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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

January 22, 2001

TO: [redacted] File

THRU: Joe C. Helfrich, Senior Reclamation Specialist, Project Lead.

FROM: David W. Darby, Senior Reclamation Specialist

RE: Significant Revision, Lodestar Energy, Inc., Horizon Mine, [redacted] SR00B-1

SUMMARY:

This technical review evaluates the completeness issues of the significant revision (SR) to the MRP. Lodestar Energy, Inc. submitted the SR on August 21, 2000 which expands coal mining operations north, in the Fish Creek Graben Zone. Mining will still take place in Federal Coal Lease UTU-74804 for which the operator has right of entry.

The significant revision extends the underground mining operation in the Hiawatha coal seam up to a vertical boundary established by Beaver Creek. The SR proposal should not effect or cause revisions to the mine pad area or surface hydrologic structures. The operator has obtained a UPDES, mine water discharge permit to discharge directly into a receiving stream. Thus, no new structure designs are required.

The reason this mining limit was established at the creek is because the groundwater regime has not been characterized beyond the proposed boundary, although the federal lease and coal reserves extend farther north. Monitoring well, HZ-95-1 is the northern most monitoring site established to identify groundwater characteristics at depth, especially in the vicinity of the intended coal seam.

Prior to mine expansion, beyond this proposed boundary, baseline groundwater information is needed to characterize the groundwater in and adjacent to the graben.

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR 783., et. al.

CLIMATOLOGICAL RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.18; R645-301-724.

Analysis:

Climate is discussed in Chapter 11. The climate information in the plan was gathered the monitoring site of nearby Skyline Mine. The plan puts the respective average annual temperatures for 1993, at the Skyline Mine at 37.7°F. The respective cumulative annual precipitation amounts for these same locations at 27.37 inches. The coldest month of 1993 was January, with an average temperature of -9°F, while the warmest month was August, with an average temperature of 80°F.

Findings:

The plan contains no site-specific climatological data, an approximate range of data can be determined from the information scattered throughout the plan. The Division finds that this information meets the minimum regulatory requirements. The Division recommends, however, that the operator set up a weather station at the site so that precipitation events can be correlated with other monitoring data.

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

Analysis:

Sampling and analysis

The operator is required to perform all sampling and analysis in a manner that meets the requirements of R645-301-723.

The groundwater, surface-water and point-source discharge site monitoring will be conducted in accordance with 40 CFR Parts 122 and 123, R645-301-751 and as required by the Utah Division of

Water Quality for Utah Pollutant Discharge Elimination System (UPDES) permits. A UPDES discharge permit application has been secured from the Division of Environmental Health for the sediment pond and mine water discharge for the Horizon Mine operation. The UPDES permit for the Horizon Mine is provided in Appendix 3-7.

When analysis of any surface water sample indicates a noncompliance with the permit conditions, the company will promptly notify the Division and immediately take actions to identify the source of the problem, correct the problem and, if necessary, to provide warning to any person whose health and safety is in imminent danger due to the noncompliance.

Baseline information

Within the permit area, the surface water resources consist of streams, springs, wells and ponds. The mine is established in Portal Canyon, an ephemeral drainage, which produced only occasionally flows until the mine started discharging water. Portal Canyon drains into Jewkes Creek. The undisturbed runoff generated above the mine pad area is directed into a 36-inch culvert, UC-2, that runs the length of the disturbed area in Portal Canyon. Mine water is discharged directly into the Portal Canyon culvert.

Jewkes Creek is a perennial stream which receives its flow from rainfall, snowmelt and springs SP-1 and SP-4. Spring Two Canyon, a tributary to Jewkes Creek occasionally contributes flow. Part of the disturbed area lies along Jewkes Creek. Another set of undisturbed 36 inch drainage culverts, UC-1 and UC-3, directs the flows in Jewkes Creek under the disturbed area and under the sedimentation pond. Drainage diversions are shown on Plate 7-4.

Beaver Creek is a perennial stream which lies in a drainage opposite the ridge of Jewkes Creek. Its flow path bisects the federal coal lease. Although the current mine plan does not extend across Beaver Creek, the operator has intentions of conducting future mining operations in the federal coal lease beyond Beaver Creek. The area surrounding Beaver Creek is privately owned and some concerns regarding subsidence and water interception have been expressed by the landowner.

There are several springs in the vicinity of Beaver Creek. Perennial and intermittent springs appear near above of the mine area. Springs occur where the recharge potential from alluvium and sandstone units in the Price River Formation and Castlegate Sandstone is high or from fractures created by faulting. Ephemeral springs tend to be linked to shallow aquifers consisting of soils, alluvium or colluvium.

Generally, there is flow in Jewkes Creek and Beaver Creek throughout the year. Several of the adjacent canyons contain flows during the spring snowmelt runoff period and also as a result of isolated summer thunderstorms. Due to the limited drainage area and high elevation of some of the canyons the duration of the snowmelt flow is short and limited to the very early spring. Locations of all baseline water data points are shown on Plate 1. Baseline data information is included in Appendix 7-1.

Plate 7-1 shows numerous springs and seeps exist within, and adjacent to, the permit area, especially in the Beaver Cr./Jump Cr. area. Based on results of the PHC determination, baseline study and other available information, the operator will monitor the significant surface water sources, including drainages above and below the disturbed mine site area, and all point-source discharges.

The operator has provided information on water rights included in Appendix 3-5. The point of diversion for water rights near the mine operations are presented on Plate 7-3. Designated uses and season of use for some water rights are not included in the water rights table provided. The operator has indicated that the area is almost exclusively used for stock watering.

The agreement between Horizon and Florence A. Sweet includes water rights, 91-94, 91-353 and, 91-330. The water rights are associated with two unnamed springs and an underground water tunnel. The point of use associated with the spring(s) are proposed to be changed to Sweets Pond. Domestic and industrial uses are proposed in association with the Horizon Mine operations.

The operator submitted an update to the water rights lease agreement between Horizon Coal Corporation and Florance Sweet. A canceled check for lease of the water shares indicates that a five-year term begins on June 20, 2000 and will expire on June 20, 2005.

Table 1
Water Rights Used in Mining

Water Right #	Season of Use	Quantity of Use (cfs)	Potential Total for Season of Use (AF)
91-94	9/1 to 5/1	0.1500	72.00
91-353	5/1 to 9/1	0.0150	3.66
91-330	1/1 to 12/31	0.5570	2565.00

General Baseline Water Quality

Baseline information was collected according to the 1986 Division guidelines. In early baseline data acquisition the operator collected data according to the 1986 guideline. The Division has a new guideline, effective April 1995. The major difference between the data collected through 1996 and the data required by the new guidelines is the acquisition of certain dissolved constituents, total alkalinity, and phosphates as orthophosphates. Although older data acquisition will provide useful information, new data should be collected according to the new guidelines. The baseline data analysis for the parameters obtained according to each guideline should be discussed in the plan. Baseline information

is being collected in accordance with the new guidelines starting in 1996. The operator should provide a table of the baseline parameters. Division guidelines request that baseline parameters be collected at low flow for monitored sites every fifth year prior to permit renewal.

Groundwater information

Seeps, springs and potential mine water discharge will be monitored in accordance with the Ground Water Monitoring Plan in Chapter 7.

Section 6.4.1 discusses site stratigraphy and provides information relative to groundwater in relation to the mine operations. Section 7.1.2 discusses the groundwater resources.

The upper Gordon Creek area is considered a regional recharge source for groundwater, although locally in the permit area it is not a region with potential for large scale groundwater development. Snowmelt and rainfall are the main sources of recharge to the groundwater system in the permit and adjacent areas. The operator provides Figure 7-4 to delineate potential recharge areas and shows a limited recharge potential except in the northern portion of the permit area and in canyon bottoms downstream. The "small" number of springs in the Gordon Creek drainage is described to demonstrate of relatively low area permeabilities by the operator. The operator has not clearly described relationship between the "small number" of springs to the local area aquifers, particularly the water in the Star Point Sandstone.

The regional area aquifers are the Emery and Ferron Sandstones of the Mancos shale, which probably do not extend to Gordon Creek (thus, the mine area), and the Star Point Sandstone and Blackhawk Formation outcrop in the mine area.

The area is also heavily faulted by major fault zones. The North Gordon and Fish Creek fault zones trend North and South, and North 60 degrees West, respectively. The faulting appears to have influenced the development of Gordon Creek and the locations of springs and seeps in the permit area. Faulting and fracturing provide conduits for surface water to enter the groundwater and allows movement between aquifers. Another major structural feature controlling groundwater occurrence is the Beaver Creek Syncline trending NE-SW with dip at approximately 3.5 degrees.

Locally, potential water bearing members below the Hiawatha coal seam include the Blackhawk Formation and the Blackhawk-Star Point aquifer. Both the Blackhawk Formation and Star Point Sandstone serve as sources of spring and seep flows. According to Price and Arnow, 1974, the upper cretaceous sediments of the area have a low hydraulic conductivities and specific yields of 0.2 to 0.7%. Two pump tests from wells drilled in the Blackhawk Formation in Eccles Canyon indicate transmissivities of 21 and 16.3 gallons per day per foot. The Blackhawk Formation aquifer is generally laterally discontinuous perched aquifers and fluvial channel sandstones

The Hiawatha Coal Seam in the Blackhawk Formation directly overlies the Star Point Sandstone. The Star Point Sandstone consists of the Panther, Storrs and Spring Canyon Sandstone members from the stratigraphically lowest to highest member respectively. The Spring Canyon Member is composed of fluvial shales siltstone and channel sandstones (Section 6.5.2.1). The Star Point is approximately 900 feet thick in the Gordon Creek area. The recharge to the Star Point occurs primarily from vertical movement thorough the Blackhawk. The operator suggest that due to the low vertical permeability the magnitude of the recharge is limited. However, the vertical permeability from fractures in the area may be relatively significant.

Above the Hiawatha, the Castle Gate "A" coal seam overlies the Aberdeen Sandstone. Drill logs indicate this sandstone member thins near the mine and is discontinuous over the permit area pinching out on the east west stratigraphic section between LMC-4 and the Arco section. The sandstone is interbedded with silts tones and shales. The operator indicates this sandstone is not anticipated to be a significant aquifer because it has a thin interbedded lithology and no springs in the permit or adjacent area issue from the formation (Section 6). The operator has determined it is not practical to mine this seam in the permit area.

