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State of Utah  
Division of Oil, Gas and Mining  
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Horizon Coal Company  
ACT/007/020  
Technical Analysis  
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## INTRODUCTION

This Technical Analysis (TA) is written as part of the permit review process. It documents the Findings that the Division has made to date regarding the application for a permit and is the basis for permitting decisions with regard to the application. The TA is broken down into logical section headings which comprise the necessary components of an application. Each section is analyzed and specific findings are then provided which indicate whether or not the application is in compliance with the requirements.

It may be that not every topic or regulatory requirement is discussed in this version of the TA. Generally only those sections are analyzed that pertain to a particular permitting action. TA's may have been completed previously and the revised information has not altered the original findings. Those sections that are not discussed in this document are generally considered to be in compliance.

## STIPULATIONS TO PERMIT APPROVAL

As determined in the findings of the Technical Analysis, approval of the plan is subject to the following Permit Conditions. Thus, the permittee is subject to compliance with these Permit Conditions, as specified, and in accordance with the requirements of:

### **R645-301-731**

The Permittee must: 1) characterize the quality and quantity of water at springs CC-5 and MC-4 by conducting quarterly monitoring of standard parameters (adequate to produce stiff diagrams) for a period of at least 2 years; 2) provide a description of the seasonal variation in water level of the HZ wells; 3) document in the Mining and Reclamation Plan that the necessary legal right to the proposed water uses has been acquired before using the water.

### **R645-301-742**

Prior to mine water discharge, the Permittee must either provide designs which demonstrate that the sedimentation pond will adequately pass and treat any mine discharge, or else obtain approval, in the UPDES permit, for an additional discharge point.

### **R645-301-731.121**

Prior to any discharge from the sedimentation pond, the Permittee must design and construct an oil skimming device for the pond.

### **R645-301-742.400**

Prior to construction of the operational drainages, the Permittee must: 1) provide designs which demonstrate that the drainage from the north side of the upper haul road will be adequately conveyed to Culvert DC-1; 2) provide designs which allow the road and the adjacent area (the area which drains to the north from the haulroad loop because of the crown of the road) to drain to the sedimentation pond; 3) provide designs which quantify the anticipated flow velocities over the outslope downstream from the ancillary roads and which adequately minimize erosion; and 4) determine the appropriate maximum discharge that should be passed through the water bars.

### **R645-301-742.300**

Within 60 days of permit issuance, the Permittee must provide reclamation designs which show the surface topography graded to drain to the channels, particularly in Portal Canyon.

**R645-301-742**

Within 60 days of permit issuance, the Permittee must: 1) correct all statements in the plan which are not consistent with a commitment to remove the sediment pond at Phase II Bond Release; 2) provide appropriate designs for silt fences and straw bale dikes which are used for sediment control in ditches and drainages (designs should take into account anchoring, height relative to heights of ditch tops, and spillways); 3) provide a clear and accurate plan between Chapters 3 and 7 for soil roughening and for the application of erosion control matting (especially important on slopes greater than 2h:1v); 4) provide a commitment in the plan to implement adequate erosion control measures, and to have the Division inspect and approve those measures, prior to removal of the sediment pond; 5) provide a detailed plan of the construction activities which shows the measures taken to minimize sediment transport from the site during reclamation. This plan should include timing and sequencing for the removal of the culvert system and must discuss regrading, topsoil placement, mulching and erosion control matting, and must include a commitment to complete reclamation of the Portal Canyon area prior to removal of the Jewkes Creek bypass culvert; 6) provide a discussion in the plan of the specific measures to be used to protect the site during a storm event if, during reclamation, there are short periods when construction is suspended; 7) provide a demonstration in the plan that, upon the establishment of the required vegetative cover, erosion will be controlled (the analysis should include the erosion production evaluated from the current vegetation standard as well as from the 71% riparian area standard).

**R645-301-353**

Within 60 days of permit issuance, the Permittee must amend the reclamation plan to show a reclaimed drainage through the Jewkes Creek area which will allow a reasonable likelihood of reestablishing the riparian/wet meadow vegetation which currently exists on site. At minimum the vegetative community must be of the extent shown on the maps in Appendix 9-2.

## ENVIRONMENTAL RESOURCE INFORMATION

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

### GENERAL

**Regulatory Reference:** 30 CFR Sec. 783.12; R645-301-411, -301-521, -301-721.

### PERMIT AREA

**Regulatory Reference:** 30 CFR Sec. 783.12; R645-301-521.

#### Analysis:

The permit area comprises approximately 345.5 acres. It is located entirely in Sections 8 and 17 of Township 13 South, Range 8 East, Salt Lake Baseline and Meridian, and includes Sweet's Pond. In addition to the permit area, the Applicant has obtained from the BLM several small parcels which make up a right-of-way, by way of which an otherwise inaccessible northern parcel will be mined.

Descriptions of the permit area are found on page 2-6 and in the newspaper advertisement in Appendix 2-2. In addition, the permit area is shown graphically on Plate 1-1--Permit Boundary, Plate 3-3--Five Year Mine Plan, Plate 3-5--Subsidence Monitoring Plan, Plate 4-1--Property and Land Use Map, Figure 4-1--Surface Ownership (page 4-4), Figure 4-2--Coal Ownership (page 4-5), Plate 4-2--Permit Area, Plate 6-1--Geologic/Structure Map, Plate 7-1--Water Monitoring Locations, Plate 7-2--Area Topography, Plate 7-3--Water Rights, Plate 7-5--Drainage-Operations, Plate 7-7--Drainage-Reclamation, Plate 8-2--Area Soils, Plate 9-1--Vegetation, and Plate 10-1--Wildlife. The BLM right-of-way is discussed and described in Appendix 2-3 and is shown on Attachment II of that appendix.

The permit area is represented accurately and consistently throughout the plan. The BLM right-of-way is delineated correctly and adequately in Appendix 2-3. Plate 3-3--Five Year Mine Plan shows the boundaries of those subareas for which it is anticipated that additional permits for mining will be sought.

#### Findings:

The plan fulfills the requirements of this section.

## **HISTORIC AND ARCHEOLOGICAL RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 783.12; R645-301-411.

### **Analysis:**

The proposed Horizon Mine site is the former site of the Consumers or Blue Blaze Mine. The Consumers Mine was developed in the 1920's. The community of Consumers had a four-story apartment house, a store service station and a post office. The Consumers Mine closed in 1938 and was again opened at a later date. By 1952, all of the Gordon Creek mines had shut down. Numerous features still remain from the old mine as described in Appendix 5-1, pages 27 to 34. Most of these features will be removed during the construction of the Horizon Mine.

In 1985, Desert West Research designated the Consumers site 42Cb517 and listed it as a potential nominee to the National Historic Register. Since that time significant impacts have occurred to the site. The Applicant's consultant, Baseline Data, Inc., concludes in its report (Appendix 5-1, page 37), that Title IV activities at the site have adversely impacted or removed major site features and have thus changed that determination of eligibility for nomination to the National Historic Register. Since other records such as maps, photos, and agency records provide information on the site, no mitigation should be required. In an October 24, 1995 letter to the Division and in a December 5, 1995 telephone conversation with Division representatives, State Historic Preservation Officer James Dykmann concurs with this determination that the proposed work will have no impact on historic properties.

### **Findings:**

Information provided in Chapter 5 of the plan meets the requirements of this section.

## **CLIMATOLOGICAL RESOURCE INFORMATION**

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

### **Analysis:**

Climate is discussed in the following areas within the PHC; Chapter 11, Soils Section, Biology Section, and in the Cultural and Paleantologic Resources Study Addendum (Appendix 5-1).

Climate information presented in the plan was obtained from three data collection sites in the surrounding area: the Skyline Mine (1993 data); the town of Price; and the town of Hiawatha. Climate variations at these sites are influenced by elevation and aspect. The Skyline

Mine lies in a high mountain canyon at an elevation of 8,710 feet; the town of Price lies in a river valley at an elevation of 5,700 feet; while the town of Hiawatha lies at an elevation of 7,200 feet. The proposed mine site is in a canyon at an elevation of approximately 7,600 feet. Climatic information, therefore, comes from sites which are slightly different from that of the proposed mine site.

In Chapter 11, the respective average annual temperatures are presented, for the Skyline Mine and for Price, as 37.7°F and 62.1°F. The respective average annual precipitation at Skyline is presented as 27.37 inches and at Price as 10.94 inches. At the Skyline Mine, 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.

According to the Soils Section, the average annual temperature at the proposed mine site ranges from 36°F to 45°F and the cumulative annual precipitation ranges from 12 inches to 30 inches. In the Biology sections the range of cumulative annual precipitation is presented as 16 inches to 20 inches.

The Cultural and Paleontologic Resources Study Addendum describes the prevailing climate using data from records compiled at Hiawatha, Utah. Hiawatha was used because its location on the east edge of the Wasatch Plateau is similar to that of the proposed mine site. Hiawatha has a mean annual temperature of 45.5°F and a mean annual precipitation of 14.5 inches for the period of record reported by the U.S. Department of Commerce in 1973. The town receives its highest precipitation in August, and averages 2 inches.

The plan contains no site-specific climatological data but, 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 Applicant set up a weather station at the site so that precipitation events can be correlated with other monitoring data.

**Findings:**

The Division finds that this information meets the minimum regulatory requirements.

## VEGETATION RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.19; R645-301-320.

### Analysis:

The Horizon permit area covers eight vegetative communities (page 9-2). The Oakbrush and Salina Wildrye communities combined make up over half the total acreage of the eight communities (Plate 9-1). The proposed new disturbance will be on areas that have been previously impacted by coal mining activities. Various degrees of mining-related impacts have occurred on the vegetation within the proposed disturbance. Therefore, the communities have been designated as: 1) slightly disturbed (altered) drainage bottoms; 2) moderately disturbed areas; 3) severely disturbed areas; and 4) wet meadow/riparian. Prior to disturbance, the drainages were probably dominated by sagebrush/grass/rabbitbrush communities with aspen, Oakbrush and fir in the deeper and more protected drainages. The slopes surrounding the drainages and valleys are now dominated by Oakbrush and Salina wildrye communities (page 9-12).

The total living cover for all areas, excluding the wet meadow, was 48 percent. The most prevalent species in total cover and frequency was rubber rabbitbrush, which comprised 22 percent of the total cover. Other dominant species included Salina wildrye, cheatgrass, big sagebrush, and mutton grass.

The Soil Conservation Service estimates that premining forage production rates were 950 lbs per acre for the sagebrush/grass/rabbitbrush communities and 900 lbs per acre for the Oakbrush/salina wildrye communities (page 9-7)

In the course of a wetlands determination site visit in August 1995, Rick Smith of the Engineering Planning Group determined that a wetland exists at the proposed site of the sediment pond. A map of the wetlands was prepared by Rick Smith and is shown in 9-2. The wetland/riparian area is approximately .42 acres in size (page 9-7). Further study and delineation was to be done as part of an application for approval to alter the wetland which was made to the U.S. Army Corps of Engineers (page 9-6). After looking at soil samples from the wetland the Corps of Engineers wanted the Division of Water Rights to visit the site and make a wetlands determination. Water Rights determined that the area was a riparian area and not considered a wetland. This statement should be qualified and restated that the area is not a Corps of Engineers jurisdictional wetlands. Riparian areas are considered to be a type of wetlands.

In the summer of 1996, Patrick Collins, Mt. Nebo Scientific, Inc., quantitatively sampled the wetland for the purposes of establishing a bond release standard. Dr. Collins describes the area as a riparian/wet meadow with 71 percent vegetative cover. The cover in the area was dominated by grass and grasslike species with perennial ryegrass comprising 21 percent of the

## TECHNICAL ANALYSIS

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cover. Native perennial species were present in the sampled wet meadow such as redtop, bluegrass long style rush, horsetail and sandbar willow. However, the presence of other species such as thistle, poverty weed, and perennial ryegrass reveals that the area is disturbed and in poor condition.

### **Findings:**

Information provided in the plan meets the requirements of this section.

## **FISH AND WILDLIFE RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 784.21; R645-301-322.

### **Analysis:**

Two major aquatic habitats occur within the Horizon Mine permit area (page 10-7), North Fork Gordon Creek and Beaver Creek. The Division of Wildlife Resources (DWR) states in a letter dated October 31, 1995 that Gordon Creek supports a population of Cutthroat trout and that they (DWR) plan to create a sport fishery there. Beaver Creek is ranked by DWR as being of substantial value as a salmonid fishery. The greatest value of both the Gordon Creek and Beaver Creek aquatic habitats is the water, cover, food and breeding sites they provide to a variety of terrestrial vertebrates (pages 10-8 and 10-15).

Jewkes Creek, an intermittent stream which flows through the lower portion of the disturbed area, is currently limited in its ability to support a fishery because of erosion, siltation, cover and low flow during most of the year. Fish have not been seen or reported in Jewkes Creek.

Aquatic surveys were conducted in 1980 and 1981 (page 10-4, pages 10-20 thru 10-24, Appendix 10-2) in Beaver Creek and North Fork Gordon Creek. Though dated, these surveys are of some value as baseline data in Beaver Creek. The study conducted on the North Fork Gordon Creek is of limited value, because the study was designed and sites selected for a study which was done for the Gordon Creek 2, 7, and 8 Mines. The permittee has committed to a macroinvertebrate and fish study in the late Summer or early Fall of 1996 and 2001 (page 10-4). DWR has just recently (September 1996) requested that fish sampling be delayed until Spring 1997. They felt that the very low water levels along with the electrical shocking of the fish could cause undue stress on the fish. They also stated that the sampling would not be representative of the normal distribution of fish. Sampling locations for the studies will be upstream and downstream from the site in Gordon Creek. Currently, the North Fork of Gordon Creek has been impacted by nearby logging activities, resulting in heavy sediment deposition in Gordon Creek.

The entire permit area is classified as critical elk summer range and critical deer summer range (Plate 10-1). The permit area is located just northwest of the DWR Gordon Creek Wildlife Management Area (WMA) which is approximately 22,000 acres and managed for big game winter range.

In June 1989, DWR conducted a raptor inventory of the permit area. One active Golden eagle nest with two young, and three inactive Golden eagle nests were found (page 10-14, Appendix 10-1). A 1995 study was conducted in the area and the nests were found to be inactive. A commitment is made to survey the trees for nests before removal for surface facilities (page 10-38). The DWR states in a letter dated October 31, 1995 that no Bald eagle nests have been found in the area, but courtship activity has been observed at the winter roost on the Gordon Creek Wildlife Management Area. The letter continues to include that Bald eagles are likely to use the permit area (page 10-34). Golden eagles and red-tail hawks are found and Sharpshinned hawks and goshawks may use the area.

No threatened or endangered species were found on, or near, the permit area (page 9-10). Federal plant species are listed in Table 9-6.

In 1981, the U.S. Fish and Wildlife Services (USFWS) inspected the site. The biologist concluded that although power lines were considered unsafe, hazard was slight due to positioning.

A letter to DWR from Mr. Skaggs, dated April 30, 1992 (Appendix 7), states that no bats had been observed inhabiting the old mine workings. Additionally, on June 14, 1996 a bat survey performed by a qualified biologist, Brad Lengas, concluded that the old mine portals were not being used as a summer bat roost (Appendix 10-1). Mr. Lengas could not determine during the survey whether the portals had been used as winter roost (hebernaculum). If portal development occurs during the winter hibernation period an additional survey may be required prior to disturbance.

#### **Findings:**

The plan meets the requirements of this section.

### **SOILS RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.

#### **Analysis:**

The soils within the proposed disturbance are primarily colluvium, alluvium, and residuum derived from sandstone, shale, limestone, and siltstone. Soil textures vary from silty

clay loam within the Shupert-Winetti Complex, to gravelly loam within the Brycan, Rabbitex, Senchert and Curecanti Series.

The soil capability classification includes III-e3 irrigated, VII-e nonirrigated, VIe, nonirrigated and VIw, nonirrigated. Under native vegetation, the water erosion hazard associated with these soils is slight to moderate. Otherwise, the erosion hazard for disturbed soils are moderate for Shupert-Winetti Complex, Brycan, & Senchert Series, high for Rabbitex Series, and severe for Curecanti Series. The soils are generally deep, well drained and moderately permeable. The pH of the surface horizon ranges from 7.2 to 8.0. The electrical conductivity ranges from 0.4 to 1.2 mmhos/cm at 25°C.

The Horizon Mine soil resource were originally surveyed at the Order II scale (Henry Sauer, personal communication with Leland Sasser USDA/SCS, 1991). The survey includes seven soil pits with horizon identification, soil descriptions, and physical/chemical properties. Correlation of the soil map units with currently recognized soil series or complexes are as follows:

- Brycan Loam - fine-loamy, mixed Cumulic Haploborolls
- Curecanti Family - loamy - skeletal, mixed Typic Argiborolis
- Rabbitex Site Loam 15 to 50 percent slope - fine - loamy, mixed Typic Calciborolls
- Senchert Loam - fine - loamy, mixed Argic Pachic Cryoborolls
- Shupert-Winetti Complex - loamy - skeletal, mixed (calcareous), frigid Typic Ustifluent.

The depths of reported A horizon range from 0 for disturbed Shupert-Winetti Complex to 43 inches for Brycan Series. Soil profile depths generally range from 60 to 70 inches.

The major limiting factors for the soils within the planned disturbance are high clay content (>40% clay) and high percent coarse rock fragments (>35% coarse rock fragments). The Division currently does not consider high percentages of coarse rock fragments as a limiting factor in mine reclamation soils. The removal of large boulders, prior to soil placement in stockpiles, is therefore unnecessary. Also as stated, a certain amount of coarse fragments can be tolerated depending upon the size and intended use of the reclaimed area. The only area limited by high clay content is the Shupert-Winetti Complex soil located at Test pit #1 which contains an average 43% clay in the top 30 inches.

