater was monitored within the Horse Canyon mine in several locations. Generally, the underground flows occurred from roof drips or areas where entries encountered sandstone lenses. Flows which issued from rock slopes and gob areas, where roof collapse may have occurred, were small, indicating that limited water inflow from overlying strata occurred.

During the period from 1957 to 1962, an exploration test entry was mined south from the Geneva Mine into the Lila Canyon Area. This entry encountered in-place water, which was allowed to collect in short cuts made into the down dip entry which was sufficient to keep excess water from working areas. The exploration entry was terminated when the Entry fault was encountered (see Plate 7-1). More than two months was spent drilling to ascertain the nature of the fault and locate the coal seam. During this period, there is no mention in the records of excess water or that water was encountered in the Entry fault area.

There is no estimate of water quantity and quality retrieved while mining the exploration entry other than mentioned above. However, water flow and seeps were reported to be in the range of 1 to 24gpm.

Spring (H-92) was developed by excavating into bedrock. The discharge from this spring is through a pipe.

An additional spring and seep survey was conducted in the area, including the proposed Lila Canyon Mine area, by Earthfax Engineering in 1993 through 1995. Results of this survey are included in Appendix 7-1 of this permit. This is the most consistent and most recent data; therefore, this data has been used for baseline monitoring in Appendix 7-1.

All of the spring and seep sites identified from the various surveys are presented on Plate 7-1A. The geologic source for the springs can be determined by comparing Plates 6-1 and 7-1 and 7-1A. Additionally, the elevation of the sampling points can be estimated from the topographic base map. All groundwater use (seeps and springs) within the permit and adjacent areas is confined to wildlife and stock watering.

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It should be noted that a number of sample sites and monitoring holes have been noted in previous submittals. Sites A-26 and A-31 were mentioned in the Horse Canyon Mine Plan; however, these sites were drilled in 1981, and no data is available as to location and/or water quality data. These sites are considered non-usable for this plan. Sites H-21A, H-21B, H-18A, H-18B, HC-1A and an unidentified spring 1000' southwest of HCSW-2 have been mentioned; however, no sample data or pertinent information is available for these sites, and they have been removed from Plates 7-1 and 7-1A. Plates 7-1 and 7-1A has therefore been revised to show only seep/spring and other pertinent hydrologic data points for which adequate, reliable data is available for the plan.

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Water rights for the mine and adjacent areas are addressed in Section 722.200 of this P.A.P.

Sample sites B-1, HC-1, RF-1 and RS-2, along with the UPDES Discharge Points 001A and 001B, have been monitored quarterly since 1989 in accordance with the approved water monitoring plan for the Horse Canyon Mine (Part A). The results of this monitoring have been submitted to the Division each year with the Annual Report and or have been entered into the Divisions electronic data base.

Baseline monitoring was also conducted on the proposed Lila Canyon Mine extension area by Earthfax Engineering in 1993-1995. Some 60 sites were identified and monitored. This data is presented in Appendix 7-1.

The operational water monitoring program committed to the permit application was implemented in July, 2000. Data will be collected from new monitoring sites L-1-S through L-4-S. L-5-G has yet to be installed. These sites are typically dry and no quality data has been gathered as yet. Sites L-6-G through L-10-G have been monitored for baseline in 1993, 1994, and 1995. These sites, along with Piezometers IPA-1, IPA-2 and IPA-3, were monitored in December 2000 to determine if they were still viable and to establish a current baseline that will be continuous with operational monitoring.

Sites L-11-G and L-12-G were added in October 2001 to replace sites L-6-G and L-10-G. Sites L-13-S, L-14-S, L-15-S, and L-1~~5~~8-S are being used to determine flow characteristics of the Williams Draw Wash, Wash below L-12-G, ~~and~~ Little Park Wash, and Stinky Springs Wash.

Sites L-6-G, L-10-G and L-15-S were determined to either provide no flow data or data that was less representative than the replacement sites and will be suspended from sampling in the 1st quarter of 2003.

Wells. The wells in the mine area consist of two water supply wells, three water monitoring piezometers, and an exploration borehole converted to a monitoring well.

Two wells are located within the alluvium of lower Horse Canyon Creek, near the Horse Canyon Mine. These wells area completed in the aerially small, alluvial aquifer at the

Only when the mine neared the Sunnyside Fault was significant water encountered. The water was initially pumped for use in the water supply system for the mine. When inflows increased beyond in-mine needs, to keep the workings near the Sunnyside Fault from flooding, the mine pumped water collected from this area from the workings during the period 1980 through 1983, prior to suspending operations. The development plan for the mining within the Lila Canyon extension is planned to avoid the Sunnyside Fault. Therefore, the amount of water to be encountered underground will be limited.

The rate of inflow into the ~~m~~Horse Canyon Mine is not precisely known. In U.S. Steel's Permit Application Package (PAP) (1983) they estimated the average discharge from the mine to be 0.2 cfs. Lines and Plantz (1981, p. 32) also estimated the discharge from the mine to be 0.2 cfs and mentioned that the discharge was intermittent. It is not known, however, if this represents a constant average flow or the average flow rate during discharge periods. The mine was using an unknown volume of water within the mine for dust suppression and other operational needs.

According to the I.P.A. Mining and Reclamation Plan for Horse Canyon, Kaiser Coal re-entered the mine in 1986. They found that at the intersection of the Main ~~s~~Slope and 3rd level, at the rotary car dump, there was water in the bottom of the dump. The water level in the dump was described in the Horse Canyon P.A.P. as being "about 30 feet below the floor (personnel communication, 1990)". U.S. Steel monitoring site 2 Dip, a sump where water collected, is very near this location and has an elevation of 5,827 feet. Therefore, the water level in the rotary dump would be at a level of about 5,800 feet. No other water levels were obtained during 1986.

In 1993, BXG also re-entered the Horse Canyon Mine. They reported water levels at the rotary car dump at approximately 5870. It is not known if this reported level was for the same locations, but it is assumed to be the close to the same location. Due to the extended period without pumping, this water level is probably representative of the level of water collected in the rest of the mine. Therefore, to be conservative, it is assumed that the Geneva exploration entries driven south from the Horse Canyon Mine into the proposed Lila Canyon mining area do contain water since the tunnels elevation is approximately 5855 feet.

The Horse Canyon Mine has been closed and the surface area reclaimed. With no significant inflow to the old workings, no discharges are occurring from any of the portal areas nor are expected in the future. It is known however, that water has collected in the old entries. As future mining activities, for the proposed Lila Canyon Mine, will be occurring near this area of collected water in the old exploration entry workings, it is likely that some or all of this water will be intercepted by the proposed Lila Canyon Mine (see Plate 7-1). Water may then have to be pumped from the mine. Because of undulationing floor and unknown void areas, it is impossible to determine the amount of water that would be pumped. The rate of pumping, if any, would be determined by the water discharge system design. All water discharged from the mine would be discharged at UPDES Site # 002A which is Site L-5-G, and will meet all UPDES standards. DOGM has specified planning to include a mine discharge of 500 gpm maximum.

An inspection of the Horse Canyon area following mining has shown no diminution of reasonably foreseeable use of aquifers. Since mining ceased in 1983, subsidence should have occurred within two years. However, no deterioration of the aquifers in the area was identified. Mining has not yet begun on the Lila Canyon site; however, since the structure and groundwater regime is similar to the Horse Canyon area, no diminution or deterioration of groundwater resources is expected in this area.

Occurrences of ground water in the Lila Canyon Mine are expected to be similar to the Geneva Mine (Horse Canyon). Inflows of water encountered while mining reduced to seeps or dried up in a short period of time. If a significant water inflow is encountered, the water, which is not needed for underground operations, will be collected, treated as necessary, and pumped to the surface for discharge under the terms of the UPDES permit.

Groundwater Systems.

In the Lila Canyon Lease area, the groundwater regime consists of two separate and distinct multilayered zones. The upper zone consists of the Wasatch Group which consists of the Colton Formation, the undifferentiated Flagstaff Limestone-North Horn Formation, and the Price River Formation. These formations contain groundwater in perched aquifers. These perched zones are classified as aquifers because they supply groundwater in sufficient quantities for a specific use (as specified by R645-100-200). The lower zone consists of the Castlegate Sandstone and the Blackhawk Formation (where the coal seams are located). ~~This~~These formations consist of low-permeable strata which contain groundwater in isolated saturated zones. Based on the definition in the DOGM regulations (R645-100-200), there is no aquifer in the lower saturated zone, because the water is not developed for a specific use nor does the strata transmit sufficient water to supply water sources. Additionally, there is no discharge along any fault or fracture or in any adjacent canyons. The lower zone is underlain by the Mancos Shale.

Geologic conditions in the permit and adjacent areas are described in detail in Chapter 6 of this P.A.P. ~~F~~Though discussed in several publications for the general Book Cliffs area, formal aquifer names have not been applied to any groundwater system in the permit and adjacent areas because the geometry, continuity, boundary conditions, and flow paths of the groundwater systems in the area ~~are not fully understood~~differ somewhat from the general published discussions. However, the data do suggest that groundwater systems in each of the bedrock groups are sufficiently different from each other to justify the informal designation of groundwater systems based on bedrock lithology. Thus, the informal designation of the Upper zone - Colton, Flagstaff/North Horn, and Price River and the Lower zone - Castlegate, Blackhawk, and Mancos groundwater systems is adopted herein.

~~G~~ The majority of groundwater in the permit and adjacent areas generally occurs within perched aquifers in the upper zone overlying the coal-bearing Blackhawk Formatio~~n as~~. ~~well as withi~~ In the lower zone ~~of~~groundwater occurs in saturated zones in the Blackhawk Formation~~ and Mancos~~. Hydrogeologic conditions within the permit and adjacent areas are summarized below:

Upper Zone

Colton Formation. The Colton Formation outcrops in the northeast portion of the permit and adjacent areas. This formation consists predominantly of fine-grained calcareous sandstone with occasional basal beds of conglomerates and interbeds of mudstone and siltstone. Data presented in Plates 7-1 and 7-1A and Appendices 7-1 and 7-6 indicate that 16 springs issue from the Colton Formation within the permit and adjacent areas.