The floor of the Castle Gate "A" seam is carbonaceous silty shale to fine grained fluvial sandstone. Water production was not observed from the floor in previously mined areas according to the operator. The roof consists of carbonaceous silty shales over 80% of the permit area and the remaining 20% consists of fluvial channel sandstones that initially produce water then tend to dry up. The general channel trend is NE-SW and the channels tend to increase in frequency to the West. If these channels connect with a Fault, water may be diverted to the mine workings and directed/redirected based on the prominent ground water control mechanisms. The flow rate would be dependent on the fault/channel systems transmissivity. Whether or not this connection exists is unknown

Other members containing aquifers above the coal to be mined include the Castle Gate Sandstone, the Price River Formation and unconsolidated alluvial sediment deposits. The Castle Gate Sandstone is exposed in the central and northeastern section of the lease block and is approximately 300 feet thick in the Gordon Creek area. The Price River formation overlies the Castlegate Sandstone and occurs in the north eastern portion of the permit area. Additionally, unconsolidated deposits occur along valley floors and at the base of steep slopes. Some of these deposits are recharged from the Blackhawk Formation and Star Point aquifers. The thickest alluvial deposits in the permit area occur along Beaver Creek.

Local Drilling Information and Occurrence of Ground Water

Information regarding baseline groundwater data collection is discussed in Chapter 7, Section 7.1.2.2. Four exploratory holes drilled in 1970's and 1980's were monitored for water in 1995. Drill logs of Holes LMC 1, LMC 2, LMC 3, and LMC 4 are found in Appendix 3A. Also, three wells were drilled and completed in the Star Point Spring Canyon Sandstone in 1995 and are discussed below.

Tables 1A and Table 1B were generated to present information gathered from the LMC drill holes and the HZ wells. Data from the tables were used in determining groundwater occurrence in the permit and adjacent areas.

Table 2.1
LMC Drill Hole Information

HOLE ID	DATE DRILLED	DEPTH DRILLED	DEPTH OF PLUG	1992 Drill Hole Depth ft msl (depth)	CASTLEGATE Elevation ft msl (depth)	HIAWATHA DEPTH*
LMC-1	Sept. 1976	900 ft.	600 ft.	7,852 (599 ft)	7,658 (793 ft)	Unknown*
LMC-2	Oct. 1976	568 ft.	50 ft.	None	518 ft.	Unknown*
LMC-3	Nov. 1976	836 ft.	665 ft.	7,556 (664 ft)	7,590 (630 ft)	791 ft.
LMC-4	Jan. 1980	430 ft.	220 ft.	7,587 (217 ft)	7,698.8 (105.2 ft)	7,588.7 ft.

*** Drilling completed before reaching the Hiawatha Seam.**

The data shows that groundwater occurs above, within, and immediately below the Castlegate 'A' seam. It is not continuous and may be inconsequential in the strata above the mine. Documentation of the LMC drilling procedure was provided in a notarized letter from Mr. Joseph A. Harvey to Rich White, Engineering Consultant for Horizon Mine, on March 24, 1992 (Appendix 7-1). As stated in Mr. Harvey's letter, all these holes were drilled with air rotary, monitored for water, and found to be dry (during drilling). Thus, no water quality data was collected Following drilling the drill holes were injected with compressed air and then mud for geophysical logging. The drill holes were abandoned by injecting cement. Mr. Harvey indicated there was an inability to cement the full length of the drill holes because there were large voids connected to the drill hole annulus, thus, resulting in the existing hole depths as measured in the 1995 monitoring.

If one can assume the drill holes would seep water during drilling, and given there were no noted water occurrences in the cuttings, then these drill holes indicate the stratigraphic members above, within, and below the Castlegate 'A' seam are probably dry. LMC 1 was originally drilled to 200 feet above the Castlegate 'A' seam. LMC 2 was originally drilled through the Castle Gate "A" seam. LMC 3 was originally drilled through the Hiawatha Seam and 32.8 feet into the Upper Spring Canyon Sandstone. LMC-3 is located north east of old workings developed from the Blue Blaze No.3, Castlegate "A" Seam.

Drill hole LMC-4 extended through the Hiawatha Seam, ending 213 feet into the Storrs Sandstone. LMC-4 penetrates old workings in the Hiawatha coal seam and is located in an area that is possibly hydrologically disconnected from the majority of the area to be mined due to the surrounding faults (see Plate 6-1). Therefore, LMC-4 probably does not represent information on groundwater occurrences for the unmined portions of the lease outside of the surrounding faults.

Section 6.5.1.1 states that Drill holes LMC-1, LMC-2 and LMC-3 will be plugged and abandoned following State approved methods. Of the LMC drill holes, it seems as though well LMC-4 could provide information for the mined out area should it flood during or after mining. However, it appears to provide little useful information on aquifers in the baseline/operational phases for the proposed mining area. These wells should be capped now unless they are considered necessary for further monitoring purposes.

Table 2.2
HZ Drill Hole and Well Completion Information

Hole ID	Date Drilled	Drilled Depth ft msl (Depth from surface ft)	Completed Formation	Base of Hiawatha Coal Seam (ft msl)	Screen Completion	Water Elevation Dec.1995
HZ-95-1	12/13/95	7,272.6 (1080)	Star Point Spring Canyon	7331.6	7,277.6-7,287.6	7570.7
HZ-95-1S	12/5/95	8132.6 (220)	Blackhawk	NA	8,101.6-8,110.6	8221.5
HZ-95-2	12/5/95	7,146.3 (1200).	Star Point Spring Canyon	7189.3	7,151.3-7161.3	7519.3
HZ-95-3	10/28/95	7,427.6 (470)	Star Point Spring Canyon	7477.6	7,432.6-7,442.6	7522.7

With the information provided from the HZ wells, the operator has constructed a piezometric map for the Spring Canyon Sandstone. The presented information suggests the Spring Canyon aquifer has a hydraulic gradient of 0.014 and an east southeast direction. The overlay of the potentiometric surface and elevation of the Spring Canyon Tongue was used to estimate the saturated portion of the coal formation. The operator indicates the Hiawatha coal may be saturated very soon in the mining

operations. It should be noted that the coal itself may not be saturated and water that may occur in mine could be produced from the floor.

In building the potentiometric surface map, the operator has assumed maximum water level fluctuations of + or - 30 feet based on Skyline Mine well data from 1982 to the present. The intent in using this data for this purpose is not clear since mining has occurred at Skyline and the change in water levels may not be considered "baseline" information, therefore the use of this data may not be appropriate for the comparison presented.

The HZ wells all appear to be drilled near associated fracture systems. The location of these wells may influence the assumptions used in the potentiometric surface presented in Figure 7-2. Each well, if fracture influenced, may respond according to the behavior of the fracture feature and not the overall piezometric surface of the Star Point Sandstone.

For instance the piezometric surface elevation varies by 51 feet over approximately 4,000 aerial feet between HZ95-2 and HZ95-1, having an approximate 0.0128 feet/foot water surface gradient between those wells. If one looks further into the structural geology of the area, it would be noted that the permit area sits between a WNW-ESE trending fault. A gentle NW-NE dip is associated with the Beaver Creek Syncline. The Beaver Creek Syncline axis trends and plunges to the north. Rocks dip 3-5 degrees on both limbs of the fold except where steepened by fault drag or fault displacement. The fold follows Beaver Creek drainage up to Section 8, T13 S R8 E where Beaver Creek diverges from the axis to the north east along a suspected fault zone. HZ95-1 appears to be located on the other side of the Beaver Creek Fault Zone. If the structural geology controls the piezometric surface such that the south side of the Beaver Creek Fault Zone has a piezometric surface somewhat separate from the north side, a gradient for the piezometric surface may occur on the south side of Beaver Creek in a north west direction.

Except for the HZ-95-1S well, the majority of the springs issue above the presented Piezometric surface of the Star Point wells. This may indicate the Star Point is not in connection with the fractures. However, the operator has not completed this well fully through the formation and there is some question as to whether lower sandstone tongues may have a greater connection with the fractures. Additionally, no lithologic or geologic logs are presented and the initial occurrence of water was not presented in the MRP. Water levels, other than the December value, could not be located in the MRP. Because many of the formations in this region are fairly slow to transmit water, it is unknown if the well has reached equilibrium.

Recent monitoring of HZ-95-1, during later 1999 and 2000, indicates that pumping associated with mine water discharge is effecting the water level (head) in the well. HZ-95-1S has not shown extensive drawdown. All wells and springs have shown a decline in the past year, likely the result of a dry year.

Additional water level information should be collected and submitted to substantiate that the wells are at being effected by pumping or are in equilibrium. No pumping test data or drill logs are presented for these wells. Pump testing or other methods of determining the hydraulic conductivity of these wells would provide a great deal of necessary information on whether these wells were influenced by the nearby fracture zones. Logs of these wells should verify whether aquifers exist above the coal seam as identified by the presented LMC holes. Unfortunately it appears these wells are all completed in the upper tongue of the Star Point and are not completed through the formation. The operator must provide the geophysical and lithologic logs and hydrologic conductivity (pump test data) for these wells.

The advantage to the location of these wells becomes critical should the mining operations intercept the related fracture system. These wells will be useful in determining the first year mining impacts. However, the operator's five year mine plan proposes to mine near well HZ95-1 potentially eliminating the third point used to monitor the Star Point piezometric surface. There is a possibility the information would be necessary to complete the CHIA if additional information does not adequately describe the groundwater system. It is recommended that the additional well be placed on the north side of Beaver Creek and outside of the proposed mining area, within the graben but, away from a local fracture and be completed through the formation, in each sandstone tongue: not just the first tongue of the Star Point. It should be noted that the deficiency from the previous Blue Blaze mine proposal required the well be drilled through the formation in order to mine into the Hiawatha coal seam.