Pit 8 was excavated and sampled in the embankment area during 1990. Pit 8 sample analysis (Appendix 8-1) indicated suspect levels of Boron. The 0 to 12 inch contained 4.8 mg/kg boron and in the 10 to 11 feet zone the boron level was 5.19 mg/kg. Boron which exceeds 5 mg/kg is considered unsuitable growth medium and must be covered with a minimum of 4 feet of suitable growth medium. Material in pit 8 is assumed to be refuse/coal waste material.

To verify the suspect Boron levels, three additional soil pits were excavated in the embankment area located southwest of the portals during 1996. Profile descriptions show that the materials consist mainly of layered coal debris, coal waste, rock fragments and disturbed soils from previous mining operations. Physical and chemical results show that the materials are within the Division's acceptable range for overburden for all parameters except coarse fragments; none of the samples showed elevated levels of Boron. However, one pit sample showed an Acid/Base Potential (ABP) of -1.16 tons CaCO<sub>3</sub>/1000 tons material. This value approaches the Division's cutoff limit for ABP at -5 tons CaCO<sub>3</sub>/1000 tons. The concentration of coal eliminates most of the material from being used as topsoil. Therefore, the coal and coal waste materials from the embankment will be used as backfill in the facilities area and covered with at least four feet of acceptable backfill material as described in Section 3.3.2.5.

Two additional soil pits were excavated in the lower facilities area during 1996. The first pit was located in the bottom of Jewkes Creek channel while the second pit was located on top of the west bank of the Jewkes Creek drainage. In both locations, soils have been previously disturbed and covered with imported materials. The upper 5 feet of soils in the west bank have been previously disturbed and/or imported. Sample results indicate that soils in both areas would be acceptable as substitute topsoil and/or backfill with the exception of the coal fines layer in the Jewkes Creek channel. *The Jewkes Creek channel soils are unique since they have a fluvial origin which terminates at bed rock located 12 feet down. The material consists mainly of sandy loam interbedded with coal fines (~30%) and loam with a high bedding angle. The Jewkes Creek soils contain less than 10 percent rocks with no coarse fragments.*

No prime farmlands and/or pasture land exists within the permit area as determined by the SCS. The soils have been used as rangeland in the past. Soil erosion and shallowness restrict the use of the land to grazing, woodland or wildlife.

#### **Findings:**

The information provided meets the regulatory requirements of this section.

### **LAND-USE RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 783.22; R645-301-411.

#### **Analysis:**

The canyon in which the Horizon Mine is proposed to be built has been used for coal mining since the early 1900's and apparently was abandoned in 1953. Other than coal mining, the area has been used for wildlife habitat, limited sheep grazing and recreation (page 4-7).

Carbon County has zoned the proposed Horizon Mine site area as M & G 1 (page 4-7 and Plate 4-1). M & G 1 is a mining and grazing zone.

The permit area has been extensively mined previously (Plates 4-1 and page 4-7). Room and pillar methods of mining were commonly used in both the Hiawatha seam and the Castlegate 'A' seam. Prior to coal mining (late 1800's), the area was used primarily for ranching with limited timber operations.

No public park or cemetery is located within or adjacent to the permit area. Carbon County owns and maintains two roads which run parallel to and through the disturbed area. The roads are currently (1995) being used extensively by logging trucks with county maintenance.

#### **Findings:**

Information regarding land use classification meets the minimum regulatory requirements of this section.

## **ALLUVIAL VALLEY FLOORS**

**Regulatory Reference:** 30 CFR Sec. 785.19; R645-302-320.

#### **Analysis:**

The Applicant provides a discussion on Alluvial Valley Floors (AVF's) in Section 7.4. In Appendix 7-6, a June 13, 1980 memo from the Soil Conservation Service State Soil Scientist, T. B. Hutchings addresses AVF's. According to the memo no AVF's, as defined in the Permanent Regulatory Program Office of Surface Mining Department of Interior, exists in Section 17, T 13S. R. 8.E. SLBM. This location is specific to the proposed disturbed area and does not mention the adjacent areas. The following paragraphs discuss the potential for AVF's in the permit and adjacent areas.

According to the reconnaissance map completed by the Office of Surface Mining, dated June 1985, Gordon Creek, downstream of the mine site, is a "Potential" Alluvial Valley Floor. Mining is not expected to materially damage the water supply of these potential alluvial valley floors because the mine site is contained in a relatively small contributing section of the watershed.

Information on Plate 6-1 indicates alluvial deposits exist in the permit and adjacent areas along Beaver Creek, the North Fork of Gordon Creek, and Jewkes Creek, as well as, short distances into the tributaries above the drainages. Alluvial deposits were also identified at the mouth of Jewkes Creek and along the North Fork of Gordon Creek. Alluvial deposits at the

mouth of Jewkes Creek and along the North Fork Gordon Creek are below the coal outcrop and, therefore could not be directly impacted by mine subsidence. Soils in the valley exhibit localized signs of being flooded or water logged.

According to the Applicant agricultural developments are not found along the North Fork of Gordon Creek or along Beaver Creek and their tributaries. The agricultural value in these areas is limited by the soil capability and short growing season. If these areas would be developed for agriculture, development would be restricted to grasses and pasture, however, because of the high elevation, short growing season and narrow valleys the development of meadow or pasture is not practical. Grazing on undeveloped rangelands can be found on Plate 4-1 - Land Use map.

Based on the information presented in the plan, the Division makes the following findings, in accordance with R645-302-321.310:

- 1) Unconsolidated stream-laid deposits holding stream channels are found in the area of the proposed mine site.
- 2) There is sufficient water to support agricultural activities, as evidenced by subirrigation of the lands in question.
- 3) The undeveloped rangelands found in the permit and adjacent area on alluvial materials are not significant to farming and therefore are exempt to prohibition of mining according to the Alluvial Valley Floor Identification and Study Guidelines provided by the U. S. Department of the Interior Office of Surface Mining Reclamation and Enforcement, 1983.

**Findings:**

The Applicant has met the requirements of this section.

**PRIME FARMLAND**

**Regulatory Reference:** R645-301-221, R645-302-310

**Analysis:**

No prime farmlands and/or pasture land exists within the permit area as determined by the SCS. The soils have been used as rangeland in the past. Soil erosion and shallowness restrict the use of the land to grazing, woodland or wildlife.

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**TECHNICAL ANALYSIS**

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**Findings:**

The plan fulfills the requirements of this section.

**GEOLOGIC RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 784.22; R645-301-623, -301-724.

**Analysis:**

The Applicant is required to provide geologic information to meet the requirements of R645-301-601. Characterization of the lithology and structure in the adjacent and mine plan area provides the basis for analyzing groundwater quality and groundwater movement, coal reserves, and surface subsidence.

**Stratigraphy.**

The Applicant presents a geologic description of the mine plan area in Chapter 6. A generalized stratigraphic column in Table 6-1 illustrates the stratigraphic sequence. The site is characterized by Cretaceous and Tertiary formations deposited along the western edge of a ocean basin. The lithology and structure are described and illustrated in Figures 6-2 and 6-3. A short summary of each stratigraphic unit depicts the thickness, origin and character of each formation or member functioning as an aquifer or coal bed.

The alternating sequences of shales and sandstones in the Mancos Shale and heterogeneous terrestrial, fluvial, paludal and marine characteristics of the coal bearing Blackhawk Formation reveals a depositional environment in a fluctuating regressive seaway.

The Blackhawk Formation is the only formation in the area that contains coal bearing units. Eight coal beds have been identified in the vicinity of the mine plan area, four of which outcrop in the North Fork of Gordon Creek Canyon, Coal Canyon and Bryner Canyon.

The Hiawatha and Castlegate 'A' coal seams are the only beds in the area thick enough to mine.

**Structure.**

The minesite is surrounded by two major fault systems: the Gordon Creek fault zone, trending north-south, and the Fish Creek fault zone trending approximately north 60 degrees west. Two major faults of the Fish Creek fault zone create a graben and enclose the lease block.

This area has a history of mining. The Horizon Mine will initially mine coal between the old National Mine and Beaver Creek Coal Company #3 Mine on the east and the Blue Blaze No.

2 and 3 Mines on the west. The National and Beaver Creek Coal Company #3 Mine were developed within the graben area of the Fish Creek Graben. Plate 3-5 identifies some of the older workings, however several old mines adjacent to the proposed workings have not been depicted. The Applicant should identify all old workings in the vicinity of the proposed mining operation and indicate in which seam they were developed.

Personal communication with Dan Guy identified that Gordon Creek Coal Company intercepted a flow of approximately 600 gallons per minute from a fault in the Fish Creek Graben system. Fault systems can act as conduits for groundwater which can supply springs with flow or act as dams to store water when two facies of different permeabilities align as a result of the offset. The extent of faulting shown on the Geology Map, Plate 6-1, identifies an extensive fault system with some fault extending several miles through other drainages. Future mining adjacent and through these faults, as identified in the BLM application boundary on Plate 3-5, will require an analysis of the storage and transmissivity of faults.

#### **Cross-Sections.**

The Applicant submitted geologic cross-sections, Plates 6-2 and 6-3 to project the horizontal extent of the lithologic layers and relationships between fault zones and coal zones. Plate 6-2 illustrates the trends from north to south from 7 drill sites, and Plate 6-3 shows a west-east diagram of 13 drill sites. ARCO's measured section 1980 and LCM-4 of Plate 6-3 reveal the local lithology. The lithologic data from drill logs HZ 95-1, HZ95-2 and HZ-95-3 should be incorporated to the cross-section information. Better yet, a fence diagram should be constructed to reveal the association of faults to lithofacies.

#### **Subsidence Monitoring Information.**

The Applicant has submitted a subsidence monitoring plan identifying subsidence monitoring stations and stream buffer zones on Plate 3-3. The subsidence monitoring stations are established along Beaver and Jump Creeks, the area of maximum subsidence will likely be in the center of mining. Additional survey markers should be stationed between Beaver and Jump Creeks to detect subsidence impacts. The Applicant has not submitted an overburden isopach map for either the Hiawatha or Castlegate "A" coal seams. The Applicant needs to address the method used to establish the stream buffer zone for Beaver Creek.

#### **Acid- and Toxic-Forming Materials.**

Acid- and toxic-forming materials were addressed by the Operator in Section 6.5.7.1. of the MRP. From the data and information presented, there is minimal chance that acid and toxic condition minerals will be present in sufficient quantities to cause deleterious impacts to water or soil. The Applicant also proposes to sample and test for acid and toxic material on 2000 foot intervals throughout the mine.

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**TECHNICAL ANALYSIS**

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**Findings:**

The plan fulfills the requirements of this section.

**HYDROLOGIC RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-720.

**Analysis:****Sampling and Analysis.**

The Applicant is required to perform all sampling and analysis in a manner that meets the requirements of R645-301-723. Sampling times, dates and methods are not available for all samples; however, recent data has included sample date, time, and method of analysis beginning in December 1993. The 1996 metal samples were not analyzed according to the guidelines. The samples were analyzed as total metals rather than dissolved. This occurred because sedimentation in the water made filtering difficult. The samples were not filtered but were preserved with an acid solution, thus it was necessary to analyze the parameters as total. In the future, samples should not be preserved if they cannot be filtered. Instead, they should be filtered immediately upon delivery to the lab, within a maximum of 2 days from obtaining the sample.

**Baseline Information.***Water Rights and Points of Diversion*

The Applicant has provided information on water rights including use description and period of use in Appendix 3-5. The point of diversion for water rights near the mine operations are presented on Plate 7-3. Water from the area is almost exclusively used for stock watering.

The Applicant has not received approval from the Division of Water Rights for the water rights. The Applicant presented the following to document the pursuit to obtain the right to use water in the area:

1. A copy of a five year water right lease agreement, dated May 1, 1995. The agreement between Horizon and Florence A. Sweet includes water rights 91-94, 91-353 and, 91-330. The water rights exchanged in the agreement with Florence A. Sweet are associated with two unnamed springs and an underground water tunnel.

2. An application for permit change filed at the Division of Water Rights. 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.
3. An assignment of the right to use Sweet's Canyon Pond and lease one acre-foot of water for evaporation losses are presented under Water User's Claim # 91-750, in Appendix 3-5.
4. A dam application is included and describes the pond use as a Water Truck Fill / Private Fish Pond. The private fish pond is proposed for a postmining land use in the agreement. An approval to use the water right(s) has not been issued.

**Table 1**  
**Water Rights Used in Mining**

<b>Water Right #</b>	<b>Season of Use</b>	<b>Quantity of Use (cfs)</b>	<b>Potential total for season of use (AF)</b>
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
91-750	1/1 to 12/31	1AF evaporation	1 AF

*General Baseline Water Quality*

Baseline information was collected according to the 1986 Division guidelines. During early baseline data acquisition the Applicant 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 will be collected according to the new guidelines. Table 7-5 presents surface water operational and reclamation parameters, while groundwater operational and reclamation parameters are provided, in Table 7-2. The baseline groundwater parameters are described in the plan under Section 7.1.5, and the baseline surface water parameters are presented in Section 7.2.2.3. Baseline parameters will be collected every fifth year, prior to permit renewal, at low flow for the operational monitoring sites.

### Groundwater Information.

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

The Gordon Creek area is considered a regional recharge area to groundwater. Currently it has not been considered a region with potential for large scale groundwater development. Most groundwater use has been related to spring discharge and mining consumption. The Applicant delineates potential recharge areas in Figure 7-4, which shows a limited recharge potential except in the northern portion of the permit area and in canyon bottoms.

The area is also heavily faulted. Faulting and fracturing provide conduits for surface water to enter the groundwater and allows movement between aquifers. Under the discussion the Applicant states that a relatively small number of springs are within the proposed mined area, which supports the theory of limited recharge. However, the adjacent area has numerous springs, mostly associated with fault/fractures systems and the previously mined areas are discharging water from associated fractures. (See Table 3, which presents a summary of the springs found in the permit adjacent area.)

The major faults that bound the proposed mine workings are associated with a graben. The graben is within the North Gordon and Fish Creek fault zones which trend North and South, and North 60 degrees West, respectively. The faulting appears to have influenced the location and orientation of Gordon Creek and influences the locations of springs and seeps in the permit area. Another major structural feature potentially controlling groundwater occurrence is the Beaver Creek Syncline which trends NE-SW and dips at approximately 3.5 degrees.

The regional aquifers are the Emery and Ferron Sandstone of the Mancos shale, which probably do not extend into the Gordon Creek area (thus, the mine area). Other important aquifers are the Star Point Sandstone and Blackhawk formations which are located in the mine area. Locally, potential water bearing members below the Hiawatha Coal Seam include the Blackhawk-Star Point aquifer. Both the Blackhawk and Star Point Formations serve as sources of spring and seep flows. According to Price and Arnou, 1974. The upper cretaceous sediments of the area have 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 aquifers are generally laterally discontinuous perched aquifers and fluvial channel sandstones.

The Hiawatha Coal Seam 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 formation 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 Applicant suggests that due to the low vertical permeability the magnitude of the recharge is limited. However, the vertical permeability from fractures in the area appears to be relatively significant. Within the permit adjacent area springs issue from the Star Point formation through fractures in connection with previous mining activities as evidenced by springs issuing from the formation in Coal Canyon.

Above the Hiawatha, the Castlegate 'A' coal seam overlies the Aberdeen Sandstone. Drill logs indicate this sandstone member thins near the mine and is discontinuous over the permit. The sandstone is interbedded with siltstones and shales. The Applicant 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). However, one seep appears to issue from this formation in Coal Canyon.

The floor of the Castlegate 'A' seam is carbonaceous silty shale to fine grained fluvial sandstone. It has been stated that water has not been produced from the floor in previously mined areas of the Castlegate 'A' seam. 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.

Other members containing aquifers above the previously mined portions in the Castlegate 'A' seam include the Castlegate Sandstone, the Price River Formation and unconsolidated alluvial sediment deposits. The Castlegate 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 and Star Point aquifers. The thickest alluvial deposits in the permit area occur along Beaver Creek.

#### ***Local Drilling Information and Occurrence of Ground Water***

The information regarding baseline groundwater data collection is discussed in Chapter 7, Section 7.1.2.2. Four exploratory holes drilled in the 1970's and 1980's were monitored for water occurrence 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 Spring Canyon Sandstone in 1995 and are discussed below. The Spring Canyon Tongue of the Star Point Sandstone is estimated to be approximately 75 feet thick in the permit area.

Tables 2A and Table 2B were generated to present information gathered from the LMC drill holes and the HZ wells to present data used in determining ground-water occurrence in the permit and adjacent areas.

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**Table 2A  
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.	7,682 (568 ft.)	7,732 (518 ft.)	Unknown*
LMC-3	Nov. 1976	836 ft.	665 ft.	7,556 (664 ft.)	7,590 (630 ft.)	7499 (791 ft.)
LMC-4	Jan. 1980	430 ft.	220 ft.	7,585 (215 ft.)	7,694.8 (105.2 ft.)	7,584.7 (215.3 ft.)

\* Drilling completed before reaching the Hiawatha seam.

The data presented indicate that groundwater occurrence above, within, and immediately below the Castlegate 'A' seam is not continuous and may be inconsequential in the overlying strata within this permit term. Documentation of the LMC drilling procedure was provided in a notarized letter from 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 occurrence, 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 the Castlegate 'A' seam are probably dry in the area covered by this permit term. LMC-3 is located north east of old workings developed from the Blue Blaze No.3, Castlegate 'A' Seam. Drill hole LMC-4 extends through the Hiawatha Seam, ending 213 feet into the Storrs Sandstone. LMC-4 penetrates old workings in the Hiawatha Coal Seam. Therefore, LMC-4 does not represent information on groundwater occurrences for the unmined portions of the lease area. Water however, was found in the formations above the Castlegate 'A' seam in the HZ wells. (See discussion below.)