—— The groundwater regime in the Flagstaff-North Horn Formation appears to be influenced predominantly by the combined effects of lithology and topographic expression. Because the Flagstaff-North Horn Formation forms the upland plateau of the permit and adjacent areas, this formation is capable of receiving appreciable groundwater recharge from precipitation and snowmelt.

—— Waddell et al. (1986) concluded that the Flagstaff-North Horn groundwater system is perched. They indicate that approximately 9 percent of the average annual precipitation recharges the Flagstaff-North Horn groundwater system and that recharge water entering the Flagstaff-North Horn Formation moves downward until it encounters low permeability shale or claystone layers in the lower portion of the formation, where almost all of the water is forced to flow horizontally to springs.

—— Data presented in Appendices 7-1 and 7-6 indicate that groundwater issuing from the Flagstaff-North Horn Formation has a TDS concentration range of 400 to 700 mg/l. This water tends to be slightly alkaline and, similar to conditions encountered in the overlying Colton Formation, is of the calcium-magnesium-bicarbonate type.

—— The data presented in Appendices 7-1 and 7-6 indicate that the total iron concentration of groundwater discharging from springs in the Flagstaff-North Horn Formation is generally less than 0.04 to 0.15 mg/l. Total manganese concentrations in Flagstaff-North Horn groundwater are generally less than 0.03 mg/l. These data do not exhibit seasonal trends.

—— Price River Formation. The Price River Formation consists of interbedded mudstone and siltstone with some fine-grained sandstone and carbonaceous mudstone. Within the permit area, 17 springs have been found issuing from the Price River Formation as indicated based on data presented in Plates 7-1 and 7-1A and Appendices 7-1 and 7-6. Flows from these springs are limited in quantity and generally show a seasonal decrease with time, being high in the spring and reduce to very low or dry conditions in the summer. Such fluctuations indicate that these springs originate from limited recharge areas. Therefore, these springs are also part of a series of perched saturated zones and not part a regional aquifer system. Transmissivity in the Price River Formation is estimated by Waddell (1986) to be 0.07 ft^2/day or 0.00013 ft/day. Based on specific conductance measurements collected from these springs, the TDS concentration of water issuing from the Price River Formation varies from about 750 to 850 mg/l. The water is slightly alkaline, with a pH of 7.9 to 8.9.

Lower Zone

Castlegate Sandstone. The Castlegate Sandstone consists of a fine- to medium-grained sandstone that is cemented with clay and calcium carbonate. The outcrops of this sandstone form prominent cliffs in the area. No springs were identified in this formation, suggesting that it is not a significant aquifer. The absence of springs is of great significance, since this formation is situated between the overlying Upper groundwater zone (in the Colton, Flagstaff/North Horn, and Price River Formations) and the underlying lower zone (in the Blackhawk Formation). This lack of springs indicates that there is separation between the upper and lower groundwater zones. Most likely this zone is the result of two factors: 1) clay horizons in overlying formations inhibit vertical recharge from groundwaters in the Flagstaff-North Horn Formations, and 2) the exposed recharge area of the ~~Price River Formation and~~ Castlegate Sandstone is limited primarily to areas of steep cliff faces.

Blackhawk Formation. The Blackhawk Formation underlies the Castlegate Sandstone and consists of interbedded sandstone, siltstone, shale, and coal. The lower Sunnyside coal seam, to be mined by UtahAmerican, is located in the upper portion of the Blackhawk Formation.

Across the formation some of the individual sandstone bodies are discontinuous. This results in areas that are saturated; i.e. sandstone lenses; and areas that are dry; i.e. siltstone and shale sections. This discontinuous nature results in the typical pattern found in the mines of the Wasatch Plateau and the Book Cliffs. As mining advances an isolated area of saturation (perched aquifer) is encountered by the entry or by roof bolting or fractures due to subsidence. As the water from the saturated zone drains into the mine it starts at an initially high rate and over time as the limited extent of the zone is emptied, the rate of flow decreases. Some zones which are laterally connected are able to reach a consistent inflow which is a balance for the recharge to the system with the outflow to the mine entry.

The hydraulic conductivity of the lower zone is believed to be about 0.01 to 0.02 ~~feet per day~~ft/day, similar to values reported by Lines (1985) from the Wasatch Plateau for similar lithologies. Structural dip in the Lila Canyon area is about 6 to 7 degrees. The gradient of the lower zone in the Horse Canyon/Lila Canyon area is probably less than 2 degrees.

The IPA monitoring piezometers (Plate 7-1) were completed within the first formation with identifiable water below the coal seam, the Sunnyside Sandstone of the Blackhawk Formation. In all three piezometers, immediately below the coal seam, a mudstone layer was encountered. Above the mudstone layer no significant water had been identified. Below the mudstone layer, a sharp transition to a sandstone layer was encountered. This sandstone layer was identified as the Sunnyside Sandstone. Water was identified as occurring from the sandstone layer in each of the piezometers. According to the EarthFax completion logs, the screened zones in the piezometers were located within the Sunnyside Sandstone layer and a cement-bentonite seal was placed from the top of the sandstone layer to the ground surface of the piezometer. Thus, the water level measured in the piezometers is indicative of the conditions found within the sandstone layer.

Data collected from the piezometers (Appendix 7-1) indicate that the water in the sandstone is under pressure. In IPA 1, the water level is approximately 590 feet above the completion zone. In IPA 2, the water level is about 810 feet above the screened level. While, IPA 3 has a water level approximately 250 feet above the completion level.

Additionally, water levels in IPA 2 and 3 varied by approximately 2 feet during the period of July 1994 through April 1996, but showed no consistent trend. IPA 1 showed a rise of 5.6 feet over the same period. Measurements collected in 2001 indicated that the water levels in IPA 2 and 3 were 1 to 2 feet higher than the last time it was measured nearly 5 years earlier, while IPA 1 showed a rise of 16 feet. For the period since 2001, no trend has been identified for IPA 2 and 3, while IPA 1 has continued a slow increase. Although an increase in water levels has occurred during the period of record, this increase is not considered significant.

As the piezometers are completed in the same saturated zone, the piezometric surface shows that groundwater in the Sunnyside Sandstone to be moving to the northeast, into the Book Cliffs (see

— Quality and quantity of underground water is the most difficult to ascertain due to geologic variables such as faults, fractures, channel sands and isolation of these particular features when water is encountered in order to gain reliable samples. Underground water tends to be co-mingled with water from other places in the mine and water pumped through the mines for mine equipment and dust suppression. Thus, care needs to be taken to obtain representative samples. Specific undisturbed water samples of the subsurface inflows are not known to have been collected. However, the quality results reported in the Horse Canyon records are consistent with in-mine samples from adjacent mines.

— The dissolved iron concentration of groundwater flowing into the Horse Canyon Mine has historically been less than 0.5 mg/l and is generally less than 0.1 mg/l (see Appendices 7-1 and 7-6). The total iron concentration of this water has historically been less than 0.7 mg/l and generally less than 0.1 mg/l. The total manganese concentration of Blackhawk Formation water (as measured in the Horse Canyon Mine) has historically been less than 0.05 mg/l and is typically less than 0.03 mg/l (see Appendices 7-1 and 7-6).

Mancos Shale. The Mancos Shale is exposed south and west of the permit area. This formation is a relatively impermeable marine shale and is not considered to be a regional or local aquifer. Groundwater samples collected from two monitoring sites located in Stinky Spring Canyon approximately 2 miles southeast of Lila Canyon Mine have a TDS concentration in the range of 2200 to 4200 mg/l and are of the sodium-sulfate-chloride type (Appendix 7-1). The flow rate for these two springs is less than 1 gpm, indicating the impermeable nature of the source formation. In the 1981 baseline study for the Kaiser Steel south lease permit document, Kaiser indicated that no springs were identified below the coal seam along the face of the Book Cliffs. Therefore, at that time, these springs were not flowing. Total iron concentrations ranged from 0.35 to 11.8 mg/l. Total manganese concentrations ranged from 0.05 to 0.29 mg/l. Chemical compositions of other parameters are consistent with waters from the Mancos Shale in the Book Cliffs area. The ~~springs~~change in water type, from sodium-bicarbonate in the overlying Blackhawk Formation to sodium-sulfate-chloride in the Mancos, and the increased iron and manganese concentrations indicate that the Big and Little Stink spring waters are not from the same source, but are isolated waters from different recharge sources.

The two springs, which are located stratigraphically near the top of the Mancos Shale, appear to be fault related.

As shown on Plate 7-1a, there is an east-west trending fault zone that is located within the canyon where Big and Little Stink Springs are located, referred to as the Central Graben. These two springs are located on the southern side of the northern fault of the graben. Due to the isolated nature of this graben block, being down dropped relative to the surrounding strata, within the highly impermeable Mancos Shale, it is unlikely that these springs are connected to any other water sources within the permit area. Further, the water quality and flow of the these springs, as discussed above, also indicate an isolated nature of the waters. Based on these results, the waters from Big and Little Stinky Springs are considered are from a localized, isolated saturated zone, but not part of a regional aquifer or an extensive saturated zone.

Recharge and Discharge Relations

Recharge in the permit and adjacent areas occurs from precipitation to the exposed strata. Plate 7-1a shows the major zone of recharge. This recharge area corresponds to the outcrop of the Colton/Flagstaff-North Horn formations. No perennial surface water streams or surface water bodies exist within the permit or adjacent areas which contribute water to the groundwater systems. Any infiltration is a near surface occurrence into the alluvial fills within the drainages. The deeper sediments underlying the drainages (Blackhawk and Mancos) consist of low transmissivity strata which would prohibit the vertical movement of groundwater.

Recharge rates were calculated by Waddell and others (1986, p. 43) for an area in the Book Cliffs. Waddell estimated recharge at about 9 percent of annual precipitation. Lines and others (1984) indicate the mean annual precipitation along the Book Cliffs in the area of the Horse Canyon Mines is about 12 inches, indicating a recharge rate of just over 1 inch per year.