Previous Mining History

According to the operator the Gordon Creek #2 Mine operated by BCCC in the Castlegate A seam received sporadic occurrences of groundwater inflow which dried in a short time period. The Gordon Creek #3 Mine operated by BCCC in the Hiawatha Seam (located east and down gradient of the permit area) received approximately 400 g.p.m. inflow when a 12 foot graben was encountered in the northeast section of the mine. Water was produced from the floor. When retreat mined later the area was dry as a result of previous dewatering or elevation differences upgradient of the mine. It was also deemed possible that groundwater stored in the fault zone did not have a significant recharge rate that maintained the flow.

The location and extent of all known abandoned underground mine workings within the permit area and adjacent area are not shown on Plate 3-3. This information is critical to the development of the PHC and the CHIA.

Springs

The PAP indicates baseline reconnaissance information was gathered in the field with an Oil. Gas and Mining employee named Darin Worden from 1988 to 1990. Other information was derived from state and federal published open file reports. A complete spring and seep survey in the proposed permit and adjacent area was not conducted. Currently the PAP does not contain a map showing spring locations in the permit and adjacent area.

The baseline sampling information is gathered form springs which issue from the Blackhawk Formation and were characterized as Calcium Bicarbonate type waters.

Table 2.3
Baseline Spring Sampling Summary
(Summary of information from Plate 7-1, Figure 7-3 and Sections 7.1.3, 7.1.5 and 7.2.6)

Sampling Point	Monitoring History	Location (Formation)	Water Quality	Water Quantity	Comments
SP-1 1989 to present	Station #1 1989 through 1993	Issues from Hillside and flows into Jewkes Creek (Blackhawk Formation sandstone unit above coal seams 8195 ft msl.)	TDS 230-330 mg/l pH 7.5 - 8.5	Late Spring 10-15 gpm High flow on 5/89 was 45 gpm Late Summer/Fall 5 to 6 gpm	
SP-2 1989 to present	Station #2 1989 through 1993 (This description matches the station number 1 previously; Channel in North Fork of Gordon Creek.)	Issues from Hillside and usually flows approximately 100 feet (Blackhawk, 8005 ft msl)	TDS 480-540 mg/l pH 7.5 - 8.5	Flow in Late Spring 1-2.5 gpm Flow in Late Summer/Fall <1 gpm Dry 7/1991, 8/1991, through 12/1992	Spring flows through alluvium below the point of origin.
SP-4 1989 to present	#4 1989 through 1993	Jewkes Creek Drainage flows along road empties into Jewkes Creek (Blackhawk, 8102 ft msl)	TDS 350-480 mg/l pH 7.5 - 8.5	Flow in Late Spring 1-2.25 gpm Flow in Late Summer/Fall <1 gpm	Location not clearly mapped

Sampling Point	Monitoring History	Location (Formation)	Water Quality	Water Quantity	Comments
SP-6 1989 to 1995	#6 1989 to 1995	Upstream from the proposed mine portal (Blackhawk)	N/A	dry from 1989 through 1995	This location is not a spring and will not be included in future monitoring
not found	Gunnison Homestead Spring/Tributary to Beaver Creek near confluence of spring discharge channel and Beaver Creek	(Blackhawk)	not discussed	3-136 gpm the 136 gpm included snowmelt runoff.	Location removed from Figure 7-3
SP-9	Jewkes Spring U.S.G.S. 1979-1983 Station 2-5-W Beaver Creek Coal Company 1985-1995	Near Beaver Creek Channel, south west corner of proposed LOM permit area. (Blackhawk, 8550 ft msl)	TDS 240-300 mg/l pH 7.5 - 8.5	Typical Late Spring flow 20 to 60 gpm decreasing late fall 1.10 to 38 gpm (Maximum flow on 7/85 was 1372 gpm considered inaccurate)	Location mapped on Figure 7-3 Information on flow discussion in Section 7.2.2.2 varies from Section 7.1.2.2

In Section 6.4.2 the operator has indicated a series of springs in the North Fork of Gordon Creek in the north west corner of Section 18 T13S R8 E may be related to faults bisecting the area. The North Fork drainage may have formed subsequent or contemporaneously with the movement along the Gordon Creek Fault Zone.

The operator has stated the Homestead Spring is one of the main contributing springs to Beaver Creek. However, the operator has not included this spring in the baseline or operational monitoring regime. The operator has identified this spring as important to Beaver Creek flows, but has not indicated

why the spring should not be part of a sampling point (i.e.; why is this spring considered outside the zone of potential impact?).

Groundwater Quality

Two water quality samples were collected in the Blue Blaze No. 1 Mine workings, one in May 1992 and one in November 1995. The water was determined to be a calcium bicarbonate type with TDS ranging from 414 to 452 mg/l and pH from 6.8 to 7.66.

Groundwater collected from the HZ wells in December 1995, November 1996, and January 1996 may have been somewhat affected from the foam drilling fluid used during installation. Data analyses indicate TDS ranged from 380 to 680 mg/l. Due to the potential effects from the foam drilling additional water quality data is necessary.

Surface-water information

The Horizon Mine lies within the headwater streams of the Price River Basin. Major drainages within the permit and adjacent area are; Beaver Creek north of the mine site, and the North Fork of Gordon Creek and Gordon Creek south of the mine site. The disturbed area drains into the North Fork of Gordon Creek. The State Division of Water Quality classifies Gordon Creek as Class 3C and Class 4 waters. These classifications are designated as; non-game and aquatic life, and agricultural uses, respectively. Beaver Creak, located over the future proposed mine workings, is classified as 1C and 3A, designated as domestic and agricultural uses respectively. Down stream of the proposed disturbed area in Gordon Creek there are fisheries. Information on the fisheries is lacking in the plan. For further discussions see the **Fish and Wildlife** sections in this TA.

Drainages adjacent to the proposed disturbed area are named for referencing purposes as shown on Plate 7-4. The following designated names are assigned for the drainages flowing through the proposed disturbed area:

1) Jewkes Creek - the main drainage through the site which joins the North Fork of Gordon Creek's main stem at the southern boundary of the permit area.

2) Portal Canyon - this drainage is the first drainage entering from the west after crossing the permit area boundary and joins Jewkes Creek. The portal entries are located in this drainage.

3) Spring Two Canyon - is the second drainage entering from the west after crossing the permit area boundary and joins Jewkes Creek. This drainage is upstream of the disturbed area.

Streams within the permit area receive their maximum flows in late spring and early summer as a result of snowmelt runoff. Flows decrease significantly during the autumn and winter months. Jewkes Creek has experienced no flow during the winter and late summer months.

Beaver Creek is a perennial stream with base flow maintained by seeps and springs. Beaver ponds are common in Beaver Creek and also play a part in providing perennial flows. Springs contributing to base flow include the Gunnison Homestead Spring, within one mile west of the proposed additional lease area, and Jewkes Springs one mile west of the permit area near the north west corner. Discharges from these springs vary between 3 to136 gpm and 1.1 to 38 gpm respectively.

The USGS maintains a gauging station (09312700) near the mouth of Beaver Creek several miles northeast of the permit area with a period of record from 1960 through 1989. The minimum annual discharge for this period was 338 acre feet in 1961. The maximum annual discharge of 1,610 occurred in 1973. The average annual discharge for the 29-year period of record was 3,310 acre feet. Decreases in downstream flow are observed in Beaver Creek between monitoring stations SS-7 and SS-8. The decrease is most prevalent during the low flow season. This losing stream section may occur due to either alluvium, fracture and fault systems or other unknown factors.

The operator discusses the annual variability of flow in Beaver Creek. Although there is annual variability, the variability in base flow related to snowfall and possibly spring run off would provide more significant information. Snowmelt survey and precipitation information, where available, should be used to compare annual base flow changes with the precipitation rates.

Jewkes Creek drains a watershed area slightly greater than 1 square mile and discharges to the North Fork of Gordon Creek. The operator has referred to this stream as intermittent. The flow data submitted indicate that normally the creek flows all year at Sampling Point 5, but becomes intermittent at Sampling Point 3. The flow diminishes in a downstream direction beyond sampling point SS-5, infiltrates into the alluvium and does not reappear immediately downstream according to information in the PAP. Water may reappear one half mile down stream in the North Fork Gordon Creek where the Mancos shale outcrops. A potential reason for the diminished flows in this area may be due to recharge of subsurface soils in the riparian area near this monitoring site. Characterization, by collecting water quantity data and by observation in the North Fork of Gordon Creek, to determine whether this stream re-emerges as constant flow downstream should be made.

The North Fork of Gordon Creek flows along County Road 290 southeast of the permit area. The elevation of the creek is lower than the Hiawatha coal seam. The operator suggests the mining of the Hiawatha would not affect the quantity or quality of flow in the North Fork of Gordon Creek. However, the operator has shown the Spring Canyon Aquifer below the Hiawatha coal seam contains water and mining might reduce the piezometric water elevation potentially affecting the surface water in this stream. Discharge from the Star Point aquifer to this stream section should be determined. Losing and gaining reaches in this section of the stream should be identified.

The proposed Mine Plan as shown on Plate 3-3, illustrates a proposed lease area to the north and east of the currently designated permit area. The surface water descriptions and baseline information for the permits adjacent areas have not been presented. The operator's future mining operations are proposed to take place under Sand Gulch and an unnamed drainage to the north. No baseline information was collected for this area. In addition, Plate 3-3 shows the major fault systems which run northeast and southwest of the proposed mine operations. This fault system should be used to describe the geologically defined adjacent area. The graben and fault system appears to extend all the way up to Jump Creek. Additional baseline information will be necessary to permit this site in the future and may be necessary to complete the CHIA. Further baseline sampling should focus on the springs and surface waters potentially impacted through intercepting water from faults and fractures and diverting. Baseline information should extend to Jump Creek until adequate information is supplied to the Division to consider Jump Creek outside of the adjacent area.