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.

**Table 2B  
 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)	Spring Canyon	7,331.6	7,277.6-7,287.6	7,570.7
HZ-95-1S	12/5/95	8132.6 (220)	Blackhawk	NA	8,101.6-8,110.6	8,221.5
HZ-95-2	12/5/95	7,146.3 (1200).	Spring Canyon	7,189.3	7,151.3-7161.3	7,519.3
HZ-95-3	10/28/95	7,427.6 (470)	Spring Canyon	7,477.6	7,432.6-7,442.6	7,522.7

In building the potentiometric surface map, the Applicant 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. The changes may be the result of present mining activities and therefore the use of this data may not be appropriate for the comparison presented.

With the information provided from the HZ wells, the Applicant has constructed a potentiometric map for the Spring Canyon Sandstone. The presented information suggests the Spring Canyon aquifer has a hydraulic gradient of 0.014 in 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 Applicant indicates the Hiawatha Coal Seam may be saturated very soon in the mining operations. The potentiometric surface map was developed based on water elevation data obtained in December, 1995. Data obtained in July and August 1996 indicate the surface water elevation had remained relatively steady in Well HZ-95-2 Other water levels had changed. Water elevation decreased by approximately nine feet at Well HZ-95-3 and, increased by 15 feet at HZ-95-1, from December 1995 to August 1996. Currently it is not known whether the potentiometric surface has stabilized. Water elevation data is presented in Table 7-1.

In the plan, Applicant states that the data collected in July 1996 verifies the December 1995 data. The Division does not agree with this statement. However, other information in the

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**TECHNICAL ANALYSIS**

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plan, such as water issuing from fractures, indicates the general direction of flow is accurate but may have a steeper gradient and may be more southerly than indicated.

A Slug test was completed to determine the hydraulic conductivity of the HZ wells except for Well HZ-95-1-S. The hydraulic conductivity for Well HZ-95-1 was determined to be 16.1 ft/day while HZ-95-2 and HZ-95-3 were 0.25 and 0.20 respectively. HZ-95-1 is located on the north side of Beaver Creek, and HZ-95-2 is located on the northeast side of the Beaver Creek Fault zone and is outside of the proposed mined area. These wells are all completed in the upper tongue of the Star Point and were not completed through the formation.

The HZ wells were drilled near fracture systems as shown on Plate 6-1. The wells associated with the baseline information indicate the unfractured portion of the Star Point Spring Canyon tongue has relatively low conductivities and does not transmit water quickly. Well HZ-95-1 is within a permeable zone associated with the fracture and has increased permeability over the other two wells completed in the Spring Canyon Tongue. This is evidenced by the 15 foot increase in the water elevation over the initial water measurement and the hydraulic conductivity determined by the slug test, as well as, drill log information. The cause of increase in head at this well is unknown, but could be caused by any of the following: recharge from aquifers in connection with the fracture zone, drilling fluid losses, transmission of water between the aquifers due to poor well development, increased porosity and water availability from previous mining activities, and an inability of the well to reach equilibrium with the potentiometric surface since development (wells may not have recovered from pumping completed during drilling and sampling). The fracture associated with the well is shown to extend across Beaver Creek and into the proposed mining area. It is unknown at this time whether Beaver Creek plays a part in recharge to this fracture.

Groundwater was observed in the HZ wells above the Star Point and was present from 100 to 600 feet below the ground surface. The presence of water indicates a potential for aquifers to be present above the Hiawatha seam in areas that were not previously mined. Well HZ-95-1-S was completed above the Hiawatha at 205 to 210 foot depth. Two drill holes previously drilled by Beaver Creek Coal Company near Beaver Creek were artesian flow and are referred to as BC-1 and BC-2. These wells are assumed to produce water from 80 to 100 feet below the ground surface. The Applicant indicates that since these are artesian wells this suggests the water rests on aquitards and are overlain by confining units. Most springs issue above the presented potentiometric surface of the Star Point. This may indicate the Star Point is not in connection with the fractures or, because of the low hydraulic conductivity of the lower formation, water transmission may occur slowly causing the water to be retained and discharge through springs associated with fractured systems near the surface.

The Applicant has not completed the wells fully through the Star Point Formation. The Star Point sits over shale members through the proposed permit area potentially blocking vertical

flow below the aquifer. However, where there is fracture related flows water has issued from formations below the Star Point. No wells were completed in the Blackhawk, where the coal is to be mined.

The water quality of the wells without influences from the drilling fluid were not available and are not proposed to be presented from the Applicant. The following characterization from Waddell et. al. (1981), was presented in the plan regarding the Star Point Sandstone. TDS ranged from 335 to 391 mg/l. The Applicant has proposed that water elevation be the only data obtained at the HZ wells. The reasoning presented include the intensive pumping required to obtain a sample and the inability for quick recharge. The ability for recharge would also influence the ability of the well to reach equilibrium following sampling. Currently, the water elevation is of more relative importance. However, it would appear that recharge to Wells HZ-95-1 and HZ-95-1-S are not as tight and water samples should be obtained to characterize the signature of the water quality of these two points.

The following are recommended as permit conditions, based on lack of conclusive baseline data concerning ground water. Prior to mine development the Applicant must determine what conditions cause the increase in head at Well HZ-95-1 and must provide a discussion with supporting information in the permit. Because of the disparity in the original potentiometric surface, the Applicant has committed to monitor the HZ well levels monthly. The Applicant has committed to discuss a more stringent monitoring program for Well HZ-95-1 prior to entering the northernmost mining block in Section 8. Currently it is the Division's recommendation that when mining progresses into the area near the fracture zone, monitoring will increase to weekly monitoring and increase to daily monitoring if water is expressed from the fracture, or increased flows are expressed from the roof or floor. The Applicant should provide a commitment in the plan, with measures to ensure that access to the wells and data from the wells may be collected over the period where mining will occur near the fault system. The hydraulic conductivity of the alluvium, HZ-95-1-S, baseline water quality samples and, the differences in stream flow should be analyzed.

Additionally, the Applicant's five year mine plan proposes to mine through the Beaver Creek Fault Zone and will also mine through Well HZ-95-1 eliminating the third point used to monitor the Star Point piezometric surface. The Applicant will, therefore, need to supply additional well(s) for the proposed five year lease area. Since mining this area is not approved in this permit, this request is a consideration for future baseline needs. It is recommended that placement of the wells be promptly conducted promptly and coordinated with the Division. It is recommended the well be completed in each water bearing formation above, within and below the coal seam to be mined. It should be noted that the deficiency from the previous Blue Blaze Mine proposal required the well be drilled through the Star Point Formation in order to mine into the Hiawatha Coal Seam.

### *Previous Mining History*

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**TECHNICAL ANALYSIS**

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According to the Applicant the Gordon Creek #2 Mine, operated by Beaver Creek Coal Company (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 in Coal Canyon, 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, 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. Within the past 10 years an area below Gordon Creek #3 Mine has increased in water seepage. It is suspected that currently much of the groundwater collecting in the abandoned Gordon Creek #3 and #6 Mine is draining toward this fracture. Until now there was no monitoring of this site. However, there has been a notable vegetation change (Cottonwood die back and increased wetland species) and increase in flow north west of the junction of County Road 290 and the Beaver Creek #3 road.

The location and extent of all known, abandoned, underground mine workings within the permit area and adjacent area are shown on Plate 3-3, Figure 3-1, and Figure 3-2. Figure 3-1 shows the Consumer's Mine and Blue Blaze Coal Co. #3 Mine have mined the Castlegate 'A' Seam underneath Beaver Creek. The Creek will also be undermined by Horizon in the Hiawatha Seam.

The in-mine waters sampled at Horizon No. 1 Mine in 1995 and 1996 indicate the standing water in the mine has varied from 7584.1 feet msl in December 1995, to 7587 feet msl in May 1996, then to 7585 feet msl in June 1996.

### *Springs*

The plan indicates baseline reconnaissance information was gathered in the field with former Oil, Gas and Mining employee, Darin Woden, 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 conducted in 1996. Plate 7-1 identifies springs in the permit and adjacent area.

**Table 3**  
**Spring Survey Summary**  
 (Summary of information from Plate 7-1, Figure 7-3 and Appendix 7-2)

Drainage	Number of Springs located spring and formation*	Elevation (ft msl)	Water Quality	Water Quantity	Comments/ Characteristics
Coal Canyon	6 springs, July 1996 CC-1,-5,-6 (kss or km17) CC- 2(Kba) CC-3, -4 (Kbm 2-4)	CC-2 to CC-4 occur between 7,675 ' and 7,925' CC-1, CC-5, and CC-6 occur at approximately 7,360 '	CC-2 -CC-4 pH from 7.35 to 7.79 SP.Cond. from 788 to 922 CC-1,-5,-6 pH from 7.34 to 7.69 SP.Cond. from 714 to 788	CC-2 -CC-4 flowed < 1 gpm CC-1 flowed 10 gpm, CC-5 flowed 2 gpm and CC-6 flowed 20 gpm	Flows in this area are likely affected by previous mining activities. CC-1, -5,-6 are issuing from a fault down stream of Gordon Creek 3 and 6.
Unnamed drainage west of Coal Canyon	5 springs MC-1, MC-2, MC-3, MC-3a,-MC-4	Between 7360' and 7450'			Newly developed springs. Information was not presented in adequate time to analyze.
Upper Beaver Creek Drainage south and west of the Main fault bounding the permit area.	Upper drainage 10 springs and seeps CV-1,-2,-3, -4, (Kbm 1-4) CV -5, -6, -30, -31, -32, (Kbm 1 CV-4 fracture related)	CV-1,-2,-3 and SP-9 occur between 8,480' and 8,640 CV -4, -5, -6, -30, -31, -32, occur between 8,720 to 8,960.	pH ranged from 6.89 to 7.37 while Sp. Cond. Ranged from 250 to 429	CV-1,-4, -5, were Seeps. CV-6, -30, -31, -32 flows were 1 gpm to 2 gpm. CV-2, and-3 flowed at 15 and 9 gpm respectively.	These springs may be in line with a fracture in connection with SP-4, and SP-1 (Interim Geologic Map of the Jump Creek Quadrangle).
Beaver Creek Drainage Beaver Creek and Sand Gulch	5 springs and seeps GV-32 -Beaver Creek(Kbm 1-4/fract) GV -25, -26,-27,-28 Sand Gulch (Kc and GV-25 fracture)	Between 8400' and 8880'	not obtained	GV-32, Seep GV-25, -26,-27,-28 flows were 3 to 5 gpm.	Springs located within the existing and proposed mine lease area..

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Drainage	Number of Springs located spring and formation*	Elevation (ft msl)	Water Quality	Water Quantity	Comments/ Characteristics
Beaver Creek Drainage , Unnamed Drainage North of Sand Gulch	4 springs and seeps GV -10, -11, -12,(Kp) GV-13 (Kc).	Between 8,640' and 9200'	not obtained	and GV- 12 flowed at 1 gpm or less GV-10,-11, flowed at 10 and 18 gpm. GV-13 flowed at 50 gpm.	Springs located within the existing and proposed mine lease area..
Beaver Creek drainage /Beaver Creek outside of the major fracture.	10 springs and seeps GV-1, -2, -3, (Kc fracture related) GV-15, 14,( Kbm 1-4) GV-16, -21, -22, -23, -24 (flow from alluvium fracture associated Kc Kp).	Between 8,150' and 8,400'	not obtained	GV-1, GV-16 Artesian Wells 50 and 30 gpm. GV-2, 3, flowed 8, 10, GV-15, -22, -23,-24 seeps to 4 gpm GV-25 flowed 25 gpm.	Artesian and larger flowing wells appear to be in connection with the Beaver Creek and Jump Creek (covered) fault zones.
Beaver Creek drainage Jump Creek/Un-named Drainage outside of major fracture.	6 springs and seeps GV-9, (fracture associated Kc ) GV-8, -7, -6, -5, (Kc) GV-4 (associated with Jump Creek Fault)	Between 8,170' and 8,640'.	GV- 9 and -6 are described as Mineral springs.	GV-9, -6, -5, seeps to 1 gpm GV-8, -7, flowed at 4 and 5 gpm GV-4 flowed 18 gpm and from the hillside at 40 gpm.	

\* formation was obtained from a map and not verified on the ground.

Kss - Storrs Sandstone member  
Kba - Aberdeen Sandstone  
Kbm - mudstone members  
Km - Mancos shale members  
Kc - Castlegate formation  
Kp - Price River formation.

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

**Table 4**  
**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 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	
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
2-6-W	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.	

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Sampling Point	Monitoring History	Location (Formation)	Water Quality	Water Quantity	Comments
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 spurious).	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 Applicant has indicated a series of springs in the North Fork of Gordon Creek, in the northwest corner of Section 18 T13S R8 E, may be related to faults bisecting the area. The North fork Drainage may have formed subsequent to, or contemporaneously with, the movement along the Gordon Creek Fault Zone.

The Applicant has stated the Homestead Spring is one of the main contributing springs to Beaver Creek. The Applicant has included this spring as a baseline monitoring site to provide information on the flows contributing to Beaver Creek. This information will be used to determine the climatic variation, as it is believed the recharge to this spring is outside of the potential impact area due to its location relative to the fault system.

### *Groundwater Quality*

Two water quality samples were collected in the Blue Blaze No. 1 Mine workings, 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 1995, and January 1996 were affected from the foam drilling fluid used during installation. Data analyses indicate TDS ranged from 380 to 680 mg/l. Due to potential effects from the foam drilling, representative water quality data is not available.

Groundwater samples collected in-mine at the Horizon #1 Mine in 1995 and 1996 show pH ranging from 7.38 and rising to 8.36, with specific conductance ranging from 485 to 595 ohms.

### 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, 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 Creek, is located over the future proposed mine workings and, is classified as 1C and 3A, designated for domestic and agricultural uses respectively. Downstream of the proposed disturbed area in Gordon Creek there are fisheries. Information on the fisheries is lacking in the plan. (For further discussion 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. Further north the fold follows Beaver Creek drainage up to Section 8 T13S R8E where Beaver Creek diverges from the axis to the northeast along a suspected fault zone. Beaver ponds are common in Beaver Creek and also play a part in providing perennial flows. Springs contributing to baseflow include the Gunnison Homestead Spring, one mile west of the proposed additional lease area and Jewkes Springs one mile west of the permit area near the northwest corner. Discharges from these springs vary between 3 to 136 gpm and 1.1 to 38 gpm respectively.

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The U.S.G.S., from 1960 through 1989, has maintained a gauging station (09312700) near the mouth of Beaver Creek several miles northeast of the permit area. 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 Applicant 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 runoff would provide more significant information. Snowtel 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 one square mile and discharges to the North Fork of Gordon Creek. The Applicant has referred to this stream as intermittent. The flow data submitted indicates that normally the creek flows all year at Sampling Point 5, but becomes intermittent at Sampling Point 3. According to information in the PAP, the flow diminishes in a downstream direction beyond Sampling Point SS-5, infiltrates into the alluvium and does not reappear immediately downstream. 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 and potential losses to fracture systems. Characterization by observation in the North Fork of Gordon Creek was conducted to determine whether this flow re-emerges as constant flow downstream; no re-emergence was noted.

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 Applicant suggests the mining of the Hiawatha would not affect the quantity or quality of flow in the North Fork of Gordon Creek. However, the Applicant 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 Starpoint aquifer to this stream section should be determined. Losing and gaining reaches in this section of the stream should be identified.

The proposed Five Year 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 area have not been presented. The Applicant'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 most likely controls the hydrologically defined adjacent area. The graben and

fault system appears to extend all the way to Jump Creek. Additional, baseline information will be necessary to permit this site in the future. Further baseline sampling should focus on the springs and surface waters potentially impacted through intercepting water from faults and fractures. Baseline information for future mining has been extended to Jump Creek.

**Table 5**  
**Baseline Surface Water Sampling**

Sampling Point	Location	Flow	Water Quality	Comments
SS-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.	Intermittent	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
SS-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
SS-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
SS-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.

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Sampling Point	Location	Flow	Water Quality	Comments
SS-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.
SS-11	Sand Gulch Tributary of Beaver Creek Drainage upstream of the Northeast Fault	Not available	Not available	Not sufficient information / associated with future mining and potentially the fault crossing Beaver Creek mined into in this permit term.
SS-10	Unnamed tributary North of Sand Gulch tributary to Jump Creek Drainage upstream of the Northeast Fault	Not available	Not available	Not sufficient information / data collection associated with future mining
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.
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

#### Baseline Cumulative Impact Area Information.

A cumulative impact area assessment is being conducted by the Division.

#### Modeling.

No specific modeling was presented.

#### Alternative Water Source Information.

In Section 7.1.6, the Applicant purports no significant impacts are foreseen to groundwater as a result of mining in the permit area. However, under this section the Applicant

has referenced 7.3 and 3.4.8.2 and committed to provide mitigation measures. In Section 3.4.8.2, under the subsidence mitigation plan, the Applicant states that if substantial groundwater inflow occurs in-mine, mitigation measures will be provided and may include: attempts to seal off inflow, increased monitoring, lining of stream bed and replacement of lost water, if indicated by monitoring. The Applicant has committed to enact a mitigation plan should mining impacts be identified. Only emergency mitigation will be performed prior to notification of Water Rights and UDOGM, with an extended mitigation plan being correlated with both agencies prior to the plan's implementation."