The recharge and discharge areas for local perched aquifers in the upper zone (Colton, Flagstaff-North Horn and Price River Formations) generally lie within the drainage areas of Horse and Lila Canyons. These local systems are complex and highly dependent on topography. Recharge water from precipitation or snow melt enters the Colton or Flagstaff-North Horn Formations and moves downward until it encounters low permeability shale or claystone layers in the formations, where almost all of the water is forced to flow horizontally to springs. The springs exhibits substantial variability in discharge in response both to spring snowmelt events and to drought and wet years. Discharge rates as great as 20 gpm have been recorded from the springs during the high-flow season, and discharge rates as low as 1 gpm are not uncommon during late summer. The effects of the drought occurring in the late 1980s and early 1990s are clearly evident in the flow records.

- Recharge to the lower zone including the Castlegate Sandstone, Blackhawk Formation, and Mancos Shale is of limited magnitude, due ~~primarily~~ to the limited area of exposure of the formation on steep outcrops and the presence of low-permeability units in overlying ~~f~~North Horn and Price River Formations. ~~C~~Additionally, the clay layers in the upper Blackh~~awk and Price River Formations and undifferentiated Flagstaff-North Horn Formations~~, which contain approximately 80 percent clays, siltstones, mudstones, and shales, are all highly restrictive to vertical groundwater movement (Fisher and others, 1960). Further, no surface water bodies are present to act a supply sources to the deep ground water system.

- Recharge to the lower zone probably occurs primarily from vertical movement of water through the overlying formations and is probably greatest where surface fractures intersect the topographic highs where the upper zone formations outcrop. The rate of recharge to the lower zone is very slow. The lack of a significant recharge source results in limited discharge areas. The largest portion of recharge to the lower zone is in the Castlegate Sandstone and upper member of the Blackhawk Formation with some leakage from the upper zone where the greatest number of springs are identified.

The Sunnyside fault zone is the major feature throughout much of the Sunnysdie Mining District. Having a north-northwest strike, the fault zone extends from West Ridge to the Horse Canyon Mine. South of the Horse Canyon Mine the faults are not mapped at the surface. South of Horse Canyon, the faults are believed to be east of the Lila Canyon extension.

At the south end of the Lila Canyon Extension, a series of east-west trending faults have been mapped. These faults form the structure known as the Central Graben. The graben is a down dropped block relative to the adjacent strata.

Faults may effect flow, direction and magnitude of both lateral and vertical flows. However, the area is abundant with plastic or swelling clays that can seal faults and fractures inhibiting both lateral and vertical flows. As discussed in the mine inflow section, significant groundwater was only encountered in the Horse Canyon Mine as mining approached the Sunnyside fault zone. To prevent such inflows at the Lila Canyon extension, the mining plan attempts to avoid the fault zone. Also, exploratory mining by U.S. Steel, during the period 1952 to 1960, encountered the east-west trending Entry fault in the proposed Lila Canyon area. After extensive exploration, no significant water was encountered from the east-west trending fault.

Assuming mass-balance and stable hydrologic conditions, recharge will equal discharge over the long term. The relatively rapid groundwater discharge from the upper zone formations as compared with the underlying lower zone formations suggest that the stratigraphically-higher water discharges are local and are not hydraulically connected with the lower zone. Waddell et al. (1986) conclude that the perched nature of the upper zone formations protect them from the influence of dewatering of the coal-bearing zone unless the upper zone is influenced by subsidence.

Groundwater resources in the permit area are limited due to the small surface area and low recharge rates. There is not enough base flow from groundwater discharge to maintain a perennial flow in Horse Canyon Creek or Lila Canyon.

The upper groundwater zone produces low volume spring flows from up-dip exposures of bedrock and overlying alluvium. Some spring discharges from this zone have been developed and are used for livestock and wildlife. The lower groundwater zone has very limited discharges that are used for wildlife, generally during the early spring. Based on the location of these lower zone points and the vertical separation (500 feet) between the coal seam and the points, there is no possibility of mining impacting the springs.

724.200 Regional Surface Water Resources. The permit area exists entirely within the Horse Canyon, Lila Canyon, and Little Park Wash watersheds. The regional drainage patterns are generally north-south with steep canyons which are incised in the Book Cliffs escarpment. Stream flows within the region, generally, are the result of snowmelt runoff or summer thunderstorms. Water is not abundant as evapotranspiration exceeds precipitation.

Permit Area Surface Water Resources

Within the permit area, the surface water resources consist of three main drainages: Horse Canyon Creek, Little Park Wash, and Lila Canyon. Horse Canyon flows to Icelander Wash which, in turn, flows to Grassy Trail Creek and the Price River. Little Park Wash flows southward to Trail Canyon and the Price River. Lila Canyon flows southwest to Grassy Wash, then south to the Marsh Flat Wash and the Price River. (see Plate 7-1).

Based on field observations (described in Appendix 7-7) and flow data obtained during the collection of water-quality samples within the permit and adjacent areas, Horse Canyon Creek is considered intermittent by rule with ephemeral ~~acting~~flow within the permit area. Lila Canyon and Little Park Wash ~~appear to be ephemeral in and adjacent to the permit area.~~, based on the size of the drainage area (greater than 1 sq. mi.), are defined by regulation as intermittent but have been shown to be intermittent by rule with ephemeral flow (see Appendix 7-7). Several smaller tributaries of these streams within the permit and adjacent areas are ephemeral. ~~However, based on the size of the drainage area (greater than 1 sq. mi.), by regulation these drainages are defined as intermittent but have been shown to be ephemeral acting not intermittent.~~

by flow pattern and by rule.

Generally, Horse Canyon, Little Park and Lila Canyon flow during the spring snowmelt runoff period and also as a result of isolated summer thunderstorms. Due to the limited drainage area and elevation of Lila Canyon, the duration of the snowmelt flows is quite short and is limited to the very early spring. Flows in Horse Canyon, generally, are limited to the early spring period (Lines and Plantz, 1981). By mid to late ~~spring to early summer~~, usually no flow is evident in Horse Canyon Creek, below the minesite or Lila Canyon.

Over the period of record, 1981 through present, there have been both wet and dry periods. From 1983 through 1984, the area had high precipitation. In the late 1990's through the present, a drought has been evident in the area. Over this period of record, the flows in the streams have increased and decreased based on the available water. Also, during both of these periods, flows in Horse Canyon Creek during the summer and fall are generally not evident below the mine site. Only flows from summer thunderstorms upstream of the site have resulted in flows below the mine. This indicates that the while surface water resources may fluctuate, the fluctuations are not great enough to change the response of the stream to overcome the hydraulic and geologic characteristics of the area.

During most years, the snowmelt peak is the highest peak flow for the drainages. Under certain circumstances, when a significant summer thunderstorm occurs over the drainages, the runoff event can be quite large.

There are no indications that any of the reaches of Lila Canyon or Little Park Wash are perennial. Since the spring of 2000, both areas have been observed numerous times (at least quarterly) and no flow has even been noted in either drainage. Normally, this would indicate an ephemeral drainage, however, since the drainage areas are greater than one square mile and exhibit no consistent flows, they are classified by regulation as intermittent.

A number of springs do exist in the Little Park Wash drainage; however, the flows from the springs dry-up, dissipate or go underground before reaching the main drainage channel. The springs and seeps in the area have been sampled, as indicated in this application, as part of the baseline and spring/seep inventories.

Precipitation in the area generally consists of either high-intensity, localized thunderstorms or area wide, frontal storms. ~~The frontal precipitation events produce only limited amounts of flow in the local ephemeral washes~~Table 7-1A presents rainfall-runoff model simulation results of both the 6-hour and 24-hour rainfall events of the drainages in the site area. Appendix 7-10 present the simulation calculation results. These peak flow results show that for short duration events with small return periods, there is little or no runoff from the watersheds. Likely, the localized character of the thunderstorms affect only a part of the watershed and the runoff that does occur is lost to channel losses within the portion of the watershed that is not affected by the rainfall event. As the return period increases, storms have a greater intensity and tend to be larger and likely affect most if not all of the watershed. Therefore, flows tend to increase. Intense rainfall may cause heavy flooding, but likely only ~~affecting small areas. The highest concentrations of suspended sediment will occur during high-intensity runoff from~~

thunderstorms, and the lowest concentrations will occur during base flow or snow melt events. It is anticipated that only during longer duration, high-intensity thunderstorms that flow affect small areas and do not result in large volumes of runoff.

For the long duration, frontal type storms, the entire watershed is covered for each event. The frontal precipitation events tend to produce only limited amounts of flow in the local ephemeral washes for the short return periods. With the increase in the return period, the flow events tend to be larger. This is due to the contribution from the entire watershed.

The duration of these runoff events is generally short. For thunderstorm events, the flow is generally less than a few hours. Duration of runoff from the frontal runoff events is moderate in length, generally on the order of 11 to 14 hours. Based on the end of rainfall, the runoff would generally end within 3 to 5 hours. Therefore, if a sampler were not on-site during the event, it is unlikely that any flow would be observed.