Table 2.4
Baseline Surface Water Sampling

Sampling Point	Location	Flow	Water Quality	Comments
#3 1993 through 1995	Channel in Jewkes Creek /below disturbed area upstream of the intersection with the North Fork of Gordon Creek and below the surface facilities.	Intermitte nt	TDS 388 to 799 mg/l. Total Fe <0.02 to 8.7 mg/l Total Mn <0.01 to 0.05 mg/l TSS <1 to 72 mg/l pH 6.25 to 9.5	Information presented in the text does not match the data in appendices
#5 1993 through 1995	Jewkes Creek upstream of disturbed area but downstream of the confluence with Spring Two Canyon.	Perennial	TDS 198 to 550 mg/l. Total Fe .05 to 3.9 mg/l Total Mn 0.05 to 1.0 mg/l TSS 1 to 245 mg/l pH 6.7 to 8.99	Information presented in the text does not match the data in appendices

Sampling Point	Location	Flow	Water Quality	Comments
#6 1991 through present	Right Fork North Fork Gordon Creek In the east Drainage above proposed portals and disturbed area	Ephemeral	Removed from proposed monitoring schedule. Samples were never obtained.	This should be monitored on the same day as sites 3 and 7 when sampling during a precipitation event or snowmelt period
#7 1991 through present	Beaver Creek above pond upstream of the proposed future permit area outside of potential subsidence zone?.	Perennial	TDS 216 to 353 mg/l. Total Fe 0.05 to 5.19 mg/l Total Mn <0.1 to 0.19 mg/l TSS <1 to 297 mg/l pH 6.0 to 8.54	Beaver Creek tends to have a lower TDS than Jewkes Creek.
#8 1991 through present	Beaver Creek station downstream, does not appear to be downstream of potential impact area for future mine plan.(see Plate 3-3 and 7-1).	Perennial	TDS 192 to 357 mg/l. Total Fe <0.02 to 1.3 mg/l Total Mn <0.01 to 0.078 mg/l TSS 4.0 to 52 mg/l pH 6.6 to 8.69	Flows tend to be lower than the upstream Beaver Creek station. Located near the Fault system.
2-2-W	Gordon Creek above confluence of North Fork Gordon Creek below the Hiawatha	Perennial	Not discussed.	Impact more likely to be below confluence because of fracture system.

Sampling Point	Location	Flow	Water Quality	Comments
2-3-W	Beaver Creek	Perennial	Not discussed	Monitored by Beaver Creek Coal. Not found on any map
2-4-W 1982-	Beaver Creek 1 -1/2 mile west of permit area	Perennial	Not discussed	Monitored by Beaver Creek Coal.

The operator has not adequately discussed the variation in the data presented as baseline information. Data presented in the text does not reflect data presented in the appendices.

Baseline cumulative impact area information

The Division will make a finding of the cumulative impacts when the Mining and Reclamation Plan is complete.

Modeling

Actual surface and ground water information is supplied in this application; therefore, modeling is not proposed. No surface water modeling has been conducted.

Alternative water source information

In Section 7.1.6 the operator purports no significant impacts are foreseen to ground water as a result of mining in the permit area. In Section 3.4.3, page 3-18, the operator states, "As noted in Section 7.1.6, alternative sources will be developed and provided if water rights or uses are affected by mining operations," however, no discussion on alternative sources were presented in this section. Section 3.4.3 states, "Should Horizon's mining activities cause an adverse impact on the areas water supply, the operator intends to mitigate the effects. The mitigation will be negotiated between Horizon and the injured party."

Because "Alternative Water Source Information" applies to Surface Mining and Reclamation activities under R645-301-727 there are no requirements under this regulation as it applies to underground mining. However, the operator is required to notify the Division of Oil Gas and Mining when analysis of any groundwater or surface water sample indicates non compliance with the permit conditions, which include the performance standards under 752.220 through 752.250. The Division of Water Rights and other agencies may also request notification should a water use be disrupted.

Information provided in the PAP indicate the water rights applied for are a leased right and not an acquired right. Therefore, the operator would not be able to replace a right with these sources should diminution or quality of a water right be impacted through mining activities.

In the MRP, Section 3.4.3, the operator should remove the reference to discussions found in Section 7.1.6, regarding replacement of water rights, since there are no such discussions. The operator should cross reference Section 3.4.3, which describes the actions to be taken should loss of a water right use result from mining activities under Section 7.1.6 in order to provide a clear plan. The requirements under R645-301- 731.223 and 731.212, should be addressed. The operator should provide a plan which clarifies who will be notified should it be known that a water resource has been impacted by mining activities

Probable hydrologic consequences determination

Acid- and Toxic-Forming Material

Operational Monitoring and Identification of Acid- and Toxic-Forming Materials

The operator has not provided a specific discussion for the potential for acid and toxic forming materials under the Probable Hydrologic impacts. However, the operator provided the following in other sections of the plan:

1) Disposal of waste rock from partings and splits will be in underground workings. No acid or toxic forming materials are present in the overburden or underburden for samples analyzed (Section 6.5.7.1), suggesting no acid or toxic forming materials will be in the partings. The waste rock will be backfilled and compacted after second mining subsidence occurs and the waste rock will not be saturated, thus, water quality would not be impacted (Section 3.3).

2) If underground waste cannot be blended, sold, or gobbed, arrangements will be made to dispose of this material in permitted refuse piles at a nearby mine.

3) Noncoal waste rock from initial development will be incorporated as fill in the mine yard (Section 3.3).

Table 6-5 summarizes the quality of the Hiawatha Coal seam. The acid base potential of each of the three coal samples collected from the HZ-series holes indicate the coal has a potential to be acid-forming (Section 6.5.6). Coal will be stored on the surface for short periods and run off from the coal stockpile will be routed through the sedimentation pond where it will mix with run off water that is more alkaline.

Tests for acid and toxic forming materials were conducted on roof and floor samples in LMC-4 and HZ drill holes. One sample contained a high pyritic sulfur content of 0.24 percent. The operator suggests this pyritic sulfur content is likely of limited areal extent. This information conflicts with the statement in Section 6.5.7.1.

In Section 6.5.6, the operator has presented analysis from a core sample of the coal obtained from the Hiawatha Seam, drill hole LMC-4. The presented analyses has a sulfur content of 0.47% of which 0.04% is Pyrite Sulfur with Marcasite, 0.038% Pyrite and 0.002% is Marcasite.

All of the coal will not be removed from underground. Much of this coal will be in contact with air and water during the mining operations and may cause a lowering in the pH of those waters. Currently water from the old Blue Blaze No.1 Mine workings are shown to have a pH of 6.8 to 7.66. In general, these are lower than the surrounding area pH values.

Acid forming discharges have been uncommon and are generally not regionally extensive. Should the presence of pyrite in the mine area cause a decreased pH locally the mixing with higher pH waters in the system would result in localized affects due to downstream buffering.

Where material is trucked to permitted refuse piles at a nearby mine, the acid and toxic characteristic of this material, should be known at the permitted mine receiving the waste.

Potential Groundwater Impacts

The operator indicates inter basin transfer out of the Price River drainage cannot occur in this region. However, inter basin transfer between Beaver Creek and Gordon Creek could occur. Because the coal seams dip away from the portal entrance, flow is likely to be sumped underground and could be directed toward the fault systems to the northwest, however, the operators information indicates the Piezometric surface for the Star Point regional aquifer is to the east southeast. Flow will occur in the direction influenced by the prevailing geologic controls which are not definitively known at this time.

The control of faulting on groundwater flow can be seen by comparing the potentiometric surface map to the geologic structure. The operator indicates that due to low permeability, and due to the plan to avoid mining into faulted zones, in flow to the mine from faulted zones is projected to be minimal (Section 7.1.2.2). Discussions on how the faults will be avoided were not presented.

The operator has concluded that the Hiawatha coal seam will be saturated from the beginning of mining operations. The rate of inflow will depend primarily on whether a faulted zone is encountered that contains groundwater in storage or that is in connection with an overlying perched aquifer. Although the possibility of a significant sustained inflow occurring is probably low to moderate, the actual potential impact from intercepting a fracture reservoir and depleting or intercepting the flow is moderate to high. A resulting loss of head could disrupt stream and spring flows and possibly recharge the fracture zone down dip to the north east or in the direction of regional flow to the east southeast.

Changes in quantity and quality to spring and surface water discharges associated with the faults could be the result.

Waste rock from the mining procedure is proposed to be gobbed underground and backfilled. Because the materials will have an increased surface area due to removal the potential impacts, should water and air come in contact with the materials, would be increased TDS (ions in solution) and potential acid and toxic formation. Data from a recent underground mine water sample from the No. 1 Mine is found in Chapter 7 and may be indicative of some potential water quality changes. See the section above on **Acid and Toxic Forming Materials** in this TA.

Section 3.3.1, Plate 3-3, does not show all known and existing mine workings in the permit and adjacent area. These areas are critical to supporting documentation regarding the Probable Hydrologic Consequences of mining as it might relate to other mines v.s. the proposed Horizon Mine. The operator must include this information in the plan for all seams and mining in the permit adjacent area.

The operator states, "It is not anticipated that large quantities of ground water will be encountered throughout the duration of mining." The Division believes the potential for impact increases, if water is intercepted by mining through paleochannels associated with fractures, or a water bearing fault/fracture system is intercepted by mining activities. The potential for impact appears to be highest if fracture associated flows in the Hiawatha Seam are intercepted as occurred in the Beaver Creek Coal Mine.

The operator has estimated the "worst case" potential inflow through a porous formation (exclusive of fracture flows) to be $2.6 X10^{-4}$ and to have an average potential inflow of $1.5X10^{-4}$. Or, a flow rate of 9 and 5 gpm per section. Assuming six sections the total potential inflow would vary between 30 and 54 gpm. This information assumes a worst case scenario between 270 to 130 feet of head. Therefore, the potential is that a decrease of head in the Star Point aquifer of between 270 and 130 feet could occur over time. The extent to which this affects the adjacent area is limited to the interaction of the members along the fault zones and determination of discharge areas. The aquifer may be dewatered within the graben without interaction with the fracture/fault related waters or, may affect the waters associated with the fault system.