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

#### **Probable Hydrologic Consequences Determination.**

##### *Acid- and Toxic-Forming Material*

#### Operational Monitoring and Identification of Acid- and Toxic-forming materials

The Applicant has provided a discussion for acid- and toxic-forming materials potential under the Probable Hydrologic impacts. Additionally, the Applicant 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. Hi-tech Engineering in their forthcoming letter, have agreed to accept coal refuse from the Horizon No.1 Mine at the refuse disposal site at Hiawatha.
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 with values from -9.1 to -13.6 tons CaCO<sub>3</sub> per 1000 tons of material (Section 6.5.6). 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 Applicant suggests this pyritic sulfur content is likely of limited areal extent. In Section 6.5.6, the Applicant has presented analysis core samples of the coal obtained from the Hiawatha Seam. The presented analyses show total sulfur content from 0.38% to 0.61% of which 0.02% to 0.07% is shown to be Pyritic Sulfur.

Coal will be stored on the surface for short periods and runoff from the coal stockpile will be routed through the sedimentation pond where it will mix with runoff water that is more alkaline. However, all of the coal will not be removed in the mining process and much of this coal will be in contact with air and water during and following mining operations. This may cause oxidation and a lowering in the pH of water in contact with the pyritic sulfur. Recent water samples obtained from the old Blue Blaze No.1 Mine workings are shown to have a pH of 8.65 to 8.63 and have increased from the 1995 values near a pH of 7.4.

Acid-forming discharges are uncommon in the region and acid forming materials are not known to be extensive in Utah coal mines. Should the presence of pyrite in the mined area cause a decreased pH locally, the mixing with higher pH water in the system would result in localized effects in the permit area and would not likely occur off the permit area due to downstream buffering.

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

#### *Potential Groundwater Impacts*

The following are considered by the Division to be the potential groundwater impacts in the permit and the hydrologically defined adjacent area:

1. Interbasin transfer of waters between Beaver Creek Drainage and Gordon Creek Drainage.
2. Dewatering fractures and associated springs or surface waters.
3. A change in the potentiometric surface.

The potentiometric surface map is presented based on the December 1995 elevations and ranges from 7,570 ft. msl to 7,520 ft. msl. With the information presented to date, it seems likely that the high permeability at HZ-95-1 is an important recharge zone for the aquifers in connection with the fracture. Sources of water issuance, geology and topography are compared to the potentiometric map in order to understand potential impacts.

The Applicant 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. Currently, the presented information suggests the Spring Canyon Tongue aquifer has a hydraulic gradient of 0.014 and an east southeast direction. The permit area sits within a graben

between two WNW-ESE trending faults. In the northwest section of the permit and adjacent area there is a gentle NW-NE dip 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. This structure influences the dip of the coal seam and may influence the potentiometric water surface that would result due to mining the coal.

The elevation of HZ-95-1 was 7585.4 in July 1996. The standing water elevation in the Blue Blaze No. 1 Mine was 7,587 ft on 5/16/96, and 7,585 ft on 6/14/96; similar to the surface elevation in HZ-95-1. This could indicate an interconnection with the in-mine water and the fracture, but could also be due to local influences. The base of the Hiawatha at Well HZ-95-1 is approximately 7,331.6 feet msl; at HZ-95-3 approximately 7,477.6 ft msl; and HZ-95-2 is approximately 7,189.3 ft. msl (288 ft. difference) and is outside the proposed mining area on the side opposite the fracture associated with the graben. The potentiometric surface elevation presented indicates the Star Point aquifer is in connection across the fracture of the graben. The elevation to which coal is removed could potentially decrease the potentiometric surface in the permit area and could affect springs outside the permit area.

The largest volume of water issuing from springs associated with outcrops of the Star Point include spring discharges in Coal Canyon which increased following mining of the Gordon Creek #3 and #6 Mines. Additional evidence, of newly formed springs, occur in Coal Canyon (based on discussions with Chris Hansen, Earth Fax Engineering). These springs discharge from the Star Point formation at, or below, the lower end of the Storrs Sandstone member outcrop at an elevation of approximately 7,360 ft msl. If the coal is removed at, or below, 7,331.6 feet and if the water is in connection with the fracture the seeps in Coal Canyon and the unnamed canyon to the west could potentially be affected. A resulting loss of head could disrupt stream and spring flows relocating the water along the geologic structure of the Beaver Creek Syncline. Changes in quantity and quality to spring and surface water discharges associated with faults in hydraulic connection with the mined area, could result. The potentiometric surface elevation could be lowered and local changes in gradient and flow direction could result. Decreased late season flows at the seeps and potential drying of seeps could occur during mining. This would continue until after mining ceases or water fills the mine to an elevation where discharge would again occur. The proposed operations have the potential to affect these springs (depending on the depth to which the coal is removed). However, no baseline (seasonal quantity or quality) information other than initial flow and field parameters were collected for this area. There is no proposed operational monitoring for these springs. It should be noted that these springs are new occurrences or, have increased in flow and appear to be associated with previous mining activities.

A fracture is present at the north end of the permit area. This fracture appears to be in connection with HZ-95-1 and is shown on the geologic map to cross Beaver Creek into the

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permit area. Mining into the region where this fault occurs could result in dewatering the fracture and reducing recharge to associated aquifers. Currently it is unknown whether Beaver Creek is in connection with the fracture, recharging the fracture. A monitoring plan that increases monitoring over the period where mining will occur near the fracture must be proposed for water level monitoring at Well HZ-95-1 and Beaver Creek.

The Applicant indicates that due to low permeability of the formations and due to the plan to avoid mining into faulted zones, inflow to the mine from faulted zones is projected to be minimal (Section 7.1.2.2). The Applicant presents an inflow analysis that assumes porous medium flow rather than fracture flow. Lines stated that fractured bedrock flows are on the order of one magnitude larger than that predicted for unfractured bedrock. The inflow from fractured bedrock was using Lines (1985) was estimated to be 0.08 cfs or 36 gpm. The inflow estimated over initial and future permit terms was in the range of 36 to 90 gpm. This prediction was based on a hydraulic gradient of 0.041 ft/ft. The true gradient in the HZ-wells cannot be determined based on the variation in data. Based on the 1996 data this value may be greater than that estimated by the Applicant.

Average water use was predicted to be approximately 21 gpm with 15 gpm to be used underground and 6 gpm to be used in surface operation. The 37 gpm were considered consumptive use and is lost through the following: 6 gpm were estimated to be lost in surface consumptive uses; 25 gpm were predicted lost due to coal removal; another 6 gpm is estimated for evaporative loss through mine ventilation. With future expansion it is predicted that up to 50 gpm would be discharged from the mine. The Applicant has stated the fault associated with the water in the Beaver Creek No. 3 Mine will be closely monitored and periodically drilled horizontally into the fault zone. This should aid in avoiding water in this zone and the Applicant should provide a commitment to document these activities.

The Applicant 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. The potential sustained inflow occurring was estimated to be 36 gpm. The actual potential impact from intercepting a fracture reservoir and depleting or intercepting the water in the fracture is moderate to high.

The coal seams dip away from the portal entrance and excess water will be sumped underground. Waste rock from the mining production is proposed to be gobbled 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 Horizon No. 1 Mine is found in Chapter 7. The Applicant has presented the average concentration and compared it with the data obtained in mine. These

values fall within the 95% confidence interval for the data and indicates the water should not be adversely impacted. However, this method ignores potential seasonal variations. The Applicant has indicated Calcium Carbonate Rock dust will be used in mining thus, minimizing impacts to water quality. See the section above on **Acid and Toxic Forming Materials** in this TA.

The Applicant 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 where 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 similar to the water interception which occurred in the Beaver Creek Coal Mine.

The Applicant has estimated the "worst case" potential inflow through a porous formation (exclusive of fracture flows) to be  $2.6 \times 10^{-4}$  and to have an average potential inflow of  $1.5 \times 10^{-4}$ . 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 de-watered 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 Applicant states that proposed mining operations will occur north of Gordon Creek and should not affect the quantity or quality of water in this drainage. However, it was noted that approximately 400 gpm 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 and change the potentiometric surface of the Star Point aquifer immediately below the Hiawatha Coal Seam. This flow interception could impact base flow to Gordon Creek, or relocate the source of the flow. It is assumed the control point for the piezometric surface would likely be at the elevation related to the lowest point that the coal is removed. The coal dips 5.3% to the northwest, with an outcrop elevation of approximately 7,600 feet at Portal Canyon. LMC-3 indicates the depth of the Hiawatha Coal Seam is at 7,499 feet to 7,491.8 feet. The furthest extent of the block of coal to be removed is north and east of this drill hole, indicating the depth to which the coal will be removed is lower than that presented by the LMC-3 drill hole. Therefore, the potentiometric surface (estimated as 7570 feet to 7520 feet) may be impacted and decreased to somewhere below 7,491 ft. As a result of the change in potentiometric surface the water quantity and water quality to Gordon Creek could be affected due to changes in discharge received by springs from Coal Canyon. Seasonal baseline quantity

and quality for sections of Gordon Creek above and below this section should be assessed. A continuous recording flume is recommended for operational monitoring.

The Applicant indicates the water intercepted from the fault associated with the Beaver Creek Coal Company No. 3 Mine will be avoided when mining the proposed Horizon No. 1 Mine. Avoidance will occur by evaluating maps, closely monitoring the activities in the fault area and, if necessary, periodically drilling horizontally into the fault zone .

#### *Subsidence Control and Renewable Resource Protection*

The Stream Buffer Zones will be maintained for 100 feet on either side of Beaver Creek within which second mining will not occur without regulatory approval. No mining under Beaver Creek is proposed under this permit term. Presently mining panels are set up to avoid Jewkes Creek.

The Applicant has stated that mining is designed to preclude subsidence of perennial and intermittent stream reaches. The Applicant references Gentry and Abel 1978 which indicate streams tend to be protected by upwarping of adjacent slopes during subsidence.

Mining 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 Castlegate '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.

The Division has received a public complaint that suggests subsidence has occurred in areas of Beaver Creek. This concern is under further investigation.

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 for mitigation, if significant groundwater inflow occurs or, if intermittent or perennial stream flows are depleted, are found within the plan under Sections 3.4.8.2 and 7.1.6. The 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). The Applicant also indicates an extended mitigation plan will be enacted if an impact is determined to be mining related. Only emergency mitigation will be completed prior to notifying the UDOGM and Water Rights. A mitigation plan will be correlated with both agencies prior to implementation.

#### *Water Use*

Based on the predicted inflow information (36 gpm), the Applicant has estimated water will need to be pumped into the mine only at initial development and during peak operating procedures. It is estimated that approximately 60 acre-feet of water per year will be removed with the coal.

#### *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 Applicant 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 Applicant has also committed to store snow in sites that will directly drain to the sedimentation pond (Section 3.3). Following backfill and grading operations, sedimentation ponds are proposed to be removed. Alternate sediment control measures are discussed in Section 3.5.4.3.

#### **Surface Water Quality**

The Applicant considers impacts from increases in TDS to be minimal and cites downstream increase in TDS when water comes in contact with Mancos Shale, as the major factor in this determination. Because downstream waters are naturally degraded the use and quality of the upstream waters retains its importance. However, impacts to downstream waters, where the water comes in contact with the Mancos Shale, 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 Company indicates diesel fuel, oils, greases and hydrocarbon products will be stored above-ground 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. A shop maintenance area will be located next to the mine office area.

The Applicant proposes a concrete containment structure with a drain will be used and will be adequately sized to contain any spill, Section 3.23. The Applicant indicates spills will be handled in accordance with the Spill Prevention and Contamination Control (SPCC) Plan. This plan is provided in Appendix 7-10 without a certified signature required by the SPCC regulations and should be present on the mine manager's copy. 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.

The Applicant's proposal uses accepted practices for their SPCC plan. The Applicant's operation plan includes cleanup procedures for small scale spills, and a commitment to retain absorbent materials on site. A copy of the SPCC plan will be maintained on file in the Mine Manager's office and the Mine Engineer's office.

#### *Flooding or Streamflow Alteration.*

The Applicant discusses the potential for flooding as being diminished during operations due to reducing peak flows through attenuating water in the sedimentation pond. In addition to the Applicant's 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 increased downstream erosion. Currently the waters that exit from portal canyon are collected behind the waste embankment and are evaporated, used by vegetation or seep through the waste pile. The reclamation of Portal Canyon will return the ephemeral flows from this canyon directly to Jewkes Creek. The Applicant has provided riprap channel designs for the velocities that may occur from a 100 year- 6 hour event for Portal Canyon and has developed a channel design in order to encourage development of riparian vegetation in Jewkes Creek. Other potentials for streamflow alteration include an increased discharge through the operation period due to mine dewatering and other changes discussed under Potential Surface Water Impacts and Potential Groundwater Impacts.

#### **Findings:**

The Applicant has met the minimum requirements for this section, except for the following requirements which will be stipulated as part of permit approval. The permittee is subject to compliance with the following conditions in accordance with the requirements of:

#### **R645-301-731**

The Permittee must: 1) characterize the quality and quantity of water at springs CC-5 and MC-4 by conducting quarterly monitoring of standard parameters (adequate to produce stiff

diagrams) for a period of at least 2 years; 2) provide a description of the seasonal variation in water level of the HZ wells; 3) document in the Mining and Reclamation Plan that the necessary legal right to the proposed water uses has been acquired before using the water.

## **MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 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 Applicant'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.

The boundary of the permit area, including the disturbed area, is shown on Plate 1-1--Permit Boundary. It is also shown on the other relevant 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.

#### **Archeological Site Maps.**

No known archeological sites are located within or immediately adjacent to the permit area.

### **Coal Resource and Geologic Information Maps.**

The nature, depth, and thickness of the Hiawatha (lower) Seam, which is the seam to be mined, the coal and rider seams above that seam, each stratum of the overburden, and the stratum immediately below the Hiawatha Seam, as determined from borings at individual sites designated LMC-1, LMC-2, LMC-3, and LMC-4, are shown on Plate 6-1--Geology. These same data are shown in more detail in geologic cross sections on Plate 6-2--N-S Geologic Cross Section and Plate 6-3--W-E Geologic Cross Section.

### **Cultural Resource Maps.**

No public parks, and no cultural or historical places or cemeteries which might be listed or eligible for listing in the National Register of Historic Places, are found within the permit area. This finding was made by State Historical Preservation Officer Jim Dykman and documented in an October 24, 1995 letter to the Division.

### **Existing Structures and Facilities Maps.**

The locations and dimensions of all existing structures and previously disturbed areas within and adjacent to the permit area, including buildings, dams, embankments, and areas wherein spoil, waste, coal development waste, and noncoal waste have been disposed of, are shown on Plate 3-1--Surface Facilities and Plate 3-6--Premining Topography. 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. These maps show that most of the permit area has not been disturbed, but that all of the proposed 10.77-acre disturbed area and much of the land contiguous to and surrounding it have been disturbed repeatedly in the past by other mining operations, by camping and offroad vehicles, and by livestock-related activities. Consequently, the entire area is sparsely vegetated, is covered with coal waste, debris, and trash, and contains old concrete building ruins, old highwall remnants, and abandoned portals and portal faceups.

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 existing structures and facilities maps--Plate 3-1--Surface Facilities, Plate 3-6--Premining Topography, and Plate 3-7--Post Mining Topography--accurately show all existing structures, facilities, and previously disturbed areas within the permit area, as defined in this section, and thus fulfill the requirements of this section.

### **Existing Surface Configuration 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.

### **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--Five Year 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.**

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.

Surface water monitoring stations including the baseline spring and seep survey, the operational monitoring program and the UPDES sedimentation pond discharge point are shown on Plate 7-1.

### **Permit Area Boundary Maps.**

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

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**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 and Subsurface Manmade Features 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.

**Surface and Subsurface Ownership Maps.**

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).

**Surface Water Resource Maps.**

While surface water drainages can be found on surface maps, names or designated labels are not presented. In order to have a clear understanding of the surface hydrology discussions and designs the Applicant must provide adequate labels for drainages that may be referenced altered or changed during mining and reclamation operations. The names of important perennial and intermittent drainages where available must be included for surface waters in the permit and adjacent area.

**Groundwater Resource Maps.**

Surface water resource information providing the locations of springs in the permit and adjacent area are presented on Plate 7-1. See the discussions under the **Environmental Description** under the **Hydrology** heading in this T.A.

**Vegetation Reference Area Maps.**

No vegetation reference areas are proposed for the vegetation success standard.

**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.

**Findings:**

The plan meets the minimum requirements of this section.

## OPERATION PLAN

### MINING OPERATIONS AND FACILITIES

Regulatory Reference: 30 CFR Sec. 784.2, 784.11; R645-301-231, -301-526, -301-528.

#### Analysis:

##### General.

The Horizon Coal operation will be located in Gordon Creek Canyon, approximately 14 miles northwest of Price, Utah. All coal and surface land now in the permit area is privately owned. The mine will operate in the Hiawatha Seam. Production is expected to be about 700,000 tons per year.

The Applicant now holds a lease with Hidden Splendor Resources, Ltd. A right-of-way granted to the Applicant by BLM in 1996 (ROW Application UPU-73227) will allow the Applicant to mine about one year's worth of reserves. On August 16, 1995, the Applicant filed a lease application with BLM (Application No. UPU-74804) for an additional 1,288 acres of Federal coal to the northwest of the present permit area. This lease area contains an estimated 4 to 5 years' worth of coal.

##### Type and Method of Mining Operations.

The Hiawatha Seam lies on top of the Starpoint Sandstone and is estimated to contain 4.85 million recoverable tons of coal. Of this total tonnage, 3,578,000 tons are considered minable. Since the anticipated recovery rate is 60%, the Applicant expects to mine approximately 2,147,000 tons from the Horizon operation. This will make for a total operational mine life of 6-10 years, depending on production rates and market conditions.

Coal will be mined by continuous mining machinery, loaded into shuttle cars, and hauled to a feeder breaker. The feeder breaker will reduce the coal to a top size of 8 inches. The coal will then be placed on a rope-hung conveyor which will carry it to the surface. It will then be transferred to a fixed, covered conveyor which will carry it to a crusher, which will further reduce its size. From the crusher, the coal will be carried, again by covered, fixed conveyor, to the coal storage pile. From the coal storage pile, it will be loaded into trucks by belt or front-end loader and hauled to its final destination.