Table 7-1A

PEAK FLOW SIMULATIONS OF UNDISTURBED DRAINAGES IN THE LILA CANYON MINE AREA

Watershed ID	Return Period	2yr	5yr	10yr	25yr	50yr	100yr
WS1.1	6 hr	0	0	1.39	5.54	9.98	17.18
	24 hr	0.65	3.22	9.31	22.68	39.50	59.77
WS1.2	6 hr	0	0	1.21	6.43	12.77	22.18
	24 hr	0.86	3.82	9.45	20.66	33.99	49.70
WS1 Total	6 hr	0	0	2.37	11.78	22.68	38.79
	24 hr	1.50	6.62	16.96	39.59	67.46	100.70
WS2.1	6 hr	0	0	0	1.84	4.30	7.79
	24 hr	0.17	0.81	2.54	7.96	14.23	24.90
WS2.2	6 hr	0	0	0	1.43	4.14	8.55
	24 hr	0.18	0.91	2.52	6.47	10.70	17.34
WS2 Total	6 hr	0	0	0	2.98	8.20	16.27
	24 hr	0.32	1.67	4.62	12.41	21.56	36.83
WS7.1	6 hr	0	0	2.23	10.43	19.63	33.75
	24 hr	1.29	6.04	15.85	36.15	60.94	90.24
WS8.1	6 hr	0	0	0.85	3.60	6.59	11.34
	24 hr	0.43	2.09	5.76	13.64	23.46	35.09
WS9.1	6 hr	0	0	3.46	16.17	30.46	52.36
	24 hr	2.01	9.38	24.59	56.08	94.53	139.99

Table 7-1A

PEAK FLOW SIMULATIONS OF UNDISTURBED DRAINAGES IN THE LILA CANYON MINE AREA

Watershed ID	Return Period	2yr	5yr	10yr	25yr	50yr	100yr
Little Park 6.1	6 hr	0	0	1.63	6.48	11.66	20.08
	24 hr	0.76	3.76	10.88	26.5	46.16	69.84
Little Park 6.2	6 hr	0	0	0.93	3.70	6.66	11.47
	24 hr	0.44	2.15	6.21	15.14	26.36	39.89
Little Park 6	6 hr	0	0	2.56	10.18	18.33	31.54
	24 hr	1.20	5.91	17.09	41.63	72.52	109.74
Little Park 6.3	6 hr	0	0	0.32	1.21	2.15	3.70
	24 hr	0.14	0.70	2.17	5.47	9.75	14.92
Little Park 5.1	6 hr	0	0	0.31	1.00	1.73	2.93
	24 hr	0.11	0.59	2.41	7.85	15.16	23.59
Little Park 5.2	6 hr	0	0	0.73	2.75	4.87	8.38
	24 hr	0.32	1.59	4.92	12.40	22.10	33.82
Little Park 5	6 hr	0	0	2.82	11.34	20.41	35.22
	24 hr	1.77	8.54	24.80	61.16	107.32	163.42
Little Park 4.1	6 hr	0	0	0.75	2.58	4.47	7.65
	24 hr	0.29	1.49	5.31	14.72	28.04	43.72
Little Park 4.2	6 hr	0	0	0.76	3.01	5.42	9.33
	24 hr	0.36	1.75	5.06	12.32	21.46	32.47
Little Park 6.4	6 hr	0	0	0.23	0.86	1.53	2.64
	24 hr	0.10	0.50	1.55	3.90	6.95	10.64

Table 7-1A

PEAK FLOW SIMULATIONS OF UNDISTURBED DRAINAGES IN THE LILA CANYON MINE AREA

Watershed ID	Return Period	2yr	5yr	10yr	25yr	50yr	100yr
Little Park 6.5	6 hr	0	0	0.90	3.58	6.45	11.10
	24 hr	0.42	2.08	6.02	14.66	25.53	38.63
Little Park 4	6 hr	0	0	6.17	24.81	44.74	77.12
	24 hr	2.93	14.01	40.73	101.08	178.91	269.04
Little Park 6.6	6 hr	0	0	0.87	4.44	8.64	14.92
	24 hr	0.58	2.60	6.58	14.58	24.18	35.52
Little Park 3.1	6 hr	0	0	2.35	8.86	15.72	27.03
	24 hr	1.03	5.13	15.87	40.00	71.27	109.07
Little Park 3.2	6 hr	0	0	1.00	4.65	8.76	15.07
	24 hr	0.58	2.70	7.08	16.14	27.20	40.29
Little Park 3	6 hr	0	0	9.73	42.29	77.65	133.01
	24 hr	5.08	23.46	65.66	162.22	284.24	430.10
Little Park 6.7	6 hr	0	0	1.12	6.47	14.50	26.85
	24 hr	1.14	4.69	10.58	21.76	34.48	49.42
Little Park	6 hr	0	0	10.48	47.97	90.92	152.74
	24 hr	6.19	26.34	70.46	170.78	298.11	448.73

The highest concentrations of suspended sediment will occur during high-intensity runoff from thunderstorms, and the lowest concentrations will occur during base flow or snow melt events. It is anticipated that only during extremely long duration, high-intensity thunderstorms that flow from the ephemeral drainages within the permit area would reach the Price River.

The sediment pond at the mine site is designed to contain disturbed area flows, up to the 10-yr, 24-hr event.

Surface waters in this part of the Book Cliffs drain to the Price River. The Price River flows to the Green River which, in turn, flows to the Colorado River.

Lines and Plantz (1981, p. 33) conducted three seepage surveys of Horse Canyon Creek in 1978 and 1979. The results of the surveys show no consistent trends through time. Mine discharges create difficulties in interpretation of the data because there is no indication of whether the mine was or was not discharging water at the time of the surveys.

The Lila Canyon drainage is normally dry, flowing only in response to precipitation runoff or rapid snowmelt.

The mine facilities will be located in the Right Fork of Lila Canyon. In January 2004, an assessment of the geomorphic character of the channel was conducted to address DOGM comments. A series of channel cross-section measurements were taken and the bed and bank materials visually observed. During this evaluation, it was discovered that a diversion structure had been installed just above the confluence of the Right Fork of Lila Canyon and Grassy Wash (see Appendix 7-9 and Figure 7-3). This diversion structure will divert all flow from the drainage and convey it by diversion channel to a stock pond located in the SW/4, SW/4 of Section 28, T. 16 S., R. 14 E. Subsequently, it was determined that the improvements were part of a BLM range improvement project. This structure has significantly modified the drainage pattern for this area. Flows that previously would have flowed into Grassy Wash will now be detained in the stock pond.

The closest perennial stream to the permit area is Range Creek. The drainage is located approximately 6 miles east of the proposed Lila Canyon permit area boundary (see Plate 7-1a). Range Creek is in a broad, south-southeast oriented drainage that has been eroded into the Roan Cliffs. A western extension of the Roan Cliffs (Patmos Ridge) lies between Range Creek and the Book Cliffs. The proposed Lila Canyon operation is on the west side of Patmos Ridge. The Colton Formation is exposed at the surface from Patmos Ridge east to the main body of the Roan Cliffs, and between these two escarpments Range Creek has eroded into but not through the Colton Formation. Approximately eleven miles southeast of the permit area, just upstream of Turtle Canyon, Range Creek has eroded through the Colton, Flagstaff, and North Horn Formations, but it reaches the Green River without having eroded through the Upper Price River Formation. The nearest Blackhawk outcrop is 10 miles south, along the Price River.

Based on the thickness of the formations underlying the Range Creek channel in the area - the North Horn/Flagstaff (570 ft), the Price River (533ft), Castlegate Sandstone (160ft), and the upper Blackhawk (170ft) - there are approximately 1,400 feet of sediment between the coal seam and the channel. Of this strata, according to Fischer, et.al. (1960) more than half of this strata is shale, clays, siltstones, or mudstones.

As a result of the five to six miles horizontal distance from proposed permit area to Range Creek (see Plate 7-1a) and the isolating effects of the over 1,000 feet of low-permeability, isolating strata (see Plate 7-1B), it is not likely that the Lila Canyon Mine will adversely effect Range Creek. Due to these conditions, no baseline or other sampling has been gathered nor anticipated on Range Creek.

The Horse Canyon drainage is monitored in accordance with the approved monitoring plan for the permit. There have been no samples taken in the Lila Canyon or Little Park Wash drainages because no flow has been observed. A factor in the lack of data is a result of accessibility to the sites during the winter period and immediately after summer rain storm events is generally not possible, due to safety issues. However, the lack of flow is data in and of itself showing that the drainages do not have a base flow component. The sequence of sampling efforts have demonstrated that there is no long-term flow events occurring in the mine permit area or adjacent areas. Also, photographs show that for some years no flow occurred from the fall to spring measurement events. Further, the peak flow simulation results show that the duration of any flow events would be of extremely limited duration.

Therefore, a pattern has been identified of a set of drainages that only flow in direct response to precipitation or rapid snow melt. The flow events are localized, sporadic events with no consistent sequence and timing and are extremely limited in duration.

U.S. Steel conducted water quality monitoring of the Horse Canyon drainage. These monitoring efforts were conducted prior to the development of DOGM's present Water Monitoring Guidelines, and as a result the data is quite limited. The most recent results of these water monitoring efforts are presented in Appendix 7-2 and historic results are included in the DOGM electronic database.-

Monitoring efforts did not include remote or automatic sampling efforts because of inherent problems attempting to implement these methods for this application. It has been suggested that crest-staff gauges, single-stage samplers, ISCO instruments, etc. could be used to collect samples. These are methods that the USGS uses for developed remote sampling sites. However, none of the UEI sampling sites are developed. In the case of crest gauges, for these methods to be feasible, the sites need to be developed with lined channel sections. For the channel configurations at the UEI sites, the channel bottoms consist of movable beds. These are channels that change configuration from storm to storm. As a result of channel erosion and deposition, the stage discharge relationship of the channel changes with each storm event. Therefore, while the crest gauge would indicate that a flow event may have occurred, the ability to determine what the flow rate was is greatly compromised.

For the use of single stage and ISCO samplers, with sampling limited to monthly and quarterly readings, the holding time on many water samples would be exceeded. Therefore, the water quality data would not be usable for determining the baseline or impact conditions.

As a result of these difficulties, it was determined that these methods would not be used.

724.300 Geologic Information Detailed geologic information of the permit and adjacent areas is included in Section 600, with specific strata analyses, as required, in Section 624.

724.310 Probable Hydrologic Consequences. The geologic data indicate that no toxic- or acid-forming materials are known to exist in the coal or rock strata immediately below or above the seam (see Section 624.300). The probable hydrologic consequences of the proposed operation will be discussed in Section 728 and Appendix 7-3 of this application.

724.320 Feasibility of Reclamation. The geologic data in Section 600 provides sufficient detail to allow: the evaluation of whether toxic- or acid-forming materials are expected to be encountered in mining; subsidence impacts; whether surface disturbed areas are designed to be constructed in a manner that will allow for reclamation to approximate original contour; and whether the operation plans have been design to ensure that material damage to the hydrologic balance does not occur outside of the permit area. These issues are evaluated in the R645 rules and discussed in Section 728 of this application.