Potential Surface Water Impacts

On page 7-22, the operator states that proposed mining operations will occur north of Gordon Creek and should not effect the quantity or quality of water in this drainage. However, it was noted that approximately 400 g.p.m. inflow was produced from the floor when mining the Hiawatha Seam. This information, along with the dewatering estimates discussed above under the *Potential Groundwater Impacts* of this T.A., indicate there may be a potential to intercept groundwater flow from below the Star Point below the Hiawatha Seam. This flow interception could impact base flow to Gordon Creek, or relocate the source of the flow. Supporting information can be determined by assuming the control point for the piezometric surface would likely be at the elevation related to the dip. With a dip of 5.3% to the

northwest an outcrop elevation of approximately 7,600 and a maximum linear distance down dip of 5,000 feet the zone of influence most likely to be impacted below the Hiawatha Seam would be from approximately 7,600 ft to 7,335 ft. This is also within the range of the piezometric surface of 7,500 and is in the general direction of the assumed groundwater flow. Water quantity, water quality, and losing and gaining sections for reach segments should be determined for Gordon Creek above and below this section. A continuous recording flume is recommended for operational monitoring if the characteristic of the stream is determined to be potentially impacted.

The operator indicates the water associated with the Beaver Creek Coal Company No. 3 Mine is believed to be in communication with Beaver Creek and will be avoided when mining the proposed Horizon No. 1 Mine. Avoidance will occur by closely monitoring the activities in the fault area. The operator has not demonstrated why they believe the communication with Beaver Creek exists and has not provided a monitoring plan which addresses this potential impact.

Subsidence Control and Renewable Resource Protection

The Stream Buffer Zones will be maintained beneath Beaver Creek and the North Fork of Gordon Creek should mining proceed beneath either creek (Section 3.3.2.2).

The proposed stream channel buffer zone is shown on Plates 3-3. Retreat mining will not occur under those areas shown to be within the buffer zone. A discussion on the width of the buffer zone was not found. The operator has stated that mining is designed to preclude subsidence of perennial and intermittent steam reaches. Specifics to the statements regarding these buffer zone areas could not be located. However, comments made by the operator suggest that massive sandstone units make it unlikely that subsidence will reach the surface, and swelling shales in the overburden would have a tendency to heal fractures.

According to the operators subsidence plan a measurable subsidence effect would include a marked decrease in flow of 30%. In order to determine whether a marked decrease in flow occurred frequent monitoring would be required. The operator should describe how the monitoring plan monitors for this potential impact.

The operator suggests the following reasons indicate potential for damage due to subsidence will be low because no noticeable mining subsidence has occurred in the Gordon Creek #2 area (mined over 40 years ago) and in the Consumers No. 3 Mine, Section 3.2.3. The following areas were previously mined beneath Beaver Creek

- Swisher Coal Company mined under Beaver Creek in the northern most west panel of the Castle Gate "A" seam in January 1978. Overburden is approximately 650 ft.

- Beaver Creek Coal company mined under Beaver Creek in the "A" panel in September 1981. Overburden was approximately 425 feet.

Although longwall mining subsidence occurs immediately following mining, room and pillar subsidence may not occur for a long period of time. The proposal to monitor subsidence annually for two years following cessation of mining is probably adequate for determining immediate subsidence response. However, prior to bond release the lack of, or presence of, subsidence should be confirmed.

Statements in the PAP indicate that if significant inflow of groundwater occurs mitigation measures may include; attempts to seal the inflow, increased monitoring program, lining the stream bed through an effected area, and replacement of water, should it be indicated through monitoring to be mining related (Section 3.4.8.2). In Section 3.4.8.4, the operator commits to notify the Division in writing and begin implementation of the approved mitigation plan if adverse impacts to Beaver Creek are noted as a result of mining. The operator will be encouraged to complete short term mitigation measures such as sealing the flow from in the mine. However, Division notification should occur as soon as possible and coordination with concerned parties may be necessary prior to approval of a site specific mitigation plan.

Water Use

"Water will be pumped from the North Fork of Gordon Creek into the mine for use in dust abatement." Based on the predicted inflow information the operator has estimated approximately 31 acre feet per year will need to be pumped into the mine, while it is estimated that 41 acre feet will be removed with the coal each year. The water rights applied for by the operator exceeds the predicted water needs.

Sediment Yield

The potential for increased suspended solids and sediment loading to Gordon Creek is probably highest during the construction phase of operation and reclamation. The operator has committed to monitor for turbidity of the water upstream and downstream of the site during the construction phases. A criteria for Class 3C allows a turbidity increase of 15 (NTU).

Increases in sediment during the operational period will be minimized through the use of a sedimentation pond and drainage controls. The operator has also committed to store snow in sites that will directly drain to the sedimentation pond (Section 3.3). During the reclamation period it is not clear whether alternate sediment control measures or sedimentation pond measures will be used.

During the past four years logging activities have taken place in the Beaver Creek area on Stamatakis property. Logging and transport activities have disturbed substantial areas along the roads and riparian areas of Beaver Creek, the North Fork of Gordon Creek and Jewkes Creek. Trees are removed from the property and transported out over the county road which connects to State road 139,

the North Fork of Gordon Creek. There have been no Best Management Practices for logging conducted on this logging site. Sediment yield from the logging sites and roads have been substantial. During the summer of 1997 the team conducting a subsidence noticed areas logged down to the Beaver Creek without a protection barrier. Sediments from the logging sites and access road flowed directly into the creek. Trees and branches littered the side of the creek. The dirt road along Beaver Creek was ground to a fine powder, in some places as much as 1 foot deep. The point bars and bottom of Beaver was covered with silt.

Logging continued during the winter months. As roads became muddy, the logging company used a graders and bulldozers to excavate the muddy layers which were pushed in mounds above the roads and creeks, where they could easily flush into the creeks (Beaver Creek, a tributary to the North Fork of Gordon Creek and Jewkes Creek). Sediment loading into the creeks will likely continue until logging is completed. Operational monitoring could show significant changes in water quality and aquitic wildlife levels as a result of the logging practices.

Surface Water Quality

Currently coal mining waste may exist near Test Pit No. 8. This waste (potentially 9,718 cubic yards) is proposed to be stockpiled adjacent to the coal stockpile and blended (Section 3.3.2.7). The operator has stated that if acid and toxic materials remain on site they will be buried by 4 feet of cover. Currently water moves through the fill and seeps toward Jewkes Creek. The water quality of this site is likely to be improved with the proposed reclamation measures.

The operator should provide a discussion on potential changes in water quality based on data obtained from the Blue Blaze in mine waters. Based on impacts from other mining operations the potential for increased TDS is likely in the permit area. The operator sites downstream increases in TDS when flowing over Mancos as a factor in considering impact as minimal. Because downstream waters are naturally degraded the use and quality of the upstream waters retains its importance. However, impacts to downstream waters would probably not be notable.

The road to the mine is maintained as a gravel road therefore the use of road salting is not likely to affect water quality.

Hydrocarbons

Horizon Coal indicates Diesel fuel, oils, greases and hydrocarbon products will be stored aboveground and may be spilled in the mine and on the surface during mining operations. An above ground 5,000 gallon diesel fuel tank will be located between the coal stockpile and the truck turn around as indicated on Plate 3-1 (review plate for proximity to surface water). A shop maintenance area will be located next to the mine office area.

The operator proposes the berm surrounding the tank will be adequate to contain the total volume of the tank, in the event water needs to be drained from the berm. The operator indicates spills will be handled in accordance with the Spill Prevention Control and Countermeasure (SPCC) Plan. This plan is provided in draft form without a certified signature in the PAP under Appendix 7-8. Elements of the plan include:

- Visual inspection of all tanks, associated valves piping and containment areas.
- Notification to the Mine Manager and containment of the spill
  Reporting requirements for spills.
- Procedures for preventing spills during filling tanks.
- A copy will be maintained on file in the Mine Manager's Office and the Mine Engineer's office.

The operator's proposal uses accepted practices for their SPCC plan. The operator should include; clean up procedures for small scale spills, commit to retain absorbent materials on site and, should provide either a concrete containment structure with a drain or provide for disposal and sampling of the earth material below the fuel tanks and areas of hydrocarbon use.

The operator can provide additional reasonable operation measures to minimize hydrologic impacts on and off the permit area.

Flooding or Streamflow Alteration.

The operator discusses the potential for flooding as being diminished due to the sedimentation pond reducing peak flows. In addition to the operators comments, it is likely that the water flowing through the culvert will have increased flow velocity over the natural velocities for the same discharge rates. A potential impact includes downstream erosion. The operator has provided riprap channel designs for the velocities than may occur from a 100 year- 6 hour event which meets the minimum regulatory requirements. Other potentials for streamflow alteration are discussed under Potential Surface Water Impacts and Potential Groundwater Impacts.

Findings:

The operator has submitted sufficient information to address this section.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.24, 783.25; R645-301-323, -301-411, -301-521, -301-622, -301-722, -301-731.

Analysis:

All of the plates in the plan, including the resource information maps listed in this section, consist of, or are based on, old Swisher Coal Company maps. The plates were created originally as part of the mine plan for the proposed Blue Blaze operation. They were revised in 1990 to include the proposed permit and disturbed area boundaries, the proposed surface facilities, additional geologic information, and other information relevant to that operation. They were again revised in early 1996 to correct some inconsistencies in the permit area boundaries and to update them to the operator's format. All were certified in 1996, after their latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

Affected Area Boundary Maps

The affected area, as defined by R645-100-200, includes both the area of actual surface disturbance and the area above the underground mine workings, which might be affected by subsidence resulting from the underground mining operation.

The boundary of the disturbed area of the Horizon Coal operation, which includes; proposed as well as previous disturbance, is shown on Plate 3-1--Surface Facilities. The boundaries of all areas which are to be newly disturbed by this operation are also shown on Plate 3-6--Premining Topography and Plate 3-7--Post Mining Topography.

Mine Working Maps

The location and extent of all known abandoned underground mine workings, including mine openings to the surface within the proposed permit and adjacent areas, are shown on Plate 3-3-- Mine Plan. There are no active underground mines and there has been no surface mining within the permit and adjacent areas.

Monitoring Sampling Location Maps

The permit application package identifies that the location of all known seeps and springs, as well as watering ponds or tanks are shown on Plate 7-1. There are no streams, lakes or ponds or irrigation ditches known to exist within the proposed permit or adjacent areas. Both geologic and groundwater information were obtained from test borings done at sites designated LMC-1, LMC-2, LMC-3, and LMC-4. The locations of these sites are shown on Plate 6-1--Geology and Plate 7-1--Water Monitoring Locations.