There will be 2 entries in the Horizon Mine. The air intake entry will occupy the present rock slope. It will be expanded and divided into 2 entries: one air intake/manway and one beltway. The second entry will be an exhaust entry.

The actual mining operation will proceed as follows: 3 main entries will be driven, on 70-foot centers, to within 80-100 feet of the property boundaries. Three-entry sub-main entries will be driven from the main entries and standard room-and-pillar panels will be developed from the sub-main entries on 140-foot centers.

100- to 300-foot barrier pillars will be left between main entries and extracted on final retreat. 80- to 100-foot barrier pillars will be left at all property boundaries, as required by Utah law. 100-foot barrier pillars will be left at all coal outcrops.

### **Facilities and Structures.**

All surface facilities are shown on Plate 3-1--Surface Facilities. There are at this site no existing structures, as defined in this section. All surface facilities will be removed during final reclamation. Following is a list and description of all surface facilities (see pages 3-2 through 3-5):

- a) Portals - There will be 2 portals in the Hiawatha seam: one air intake/manway, one air return/beltway.

The portal faceups and mine bench cuts and the outcrops of the mine bench were analyzed for stability. These analyses are found in Appendix 3-3--Static Safety Factor Calculations. The portal faceups and the mine bench cuts will have a maximum slope of approximately 72° (0.3h:1v), while the outcrops of the mine bench will have a maximum slope of approximately 34° (1.5h:1v). The portal faceups and mine bench cuts and the mine bench outcrops will have respective minimum static stability safety factors (under saturated conditions) of 2.6 and 1.4, both of which are greater than the minimum of 1.3 required by R645-301-534.130.

- b) Fans - An exhaust fan will provide ventilation for the entire mine. The Hiawatha fan will be located just above the main pad and will be accessed by a 600-foot primary road.
- c) Mine Building - This 20-foot X 40-foot trailer will serve as mine office, lamphouse, and temporary bathhouse. A 14-foot X 60-foot permanent bathhouse will be constructed later, after approval by the Division and the Utah Department of Health. The mine building will be located on the main pad, adjacent to the Hiawatha portal.
- d) Conveyor - Coal will be brought from the mine by a covered conveyor. The conveyor will transport the coal to the coal stockpile.

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- e) Supply Trailers - These trailers will be located on the main pad next to the conveyor. They will serve as onsite warehouses for maintenance parts and equipment.
- f) Substation - The substation will be located on the main pad adjacent to the Hiawatha portal.
- g) Diversions - A bypass culvert will take undisturbed drainage from the main drainages, upstream of the disturbed area and discharge it into Jewkes Creek. Disturbed drainage ditches pass water to the sedimentation pond
- h) There will be one primary road and two ancillary roads. The Main Access Road will be a primary road. The Fan Portal Access Road and the Drill Road will be ancillary roads. The roads are described in the list of surface facilities on page 3-3 and in Section 3.2.10 on page 3-5.

A plan view of the Main Access Road is shown on Plate 3-1 and designs are shown on Plate 3-4. This road will be approximately 1200 feet long and will go from Carbon County Road 290 (formerly Utah State Highway 139), at the mouth of the canyon, to the coal stockpile area.

The Fan Portal Access Road and the Drill Road are shown in plan view on Plate 3-1 and a typical cross section is shown on Plate 3-4A. The Fan Portal Access Road goes from the west side of the main facilities area to the fan portal. The Drill Road ascends the east side of the canyon from the main facilities pad to an abandoned drill pad.

- I) Water Supply System - Non-culinary water will be pumped from Sweet's Pond. A series of sumps will be constructed underground to store water. Culinary water will be purchased from Price River Water Improvement District, hauled to the site, and stored in a holding tank on the main facilities pad near the mine office trailer.
- j) Bathhouses - There will be two bathhouses, one for men and one for women. They will be trailer units and will be located on the main pad adjacent to the mine office trailer.
- k) Sedimentation Pond - Runoff from the entire Horizon site and the adjacent undisturbed areas will go to a single sediment pond. This pond will be located just east of the County Road.

The sediment pond will be of combined incised/embankment construction, with 2H:1V side slopes. The Applicant has analyzed the pond embankment designs for stability, and this analysis is found in Appendix 3-3-Static Safety Factor Calculations. Using a standard, circular failure model and the Hoek Circular Failure Charts, the Applicant has found that the pond embankments, which will have a maximum slope of 2H:1V, will have a static safety factor of 4.81 for dry conditions and 4.44 for saturated conditions.

The sediment pond will be inspected at the end of construction and yearly thereafter by a professional engineer. The professional engineer will promptly, after each inspection, provide to the Division a certified report indicating that the sediment pond has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules, as required by R645-301-514.310. The annual pond inspection report will be submitted to the Division with the full Annual Report.

In addition to the certified inspections, the pond will also be inspected quarterly by a registered professional engineer. A copy of the report on these quarterly inspections will be compiled, recognizing any appearance of structural instability or other hazardous condition, as required by R645-301-514.330. See: **Sedimentation Ponds, Hydrologic Information** under this T.A. for more information.

- l) Sewage System - This will initially consist of chemical toilets, the sewage from which will be taken from the site by a private contractor. Eventually, this system will be replaced by a permanent system after approval by the Division and the Utah Department of Health.
- m) Fuel Tank - This 5000-gallon diesel fuel tank will be located above ground at the south edge of the main pad.
- n) Shop - The maintenance shop will be located on the main pad between the mine office and the substation.
- o) Temporary Coal Mine Waste Stockpile - This pile will contain underground development waste and coal refuse from site cleanup for a maximum of 90 days until it can be disposed of underground. It will be surrounded by a berm and will be located adjacent to the coal stockpile (pages 3-10, 3-18). A full analysis of the temporary surface storage of coal mine waste and a finding of deficiency for the plans thereof is found in the subsection entitled **Coal Mine Waste under SPOIL AND WASTE MATERIALS** below.

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**Findings:**

The plan fulfills the requirements of this section.

**EXISTING STRUCTURES**

**Regulatory Reference:** 30 CFR Sec. 784.12; R645-301-526.

**Analysis:**

No existing structures, as defined in this section, will be used in connection with or to facilitate the proposed coal mining and reclamation operation at this site.

**Findings:**

The plan fulfills the requirements of this section.

**PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES**

**Regulatory Reference:** 30 CFR Sec. 784.17; R645-301-411.

**Analysis:**

No public parks, and no cultural or historical places or cemeteries which might be listed or eligible for listing in the National Register of Historic Places, are found within the permit area. This finding was made by State Historical Preservation Officer Jim Dykman in an October 24, 1995 letter to the Division.

**Findings:**

The information provided meets the regulatory requirements of this section.

**RELOCATION OR USE OF PUBLIC ROADS**

**Regulatory Reference:** 30 CFR Sec. 784.18; R645-301-521, -301-526.

**Analysis:**

No public road will be relocated by this operation. However, the operation will extend to within 100 feet of the right-of-way line of Carbon County Road 290 (formerly Utah State Highway 139).

Page 3-2 and Appendix 3-1 of the plan adequately describe the measures used by the Applicant to insure that the interests of the public and landowners will be protected from coal mining and reclamation operations which will be conducted within 100 feet of Carbon County Road 290 (formerly Utah State Highway 139). The former Applicant, Blue Blaze Coal Company, provided an opportunity for a public hearing by publishing for four (4) consecutive weeks in the Sun Advocate, a weekly newspaper of general circulation, beginning on April 25, 1991, a notice of intention to commence underground mining operations (Appendix 2-2). An identical notice was also published in April and May of 1991 in the Salt Lake Tribune and the Deseret News (Appendix 2-2), which are daily newspapers of general circulation. No public comment was received and no public hearing requested as a result of the publication of this notice. Consequently, in a May 5, 1992 letter, Emma R. Kuykendall, Commissioner of Carbon County, which has jurisdiction over Carbon County Road 290, stated her finding that the interests of the public and affected landowners will be protected under R645-301-234.400 and granted the former Applicant permission to use the road for coal haulage (page 3-5). Since the Horizon operation will be identical to that planned by the former Applicant, the Division is satisfied that the requirements of this section have been fulfilled.

#### **Findings:**

The plan fulfills the requirements of this section.

### **AIR POLLUTION CONTROL PLAN**

**Regulatory Reference:** 30 CFR Sec. 784.26, 817.95; R645-301-244.

#### **Analysis:**

The only air pollutant from this site will be fugitive dust from coal handling and from the use of improved haul roads. However, the effect on air quality of fugitive dust is expected to be small because of the rapid fallout of particles with distance from the source and the high moisture content of the loaded out coal (page 11-1).

Topsoil stockpiles will be seeded with a temporary seed mix to help protect the topsoil material from erosion by wind and precipitation. Once the temporary vegetation is established, dust from the stockpiles will be minimal (page 11-1).

The in situ moisture content of the coal is approximately 4.4%. In addition, water is added to the coal for dust suppression both at the continuous miner face and at the point where coal is loaded onto the mine conveyor. The high moisture content of the coal will thus serve to minimize air pollution from coal dust (Appendix 11-1).

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Road dust is the greatest potential source of air pollution from fugitive dust. The Applicant commits to watering the haul road and pad areas as necessary. In addition, the Applicant commits to using a chemical dust suppressant (magnesium chloride) and perhaps road surface stabilizers if dust levels exceed standards established by the Utah Division of Air Quality (page 11-2).

The Utah Department of Environmental Quality requires that all Operator's obtain an Air Quality permit. A copy of this permit is found in Appendix 11-1.

**Findings:**

The plan fulfills the requirements of this section.

**COAL RECOVERY**

**Regulatory Reference:** 30 CFR Sec. 817.59; R645-301-522.

**Analysis:**

The Horizon Mine will operate in the Hiawatha Seam. Production is expected to be about 700,000 tons per year.

Room-and-pillar mining methods with continuous mining machinery will be employed in this operation. By extracting the highest ratio of coal safely extractable, the Applicant expects to achieve a coal recovery rate of approximately 60%, which is the average recovery rate for room-and-pillar operations in the United States. The Applicant commits to extract the maximum coal possible while working with the U.S. Bureau of Land Management on any changes in the resource recovery plan.

The Hiawatha Seam is estimated to contain 4.85 million recoverable tons of coal. Of this total tonnage, 3,578,000 tons are considered minable. Since the anticipated recovery rate is 60%, the Applicant expects to mine approximately 2,147,000 tons from the Horizon operation.

The Applicant now holds a lease with Hidden Splendor Resources, Ltd. A right-of-way granted to the Applicant by BLM in 1996 (ROW Application UPU-73227) will allow the Applicant to mine about one year's worth of reserves. On August 16, 1995, the Applicant filed a lease application with BLM (Application No. UPU-74804) for an additional 1,288 acres of Federal coal to the northwest of the present permit area. This lease area contains an estimated 4 to 5 years' worth of coal. This will make for a total operational mine life of 6-10 years, depending on production rates and market conditions (pages 3-8, 3-10, 3-11).

**Findings:**

The plan fulfills the requirements of this section.

**SUBSIDENCE CONTROL PLAN**

**Regulatory Reference:** 30 CFR Sec. 784.20, 817.121, 817.122; R645-301-521, -301-525, -301-724.

**Analysis:**

**Renewable Resources Survey.**

There are no manmade structures above the permit area. The only renewable resources in the area are rangeland, two springs, and one perennial stream (Beaver Creek). There will be a minimum of more than 800 feet of cover below Beaver Creek.

Based on the past experience of other operations in this area, no significant subsidence effects are expected. Swisher Coal Company mined beneath Beaver Creek in 1978 and removed pillars. No subsidence occurred due to this operation. In addition, mining operations were carried out more than 30 years ago in the Gordon Creek No. 2 Mine and in the Consumers No. 3 Mine. To date, there has been no observable subsidence from these operations.

No damage of consequence is likely to occur to the vegetative resources in the area. In the event of subsidence, vegetation will not be damaged but will merely be displaced along with the ground surface (page 3-21).

**Subsidence Control Plan.**

Mining in the Horizon operation will be by room-and-pillar methods with pillar extraction. Barrier pillars will be left at seam outcrops and permit area boundaries. Development will proceed from north to south in the Hiawatha seam (year one). Development will be followed by pillar extraction, which is expected to last through year 6.

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 (page 3-23, Plate 3-5).

Subsidence will be monitored by the periodic redetermination of the northing, easting, and elevation coordinates of all monuments. This will be done with a one-second theodolite and a six-mile electronic distance measurement (EDM) device. After the initial coordinates of a station have been established, monitoring of that station will begin and will continue to be done

at nominal one-year intervals until 2 years after the cessation of mining operations (page 3-24). According to the nomogram which constitutes Figure 33 of the *Subsidence Engineers' Handbook*, given the depth of cover, the face advance rate, and the limit angle (assumed to be the same as that at nearby sites) at this site, all subsidence should have occurred within one year after mining has ceased in any given area (see *Subsidence Engineers' Handbook*, Second Edition, National Coal Board, London, 1975; page 43). The extended monitoring period of 2 years for all monuments will both allow for the development of a broad and comprehensive picture of subsidence at this site and also give the Applicant the empirical data necessary to determine when subsidence is complete and verify that for the Division and other regulatory agencies.

Data compiled by the National Coal Board of Great Britain indicate that with geometric parameters such as those which are found at this site, subsidence could reach a maximum of about 2.33 feet (see *Subsidence Engineers' Handbook*, Second Edition, National Coal Board, London, 1975; pages 9-10). However, given the past experience of other Operators in this area, and given the presence of massive, well-consolidated sandstone beds above the coal seam, there is every reason to believe that subsidence will never be this great (page 3-23).

#### **Performance Standards for Subsidence Control.**

As a necessary part of the operation, a map of the underground workings will be kept current from the time that underground development begins. An updated copy of this map will be submitted to the Division with each Annual Report or whenever the Division requests (page 3-7).

In the event that subsidence causes a diminution of flow in Beaver Creek, the Applicant proposes to stem the loss by either grouting the affected area or lining the streambed of Beaver Creek with impermeable clay material, or both. Such a diminution of flow, however, is very unlikely for two reasons. First, Beaver Creek Coal Company mined beneath Beaver Creek for a number of years with no effect on the creek's flow. Second, subsidence cracks are very unlikely to reach Beaver Creek because there are approximately 800 feet of massive, well-consolidated sandstone cover above the workings in this area. If cracks reached the channel of Beaver Creek and inflow occurred, the interbeds of swelling shale in the area would tend to "heal" the cracks and quickly bolt the inflow (page 3-21).

R645-301-525.300 requires that, at least 6 months prior to mining, the Operator notify all owners of surface property located above the underground workings. The plan contains this commitment on page 3-20.

#### **Findings:**

The plan fulfills the requirements of this section.

## **SLIDES AND OTHER DAMAGE**

**Regulatory Reference:** 30 CFR Sec. 817.99; R645-301-515.

### **Analysis:**

At any time a slide occurs which may have a potential adverse effect on public health, property or safety, or on the environment, the Applicant will notify the Division as quickly as possible. The Applicant also commits to comply with any remedial measures required by the Division (page 3-18).

If any examination or inspection discloses that a potential impoundment hazard exists, the Applicant will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action (page 3-20).

### **Findings:**

The plan fulfills the requirements of this section.

## **FISH AND WILDLIFE INFORMATION**

**Regulatory Reference:** 30 CFR Sec. 784.21, 817.97; R645-301-322, -301-333, -301-342, -301-358.

### **Analysis:**

#### **Protection and Enhancement Plan.**

The Applicant's discussion on minimizing potential impact to fish and wildlife from the mining operation is on page 3-34 and 3-35. The first impact is loss of habitat and since the area is small the impact should be minimal. The previously disturbed area has mostly revegetated and provides food, shelter and cover to resident wildlife. The DWR estimates that 327 acres of critical deer winter range will be lost due to increased traffic along the haul route (county road).

The Applicant states that to minimize adverse impacts to the fish and wildlife of the area an employee awareness program will be initiated to reduce wildlife harassment and road kills. The Applicant recognizes the potential for big game kill through the Wildlife Management Area (page 10-35) and has committed to controlled speed limits. Horizon has committed to monitoring road kills and reporting numbers weekly to the DWR; and agrees to remove killed deer and elk from the road between the Wildcat Coal Loadout and the mine site.

A wildlife monitoring program is to be conducted throughout the operation life of the mine by an environmental specialist (page 3-37), as required by the Division.

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The Operator has committed to fencing and maintaining the riparian zone from the sediment pond to County Road 290 (page 9-6) as mitigation for the disturbance. The type of fencing will exclude sheep and be as specified by DWR. DWR has requested the fencing of a riparian zone in Spring Two Canyon; and details will be discussed with the Operator and the Division.

**Endangered and Threatened Species.**

Fish and wildlife species which are listed endangered, threatened and of special interest are listed on pages 10-25 thru 10-33. The permit states that only the American Peregrine falcon and the Bald eagle would likely be present in the area (page 10-24), but not within the permit area. The DWR states that bald eagles are likely to use the permit area. They also state that while no Bald eagle nests have been found in the Gordon Creek area courtship activity has been observed at the winter roost.

**Bald and Golden Eagles.**

Bald and Golden eagles are likely to use the permit area. A Golden eagle/Prairie falcon nest is shown on map in Appendix 10-1. Apparently the area is used by both the Golden eagle and the Prairie falcon but never at the same time. The nesting territory identified is currently outside of the permit area and within several hundred feet of the permit area. The current mining plan should have no effect. Since these nests have been inactive for years it may be possible that a permit could be obtained from the U.S. Fish and Wildlife service for a take permit when mining is anticipated to impact the area. A commitment is made (page 10-15) to contact the regulatory authorities should the nest become active and threatened by mining.