724.400 Climatological Information

724.410 Climatological Factors

724.411 Precipitation The closest weather recording station to the Lila Canyon Mine is located at Sunnyside, Utah. Based on the relatively close proximity and similar locations (west exposure of the Book Cliffs) the data from this station will be used to verify precipitation amounts and other weather conditions for the Lila Canyon Mine.

Precipitation data from the Sunnyside station has been gathered from 1971 to 2000, showing an average annual precipitation of 14.74 inches. The information was downloaded from the Western Regional Climate Center, as shown on Table 7-1~~A~~B.

A rain gauge will be installed at the site, once construction and operations start, to comply with the reporting requirements of the air quality permit.

724.412 Winds. The average direction of the prevailing winds is West to East, and the average velocity is 2.74 knots.

724.413 Temperature. Mean temperatures in the proposed mine area range from a high of 58.0 degrees F to a low of 33.4 degrees F. See Table 7-1~~A~~B.

724.420 Additional Data. Additional data will be supplied if requested by the Division to ensure compliance with the requirements of R645-301 and R645-302.

724.500 Supplemental Information N/A - The determination of the PHC in Section 728 does not indicate that adverse impacts on or off the proposed permit area may occur to the hydrologic balance, or that acid-forming or toxic-forming material is present that may result in the contamination of ground-water or surface-water supplies.

724.700 Valley/Stream N/A - The proposed plan does not include mining or reclamation operations within a valley holding a stream or in a location where the permit area or adjacent area includes a stream which meets the requirements of R645-302-320.

725. Baseline Cumulative Impact Area Information

725.100 Hydrologic and Geologic Information Hydrologic and geologic information for the mine area is provided in Sections 600, 724 and in the PHC Determination in Appendix 7-3. This information includes the available information gathered by the applicant. Additional information is available for the areas adjacent to the proposed mining and adjacent areas from state and federal agencies.

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~~**725.300 Available Data** Necessary hydrologic and geologic information is assumed to be available to the Division in this P.A.P.~~

Table 7-1AB

Sunnyside, Utah (428474)
Period of Record Monthly Climate Summary

Period of Record: 1971 - 2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Average Max. Temp(F)	33.7	38.4	44.1	54.0	63.5	76.2	82.4	80.3	71.3	58.3	42.8	34.9	56.8
Average Min. Temp(F)	13.9	17.5	21.8	30.0	38.3	47.2	53.6	52.2	44.7	34.6	22.8	15.3	32.8
Average Total Precip (in.)	0.80	1.01	1.30	1.22	1.22	0.85	1.46	1.50	1.80	1.67	1.14	0.78	14.74

Unofficial values based on averages/sums of smoothed daily data, Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

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725.200 Other Data Sources As indicated above, additional information is available for the cumulative impact area. In addition to the base line data for the proposed mining, additional pertinent hydrologic data is available from adjacent mines and permits and government reports.

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725.300 Available Data Necessary hydrologic and geologic information is assumed to be available to the Division in this P.A.P.

726. Modeling Where ever possible actual surface and ground water information is supplied in this application. However, the following models were used to supplement the data.

Storm 6.2, a program to calculate runoff flows was used to calculate runoff from some disturbed area drainage areas.

Hydroflow Hydrograph program by Intelisolve was used to simulate the runoff and routing from the undisturbed drainages above the proposed mine.

A simulation of transmission losses to determine potential impacts from mine water discharge to the Price River and fishery ~~will be completed prior to Mining.~~

was completed using a spreadsheet based on the NRCS channel loss evaluation.

727. Alternate Water Source Information A search was conducted of the State of Utah Water Rights files for all rights occurring within, and adjacent to, the permit area for a distance of one mile. The location of those rights are shown on Plate 7-3. A description of each of the rights is tabulated in Table 7-2.

Any State-Appropriated water supply that may be damaged by mining operations will either be repaired or replaced. As soon as practical, after proof of damage by mining in Lila Canyon, of any State-

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Table 7-2

LILA CANYON MINE AREA
Water Rights

Water Right/Owner	cfs	gpm	ac.ft.	Source	Use	Point of Diversion
91-557 Eardley, Joseph K.	0	-	0	So. Fork Horse Canyon Creek	Stockwatering	SW 34, T. 15 S, R. 14 E.
91-557 Eardley Joseph K.	0	-	0	So. Fork Horse Canyon Creek	Stockwatering	NE 34, T. 15 S, R. 14 E.
91-1903 State of Utah	0.08	36	0	Spring	Stockwatering	SE 35, T. 15 S, R. 14 E.
*91-148 IPA	0.30	135	0	U. G. Tunnel	Other	NW 3, T. 16 S., R. 14 E.
*91-149 IPA	0.10	45	0	U. G. Tunnel	Other	NW 3, T. 16 S., R. 14 E.
*91-150 IPA	0.10	45	0	U. G. Tunnel	Other	NW 3, T. 16 S., R. 14 E.
*91-4959 ~~IPA~~CEUF	0.00	-	5.00	Redden Spring	Mining	NE 3, T. 16 S., R. 14 E.
91-2616 BLM	0	-	0	Stream	Stockwatering	NW 3, T. 16 S., R. 14 E.
*91-183 ~~IPA~~CEUF	0.8	359	0	Horse Canyon Creek	Domestic, Other	SE 1/4 3, T.. 16 S., R. 14 E.
91-185 Minerals Devel. Co.	0.0190	9	0	Well	Domestic, Other	NW 9, T. 16 S., R. 14 E.
91-618 Mont Blackburn	0.0110	5	0	Mont Spring	Stockwatering	NE 11, T. 16 S., R. 14 E.
91-2615 BLM	0	-	0	Stream	Stockwatering	NW 10, T. 16 S., R. 14 E.
91-617 Mont Blackburn	0.0110	5	0	Leslie Spring	Stockwatering	NW 11, T. 16 S., R. 14 E.
91-4650 BLM	0	-	0	Tributary to Flat Wash	Stockwatering, Other	SW 9, T. 16 S., R. 14 E.
*91-399 IPA	0.050	22	0	Unnamed Spring	Mining, Other	SE 12, T. 16 S., R. 14 E.

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UEI owns the rights to approximately 1.50 cfs in this area. Although the PHC (Appendix 7-3) indicates little, if any, adverse effects on water resources resulting from the operation, if such effects should become evident, lost water sources would be replaced from the rights owned by the company.

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728. Probable Hydrologic Consequences (PHC) Determination

728.100 PHC The Probable Hydrologic Consequences (PHC) Determination is provided as a separate document in Appendix 7-3. This determination indicates minimal (or no) negative impacts of the mining or reclamation operation on the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas.

728.200 Basis for Determination The PHC is based on baseline hydrologic, geologic and other information such as public records and adjacent mine plan data statistically representative of the site (see Appendix 7-3).

With underground mining, there always exists a potential for impacting surface or ground water resources; however, as indicated in Section 525, subsidence effects are expected to be minimal due to the amount of cover and massive rock stratas between the mining and the surface. Effects on underground water are also expected to be minimal, since this water is not presently issuing to the surface, and any necessary discharges of the water would be in accordance with U.P.D.E.S. requirements.

Water in this area is primarily used for stock or wildlife watering. Any impacts to the small surface springs or seeps as a result of mining would likely be offset by the emergence of new seeps or springs due to fracturing, mine water discharge or replacement of water rights as described under Sections 525, and 731.800.

728.300 Findings

L-1-S	Lila Canyon	~~E~~Intermittent by rule with ephemeral ~~acting~~flow
L-2-S	Rt. Fork Lila (above mine)	Ephemeral Stream
L-3-S	Lila Canyon Below Mine	~~E~~Intermittent by rule with ephemeral ~~acting~~flow
L-4-S	Sediment Pond Discharge	UPDES
L-5-G	Mine Water Discharge	UPDES (Groundwater)
L-6-G (suspended)	**Sampling Suspended 1Qtr 2003**	Spring
L-7-G	Cottonwood Spring	Spring
L-8-G	Unnamed Spring	Spring
L-9-G	Pine Spring	Spring
L-10-G (suspended)	**Sampling Suspended 1Qtr 2003**	Spring
L-11-G	Lila Canyon Wash	Spring
L-12-G	Section 25 Wash	Spring
L-13-S	Little Park Wash	~~E~~Intermittent by rule with ephemeral ~~acting~~flow
L-14-S	Section 25 Wash	~~E~~Intermittent by rule with ephemeral ~~acting~~flow
L-15-S (suspended)	**Sampling Suspended 1Qtr 2003**	~~E~~Intermittent by rule with ephemeral ~~acting~~flow
L-16-G	Stinky Spring Wash	Seep
L-17-G	Stinky Spring Wash	Seep
L-18-S	Stinky Spring Wash	Intermittant by rule with ephemeral flow
IPA-1	Little Park Wash	Borehole
IPA-2	Little Park Wash	Borehole
IPA-3	Little Park Wash	Borehole

Sampling at Locations L-13-S, L-14-S, L-15-S, and L-1~~5~~8-S will no longer be required once the washes have been characterized as ~~E~~Intermittent by rule with ephemeral ~~acting~~flow or Ephemeral.

Locations of all monitoring sites are shown on Plate 7-4 , "Water Monitoring Location Map".

Proposed monitoring methods, parameters and frequencies are described in Table 7-3, "Water Monitoring Stations", Table 7-4, "Surface Water Monitoring Parameters", and Table 7-5 "Ground Water Monitoring Parameters".

In any one quarter a minimum of three unsuccessful attempts will be made by using either 4 wheel drive vehicles or ATV's to access all water monitoring sites prior to reporting any site as "No Access". However, safety and common sense will prevail while making these attempts.

Monitoring reports will be submitted to the Division at least every 3 months, within 30 days following the end of each quarter.

——Any material which exhibits acid- or toxic-forming characteristics will be properly stored, protected from runoff, removed to an approved disposal site or buried on site beneath a minimum of 4' of non-acid, non-toxic material.