Permit Area Boundary Maps

The permit area boundary is shown on Plate 1-1--Permit Boundary and on all other relevant maps.

Surface and Subsurface Ownership Maps

The topography of the proposed disturbed area is shown by contours on Plate 3-6--Premining Topography and by profiles on Plate 3-2--Premining and Operational Cross Sections. Plate 3-6 also shows the extent and nature of existing disturbance and all existing manmade structures.

Representatives of the Division visited this site several times in 1991 and 1992, in connection with the Division's review of the original Blue Blaze proposal, in order to observe the site and check the accuracy and completeness of the maps, which are identical to the maps found in the present plan. The Division found that the maps cited in this section--Plate 3-6--Premining Topography and Plate 3-2--Premining and Operational Cross Sections--accurately show the existing surface configuration of the proposed disturbed area, as defined in this section, and thus fulfill the requirements of this section.

Subsurface Water Resource Maps

The aquifers associated with the Castle Gate "A" seam were determined to be discontinuous over the area to be mined and therefore have not been mapped. Information for the Hiawatha seam is presently being gathered.

Surface Water Resource Maps

All surface and subsurface manmade features within and adjacent to the permit area are shown on Plate 3-1--Surface Facilities and Plate 1-1--Permit Boundary. These include the concrete ruins of several abandoned buildings, a substation, a short segment of power line which feeds the substation and continues to the west, a short, gravel surfaced segment of Utah State Highway 139, and an unimproved dirt road which starts at the state highway, crosses the southwest corner of the permit area, and continues to the northwest. There are no major electric transmission lines, pipelines, agricultural drainage tile fields, or occupied buildings in or within 1,000 feet of the permit area.

All boundaries of lands and names of present owners of record of those lands, both surface and subsurface, included in or contiguous to the permit area, are shown on Plate 4-1--Land Use and on Figure 4-1--Surface Ownership (page 4-4) and Figure 4-2--Coal Ownership (page 4-5).

Well Maps

There are no gas or oil wells within, and no water wells within or adjacent to, the proposed permit area, as shown by Plate 3-1--Surface Facilities and Plate 1-1--Permit Boundary. These maps, as stated above, show all surface and subsurface manmade features within and adjacent to the permit area. Three water monitoring wells were drilled in the area, IPA #1, IPA #2 and IPA #3, to monitor mine water levels. These wells are shown on Plate 7-1.

Findings:

The operator has provided sufficient information to address this section.

OPERATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

Soils at the site tend to be silty clay loam to loam within the Shupert-Winetti Complex and gravelly loam to loam within the Brycan, Rabbitex, Senchert and Curecanti Series. The SCS information the use of hydrologic groups B and C (undisturbed soils) are considered adequate. In cases where the soil phases were in group B or C the operator used group B.

The operator has used a CN of 89 for the undisturbed areas. This number is adequate at this time. However, should the operator propose additional buildings, road surfacing or pad surfacing the design CN would require re-analysis. The operator used a CN of 70 for the additional areas draining to the pond considered "undisturbed" by the operator. Some of these areas are disturbed from previous mining operations.

Groundwater Monitoring

Table 3.1
Operational Spring Water Sampling

Sampling Point	Location	Formation	Monitored Frequency	Water Parameters	Comments
SP-1	Channel in North Fork of Gordon Creek/Marakis spring	Blackhawk Formation sandstone unit above coal seams	Quarterly (when accessible)	Flow/ Parameters Table 7-2	Spring sampling should be done at source when at base flow. Location relative to numerous springs in area is not identifiable on map.
SP-2 1989 through 1993	Right Middle Fork North Fork Gordon Creek Hillside out of Creek Bottom	Blackhawk Formation	Quarterly (when accessible)	Flow/ Parameters Table 7-2	Spring flows through alluvium below the point of origin.
SP-4 1989 through 1993	North Fork Gordon Creek Drainage bottom	Not presented	Quarterly (when accessible)		
SP-9			Not discussed		

Table 3.2
Operational Groundwater Sampling

Sampling Point	Location	Frequency	Water Quality Parameters	Water Quantity	Comments
Sustained in mine flows as close to point of issuance as possible	where exceeding 1 gpm for at least 30 days	Quarterly while accessible	Identified in Table 7-2	yes Table 7-1	2 year review period
Discharged mine water	If necessary treated in underground sumps or the Sedimentation Pond. Currently not expected and not a permitted activity. Will need permit approval if it occurs.	In accordance with permit.	In accordance with permit.	In accordance with permit.	Should be conducted in accordance with UPDES permit according to emergency discharge clause.
Well HZ-1 HZ-1S HZ-2 HZ-3	Completed into the Star Point Sandstone	Quarterly while accessible	none proposed	Water level corrected to depth from ground surface	

The operator committed to submit quarterly and annual reports. These reports should be in the format required by the Division memo regarding annual report submittals, as is forwarded to the operators under R645-301-742.420. The operator is required to provide the information requested by the Division. The operator includes a commitment to notify the Division if data indicate a noncompliance with permit conditions.

The operator has not adequately described how surface data sites will be used to determine the PHC of mining. The operator has stated that springs monitoring data will provide information or impacts to localized perched aquifers within the Blackhawk Formation. It is established that these aquifers are associated with fault systems. The description of monitoring based on hydrologic impacts should be further expanded upon. Similar information will be obtained by monitoring inflows. The HZ

monitoring wells will assist in evaluation potential losses of ground water from the Blackhawk Formation/Star Point Aquifer. See discussions under **Environmental Resource Description, Hydrology**.

Surface-Water Monitoring.

Specifics in monitoring during the construction period were included and the operator has committed to collect weekly samples during the operational and reclamation construction period up stream and downstream of construction. The parameter is to be analyzed in the field is turbidity.

Proposed operational surface water monitoring is summarized in the following table:

Table 3.3
Operational Surface Water Monitoring

Sampling Point	Location	Flow	Water Quantity and Water Quality	Water Quantity	Comments
#3	Channel in Jewkes Creek /below disturbed area upstream of the intersection with the North Fork Gordon Creek and below the bypass culvert	Intermittent	Quarterly According to Table 7-5	Quarterly	
#5	Jewkes Creek upstream of disturbed area but downstream of the confluence with Spring Two Canyon.	Perennial	Quarterly According to Table 7-5	Monthly	
#6	Portal Canyon Drainage and Spring Two Canyon Drainage	Ephemeral	Not proposed	Not proposed	These sites should be monitored on the same day as sites 3 and 7 when sampling during a precipitation event or snowmelt period

Sampling Point	Location	Flow	Water Quantity and Water Quality	Water Quantity	Comments
#7	Beaver Creek above pond upstream of the permit area outside of potential subsidence zone.	Perennial Monthly	Quarterly According to Table 7-5	Late Spring gpm Late Summer/Fall gpm	
#8	Beaver Creek downstream north east of permit area. Out of potential subsidence zone.	Perennial Monthly	Quarterly According to Table 7-5		Bear Creek is dry below surface water monitoring point 8 as shown in Appendix 7-5 "Historic Mine Development" map 8. This section of the stream is affected by the Fish Creek Fault and Graben.
2-2-W	Gordon Creek above confluence of North Fork Gordon Creek below the Hiawatha	Perennial Monthly	not proposed		Impact more likely to be below confluence because of fracture system.
2-3-W	Beaver Creek	Perennial Monthly	not proposed		Currently monitored by Beaver Creek Coal previously proposed to be monitored by Horizon. Not found on any map
2-4-W	Beaver Creek 1 -1/2 mile west of permit area	Perennial Monthly	not proposed	Flume installed	Currently monitored by Beaver Creek Coal previously proposed to be monitored by Horizon.

Surface-water monitoring

Discharges of water from this operation will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U. S. Environmental Protection Agency set forth in 40 CFR Part 434. See Sections 731 and 742.

Acid and toxic-forming materials

Drainage from acid and toxic-forming materials and underground development waste into surface water and ground water will be avoided by implementation of a Spill Prevention Control and Countermeasure (SPCC) Plan and by the following:

Potentially acid or toxic-forming materials will be identified by use of Material Safety Data Sheets (MSDS), or by direct sampling and analysis in the case of underground development waste.

The operator has indicated that overburden and underburden samples will be gathered at 2,000 foot intervals throughout the mine and tested according to the Division requirements (Section 6.5.7.1). The Division understands this statement to mean the operator will test the materials according to current division guidelines for acid and toxic forming materials. See further discussions under **Acid and Toxic** headings of this T.A.

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.

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.

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.

Transfer of wells

There are presently three monitoring wells on this permit. When these wells are no longer required, they will be sealed in a safe, environmentally sound manner in accordance with regulations .

Discharges into an underground mine

There are no plans to discharge any water into an underground mine.

Gravity discharges

Based on historical data from other mines in the area, some mine water can be expected to be encountered during the mining operation. Typically, such water is stored in "sumps" or designated areas in the mine and used for mining operations or discharged to the surface.

Water quality standards and effluent limitations

Any discharge will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

Appendix 3-7 provides information about the Utah Pollutant Discharge Elimination System (UPDES), general discharge permit for coal mining. The UPDES discharge permit UTG 040019, became effective July 15, 1999 and will expire on April 30, 2003. Two sites are identified under the permit, outfall 001, minewater discharge from the sedimentation pond to Jewkes Creek and 002, mine discharge outfall to Jewkes Creek, which indicates the Department of Environmental Quality (DEQ) accepted the use of sumps for treatment of minewater.

With the minewater being directly discharged to the bypass culvert. It will be difficult to determine the visual permitting requirements as the discharge will mix with Jewkes Creek water before exiting the bypass culvert. Additional monitoring requirements required by the Division included: 1) collecting quarterly monitoring data from locations upstream and downstream from the disturbed area within a reasonable time on the same day, the minewater discharge sample is obtained, and 2) monitoring for the monthly maximum discharge flow rate as well as providing in-mine water consumption estimates.

The operator included a commitment to monitor discharge 002 on the same day during the quarterly sampling of surface water sites SS-3 and SS-5 according to the monthly UPDES discharge permit to meet the Divisions Requirement. The maximum flow for the discharge point each month required by the UPDES permit.