A raptor hazard survey was conducted in the area, which document hazardous power lines (page 10-36). The permit concludes that potential electrocutions are slight because of nonuse. The commitment is made, on page 10-35, to construct all power lines within the permit area to minimize electrocution hazards to raptors.

**Wetlands and Habitats of Unusually High Value for Fish and Wildlife.**

A wetland riparian zone was created in the area of confluence of Portal Canyon and Jewkes Creek. The wetland was probably created during the early mining of the Consumers Mine in the 1920's. The quality of this wetland/riparian area could be classified as degraded. The county has done road realignment work within the wetland. The area has been used for years, since original mining, as an unloading and camping area for recreationists, hunters and herders. During Spring 1996 the area was heavily deposited with sediments from the logging operations upstream. Nevertheless, the wetland is a high value area filtering sediments prior to entering the North Fork of Gordon Creek and providing food, water and shelter for numerous wildlife species.

The permit area is within an area classified by DWR as critical summer elk and deer habitat. The permit area is within one mile of the Gordon Creek State Wildlife Management Unit. The general area has also been ranked as being of substantial value to wintering Bald eagles. Bald eagles are likely to be seen in the area; however, to date, none have been observed roosting within the proposed disturbed area.

**Findings:**

Information regarding this section was found to meet all of the minimum regulatory requirements.

**TOPSOIL AND SUBSOIL**

**Regulatory Reference:** 30 CFR Sec. 817.22; R645-301-230.

**Analysis:**

Soil resource data show that most of the proposed disturbance area has been previously disturbed and consists mainly of fill material. Soil and substitute topsoil to be saved for reclamation were tested using the DOGM guidelines. All suitable soil will be salvaged and stockpiled. In addition, Horizon commits to excavating the A horizon for the Curecanti Family and Senchert Series in accordance with the profile descriptions from The Soil Survey. The Applicant will submit as-built surveys of the completed subsoil and topsoil stockpiles. The survey will include: volume of material, maximum and minimum elevations and slopes, cross sections, and all other pertinent dimensions with amended mass balance tables.

Approximately 13,670 cubic yards of topsoil and subsoil will be salvaged (page 8-21). Estimates of salvageable soil quantities (volume) may vary because of the amount and type of coarse rock fragments and the highly variable ranges allowed within soil taxonomic classifications. As a means of insuring proper excavation and separation of adequate quantities of topsoil (A or E horizon) and subsoil (B and/or C horizon) the Applicant has committed to having a professional soil scientist on site during topsoil and subsoil removal operations (page 8-23). Topsoil and subsoil excavation will employ the "islands" method to insure that the proper thickness of the soil is removed. Soil recovery locations, soil type, and recovery calculations are given for soil removal.

The vegetative cover will be removed with and incorporated into the topsoil prior to stockpiling. Trash, concrete, and debris will be hauled to a properly licensed disposal facility as it is removed from the mine site during topsoil removal (page 8-23).

Coal and coal waste material from these areas will be handled as outlined in Section 3.3.2.5 and covered with four feet of appropriate fill (page 8-23).

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The soil will be stockpiled in the upper facilities area as shown on Plate 3-1. The stockpile will not exceed a height of eight feet. Side slopes will not exceed 2h:1v. The stockpiles will be protected from wind and water erosion through construction of a containment berm around the stockpiles, the prompt establishment of a vegetative cover, and the application of straw mulch at a rate of two tons/acre. The stockpile area will be fenced to prevent livestock from entering the area. The soils will be tested and fertilized with an organic material, seeded (Table 3-2) for temporary reclamation, and labeled.

Since the Jewkes Creek channel soils are unique in their fluvial origin in supporting the riparian/wet meadow vegetation which currently exists on site, these soils need special consideration for salvage and storage for reclamation use. In the Jewkes Creek area of the proposed sediment pond, all available excavated soils will be salvaged and stored in the stockpile for later reclamation. Soils in the riparian area will be dried prior to salvage and the subsequent inclusion in the topsoil stockpile. These necessary steps will protect these often waterlogged soils from compaction and clodding during the soil salvage.

**Findings:**

The information provided meets the regulatory requirements of this section.

**VEGETATION**

**Regulatory Reference:** R645-301-330, -301-331, -301-332.

**Analysis:**

The Applicant has committed to interim revegetation of areas disturbed to develop the mine, but not used for the mining operation (page 3-32). On these sites, a temporary seed mixture will be used for interim stabilization (page 3-34). The seed mixture, mostly grasses, was designed primarily for quick establishment.

**Findings:**

Information found in the plan was found to meet the minimum requirements of this section.

## **ROAD SYSTEMS AND OTHER TRANSPORTATION FACILITIES**

**Regulatory Reference:** 30 CFR Sec. 784.24, 817.150, 817.151; R645-301-521, -301-527, -301-534, -301-732.

### **Analysis:**

#### **Road Systems.**

The roads are described in the list of surface facilities on page 3-3 and in Section 3.2.10 on page 3-5. There will be one primary road and two ancillary roads. The Main Access Road will be a primary road. The Fan Portal Access Road and the Drill Road will be ancillary roads.

A plan view of the Main Access Road is shown on Plate 3-1 and designs are shown on Plate 3-4. This road will be approximately 1200 feet long and will go from Carbon County Road 290 (formerly Utah State Highway 139), at the mouth of the canyon, to the coal stockpile area.

The Fan Portal Access Road and the Drill Road are shown in plan view on Plate 3-1 and a typical cross section is shown on Plate 3-4A. The Fan Portal Access Road goes from the west side of the main facilities area to the fan portal. The Drill Road ascends the east side of the canyon from the main facilities pad to an abandoned drill pad.

The plans for the Main Access Road were certified in July of 1996 by Bradley Bourquin, a licensed professional engineer registered in the state of Colorado. The plans for the Fan Portal Access Road and the Drill Road were certified in July of 1996 by Richard B. White, a licensed professional engineer registered in the state of Utah.

#### **Other Transportation Facilities.**

Coal will be brought from both seams by covered, 42-inch conveyors. The conveyor from the Castlegate 'A' seam will go to a crusher on the main pad and thence to the 2000-ton coal stockpile. The conveyor from the Hiawatha seam will transfer its coal to the Castlegate 'A' conveyor at a point on the main pad approximately 150 feet up canyon from the crusher (pages 3-7 through 3-9, Plate 3-1).

### **Findings:**

The plan fulfills the requirements of this section.

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**SPOIL AND WASTE MATERIALS**

**Regulatory Reference:** 30 CFR Sec. 701.5, 784.19, 784.25, 817.71, 817.72, 817.73, 817.74, 817.81, 817.83, 817.84, 817.87, 817.89; R645-100-200, -301-210, -301-211, -301-212, -301-412, -301-512, -301-513, -301-514, -301-521, -301-526, -301-528, -301-535, -301-536, -301-542, -301-553, -301-745, -301-746, -301-747.

**Analysis:****Disposal of Noncoal Waste.**

Noncoal mine waste--trash--will be temporarily stored in a metal dumpster within a fenced area on the site. The dumpster will be unloaded as necessary by a local contractor and the trash material hauled to the Carbon County Landfill. Additional dumpsters will be provided if necessary (page 3-7).

**Coal Mine Waste.**

By definition, coal mine waste includes both underground development waste and coal processing waste. Since no coal processing waste will be generated by this operation, only underground development waste will need to be handled.

Underground development waste will be disposed of permanently in gob areas which consist of entries and cross cuts no longer needed for operation of the mine. Since the mining operation will be intersecting old workings, underground conditions cannot be accurately predicted at this time. Consequently, no detailed plan or location for underground disposal of development waste is provided by the Applicant. However, the Applicant commits to provide such a plan, for Division and MSHA approval, as soon as underground conditions are known. The Division and MSHA will be notified and plans for such disposal will be submitted for approval at least 30 days prior to the anticipated use of these areas (page 3-6).

During initial mine development and perhaps at other times, gob areas may not be adequate to store all of the underground development waste generated by the operation. In that event, the waste material will be temporarily stored on the surface, adjacent to the coal stockpile, and blended with the outgoing coal. The amount stored temporarily in this pile will not exceed 500 tons, or approximately 330 cubic yards. Any refuse material that cannot be gobbled underground or blended with the outgoing coal will be disposed of permanently at High Tech Engineering's approved refuse disposal facility at the nearby town of Hiawatha. The refuse disposal agreement between the permittee and High Tech Engineering is found in Appendix 3-1 (page 3-7).

**Refuse Piles.**

There will be no permanent refuse piles at this site.

**Impounding Structures.**

There will be no impounding structures built of coal mine waste at this site.

**Burning and Burned Waste Utilization.**

Coal mine waste fires will be extinguished only by mine personnel, all of whom will be trained in fire fighting techniques. Fire fighting will employ, in succession, first water, then fire extinguishers, then rock dust, then foam, and lastly the sealing off of the section in which a fire is located (page 3-12).

**Return of Coal Processing Waste to Abandoned Underground Workings.**

No coal processing waste will be generated or handled at this site.

**Excess Spoil.**

Sediment pond waste is, by definition, excess spoil and will be the only excess spoil handled at this operation. After cleaning of the sediment pond, the sediment pond waste will be removed immediately from the site by blending with the outgoing coal. Though not the usual practice, this procedure is fairly common and is acceptable for the disposal of sediment pond waste (page 7-47).

There is at test pit #8 (see Plate 8-1) an embankment containing perhaps 9,718 yd<sup>3</sup> of material from earlier mining operations which is high in coal content. During initial site construction, this material will be stored adjacent to the coal stockpile and will, like sediment pond waste, be disposed of by blending with outgoing coal (page 3-10).

**Findings:**

The plan fulfills the requirements of this section.

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**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:****General.**

General hydrologic inputs for determining design standards at the Horizon Mine are described. 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 hydrologic groups B and C were used for these soils.

The Applicant has used a CN of 89 for the disturbed areas. This number is adequate at this time. However, should the Applicant propose additional buildings, road surfacing or pad surfacing the design CN would require re-analysis. The Applicant used a CN of 48 for the Curecanti/Oak-Aspen soil/cover type and a CN of 73 for the Senchert/Pinyon Juniper. The vegetation map indicates vegetation types other than those described for determining the CN. For the undisturbed areas draining the weighted value was increased to a CN of 70 which is higher than the estimated CN. Based on the increase in this value the design CN used is considered adequate.

**Water Rights/Water Use.**

Water for non-culinary use will be obtained primarily from Sweet's Pond. Culinary water will be obtained from the Price River Water Improvement District, hauled to the site and stored in an above ground storage tank designed in accordance with applicable Utah Department of Health regulations. Plans will be submitted for approval prior to construction.

Sweets Pond and the pump facilities at Sweets Pond are the only existing structures used to facilitate the proposed coal mining and reclamation operation at this site. A new pipe to the mine will be constructed to convey water from Sweets Pond to the mine. Sweets Pond and associated pump facilities may be considered leased rights and excluded from bonding requirements. See additional discussions of *Water Rights and Points of Diversion*, **Baseline Information** in this T.A.

**Groundwater Monitoring.**

The Applicant has provided a ground water monitoring plan under Section 7.1.5. The Applicant states "Data collected from the springs will allow quantification of potential impacts

to perched aquifers within the permit and adjacent areas. Data collected from mine inflows will allow impacts to be quantified to all hydrologic resources that are affected by mine dewatering, and "Data collected from the HZ wells will allow quantification of potential impacts to the regional groundwater system." Although much of the design of the monitoring program meets the goals of determining the impacts of mining on the groundwater system, the Applicant has not provided site specific information on how the data will be used to make this determination. Table 6 and Table 7 represent summaries of the groundwater sampling program.

**Table 6**  
**Operational Spring Water Sampling**

Sampling Point	Location	Formation	Monitored Frequency/Parameters	Comments
SP-1	Channel in North Fork of Gordon Creek/Marakis spring	Blackhawk sandstone unit above coal seams	Quarterly (when accessible) Flow/Parameters Table 7-2	Spring sampling should be done at source when at base flow.
SP-2 1989 through 1993	Right Middle Fork North Fork Gordon Creek Hillside out of Creek Bottom	Blackhawk	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) Flow/Parameters Table 7-2	Appears to be associated with a fracture system.
SP-9	Jewkes Spring	Blackhawk	Quarterly	
2-6-W	Homestead Spring	alluvial deposits	Quarterly (when accessible) Flow/Parameters Table 7-2	
GV-70	Markis Spring		Quarterly (when accessible) Flow/Parameters Table 7-2	

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**Table 7  
 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 flows of 2 gpm or greater occur flow will be recorded and a sample taken for water quality analysis. Flow from fractures will be mapped on the mine progression map. Flow will be collected quarterly if present 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.	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 Spring Canyon Tongue of the Star Point Sandstone.	Monthly while accessible.	None proposed.	Water level corrected to depth from ground surface.	

The Applicant committed to submit quarterly and annual reports. However, the annual report is indicated to be just a repeat submittal of the results received during the year. These reports should be in the format required by the Division. A memo regarding annual report submittal is forwarded to the Operators under R645-301-742.420, and outlines those requests. The Applicant is required to provide the information requested by the Division. The Applicant included a commitment, in the plan, to notify the Division if data indicate non-compliance with permit conditions.

The Applicant has not provided site specific information that describes how the groundwater monitoring sites will be used to determine the PHC of mining. The Applicant has stated that data collected from springs will allow impacts to be quantified, and data collected from the HZ wells will allow quantification of impacts on the regional system. Since no representative water quality data has been collected from the HZ wells, the springs and mine-water inflow are proposed to be used to monitor water quality changes.

Should the mining operations intercept the fracture system connected with HZ-95-1, the location of these wells provide useful monitoring. Even with the lack of baseline data, these wells will be useful in determining the first year mining impacts. The position of HZ-95-2 is outside of the graben within which coal will be mined. This should provide information on whether there is hydraulic connection across the graben in the Star Point, or whether the graben acts more similar to a discreet unit. The location of HZ-95-1 will aid in indicating whether mining will cause dewatering of the fracture. The location of HZ-95-1-S will aid in determining if mining affects the shallow aquifer (100-200 foot depth) adjacent to Beaver Creek.

The Applicant states that if, at the initial interception point, the flow exceeds 30 days continuous flow. The groundwater monitoring will be sampled quarterly. This may not be logical since, as mining progresses water will be discharging along different facies of the fracture resulting in the Applicant continually monitoring new seeps along the water producing zone. Rather, a fracture, if flowing, should be monitored as a unit. The Applicant has committed to discuss with UDOGM a more stringent monitoring program for HZ-95-1 prior to entering the northernmost mining block in Section 8.

The general groundwater direction is to the southeast. Springs issue from Coal Canyon and from the small drainage west of Coal Canyon. The increased flows at the Coal Canyon Springs and the new occurrence of the springs in the adjacent drainage is believed to be related to mining activities. Because the groundwater gradient occurs in this direction baseline and operational information on these springs should be included as part of this proposed mine plan. The Applicant has just recently completed a survey of these springs. Therefore, adequate baseline information does not exist. However, the Applicant has committed to provide monthly flows below Coal Canyon on the North Fork of Gordon Creek, as a surface water monitoring station, when the site is accessible. The Applicant states that this will aid in determining overall impacts of mining. Without the baseline information, the potential for identifying changes in flow related to mining may be difficult to determine, but operational monitoring would potentially provide useful information. For instance, if in-mine flows increase and flows in the North Fork of Gordon Creek increased it would indicate there is a hydraulic connection with the Horizon Mine to those fractures. If the direction of flow changes and follows the geologic feature of the Beaver Creek Syncline the spring flows would decline. Other factors such as climate would need to be considered.

The description providing information on how monitoring, based on the site specific potential for hydrologic impacts, will be used, should be further expanded upon. See discussions under **Environmental Resource Description, Hydrology** for the Potential Hydrologic Impacts and Probable Hydrologic Impacts.

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**Surface-Water Monitoring.**

Specifics on monitoring during the construction period were included in the plan and Applicant has committed to collect weekly samples during the operational and reclamation construction period upstream and downstream of construction. The parameter to be analyzed in the field is turbidity. The Applicant included a commitment to monitor baseline low-flow for springs and mine in-flow under Section 7.2.2.3, Surface Water Monitoring Plan. It is believed the intent was to identify this as surface water monitoring. Additional operational surface water monitoring is summarized in Table 8.

**Table 8  
Operational Surface Water Monitoring**

<b>Sampling Point</b>	<b>Location</b>	<b>Flow</b>	<b>Water Quality</b>	<b>Water Quantity</b>	<b>Comments</b>
SS-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	
SS-5	Jewkes Creek upstream of disturbed area but downstream of the confluence with Spring Two Canyon.	Perennial	Quarterly According to Table 7-5	Monthly	
SS-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
SS-7	Beaver Creek, upstream of the permit area outside of potential subsidence zone.	Perennial Monthly	Quarterly According to Table 7-5		

Sampling Point	Location	Flow	Water Quality	Water Quantity	Comments
SS-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	
SS-8	Beaver Creek downstream north east of permit area. Out of potential subsidence zone.	Perennial	Quarterly According to Table 7-5	Monthly	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.
Not provided	North Fork of Gordon Creek below coal Canyon	Perennial	Not Proposed.	Monthly	Not presented on the monitoring map.

**Acid- and Toxic-Forming Materials.**

The Applicant 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 Applicant 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..

**Transfer of Wells.**

No transfer of wells are requested or approved at this time.

**Discharges into an Underground Mine.**

The Applicant has not addressed this regulation. No discharges into an underground mine are approved. The underground water tunnel has a use of 0.557 cfs. The water source used by the Horizon mining operations, and water quality should be included as part of the operational monitoring plan. This will allow determination of potential impacts of water quality and use over the water intercepted through Horizons mining activities.