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731.312 Storage of Acid- or Toxic-Forming Materials Storage of potentially acid- or toxic-forming materials, such as fuel, oils, solvents and non-coal waste will be in a controlled manner, designed to contain spillage and prevent runoff to surface or ground water resources.

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All oils and solvents will be stored in proper containers within enclosed structures. Fuels will be stored in appropriate tanks, enclosed within concrete or earthen bermed areas designed to contain any spillage.

Non-coal waste (garbage) will be stored in a designated location, in dumpsters, and removed to an approved landfill (East Carbon Development Contractors - ECDC) on a regular, as-needed basis.

Unused or obsolete equipment or supplies will be stored in a designated area. Drainage from the storage area will be directed to the sediment pond as shown on the Sediment Control Map, Plate 7-5.

Underground development waste (if any) will also be stored in a designated area. Such waste will be tested for acid- or toxic-forming potential, and if found to be acid- or toxic-forming, the waste site will be protected from surface runoff by the use of earthen berms.

731.320 Storage, Burial, Treatment All storage, burial and treatment practices will be as described in this permit, and consistent with applicable material handling and disposal provisions of the R645-Rules.

Table 7-3 Lila Canyon Mine Water Monitoring Stations				
Station	Location	Type	Frequency	Remarks
L-12-G	Section 25 Spring	Spring	Quarterly	Replaces L-10-G
L-13-S	Little Park Wash	Dry Wash	Monthly	At Road Crossing
L-14-S	Section 25 Wash	Dry Wash	Monthly	At Road Crossing
L-15-S	Williams Draw Wash	Dry Wash	Sampling Suspended 1Qtr of 2003	At Road Crossing
L-16-G	Stinky Spring Wash	Seep	Quarterly	Top of Mancos
L-17-G	Stinky Spring Wash	Seep	Quarterly	Top of Mancos
L-18-S	Stinky Springs Wash	Dry Wash	Monthly	Adjacent to Access Road
IPA-1	Little Park	Borehole	Quarterly	Water Level Only
IPA-2	Little Park	Borehole	Quarterly	Water Level Only
IPA-3	Little Park	Borehole	Quarterly	Water Level Only

NOTE: Sites L-13-S, L-14-S, L-15-S, and L-158-S will no longer be monitored after the washes have been characterized.

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~~All oils and solvents will be stored in proper containers within enclosed structures. Fuels will be stored in appropriate tanks, enclosed within concrete or earthen bermed areas designed to contain any spillage.~~

~~Non-coal waste (garbage) will be stored in a designated location, in dumpsters, and removed to an approved landfill (East Carbon Development Contractors - ECDC) on a regular, as-needed basis.~~

~~Unused or obsolete equipment or supplies will be stored in a designated area. Drainage from the storage area will be directed to the sediment pond as shown on the Sediment Control Map, Plate 7-5.~~

~~Underground development waste (if any) will also be stored in a designated area. Such waste will be tested for acid- or toxic-forming potential, and if found to be acid- or toxic-forming, the waste site will be protected from surface runoff by the use of earthen berms.~~

~~**731.320 Storage, Burial, Treatment** All storage, burial and treatment practices will be as described in this permit, and consistent with applicable material handling and disposal provisions of the R645-Rules.~~

731.400 Transfer of Wells There are presently three Piezometers on this permit. When these Piezometers are no longer required, they will be sealed in a safe, environmentally sound manner in accordance with regulations (see Section 631.200). The Horse Canyon Well will be donated to the College of Eastern Utah as part of the Post Mine Land use Change

731.500 Discharges The only proposed discharges from this operation will be from the sediment pond and/or underground mine water. Each of these potential discharges would be monitored and controlled within requirements of approved U.P.D.E.S. Discharge Permits.

proposed portals are located to prevent gravity discharge from the mine (see Section 731.521).

731.600 N/A - There ~~are~~will be no ~~proposed coal mining~~surface disturbing or reclamation operations within 100 feet of a perennial or intermittent stream. All streams within the permit area are either ephemeral or intermittent by rule with ephemeral flow. However, the Operator will install stream buffer zone signs in locations shown on Plate 5-2. Since all streams within the permit area are either ephemeral or intermittent by rule with ephemeral flow. Section 731.600 is not applicable.

731.700 Cross Sections and Maps The following is a list of cross-sections and maps provided in this section of the P.A.P.

Plate 7-1	Permit Area Hydrology Map
Plate 7-2	Disturbed Area Hydrology/Watershed
Plate 7-3	Water Rights Locations
Plate 7-4	Water Monitoring Location Map
Plate 7-5	Proposed Sediment Control Map
Plate 7-6	Proposed Sediment Pond
Plate 7-7	Post-Mining Hydrology

All required maps and cross-sections have been prepared by, or under the supervision of, and certified by a Registered Professional Engineer, State of Utah.

731.710 General Area Hydrology Plate 7-1.

731.720 Plate 7-2.

731.730 Water Monitoring Map Plate 7-4.

731.740 Sediment Pond Map Plate 7-6.

731.750 Plate 7-6.

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App 7-3

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Appendix 7-3

Probable Hydrologic Consequences Determination

Updated January 2005

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#152606
R. Jay Marshall

development of vegetation along the stream banks aiding in the additional stabilization of the channel banks and bed. While these impacts are not anticipated, the applicant has agreed to monitor the conditions of the channel downstream of the site for geomorphic and erosional change as a result of mine discharges.

All construction and upgrading activities will be undertaken during periods of dry weather, commencing in late spring and lasting through fall. For both the mining and reclamation periods, it is expected that construction, upgrading, or regrading activities would cause an increase in sediment load to the stream. Temporary sediment controls will be used whenever possible to lessen the impact of construction activities.

Stream buffer zones have been delineated upstream and downstream of the disturbed area of the mine facilities. These buffer zones will aid in ensuring that no disturbance occurs within the area of the unprotected channel.

Sediment yields may increase locally due to subsidence. Subsidence cracks which intersect stream channels with steep gradients could, for a short period of time, cause an increase in the sediment yield of the stream. However, this sediment increase would cause the crack to quickly fill, recreating pre-subsidence stream channel conditions. Thus, the potential impact to sediment yield from subsidence in the permit area would be minor and of short duration.

Various sediment-control measures will be implemented during reclamation as the vegetation becomes established. As discussed in Section 542.200 of this P.A.P., these measures will include installation of silt fences and straw-bale dikes in appropriate locations to minimize potential contributions of sediment to the Right Fork of Lila Canyon. These measures will reduce the amount of erosion from the reclaimed areas, thereby precluding adverse impacts to the environment.

Acidity, Total Suspended Solids, and Total Dissolved Solids. Probable impacts of mining and reclamation operations on the acidity and total suspended solids concentrations of surface and groundwater in the permit and adjacent areas were addressed previously in this section. Since the proposed Lila Canyon Mine has not started, there is no specific data available on Lila mine water. Therefore, quality information was obtained from the adjacent Horse Canyon Mine workings.

Data presented in Appendices 7-1 and 7-6 and summarized in Section 724.100 of this P.A.P. indicate that the TDS concentration of water in the Blackhawk Formation (as measured in inflow to the nearby Horse Canyon Mine) ranged from natural discharge of groundwater through any of the sealed portals. To verify this, stand pipes will be incorporated into the grading plans for the portals so that water levels can be checked annually.

Groundwater and Surface Water Availability. Potential impacts to the availability of surface and groundwater from the Lila Canyon Mine operations include both decreased and increased stream flows and spring discharges caused by mine-related subsidence, bedrock fracturing, and aquifer dewatering. These potential impacts are discussed below.

Potential for Decreased Spring and Stream Flows

To date, while surface subsidence has been identified as a result of coal mining in the nearby Horse Canyon Mine, no impact or disruption of spring and seep of stream flows have been identified. Bedrock fracturing routinely occurs in the rock units overlying the mined coal seams. Given the limited number of springs and limited groundwater resources of the ~~Blackhawk and~~ Castlegate Sandstone and Blackhawk Formations in the permit and adjacent areas, subsidence or fracturing would affect the hydrologic balance in the area only if zones of increased vertical hydraulic conductivity were created which extended through the Price River Formation into the North Horn and Flagstaff Formations.

Several lines of evidence suggest that mining-related subsidence and bedrock fracturing have not resulted in decreased stream flows or groundwater discharge in the vicinity of the nearby Horse Canyon Mine. Although considerable seasonal and climatic variability are noted in the hydrographs of springs in the permit and adjacent areas, data for both Horse Canyon Creek and springs which overlie the Horse Canyon Mine workings do not show discharge declines which may be attributed to either subsidence or bedrock fracturing (see Appendices 7-1 and 7-6).

Active groundwater systems in the Colton, Flagstaff-North Horn, and Price River Formations are separated from the Blackhawk Formation by the Castlegate Sandstone. As discussed in Section 724.100, this formation contains no springs and is not considered to be a major groundwater resource. Past mining in the Horse Canyon Mine has not increased the rate of spring discharge from the Price River Formation, indicating that groundwater is not being diverted into this formation. The absence of increased saturation in the Price River Formation due to coal mining indicates that vertical zones of artificially-increased hydraulic conductivity do not extend into the Price River Formation and from thence into the overlying active groundwater systems of the North Horn and Flagstaff Formations.

Data presented in Appendices 7-1 and 7-6 and summarized in Section 724.100 indicate that the low-permeability lower groundwater system, in the vicinity of mined coal seams, contains groundwater which is compartmentalized both vertically and horizontally. Coal mining locally dewaters isolated, overlying saturated rock layers in the Blackhawk Formation but does not appear to draw additional recharge from overlying or underlying zones.

Additionally, the springs which supply most of the local flow discharge from the Flagstaff-North Horn or Colton Formations. This formation or aquifer is perched from the underlying lower groundwater zone and the intervening formations contains swelling clays which tend to heal small fractures. Also, since the perched aquifer materials are lenticular, there is a greater probability that fractures in one area will not drain all the different perched aquifers because they are not interconnected.