Information on mine consumption was provided as an estimate for full production. Information providing an estimate of use for each month during production was what was intended by the requirement to get a better idea on total minewater inflow. The monthly estimates can be incorporated during future mine plan amendment changes.

Diversions

Undisturbed

All diversions will be constructed and maintained to comply with the requirements of R645-301-742.100 and R645-301-742.300. Details are described under those respective sections of this chapter.

Culvert details are provided in Chapter 7. Undisturbed area culvert UC-1 will receive bypass drainage from culverts UC-2 and UC-3, Portal Canyon and Jewkes Creek. The culverts are designed to pass the peak flow resulting from the 100 yr.- 6 hr. precipitation event. Calculations supporting these designs are presented in Appendix 7-4. The combined discharge for the two drainages that will be passed through UC-1 is 27.9 cfs. The 100 yr.-6 hr. peak flow to reach UC-2 is calculated to be 8.3 cfs, and the peak flow calculated at UC-2 is 19. 6 cfs. Culverts

Calculations indicate that the flow capacity of the unaltered Jewkes Creek is 27.7 cfs above culvert UC-3 and 38.7 cfs below UC-1. The design capacities of the two culverts are 69.5 cfs and 100 cfs, respectively. The capacities of the culverts exceed the expected high capacity of Jewkes Creek. Culvert capacity for UC-2 is calculated to be 83 cfs. This capacity exceeds the Portal Canyon capacity of 13.1 cfs above the culvert in its unaltered state.

A trash rack has been installed on culvert UC-2. A generalized drawing of the trash rack is shown in Figure 7-8. There is no mention of a trash rack installed on UC-2 and no mention of a face protection at the culvert inlet. These culverts are temporary and will be removed during the reclamation phase.

Undisturbed diversions are described in the following table. All undisturbed and disturbed diversions are designed to carry the flow from a 10-year, 6-hour event. Culverts UC-4 and UC-5 receive drainage coming from the Jewkes Creek, an intermittent stream, designed to carry the flow from a 100 year - 6 hour event. The operator provided culvert sizes that may carry greater flows than the designed flow for the 10-year, 6-hour event.

Table 3.4
Undisturbed Drainage Diversions

Diversion	Ditch (D) or Culvert ©	Diameter (culvert)	Function
UC-1	**C**	**24"**	**Collects flow from UD-4 and UD-5 and Portal Canyon and routes it into UC-3.**
UC-2	**C**	**36"**	**Collects flow from UD-3 and routes it into UC-3.**
UC-3	**C**	**36"**	**Collects flow from UC-1 and UC-2 and routes it into UC-5.**

Diversion	Ditch (D) or Culvert ©	Diameter (culvert)	Function
UC-4	C	24"	Collects flow from UD-2 and from Left Fork North Fork and routes it into UC-5.
UC-5	C	24"	Collects all undisturbed flow from UC-3 and UC-4, bypasses sediment pond, and discharges it into main drainage.
UC-6	C	42"	Carries flow of main drainage (all undisturbed flow) beneath haul road and into Gordon Creek drainage.
UD-1	D	--	Collects runoff from area above topsoil stockpile and routes it into road ditch of Carbon County Road 290.
UD-2	D	--	Collects runoff from above coal stockpile and handling area and routes it into Jewkes Creek above UC-2.
UD-3	D	--	Collects runoff from area above the portal area on south east side of Portal canyon and routes it along the south and east side to a natural channel below the operations then to Jewkes Creek.
UD-4	D	--	Collects runoff from area above the portal area on the north side of Portal Canyon to the disturbed area below the operations.
UD-5	D	--	Collects flow from above the disturbed area in Portal Canyon and routes it into bypass culvert UC-1.

Disturbed area diversions are designed to handle the 10-year, 6-hour event and are described in Table 7. Many of the undisturbed drainage ditches are proposed to be designed with an elevated berm adjacent to the ditch. Most of these berms are located where undisturbed drainage is routed around the mine site. While most disturbed area diversions built with a berm are less likely to be an environmental problem, because drainage would sill reach the pond if there was a failure, failure of a bermed undisturbed area ditches would send water to the sedimentation pond which is not designed to receive and treat those waters. More prudent designs, including improved grading plans, could be conducted to meet the design requirements rather than building elevated berms for water control. Since the pond is designed to contain or treat the 10 year - 24 hour event, it would be prudent to design the undisturbed bermed diversion drainages to safely handle the flow velocity and volume from a 10 year -24 hour event.

If the ditches fail with a peak flow smaller than the 10 year - 24 hour event, the operator would have failed to adequately treat the run off from the disturbed area 10 year- 24 hour event through their pond.

The operator has provided a general channel configuration in Figure 7-7. The operator has stated that channel configuration may vary but the minimum cross sectional area will remain the same. While the channel may continue to meet design volume requirements with this statement, the stability of the design may not be prudent for slopes greater than 2:1 for certain geologic materials under certain conditions. It would be more prudent for the operator to provide a range of acceptable configurations through specific types of geologic materials and commit to maintain these ditches should they fall out of the acceptable range. Additionally, the typical designs do not match the descriptions provided for the ditches. The proposed designs are likely to require high maintenance. However, the operator has met minimum design requirement

Disturbed

There are five diversion ditches that collect the disturbed area runoff. Most disturbed area runoff will be directed to the sedimentation pond. Only two small areas at the upper end of the disturbed area will use alternative sediment control. Table 7-7 provides the sizing and characteristics of the disturbed diversions. Most of the disturbed area drainage will be collected by ditch DD-1, on the southwest side of the disturbed area. This diversion consist of eight segments. The location of diversion ditches in relation to the minesite are shown on Plate 7-4.

Disturbed area culverts are used in conjunction with the diversions to convey runoff beneath roadways and direct flow to the lower minepad. Table 7-8 provides the sizing and characteristics of the culverts on the minepad. Culvert DC-1 is 18 inches in diameter and was installed to carry runoff between DD-1F and DD-1G, under the access road to the temporary office and substation. Culvert DD-2, also 18 inches, was installed to convey runoff under the coal loadout and main facility roadway.

The operator considers any flow velocities less than 5 feet per second (fps) as non-erosive flows. However, in the literature there are values which indicate velocities less than 5 feet per second are erosive with earthen ditches that have erosive soil types. The operator has not considered soil type in the determination of erosive velocities. In some cases vegetation will be adequate to control erosion. Degradation and additional erosion control needs for drainages within the pad area draining to the sedimentation pond will be determined through site inspection. Where velocities exceed 5 fps designs must be implemented to minimize erosion.

Drainages are developed by the operator to route undisturbed drainage around the site channels. Drainages with slopes up to 0.5 feet/foot have failed when riprapped. Riprap design procedures were not based on slopes of this steepness. Adequate grading, fill and angular riprap and filter blanket designs are necessary. The operator has provided sizing for graded riprap but no filter blanket designs. It is the

opinion of the division that the operator has not minimized potential impacts to the adjacent area and undisturbed drainage slopes should be reduced where possible.

The proposed topsoil pile directs drainage from DD-3 to DC-2 into the sedimentation pond. No drainage designs specific to road drainage could be located.

Table 3.5
Disturbed Drainage Diversions

Diversion	Ditch (D) or Culvert ©	Diameter (culvert)	Function
D-1	**D**	**--**	**Collects runoff from entire No. 1 and No. 2 Mine areas and routes it into the sediment pond. according to Appendix 3-3 the portal bench will drain to D1**
DC-1	**C**	**12"**	**Collects runoff from area below the facilities pad and routes it beneath the haul road and into the sediment pond.**
DC-2	**C**	**12"**	**Collects runoff from the topsoil stockpile area and routes it beneath the haul road and into the sediment pond.**

Stream buffer zones

The operator has submitted a stream alteration permit to the Division of Water Rights. The submittal proposes a 3 foot and 2 foot culvert respectively in Jewkes and Portal Canyon. Comments on the proposal were due by May 19, 1996.

Sediment control measures

The operator proposes to begin site construction prior to installation of the sediment pond. During this period alternative sediment control measures are proposed to be used. Straw bales and silt fences are proposed to be placed in the stream channels of Portal and Spring Two Canyon Fork to capture sediment. Berms Straw bale dikes and Silt fences will be located between stream channels and areas being disturbed. The operator has committed to cleaning these structures once construction is completed using backhoes and shovels.

The culvert is proposed to be installed from the lower end of the pad in an upstream direction. Horizon Coal Company has committed to limit construction to periods when the stream is not flowing to

the extent possible. Stream flow will be bypassed around construction activities using a diversion dike and flexible culvert. The operator has committed to construct the sedimentation pond as soon as possible following construction of the downstream culvert sections and must obtain a stream alteration permit prior to approval.

The proposed measures for culvert construction are acceptable practices. The ability of these proposed measures to control sediment can only be judged in the field by inspection and technical staff and will be determined adequate based on the ability to meet the performance standards and requirements of R645-301-745.111.

Roads are proposed to be surfaced with 12 inches of crushed gravel road base. These roads are proposed to be crowned and therefore the east portion of the road from the crown at the south end to the limit of the sedimentation pond will drain toward the creek. The main access road will be 20 feet wide not to exceed a 6% vertical grade. Highwalls near the first bend will be 0.33H:1V degrees and 1.2H:1V following removal. Maximum embankment height is 100 feet at 40 degrees and maximum slope height is 50 feet at 32 degrees. Appendix 3.3 indicates the road will be sloped toward the disturbed drainage ditches. This conflicts with the road surfacing designs.

Ditch UD-2 receives extensive drainage from cut slopes as shown in Plate 3-7A, cross sections E, F, and G. These slopes are steep and can be significant sources of sediment. The operator has committed to provide erosion control matting and seeding according to Table 3-2, for all cut slopes which will drain directly to an undisturbed area diversion. As presented in Section 3.3.5.3 mulching and roughening will occur on areas before seeding where slopes are 2½:1 or less. The matting will be applied on slopes 2½:1 or steeper. It should be noted that where competent bedrock is exposed matting may not be practicable.

Currently this road is located on the east side of the stream and outside the permit area, and therefore is a potential source of additional sediment to the stream flow. The fan portal road is to be considered an ancillary road and will be cut into native materials without an engineered surface.