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**Gravity Discharges.**

The dip of the coal is away from the portal faceups. Therefore, no gravity discharges are anticipated during the operations phase. The Applicant has provided for a drain to prevent the accumulation of a hydrostatic head on the portal seams. There is a potential for gravity discharges from the portal following mining depending on the accumulation of water in mine and the elevation of the piezometric surface following mining operations.

**Water Quality Standards and Effluent Limitations.**

The Applicant provided a copy of the UPDES permit for the Horizon Coal Corporation in appendix. The permit is effective March 1, 1996 and expires at midnight on April 30, 1998. The permit number UTG040019 is authorized for discharge at outfall 001, latitude 39°41'37" and longitude 111°02'58", to the North Fork of Gordon Creek. The Applicant provided a commitment to monitor the sediment pond according to the requirements of UPDES Permit UT-0023761 until bond release or until the revegetation is adequate to permit removal of the sediment pond.

If underground water is encountered in excess of the amount required for mining, the water will be settled in underground sumps and discharges will be monitored to ensure that effluent limitations are met (Sections 3.4.3 and 3.4.3.2). The Applicant also states that dewatering plans will be developed should it become necessary (Section 3.3.1.6.). The permit, however, allows only one discharge point. The Applicant has predicted that future mining will result in a discharge, therefore, the Applicant must obtain an additional mine water discharge point or, adequately design the sedimentation pond to treat mine water discharge. The total amount of TDS discharged from all mine water and decant operations is limited to one ton per day. It should also be noted that the submitted copy of the UPDES permit is missing the even numbered pages.

Discussions of water quality standards are presented in Section 7.2.2.2, Tables 7-3, and 7-4. Other water requirements and plans needing submittal and approval from the Utah Department of Health include: culinary water facility and sewage facility plans. The Applicant has committed to construct the sewage facility upon plan approval.

**Diversions.**

Undisturbed diversions are described in Section 7.2.3.2 in the plan and summarized on Table 7. All disturbed diversions are designed to carry the flow from a 25-year, 6-hour event. This is greater than the minimum regulatory requirement for a 10-year, 6-hour event. Culverts UC-1 and UC-3 receive drainage coming from the Jewkes Creek, an intermittent stream, designed to carry the flow from a 100-year, 6-hour event.

**Table 9  
 Undisturbed Drainage Diversions**

<b>Diversion</b>	<b>Diameter (culvert)</b>	<b>Function</b>
UC-1	36"	Collects flow from UC-2 and UC-3, Portal Canyon and Jewkes Creek and routes it through the pad area.
UC-2	24"	Collects flow from upper Portal Canyon and routes it into UC-3.
UC-3	30"	Collects flow from upper Jewkes Creek and routes it into UC-3.

The Applicant has considered 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 dependant on the soil types, also it is common in the region to have flashy high intensity flows that would exceed the erosivity of the minimum design requirements. Degradation and additional erosion control needs for drainages within the pad area draining to the sedimentation pond will be determined through site inspection.

**Table 10  
 Disturbed Drainage Diversions**

<b>Diversion</b>	<b>Ditch (D) or Culvert ©</b>	<b>Diameter (culvert)</b>	<b>Function</b>
D-1	D	--	Collects runoff from 30.1 acres of disturbed and undisturbed areas upstream of the sedimentation pond and south of the haul roads.
DC-1	C	18"	Collects runoff from 15.7 acres from the fan portal road and adjacent undisturbed area and routes it beneath the haul road and into the sedimentation pond.
DC-2	C	18"	Collects runoff from 1.7 acres disturbed and undisturbed area and routes it beneath the haul road loop and into the sedimentation pond.

Roads are proposed to be surfaced with 12 inches of crushed gravel road base. All roads within the permit area drain to the pond. The ancillary roads will use waterbars and berms to control the water from the roads. The water bars were sized based on the 10-year, 6-hour event and the locations are shown on Plate 7-4. The maximum length between water bars is 250 ft on the well exploration road. The longest length of flow on the fan portal road is 494 feet. The map provided makes it difficult to determine whether water running along the road above the fan portal will continue to flow to the first downstream berm. The Applicant has stated the worst

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case peak flow estimate is 0.24 cfs based on a maximum area draining to each water bar of 8 acres and based on a maximum channel slope of 0.02 ft/ft, resulting in velocities of 1.48 fps. The non-erosive velocities for the design should also consider the maximum outslope downstream of the road to determine the maximum discharge that should be passed through the water bar.

The main haul road will be crowned to drain water off the road. A culvert was placed at the inside bend of the main haul road loop to convey water to the pond. However, no provision was made to convey water to the pond from the northwest side of the loop which could potentially send water onto the county road and out of the permit area rather than to the pond. A culvert should be placed at the junction of the loop to assure upstream water is transported to the pond.

The upper haul road is also proposed to be crowned and drains to Ditch DD-1 along the south side. No ditch design is provided along the north side of the road. Since the road is crowned, the drainage from this area will make its way to Culvert DC- 1 on the north side adjacent to the coal stock pile. This culvert was not designed to contain the flow from this area.

### **Stream Buffer Zones.**

The Applicant must demonstrate that all requirements of 742.300 have been met prior to approval and findings of this section. (See R645-301-742.322). The Applicant is required to provide the stream buffer zones and assure they are adequately marked during the channel construction. Plate 3-1 shows a buffer zone sign location. The text indicates buffer zone signs will be placed adjacent to Jewkes Creek, however, Plate 3-1 does not show a sign located upstream from the disturbance. A sign must be placed at the upstream boundary of the buffer zone.

The Applicant 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. No verification that the permit was approved is provided. The Applicant must have verification of the stream alteration permit prior to approval of this coal mining permit.

### **Sediment Control Measures.**

The Applicant 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 Canyon and Spring Two Canyon to capture sediment. Berms, strawbale dikes and silt fences will be located between stream channels and areas being disturbed. The Applicant has committed to cleaning these structures once construction is completed using backhoes and shovels.

The bypass 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. Streamflow will be bypassed around construction activities using a diversion dike and flexible culvert. The Applicant has committed to construct the sedimentation pond as soon as possible following construction of the downstream culvert sections.

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 will be determined adequate based on the ability to meet the performance standards and the requirements of R645-301-745.111.

Additional erosion control measures include topsoil treatment and snow removal methods. The topsoil is proposed to be vegetated with interim cover as discussed in Sections 3.4.4.1 and Section 3.5.2. The topsoil piles will be contoured, fertilized and seeded. A berm will be placed around each topsoil pile to minimize soil transport. In Section 3.3, the plan indicates that snow removed will be stored in sites draining directly to the sedimentation pond.

#### **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 which is currently associated with the Gordon Creek Mines #2, #7, and #8, and the sedimentation pond. For a discussion of the mine site sedimentation pond, see the **Sedimentation Ponds** heading below.

Sweets pond also has an existing pumphouse and a head gate to control inlet flows. The Applicant has proposed to build a water line from the pond to the mine. The pond 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.**

The sedimentation pond does not fall under the requirements of a MSHA structure. The 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. Embankments will be vegetated, to control erosion, with a temporary seed mix as described in Section 3.5.5.2.

The Applicant proposes to divert all disturbed area runoff to the sedimentation pond, receiving runoff from 35.1 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

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been designed to contain the runoff from a 10-year, 24-hour precipitation event calculated to be 0.56 acre-feet. The Applicant has assumed sediment production of 0.1 acre feet/acre/year from the disturbed area or, 0.92 acre-feet annual sediment production. No sediment production was accounted for from the undisturbed area draining to the pond. The total capacity of the designed sedimentation pond is 2.6 acre-feet, allowing a runoff storage volume of 0.7 acre-feet of runoff and 1.9 acre-feet of sediment storage.

The sediment will be cleaned out of the pond at 60% of the total sediment volume at 7580.6 feet. The maximum capacity for sediment storage is proposed to be at 7582.0 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 commitment to clean out the accumulated pond sediment at 60% of the maximum volume will provide adequate space to retain the estimated runoff volume.

The pond will also have a 2" diameter 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 7583.1 feet, which is approximately one foot above the maximum sediment storage clean out level and approximately two feet below the elevation of the spillway.

Should the quantity of water encountered in mining exceed the amount required by the underground operations the Applicant proposes the water be treated by the sediment pond in order to meet effluent standards. This action is not designed in the sizing of the pond. 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. The proposed spillway elevation is at 7585 feet. Calculations for the spillway do not route the flow through the pond. The Applicant's spillway depth, embankment height and estimated freeboard depth do not add up. The actual depth of the spillway is 1.5 feet, assuming the other values are correct. With a depth of 1.5 feet, a flow depth of 0.08 ft, a width of 10 feet and side slopes of 2H:1V, the spillway will have 1.42 feet of freeboard between the top of the pond embankment and the maximum flow elevation. The Applicant proposed this design is non-erodible based on a velocity of less than 5 fps. The Applicant stated the channel will be riprapped but did not provide any size criteria for the riprap.

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.

The Applicant has analyzed the pond embankment designs for stability. Using a standard, circular failure model and the Hoek Circular Failure Charts, the Applicant 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 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.

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 6 E are also certified by Mr. White.

**Other Treatment Facilities.**

No other treatment facilities area proposed at this time.

**Exemptions for Siltation Structures.**

No exemptions for siltation structures were requested or are granted at this time.

**Discharge Structures.**

The sedimentation pond discharge structure is designed to maintain the downstream riparian area. In the design the base of the spillway will have an impact pool. Water is then conveyed from the pool to the channel which carries flow from the bypass culvert outlet. The culvert outlet will then transition to a low flow channel and flood plain design with a 4 foot bottom width and 0.6 foot depth and flood plain area.

**Impoundments.**

The only impoundment proposed by the Applicant is a sedimentation pond and Sweets Pond. The sedimentation pond is discussed under Siltation Structures. In Section 3.3.5 the Applicant has committed to promptly report impoundment hazards to the Division and formulate remedial action and emergency procedures.

**Casing and Sealing of Wells.**

The Applicant 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.

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**Findings:**

The Applicant has met the minimum requirements for this section, except for the following requirements which will be stipulated as part of permit approval. The permittee is subject to compliance with the following conditions in accordance with the requirements of:

**R645-301-742**

Prior to mine water discharge, the Permittee must either provide designs which demonstrate that the sedimentation pond will adequately pass and treat any mine discharge, or else obtain approval, in the UPDES permit, for an additional discharge point.

**R645-301-731.121**

Prior to any discharge from the sedimentation pond, the Permittee must design and construct an oil skimming device for the pond.

**R645-301-742.400**

Prior to construction of the operational drainages, the Permittee must: 1) provide designs which demonstrate that the drainage from the north side of the upper haul road will be adequately conveyed to Culvert DC-1; 2) provide designs which allow the road and the adjacent area (the area which drains to the north from the haulroad loop because of the crown of the road) to drain to the sedimentation pond; 3) provide designs which quantify the anticipated flow velocities over the outslope downstream from the ancillary roads and which adequately minimize erosion; and 4) determine the appropriate maximum discharge that should be passed through the water bars.

**SUPPORT FACILITIES AND UTILITY INSTALLATIONS**

**Regulatory Reference:** 30 CFR Sec. 784.30, 817.180, 817.181; R645-301-526.

**Analysis:**

There are no major electric transmission lines, pipelines, agricultural drainage tile fields, or occupied buildings within or adjacent to the permit area.

The only utility installation within the permit area and connected with this operation is the substation. As shown on Plate 3-1, the substation will be located on the main pad adjacent to the Hiawatha intake portal. It will receive power from a large main substation which lies just outside the disturbed area at the mouth of the canyon and step the power down for distribution to

the mines and surface facilities. It will be built and maintained in accordance with MSHA regulations (page 3-2).

**Findings:**

The plan fulfills the requirements of this section.

## **SIGNS AND MARKERS**

**Regulatory Reference:** 30 CFR Sec. 817.11; R645-301-521.

**Analysis:**

All signs and markers will be of a standard, easily readable design. All will be made of treated wood or steel and will be mounted on steel or wooden posts (page 3-12).

Signs will include the mine and permit identification sign, perimeter markers, buffer zone markers, topsoil markers, and snow storage area markers. Typical signs are shown on pages 3-4 and 3-15. The mine and permit identification sign will show the mine name, the name, address, and business telephone number of the Applicant, the MSHA ID number, and the permit number.

**Findings:**

The plan fulfills the requirements of this section.

## **USE OF EXPLOSIVES**

**Regulatory Reference:** 30 CFR Sec. 817.61, 817.62, 817.64, 817.66, 817.67, 817.68; R645-301-524.

**Analysis:**

The plan states that no surface blasting will be done at this site, and thus does not include a blasting plan (pages 3-13, 3-16).

**Findings:**

The plan fulfills the requirements of 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:**

All of the plates in the plan, including the mining operations 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 Applicant'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 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.

The boundary of the permit area, including the disturbed area, is shown on Plate 1-1--Permit Boundary. It is also shown on the other relevant 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 Access Road, the Fan Portal Access Road, the Drill 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.

The roads are described in the list of surface facilities on page 3-3 and in Section 3.2.10 on page 3-5. There will be one primary road and two ancillary roads. The Main Access Road will be a primary road. The Fan Portal Access Road and the Drill Road will be ancillary roads.

A plan view of the Main Access Road is shown on Plate 3-1 and designs are shown on Plate 3-4. This road will be approximately 1200 feet long and will go from Carbon County Road 290 (formerly Utah State Highway 139), at the mouth of the canyon, to the coal stockpile area.

The Fan Portal Access Road and the Drill Road are shown in plan view on Plate 3-1 and a typical cross section is shown on Plate 3-4A. The Fan Portal Access Road goes from the west side of the main facilities area to the fan portal. The Drill Road ascends the east side of the canyon from the main facilities pad to an abandoned drill pad.

The plans for the Main Access Road were certified in July of 1996 by Bradley Bourquin, a licensed professional engineer registered in the state of Colorado. The plans for the Fan Portal Access Road and the Drill Road were certified in July of 1996 by Richard B. White, a licensed professional engineer registered in the state of Utah.

The anticipated operational surface configuration is shown by contours on Plate 3-1--Surface Facilities. The premining surface configuration and the operational surface configuration are shown in cross section and as they relate the one to the other on Plate 3-2, which bears the title Premining and Operational Cross Sections. These plates were certified in 1996, after their latest revision, 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--Five Year 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.

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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 plan fulfills the requirements of this section.

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## RECLAMATION PLAN

### GENERAL REQUIREMENTS

**Regulatory Reference:** PL 95-87 Sec. 515 and 516; 30 CFR Sec. 784.13, 784.14, 784.15, 784.16, 784.17, 784.18, 784.19, 784.20, 784.21, 784.22, 784.23, 784.24, 784.25, 784.26; R645-301-231, -301-233, -301-322, -301-323, -301-331, -301-333, -301-341, -301-342, -301-411, -301-412, -301-422, -301-512, -301-513, -301-521, -301-522, -301-525, -301-526, -301-527, -301-528, -301-529, -301-531, -301-533, -301-534, -301-536, -301-537, -301-542, -301-623, -301-624, -301-625, -301-626, -301-631, -301-632, -301-731, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-732, -301-733, -301-746, -301-764, -301-830.

### POSTMINING LAND USES

**Regulatory Reference:** 30 CFR Sec. 784.15, 784.200, 785.16, 817.133; R645-301-412, -301-413, -301-414, -302-270, -302-271, -302-272, -302-273, -302-274, -302-275.

#### Analysis:

Once mining has ceased, the disturbed areas will be reclaimed to its principal pre-mining use: undeveloped land. The general region in the area of the mine site is classified as critical deer and elk summer habitat, although most of the habitat is limited to the higher elevations within the permit area (page 4-8). Site inspection verifies that the proposed disturbed area shows low to moderate big game use. The seed mixture is designed for wildlife food value and the planting should provide for wildlife cover.

The area of proposed disturbance has been previously mined and disturbed to degrees varying from slight to severe. Areas of slight disturbance have soils which have been somewhat impacted but have remained in place and support vegetation. These soils will be salvaged for use in areas which had been severely disturbed and support none to only weedy plant growth. Thus, the area should be able to support the intended postmining land use.

Surface owner comments concerning the proposed postmining land use are in Appendix 4-1. The letter from Cecil Walker, Hidden Splendor Resources, LTD, states that they accept the reclamation plans and postmining land use proposed by Horizon Coal Corporation in the mine permit application.

#### Findings:

Information found in the plan was found to meet the minimum requirements of this section.

## **PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES**

**Regulatory Reference:** 30 CFR Sec. 817.97; R645-301-333, -301-342, -301-358.

### **Analysis:**

Wildlife habitat with limited livestock grazing is not proposed as the primary postmining land use in the reclaimed disturbed area. However, this use is likely to be a secondary use. Wildlife enhancement measures during reclamation include using a seed mixture which contains a diverse mixture of grass, forbs, and shrubs which are known to be palatable to wildlife. Container stock (page 3-37) will also be planted to provide cover for the wildlife. Rock piles will be created (page 3-38) for wildlife habitat enhancement. Approximately 1100 Salix cuttings as well as Snowberry and Water Birch (page 3-39) will be planted along the riparian areas after reclamation to stabilize the drainage and start restoration of the riparian habitat.

### **Findings:**

Information found in the plan was found to meet the minimum requirements of this section.

## **APPROXIMATE ORIGINAL CONTOUR RESTORATION**

**Regulatory Reference:** 30 CFR Sec. 784.15, 785.16, 817.102, 817.107, 817.133; R645-301-234, -301-270, -301-271, -301-412, -301-413, -301-512, -301-531, -301-533, -301-553, -301-536, -301-542, -301-731, -301-732, -301-733, -301-764.