The ~~strong~~very low permeability and vertical gradients in Blackhawk Formation rock layers underlying actively mined coal seams in the Horse Canyon Mine and the absence of significant discharge into the mine from these layers indicates that mining does not draw groundwater from the underling portions of the Blackhawk and Mancos Shale. Additionally, the distinctive solute composition of Mancos Shale groundwater has not been observed inside the Horse Canyon Mine indicating that the saturated zones in the Blackhawk and Mancos are separate.

From the above discussion, it appears that the Horse Canyon Mine has not decreased groundwater discharge in overlying or underlying groundwater systems. Hence, it is unlikely that coal mining will effect the discharges of any spring as a result of mining in the Lila Canyon permit and adjacent areas.

The closest perennial stream to the permit area is Range Creek. The drainage is located approximately 6 miles east of the proposed Lila Canyon permit area (see Plates 6-1 and 7-1B). Range Creek is in a broad, south-southeast oriented drainage that has been eroded into the Roan Cliffs. A western extension of the Roan Cliffs (Patmos Ridge) lies between Range Creek and the Book Cliffs. The proposed Lila Canyon operation is on the west side of Patmos Ridge. The Colton Formation is exposed at the surface from Patmos Ridge east to the main body of the Roan Cliffs, and between these two escarpments Range Creek has eroded into but not through the Colton Formation. Approximately eleven miles southeast of the permit area, just upstream of Turtle Canyon, Range Creek has eroded through the Colton, Flagstaff-North Horn Formations, but it reaches the Green River without having eroded through the Upper Price River Formation. The nearest Blackhawk outcrop is 10 miles south, along the Price River (see Plate 7-1B).

The maximum extent of subsidence is within the permit boundary, making it improbable that itsubsidence fractures could effect Range Creek or any contributing watershed to Range Creek.

Due to the large distance from the proposed permit area, and the 1,000 feet or more of low permeability strata between the coal seam containing Blackhawk formation, and the Colton Formation where Range Creek lies, there is little possibility of groundwater from the Blackhawk Formation being pressurized to supply water to the Range Creek drainage. Additionally, based on the permeability (0.02 ft/day), porosity (0.1) of the the formation and the hydraulic gradient (0.06), the average linear velocity would be 0.012 ft/day. Therefore, for a minimum distance of 5 miles, between the mine and Range Creek, the time of travel would be a minimum of about 6,000 years. Therefore, no baseline or other sampling has been gathered nor anticipated on Range Creek. For the above reasons Lila Canyon extension does not present any Probable Hydrologic Consequences to Range Creek.

The contamination, diminution, or interruption of any water resources would not likely occur within the mine permit or adjacent areas. Since surface water flows only a limited part of year and will be provided protection by use of sediment controls, the major usable water resources that could potentially be effected in the area would be springs that are currently in use by wildlife and livestock. Most of these springs are located upstream of the permit area or are in areas where subsidence resulting from post-1977 mining is not documented or expected. To date no known depletion of flow and quality of surveyed springs in the Horse Canyon permit area exists, and none are expected in the Lila Canyon area, based on available data from the Horse Canyon Mine. Although pre-mining data is not available for Horse Canyon, depletion problems from subsidence are not known to have been filed and are not indicated by sampling results in Appendices 7-1 and 7-2. Therefore, it is unlikely an alternative water supply will be needed, although they have been identified in Section R645-301-727.

L-16-G and L-17-G are seeps being monitored in Stinky Spring Canyon. These two seeps appear to be an important source of water for Bighorn sheep specifically in the early spring.

Flows from these springs are historically less than 0.5 gpm and show a general seasonal decrease throughout the season. These sites were not identified during baseline surveys and are believed to exist intermittently and are not always evident. The low flow rates and intermittent nature of these springs suggest that they are local in nature.

These springs are located within the Central Graben, which is a block that has been downdropped between 145 and 250 feet relative to the adjacent bedrock. They occur near the contact between the Mancos Shale and the overlying Blackhawk Formation. The fractured nature of the bedrock along the edges of the Central Graben, as a result of the faulting, likely ~~limit~~are the limits of the areal extent of the recharge or source area to the springs. The ~~fractures~~low-permeability of the surrounding Mancos Shale likely isolate the graben block from groundwater in the surrounding bedrock. Thus, the recharge to the springs is likely limited to the area of the consolidated graben block.

As indicated previously, there is no evidence that mining in the Horse Canyon Mine had any influence on the underlying formations. Therefore it is likely that the Lila Canyon Mine would have similar affects. Due to the springs location and lateral separation from the mine, outside the permit area, outside the limit of subsidence, being separated from the mine block by faulting within the Central Graben, and being 500 to 600 feet below the coal seam, there is no potential for Lila Canyon Mine to negatively impact this spring or recharge sources.

Potential for Increased Stream Flows

If sufficient water is encountered in the Lila Canyon Mine workings to require discharge of that water to the surface, the flow of the Right fork of Lila Canyon will be increased. This flow would be ultimately to the Price and Green Rivers. The impact of such discharge by the development of the Lila canyon extension would be quite limited.

The majority of water discharged from the mine would be water held in storage in the saturated zones above the coal seam. It is unlikely that any water below the coal seam would be affected or drained by the mine workings.

It is difficult to estimate the maximum potential discharge from the mine, however, DOGM has determined that a maximum discharge rate of ~500 gpm should be used for design purposes. Based on this discharge, during the life of the operation the water extracted would be 22,600 ac-ft of water. This would be approximately 800 ac-ft per year. Discharge for the Price River at Woodside has a mean annual flow of 88,000 ac-ft/yr. Discharge for the Green River at Green

River has a mean annual flow of 4,484,000 ac-ft/yr. Therefore the average discharge at 500 gpm from the mine would be 0.9% of the Price River flow volume and 0.02% of the Green River flow volume. Given the standard fluctuations in the stream flows, this small flow addition would have little effect on the streams.

It should be emphasized that ~~this~~the 500 gpm estimate is considered to be conservatively high. The adjacent Horse Canyon Mine had a maximum discharge of 90 gpm. ~~Also, the amount of water which will be discharged from the mine will equal the inflow minus that which is consumed in the mining operation (dust suppression and evaporation). Based on experience at~~While the Soldier Canyon Mine farther to the north in the Book Cliffs, the rate of water ~~to be consumed in the Lila Canyon Mine is~~discharged was estimated to be 15,000,000 gallons per year (approximately 30 gpm).

If water does need to be discharged, it will be sampled and discharged in accordance with the approved UPDES Discharge Permit. If the quality parameters of the mine water do not meet UPDES standards, the water will be treated prior to discharge. Treatment may include holding/settling in the mine, pumping to retaining or sediment ponds, chemical treatment or other approved means to prevent non-compliant discharge.

Based on the results of the evaluation presented in Appendix 7-9, the discharge of this amount of water from the mine is not expected to have a significant impact on the downstream resources. Based on the results from Appendix 7-9, the mine discharge flow will be lost due to transmission losses and percolation within 3.4 miles from the discharge point. Therefore, the discharge will not reach the Price, Green, or Colorado Rivers. The discharge of the water will have a positive impact on the vegetation and wildlife of the area by providing a fairly constant supply of water along this limited reach of the channel.

Based on comparison of upstream and downstream data gathered on Horse Canyon Creek which incorporates the analysis from past mine discharges to the channel, water quality will not be drastically affected in the intermittent drainage in the event of discharge of mine water into the channel. The expected impacts to the channels of the Lila Canyon area are very likely to be similar to those at Horse Canyon due to the close proximity, and similarities of mining and drainage conditions.

Potential Hydrocarbon Contamination. Diesel fuel, oils, greases, and other hydrocarbon products will be stored and used at the site for a variety of

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APPENDIX 7-7

Surface Water Characterizations

UtahAmerican Energy, Inc.

R. Jay Marshall P.E.

channel varies in width from 50 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The stream has cut an irregular channel into the underlying rock formation to a depth of 50 feet in places. The gradient is moderate (3.3%), with mostly gravel, sand and silt filling the channel in the upper reaches and large boulders predominate in the vicinity of the Price River.

The 20,100 foot long channel flows from a pinyon-juniper and sagebrush grass associations transgressing into a mature sagebrush habitat in the lower sections, with no riparian vegetation present.

Known springs and seeps occur along the east side tributaries. (See Appendix 7-~~6~~8 for Spring Descriptions) The tributaries are of moderate to steep gradients in narrow canyons, with mostly gravel to occasional rocky beds, with silt and sand where the gradient is reduced. The intermittent tributaries have headwaters in the Colton Formation outcrop in the sub-Roan cliffs, passing over the lower moderate slope-forming Flagstaff Limestone and North Horn Formations. The present known springs and seeps are associated with alluvium, sandstone and thin limestone beds of these geologic formations of Upper Cretaceous to Eocene age. (Plate 6-1) Observations of intermittent water flow associated with the springs indicate flows of 5 gallons per minute or less (Appendix 7-2). The intermittent flow of water from the springs probably never reaches the main channel of Little Park Wash even in years of high precipitation.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from the upper reaches of Little Park Wash are probably absorbed by the stream alluvium prior to reaching the Price River except in the most extreme situation.

No water shares are associated with the Main Little Park Wash anywhere within the permit area, or downstream, all the way to the confluence with the Price River.

Precipitation occurs mainly as summer showers and winter snow and ranges averages approximately 14.74 inches per year (Table 7-1A).

Two water monitoring stations are located in Little Park Wash (less tributaries). L-13-S is located at the road crossing of Lila Park Wash. Data collected at L-13-S, since December of 2000, has not reported any flow (Appendix 7-1). Indications of flow as a direct result of precipitation events

Because IPA#1 Wash drains more than one square mile it can be considered intermittent by definition.

The channel cuts through the Flagstaff/North Horn, and the Upper Price River formations, from an elevation of 9,000 feet to an elevation of 7,000 feet. The channel varies in width from 10 to nearly 100 feet wide. The adjacent slopes are of moderate to vertical gradient. The channel ranges from 1,400 to over 3,000 feet above the coal seam. At this depth there is no chance that underground mining can adversely effect the channel.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel.