The topsoil is also proposed to be vegetated with interim cover as discussed in Sections 3.4.4.1, page 3-19 and Section 3.5.2. The piles will be contoured, fertilized and seeded. A berm will be placed around each topsoil pile to minimize soil transport. Prior to achieving adequate vegetation establishment other measures are necessary to control erosion.

Siltation structures

Sediment ponds and all other treatment facilities are defined as siltation structures. The two siltation structure at this site include Sweets Pond, a pond developed for water rights use, and the sedimentation pond. For a discussion of the mine site sedimentation pond, see the **Sedimentation Ponds** heading below.

Sweets Pond currently is associated with the Gordon Creek Mines 2, 7, and 8. This site would be double permitted until Gordon Creek has obtained bond release. Because this is an impoundment to be associated with the Horizon Mine appropriate regulatory requirements must be addressed.

Sweets Pond also has an existing pumphouse and a water gate to control inlet flows. The operator has proposed to build a water line from the pond to the mine. This should be included in the permit area as part of the disturbed area. The pond itself need not be part of the permit area for which bonding is required as described under the "Disturbed Area" and "Permit Area" definition in R645-100, as long as the structures are constructed and maintained in accordance with R645-301 and R645-302.

Sedimentation ponds

There will be only one sediment pond. The sediment pond will be a non-MSHA structure. The sediment pond will be inspected during and after construction by a qualified, registered, professional engineer. The pond will be inspected after each storm and cleaned as necessary. Its embankments will be vegetated, to control erosion, with a temporary seed mix as described in Section 3.5.5.2.

The operator has analyzed the pond embankment designs for stability. Using a standard, circular failure model and the Hoeck Circular Failure Charts, the operator has found that the pond embankments have a static safety factor of 4.81 for dry conditions and 4.44 for saturated conditions (Appendix 3).

The operator proposes to divert all disturbed area run off to the sedimentation pond, including the proposed north return air fan, receiving runoff from 10.7 acres (Appendix 7-4). The sedimentation pond will be mostly incised except at the downstream face, which will be an earthen embankment. The pond has been designed to contain the runoff from a 10-year, 24-hour precipitation event calculated to be 0.83 acre-feet. The permit area surfacing is described as a gravel parking lot. The full extent of gravel is not defined.

The operator has assumed sediment production of 0.05 acre feet/acre from the disturbed area. The operator has not provided a technical method or calculation to determine where the 0.05 acre feet/ acre comes from, Appendix 7-4. However, the final design allowed 1.48 acre-feet for maximum sediment storage, which is closer to 0.1 acre foot/acre per year sediment production for disturbed areas and is considered a conservative estimate. Although the maximum sediment storage is considered adequate at this time, if the operator should need additional increases in the sedimentation pond capacity the 0.05 acre feet/ acre will not be considered valid until demonstrated to meet standard through accepted design methods. The operator must remove the discussions of excess design capacity or provide technical design information.

The total capacity of the pond below its emergency spillway will be 2.3 acre-feet. The sediment will be cleaned out of the pond at 60% of the total sediment volume, or 0.88 acre-feet. The cleanout volume will be marked by a calibrated pole. One pole is generally not adequate to determine sediment

capacity because the sediment tends to be deposited in deltaic form at the inlets. The operator will be expected to maintain the capacity required for runoff volume.

The pond will also have a 2" decant pipe with a locking valve. Twenty-four hours after a storm, the pond is to be drained by opening the valve on the two inch decant line in the pond. This valve is to remain locked at all times except when decanting storm runoff. The inlet of the decant line is to be located at an elevation of 7576.0 feet, which is 24 inches above the 60% cleanout level and 3.4 feet below the elevation of the spillway.

Should the quantity of water encountered in mining exceed the amount required by the underground operations the operator proposes the water be treated by the sediment pond in order to meet effluent standards. This action may be used as an emergency measure but is not an approved design. The use of the pond for this purpose would need to be approved prior to handling any runoff which might exceed the design requirements.

The sediment pond's spillway is designed to pass the peak flow of the 25-year, 6-hour precipitation event. Calculations for the spillway assume the pond is full to the elevation of the spillway prior to the onset of the event. With a depth of 2.3 feet, a width of 10 feet and side slopes of 2h:1v, the spillway will have 2 foot of freeboard between the top of the pond embankment and the maximum flow elevation. The operator designed a non-erodible, open channel emergency spillway for which the outlet will have a riprap with a D50 of 4 inches. However, no filter blanket designs were included.

Although the spillway designs meet the requirements of a single -open channel spillway design under R645-301-743.00, the spillway does not provide the protection of aquatic life through providing an oil skimmer. Since this pond will be receiving oils and grease from the site the pond should provide for some type of oil skimmer.

Pond designs, maps and calculations have been prepared under the direction and certification of Richard H. White (State of Utah, Registered Professional Engineer #7102). The information and calculations contained in Appendix 6E are also certified by Mr. White.

The pond safety factor calculations assume an 11 foot embankment height and a slope angle of 2H:1V (26.56 degrees). The soils are assumed to have soil cohesion and friction angle of 35 psi and 30 degrees respectively, which results in a safety factor of 4.81 dry and 4.44 saturated conditions.

Other treatment facilities

Two small areas above the disturbed area have been proposed for alternate sediment control. One area is at the upstream end of the topsoil stockpile in Portal Canyon, adjacent to the inlet of Culvert UC-2. This area slopes toward the culvert and will be treated with berms and straw bales. The second alternative sediment control area is the exterior embankment slopes of the sedimentation pond, which will be treated with a combination of straw bales and silt fence.

Appropriate sediment control measures will be designed, constructed and maintained using the best technology currently available to prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area and meet the effluent limitations under R645-301-751.

Exemptions for siltation structures

No exemptions requested by the operator.

Discharge structures

The sedimentation pond discharge structure is discussed under Siltation Structures.

Impoundments

No other treatment facilities are planned for this operation.

Casing and sealing of wells

The operator has stated that approvals and permits to drill wells will be received from the Division of Water Rights and appropriate Government agencies. The final casing and sealing of wells is discussed in more detail in the section entitled **MINE OPENINGS** under **RECLAMATION PLAN** below.

Findings:

The operator has submitted sufficient information to address this section.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Analysis:

Affected area maps

The boundaries of the disturbed area, as well as those of its component areas of previous and proposed disturbance, are shown adequately on Plates 3-1, 3-6, and 3-7.

Mining facilities maps

The locations and approximate dimensions of all mine facilities are shown on Plate 3-1--Surface Facilities. Included on this map are all buildings, portals, fans and earthen structures (pads, cuts and embankments), both of the large main drainage bypass culverts, the mine supply substation adjacent to the main portals, the large main substation at the mouth of the canyon, the Main Haul Road, the Hiawatha Fan Portal Access Road, the conveyor from the mine, the coal storage and loading facilities, the topsoil storage area and the sediment pond. This plate was certified in 1996, after its latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

Design details of the sediment pond are shown on Plate 7-6--Sedimentation Pond Detail Map. This plate was certified in 1996 by Richard B. White, a professional engineer registered in the state of Utah.

Mine workings maps

The location and extent of all known abandoned underground mine workings, including mine openings to the surface within the proposed permit and adjacent areas, are shown on Plate 3-3-- Mine Plan. There are no active underground mines and there has been no surface mining within the permit and adjacent areas.

Monitoring and sample location maps

Both geologic and groundwater information were obtained from test borings done at sites designated LMC-1, LMC-2, LMC-3, and LMC-4. The locations of these sites are shown on Plate 6-1--Geology and Plate 7-1--Water Monitoring Locations.

Information on water quality and quantity was obtained from monitoring stations designated 1, 2, 3, 4, 5, 6, and 7. The elevations and locations of these sites are shown on Plate 7-1--Water Monitoring Locations.

Findings:

The operator has submitted sufficient information to address this section.

RECLAMATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.

Analysis:

Groundwater monitoring

Both geologic and groundwater information were obtained from test borings done at sites designated LMC-1, LMC-2, LMC-3, and LMC-4. The locations of these sites are shown on Plate 6-1--Geology and Plate 7-1--Water Monitoring Locations.

Information on water quality and quantity was obtained from monitoring stations designated 1, 2, 3, 4, 5, 6, and 7. The elevations and locations of these sites are shown on Plate 7-1--Water Monitoring Locations.

Findings:

The applicant has submitted sufficient information to address this section.

MAPS, PLANS, AND CROSS SECTIONS OF RECLAMATION OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-323, -301-512, -301-521, -301-542, -301-632, -301-731.

Analysis:

Reclamation monitoring and sampling location maps

Both geologic and groundwater information were obtained from test borings done at sites designated LMC-1, LMC-2, LMC-3, and LMC-4. The elevations and locations of these sites are shown on Plate 6-1--Proposed No. 1 & 2 Mine Geologic/Structure Map, Plate 7-1--Hydrology Map, and Plate 7-2--Drill Hole Data of the Horizon Mine Area. These plates were certified in 1996, after their latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

Information on water quality and quantity was obtained, and will continue to be obtained through final reclamation, from monitoring stations designated 1, 2, 3, 4, 5, 6, and 7. The elevations and locations of these sites are shown on Plate 7-1--Hydrology Map. This plate was certified in 1996, after its latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

Vegetation information was obtained, and will continue to be obtained through final reclamation, from transects done at locations designated A through E. These locations are shown on Plate 9-2--Vegetation Map No. 2. This plate was certified in 1996, after its latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

A network of subsidence monitoring stations will be established, subsidence data from which will be submitted to the Division with each Annual Report. Monuments will be steel rebar with

aluminum caps. There will be a total of 26 stations: four base stations and 22 monitoring stations, five of which will be above Beaver Creek . The locations of all subsidence monitoring stations are shown on Plate 3-5--Subsidence Monitoring Plan. Plate 3-5 was certified in 1996, after its latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

Findings:

The operator has submitted sufficient information to address this section.

CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Regulatory Reference: 30 CFR Sec. 784.14; R645-301-730.

A cumulative hydrologic impact assessment will be compiled when all deficiencies are addressed.

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