Two monitoring locations, L-8-G and Piezometer IPA#1, can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-~~6~~8 contains a description of both monitoring points.

Reach #5 has been broken into three distinct sub-reaches, 5A, 5B, and 5C, each with its own characteristics. IPA #1 Wash, Reach #5, by definition and classification by the Permittee is ephemeral.

Reach #5A

Reach #5A (Table 2) is described as IPA#1 Wash above L-8-G. Reach #5A is shown on Figure 1.

Reach #5A starts at an elevation of 7,450 feet and drops to an elevations of 7,300 feet and has a minor slope (7.8%) over its 1729 foot length. The reach runs mostly through Douglas Fir in the upper sections and transgresses to pinyon juniper. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

No water shares are associated with #5A. This reach is considered ephemeral. Reach #5A can not be impacted by mining do to the coal seam depth being over 3,000 feet and location off the permit area.

Photograph 52, found in Attachment #1, depicts the conditions found in Reach #5A.

Reach #5B

Reach #5B (Table 2) is described as IPA#1 Wash at L-8-G. Reach #5B is shown on Figure 1.

Reach #5B starts at an elevation of 7,300 feet and drops to an elevations of 7,270 feet and has a minor slope (10.4%) over its 300 foot length. L-8-G is located in Douglas Fir. It flows off and on for approximately 300 feet where it either evaporates or is absorbed into the alluvium The intermittent flow of water from the spring probably never reaches the main channel of Little Park Wash even in years of high precipitation. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

L-8-G has water share 91-2638 owned by the State, and designated for stock watering, associated with it. This 300 foot reach, #5B, is considered intermittent/perennial. Appendix 7-1 contains flow data and quality information. Appendix 7-~~6~~8 contains a description of the water monitoring site.

Reach #5B can not be impacted by mining do to the coal seam depth being over 2,500 feet and location off the permit area.

Photographs 53 and 53A found in Attachment #1, depicts the conditions found in Reach #5B.

Reach #5C

Reach #5C (Table 2) is described as IPA#1 Wash from L-8-G to the confluence with Little Park Wash. Reach #5C is shown on Figure 1. Two hundred feet below L-8-G is where the channel changes from intermittent to ephemeral. From this point downstream the water table, with respect to the channel surface, could not be located using an 18" spade. The intermittent flow of water from the springs never reaches the main channel of Little Park Wash even in years of high precipitation.

Reach #5C starts at an elevation of 7,270 feet and drops to an elevations of 6,970 feet and has a minor slope (4.5%) over its 6,700 foot length. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Vegetation transgresses pinion-juniper, to a sagebrush grass type vegetation at the confluence with Little Park Wash.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel. Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Pine Spring Wash reaches Little Park Wash only in the most extreme situation.

Three monitoring locations, L-9-G, IPA #3, and L-13-S, can be found within this reach. Appendix 7-1 contains flow data, quality information, and water depths for the monitoring locations. Appendix 7-~~6~~8 contains a description of the monitoring points.

Reach #6 has been broken into three distinct sub-reaches, 6A, 6B, and 6C, each with its own characteristics. Pine Spring Wash, Reach #6, by definition and classification by the Permittee is ephemeral.

Reach #6A

Reach #6A (Table 2) is described as Pine Spring Wash above L-9-G. Reach #6A is shown on Figure 1.

Reach #6A starts at an elevation of 7,750 feet and drops to an elevations of 7,190 feet and has a slope of (14.8%) over its 3,840 foot length. The reach runs mostly through Douglas Fir in the upper sections and transgresses to pinyon juniper in the lower section. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

No water shares are associated with #6A. This reach is considered ephemeral. Reach #6A can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Reach #6B

Reach #6B (Table 2) is described as Pine Spring at L-9-G. Reach

#6B is shown on Figure 1.

Reach #6B starts at an elevation of 7,190 feet and drops to an elevations of 7,170 feet and has a minor slope (6.7%) over its 300 foot length. L-9-G is located in Douglas Fir. It flows off and on for approximately 300 feet where it either evaporates or is absorbed into the alluvium The intermittent flow of water from the spring probably never reaches the main channel of Little Park Wash even in years of high precipitation. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

L-9-G has water share 91-2638 owned by the BLM, and designated for stock watering, associated with it. This 300 foot reach, #6B, is considered intermittent/perennial. Appendix 7-1 contains flow data and quality information. Appendix 7-~~6~~8 contains a description of the water monitoring site.

Reach #6B can not be impacted by mining do to the coal seam depth being over 2,000 feet and location off the permit area.

Photographs 11 and 12 found in Attachment #1, depicts the conditions found in Reach #6B.

Reach #6C

Reach #6C (Table 2) is described as Pine Spring Wash from L-9-G to the confluence with Little Park Wash. Reach #6C is shown on Figure 1.

Four hundred feet below L-9-G is where the channel changes from intermittent to ephemeral. From this point downstream the water table, with respect to the channel surface, could not be located using an 18" spade. The intermittent flow of water from the springs never reaches the main channel of Little Park Wash even in years of high precipitation.

Reach #6C starts at an elevation of 7,170 feet and drops to an elevations of 6,840 feet and has a minor slope (3.7%) over its 8,975 foot length. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach. Vegetation transgresses pinion-juniper, to a sagebrush grass type vegetation at the confluence with Little Park Wash.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Pine Spring Wash reaches Little Park Wash only in the most extreme situation.

IPA #3, and L-13-S, can be found within this reach. Appendix 7-1 contains flow data, quality information, and water depths for the monitoring locations. Appendix 7-~~6~~8 contains a description of the monitoring points

No water shares are associated with #5C. And the Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Reach #6C can not be impacted by mining do to the coal seam depth being over 1,000 feet.

(Reach #7) No Name Wash

No Name Wash is an east-west tributary to the main Little Park Wash. Portions of this stream reach can be considered intermittent by definition. No Name Wash is shown on Figure 1.

No Name Wash drains approximately 1.41 square miles. Of the total drainage .71 square miles of drainage is within the permit area (Tables 1 and 2).

The channel cuts through the Flagstaff/North Horn, and the Upper Price River formations, from an elevation of 7,120 feet to an elevation of 6,690 feet. The channel varies in width from 10 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The channel ranges from 1,100 to over 2,500 feet above the coal seam. At this depth there is no chance that underground mining can adversely effect the channel.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel.

Two monitoring locations, L-12-G and L-14-S can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-~~6~~8 contains a description of the monitoring point. One

The reach does not contain any riparian vegetarian. The channel is filled with mostly gravel, sand and silt. Fish and macro invertebrates are non existing within this reach. No water shares are associated with this reach.

L-18-S can be found within this reach. Appendix 7-1 contains flow data. Appendix 7-8 contains a description of the monitoring point.

The chance of subsidence negatively effecting this ephemeral channel is minimal since the channel is approximately 600 feet below the coal seam and off the permit area. The physical location of the coal seam in respect to the channel results in a minimal chance of subsidence negatively effecting the channel.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Stinky Springs Wash reaches Marsh Flat Wash only in the most extreme situation.

The Permittee has classified this stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Photograph 72, 75, and 76, found in Attachment #1, depicts the conditions found in Reach #9D.

Lila Canyon -

Lila Canyon is an east-west tributary to Grassy Wash within the Cove drainage. Portions of this stream above Lila Canyon can be considered intermittent by definition.

Lila Canyon drains approximately 1.71 square miles. Of the total drainage .57 square miles of drainage is within the permit area (Table 1).

The channel starts in Colton formation then cuts the Upper Price River formation then through the Castle Gate Sandstone and then finally drops of the face of the Book Cliffs into the Black Hawk formation and then through the Mancos Shale where it converges with Grassy Wash. The channel elevation ranges from an elevation of 8,500 feet to an elevation of 5,400 feet. The channel varies in width from 10 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The channel has been previously undermined by the Horse Canyon mine with out any known negative impacts.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel.

Three monitoring locations, L-1-S, L-6-G, and L-11-G can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-~~6~~8 contains a description of the monitoring points. Fifty feet below L-11-G is where the channel changes from intermittent to ephemeral. From this point downstream there are several wet spots but no flow. The water table, with respect to the channel surface, could not be located using an 18" spade in most places. The intermittent flow of water from the springs reaches the main channel of Grassy Wash only in years of high precipitation.

Vegetation transgresses from Spruce Fir in the very most upper reaches to Pinyon Juniper and finally to a sagebrush grass type vegetation near the escarpment to a Salt Desert Shale from the bottom of the escapement to the confluence of Grassy Wash.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from No Name Wash reaches Little Park Wash only in the most extreme situation.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

This channel has been previously extensively under mined by the Horse Canyon Mine without any negative effects. No additional undermining of Lila Canyon is anticipated with the new Lila Canyon Permit. Since minimal additional undermining of Lila Canyon is anticipated, the Lila Canyon Mine cannot have a negative effect of Lila Canyon due to subsidence.

Right Fork of Lila Canyon -

The Right Fork of Lila Canyon is an east-west tributary to Grassy Wash within the Cove drainage. All portions are considered ephemeral by definition. The Right Fork of Lila Canyon drains approximately .4 square miles. Of drainage all within the permit area (Table 1).

The channel starts in the Castle Gate sandstone then drops over the Bookcliffs escarpment and then drains into Grassy Wash. The gradient is nearly vertical in the upper reaches and extremely steep in the lower reaches, with mostly gravel, sand and silt filling the channel.

Two monitoring locations, L-2-S, and L-3-S can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-~~6~~8 contains a description of the monitoring points. The water table, with respect to the channel surface, could not be located using an 18" spade.

Vegetation transgresses from pinion-juniper in the upper reaches to a sagebrush grass type vegetation at the confluence with Grassy Wash.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from the Right Fork of LIla reaches Grassy Wash only in the most extreme situation.

Fish and macro invertebrates are non existing within this reach. No water shares are associated with this reach and no riparian habitat can be found in the Right Fork of Lila.