### **Analysis:**

All previously disturbed areas within and adjacent to the permit area, including waste embankments and other areas wherein coal mine waste and trash have been disposed of, are shown on Plate 3-1--Surface Facilities and Plate 3-6--Premining Topography. 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. These maps show that all of the proposed 10.77-acre disturbed area and much of the land contiguous to and surrounding it have been disturbed repeatedly in the past by other mining operations, by camping and offroad vehicles, and by livestock-related activities. Consequently, some of the area is sparsely vegetated, is covered with coal waste, debris and trash, and contains old concrete building ruins, old highwall remnants and abandoned portals and portal faceups.

This site was originally disturbed by previous mining operations between 1928 and the 1950's. No effort was made in these operations to salvage or store topsoil or substitute topsoil

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material or to document the premining surface configuration. The restoration of the site to the original, pre-1928 surface configuration is thus not possible. However, the Applicant will restore the site to a final surface configuration which not only approximates the existing surface configuration and lends itself to the postmining land use of wildlife habitat and limited grazing, but which constitutes a great improvement over the present surface configuration as well (page 3-25).

The coal mine waste and coal material which are now found in various places on the site, including the waste embankment at Test Pit No. 8 (see Plate 3-1), will be gathered and stored adjacent to the coal stockpile, to eventually be disposed of by blending with the outgoing coal (page 3-10).

During final reclamation, all exposed coal outcrops, and all toxic- and acid-forming material, of which the site already contains a fairly large volume, will be covered with at least four feet of suitable substitute soil material (page 3-28). Also during final reclamation, all highwalls, both those created for and those redisturbed by this operation, as well as all road and pad cuts, will be completely backfilled and eliminated (page 3-31).

The final surface configuration is shown by contours on Plate 3-7--Postmining Topography Map. The final surface configuration is also shown by cross sections, as it relates to the operational surface configurations, on Plate 3-7A--Post Mining and Operational Cross Sections. These maps demonstrate that the planned final surface configuration will be close to the existing surface configuration, as required by this section, but will be greatly improved in that all new and existing highwalls, portal structures, earthen structures (pads and embankments), cuts, and fills will be eliminated.

**Findings:**

The plan fulfills the requirements of this section.

**BACKFILLING AND GRADING**

**Regulatory Reference:** 30 CFR Sec. 785.15, 817.102, 817.107; R645-301-234, -301-537, -301-552, -301-553, -302-230, -302-231, -302-232, -302-233.

**Analysis:**

Since this site was originally disturbed between 1928 and 1950 and topsoil was not saved and segregated, the Applicant will only be able to restore the area to an approximate original contour which is close to the present surface configuration and compatible with the postmining

land use of wildlife habitat and limited grazing. In general, backfilling and grading will be carried out as follows (page 3-28):

- a) After sealing of the portals and removal of all structures, a backhoe (Cat 235 or larger) will be brought to the upper portal terrace.
- b) The backhoe will reach down over the fill bank, retrieve as much material as possible, and place that material on the terrace.
- c) A dozer (Cat D-7 or larger) will work with the backhoe, taking the retrieved material and compacting it from the cut bank or highwall outward.
- d) The main mine yard will be recontoured, by backhoe and dozer, to drain to the center. A drainage channel will be established to convey runoff through the reclaimed area.
- e) The procedure previously outlined in a) through d) will continue down the haul road with the backhoe and dozer operating in conjunction to reclaim the area to the permit boundary.
- f) After completion of backfilling and grading, the surface will be scarified to prevent slippage of topsoil and promote plant root penetration.
- g) A front-end loader will load topsoil into haul trucks at the topsoil stockpile. The trucks will deliver the topsoil to where the dozer and backhoe are working. The dozer will evenly distribute the topsoil to a depth of one foot over the entire regraded area.
- h) Following redistribution of topsoil, the area will be reseeded, fertilized, and mulched.

All exposed coal outcrops and toxic- and acid-forming material will be covered with at least four feet of suitable substitute soil material (page 3-28).

All highwalls will be completely reclaimed. The fill material placed against the highwalls will be compacted by repeated passes of machinery in order to stabilize the fills. All material used in backfilling will be placed on the contour to minimize erosion and instability. Repair of erosion damage will be performed by hand as necessary (page 3-31).

There will be no surface disposal of coal mine waste and no surface refuse piles. Such materials will be disposed of underground, as described in the section entitled **SPOIL AND WASTE MATERIALS** under **OPERATION PLAN** above. All available spoil will be used in backfilling and grading.

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The Applicant has analyzed the postmining slope designs using a standard rotational failure model and the Hoek Circular Failure Charts. Using the soil parameters that prevail at the site, the Applicant has found that a fill of slope 1.5h:lv has a static safety factor of 1.92 for dry conditions and 1.37 for saturated conditions. These figures compare favorably with the minimum figure of 1.3 required by 645-301-553.130. Since most reclaimed slopes will be less steep than the 1.5h:lv slopes of the Hoek analysis, the stability safety factor will be even higher than those calculated in the analysis (Appendix 3-4).

A mass balance summary for the reclamation earthwork is included as Table 3-1A on page 3-30 of the plan. This table shows the final reclamation cut and fill volumes to be reasonably balanced--16,211 yd<sup>3</sup> of cut and 22,437 yd<sup>3</sup> of fill. The cut and fill volumes calculated in this table are derived from the areas of the cross sections shown on Plate 3-7A, the locations of which are shown on Plate 3-1--Surface Facilities, Plate 3-6--Premining Topography, and Plate 3-7--Post Mining Topography. The operational and postmining configurations of the cross sections on Plate 3-7A were taken, respectively, from Plates 3-1 and 3-7.

**Findings:**

The plan fulfills the requirements of this section.

**MINE OPENINGS**

**Regulatory Reference:** 30 CFR Sec. 817.13, 817.14, 817.15; R645-301-513, -301-529, -301-551, -301-631, -301-748, -301-765, -301-748.

**Analysis:**

Portal locations, of which there will be two, are shown on Plate 3-1--Surface Facilities Map (page 3-8).

In the event that operations are to temporarily cease for 30 days or more, the Applicant will submit to the Division a notice of intention to cease or abandon the operation. Each portal that has further projected usefulness will be protected by barricades, fenced, and posted with signs to prevent access by unauthorized persons or wildlife. These closure devices will, from time to time, be inspected and maintained by the Applicant (page 3-17).

The permanent sealing of all portals will constitute the first phase of final reclamation. Portals will first be sealed with a double block seal placed 20 to 50 feet from the entrance. A drain will be placed in the block seal of the lowest portal of each seam to prevent the accumulation of hydrostatic pressure behind the seal. The portal structures will then be removed

and the exposed coal seams covered. The remaining openings will then be completely backfilled from the block seal to the ground surface (pages 3-25, 3-26, 3-27).

Drill holes LMC-1 and LMC-2 will be plugged and abandoned and new holes will be drilled adjacent to them. Drill holes LMC-3 and LMC-4 will be improved at the surface. Three new holes, designated HZ-1, HZ-2, and HZ-3, have been drilled and completed as monitoring wells for the uppermost saturated zone beneath the Hiawatha seam.

When these 7 holes are no longer required for monitoring, and unless they are approved for title transfer as water wells, they will be capped, sealed, or backfilled, as required by the Division, and abandoned (page 6-10).

**Findings:**

The plan fulfills the requirements of this section.

**TOPSOIL AND SUBSOIL**

**Regulatory Reference:** 30 CFR Sec. 817.22; R645-301-240.

**Analysis:**

Subsequent to backfilling and grading of spoil material and prior to topsoil placement, the spoil will be scarified to a depth of no less than 12 inches. The topsoil will be redistributed at a thickness of approximately 11 inches. The thickness is based on the total available medium (13,670 CY) divided by the total disturbed area (9.15 acres). Wooden stakes will be marked and placed throughout the site to insure proper depth of topsoil redistribution (page 8-24). Topsoil will be placed along the contour (page 3-32). The soil will then be harrowed to break up the cloddy surface and scarified to a depth of 18 inches. This will decrease the potential for a failure surface and facilitate root penetration by breaking up the soil/spoil interface. The graded soil surface will be roughened by pitting and gouging to maximize surface roughness (page 8-24).

All exposed coal outcrops resulting from this operation, underground development waste, as well as toxic and acid forming materials will be covered with a minimum of 4 feet of non-combustible, non-acid, non-toxic material during backfilling and grading (page 8-23). Any refuse or coal waste material remaining on site must be tested for Boron to determine the acid/toxic forming potential prior to reclamation.

Fertilizer type and rate will be determined from soil analysis (page 8-24). Twenty samples per acre will be collected from the top 12 inches. Samples will be composited and thoroughly mixed. Five subsamples will be collected from the composite and analyzed in accordance with the Division Guidelines for the Management of Topsoil and Overburden.

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Following fertilization and mulching, seeding will then commence using the final reclamation seed mix listed in Table 3-3. Erosion control matting will be used where the slope grades are 2h:1v or steeper.

**Findings:**

The information provided meets the regulatory requirements of this section.

**ROAD SYSTEMS AND OTHER TRANSPORTATION FACILITIES**

**Regulatory Reference:** 30 CFR Sec. 701.5, 784.24, 817.150, 817.151; R645-100-200, -301-513, -301-521, -301-527, -301-534, -301-537, -301-732.

**Analysis:**

The Main Access Road, the Fan Portal Access Road and the Drill Road will be completely backfilled and eliminated and their culverts removed during final reclamation, as shown on Plates 3-7 and 3-7A. Only that portion of the Main Access Road which now crosses the lower portion of the disturbed area and which provides access to Beaver Creek from Carbon County Road 290 (formerly Utah State Highway 139) will be retained. This road will follow its present route and will be restored to approximately its present condition and configuration.

**Findings:**

The plan fulfills the requirements of this section.

**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:****Ground-Water Monitoring.**

See information under this same heading in the subsection entitled **HYDROLOGIC INFORMATION** under **OPERATION PLAN** above.

### **Surface-Water Monitoring.**

See information under this same heading in the subsection entitled **HYDROLOGIC INFORMATION** under **OPERATION PLAN** above.

### **Acid- and Toxic-Forming Materials.**

In the plan under Section 6.5.7.1 is a commitment to monitor the acid and toxic conditions of the overburden and underburden. Samples will be taken at 2,000 foot intervals throughout the mine and tested according to the Division requirements.

The Applicant has committed, in Section 3.5.4, to cover all acid- and toxic-forming material with four feet of non-combustible, non-acid and non-toxic, forming material that is a suitable growth material. The Applicant has also committed to backfill a highwall or cut slope with any underground development waste that is temporarily stored on the surface and has committed to cover it with 4 feet of suitable backfill.

Where noncoal waste rock from initial development will be incorporated as fill. The Applicant has committed to cover all coal waste with four feet of material. No coal or coal waste material will be used in the areas planned for reclamation for Portal and Jewkes Creek.

### **Transfer of Wells.**

No request for transfer of water wells are presented.

### **Discharges into an Underground Mine.**

No discharges into an underground mine are applied for or granted for the reclamation area configuration.

### **Gravity Discharges.**

The Applicant has proposed that a drain be included in the stopping for portal closure. This site may have gravity discharge and should be monitored following closure through bond release.

### **Water Quality Standards and Effluent Limitations.**

See information under this same heading in the subsection entitled **HYDROLOGIC INFORMATION** under **OPERATION PLAN** above.

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### Grading to Drain.

The Applicant has committed to keep surface drainage from entering sealed entries in Section 3.5.3.1. The Applicant has committed to recontour the area to drain to the final reclamation channel in Section 3-25. However, the elevation contour lines on Plate 3-7 does not reflect a site graded to drain to the channel. In fact, the portal canyon reclamation contours are nearly the same as the operational contours from cross section D'-D to cross section J'-J. The contour lines instead indicate a flat planar surface over the lower section of the Portal Canyon drainage. The construction of a relatively flat plane on a slope of this steepness will increase the potential for rill and gully erosion at this site.

### Diversions.

The Applicant has proposed a drainage plan which reconfigures Jewkes Creek's drainage channel and Portal Canyon drainage channel. The new configuration of Portal Canyon eliminates the basin behind the existing embankment. However, the reclamation topographic information does not provide for grading the surface to drain to the channel.

The Applicant has presented a centrally-located channel section, located away from the toe of steepened and backfilled slopes. The channel is placed to avoid a pre-existing coal spoil slope near cross section C'-C in Portal Canyon and to prevent leaching or erosion of that pile. The Applicant has assessed the design capacity of Jewkes Creek and determined the upstream channel capacity approximates a flow of 27.65 cfs while the downstream channel capacity approximates a flow of 38.67 cfs. The reclamation channel is design to pass the 100- year, 6-hour event through the channel and flood plain configuration.

The Upper Jewkes Creek channel is designed to carry 19.75 cfs in the combined channel and flood plain configuration while, the Lower Jewkes Creek channel is designed to handle a combined channel and flood plain flow of 30.21 cfs. Portal Canyon was designed to carry a peak flow of 9.95 cfs. The Applicant has not demonstrated the flow from the upstream channel can be conveyed through the proposed reclamation channel. The channel forming flows are described by Dunne and Leopold (1978) as **being related to channel characteristics** and often related to the 1.5 year recurrence interval for most perennial and intermittent systems, while the Applicant's analysis is based on a high water mark.

The Applicant's proposal includes a small riprapped channel section designed to carry a low flow from the 10-year, 6-hour event. The Applicant has provided a sand filter blanket to promote drainage to the surrounding soils. The channel presented meets the minimum design requirements by passing the 100-year, 6-hour event through the channel and flood plain configuration. The ability of the channel design to be stable may have a lot to do with the potential of the surrounding soils to attenuate flows and convey subsurface waters. Additionally

the postmining flood plain configuration has an increased slope and the limitation of 12 feet for the extended channel may not provide an adequate area to meet the vegetative requirements.

The Jewkes Creek channel design is intended to provide a means to re-establish the riparian vegetation now existing at the site and to simulate the existing channel and potential site conditions. Some issues that are related to the success of the Applicant's proposal are based on the hydraulic characteristics of the soil adjacent to the channel, the maintenance of the culvert providing a gradient control downstream of the site and, the amount of sediment and intensity of flows being transported through the system. The ability of the Applicant's design to be stable may be measured through the success of the design to withstand flows received at the site.

According to Rosgrens Classification system would approximate an E stream type configuration. The channel type is chosen based on characteristics of the existing stream gradient through this section and, assuming a moderate sediment supply and healthy vegetation. The classic channel under these conditions would have a width to depth ratio less than 12, an entrenchment ratio greater than 2.2, a sinuosity greater than 1.5 and, a surface water slope less than 0.02. Because there is a high sediment load in the existing system (upstream logging presently occurring) and because the potential for additional flows from the reclaimed channel section and an increased slope, a channel more closely resembling a C stream type may be more appropriate.

#### **Stream Buffer Zones.**

At the time of reclamation the Applicant will need to submit another stream alteration permit. The Applicant must receive approval for stream alteration before the reclamation construction can commence.

#### **Sediment Control Measures.**

The Applicant has proposed the pond be removed during the reclamation phase. The Applicant stated the location of the pond and channel re-establishment makes it impractical to retain the pond through the entire reclamation period. In Section 3.5.8 the reclamation time table shows that pond maintenance will occur 10 years after seeding and removal will occur after Phase II bond release. The Applicant has also shown pond reclamation and grading to occur in Phase II bond release period. The Applicant needs to clarify whether the sedimentation pond is proposed to be removed under Phase I or Phase II reclamation.

If the Applicant placed the culvert into the location of the Jewkes Creek the Applicant could retain the pond and culvert system until Phase II bonding or until vegetation is adequate to control erosion. The Applicant indicated that this is not practical because it would require re-disturbance of the re-vegetated areas lengthing the time necessary to establish permanent vegetation.

The Applicant states "If feasible, efforts will be made to minimize reclamation activities during periods of wet weather. During short periods when reclamation construction activities will be suspended, the construction site will be left in a condition which would minimize the impact on the hydrologic system if a rainfall event were to occur." Sediment control measures during the reclamation activities include the following:

- 1) Construction of the reclaimed stream channels and grading will commence at the upstream end of each channel/canyon working downstream. The Applicant also committed to retain the sediment pond in place as long as possible.
- 2) Alternative methods employed during reclamation include:
  - Silt fences
  - Surface ripping and Deep gouging
  - Mulching
  - Straw-bale dikes
  - Seeding
  - Reseeding areas that do not exhibit successful germination.

Silt fences and straw-bale dikes will also be installed in road ditches immediately downstream from the disturbed area. They are also proposed to be used in the channels of Spring 2 and Portal Canyon. The Applicant must provide the following design provisions for those fences installed in ditches or drainages. The bales or fences must be anchored into the bank of the ditch, must have the highest elevation of the structure, below or even with the top of the ditch and, silt fences must have a notched spillway. These are BTCA for proper installation in a ditch or channel.

A Sediment Control Monitoring and Maintenance Plan and corrective action. Measures are outlined in Section 3.5.4.2. Rills or gullies will be filled graded or stabilized then reseeded or replanted. In Section 3.5.5.4 the Applicant indicates erosion will be monitored and will be controlled by regrading (if necessary), mulching, and matting. As presented in Section 3.3.5.3 mulching and roughening will occur on areas before seeding where slopes are 2 ½:1 or less. The matting will be applied on slopes 2 ½ : 1 or steeper.

Silt fences will be placed parallel to the contours with ends turned up perpendicular to the slope. Approximate locations are on plate 7-7. Installation will be completed according to Figure 7-9. As each reclaimed channel reach is reconstructed, the channel will be lined with silt fence or straw bale dikes. Silt fences or strawbale dikes will be used in road ditches, and immediately downstream of the road ditches. In addition, Section 3.5.4.3 indicates silt fences will be established at the bottom of fill slopes and along the top bank of the reclamation channel.

In Section 3.5.5.1 the Applicant suggests mechanical treatment of disc, harrow or clod buster for seed bed preparation. Mechanical treatment of slopes with a grade of less than 10 percent will be completed by ripping the soil 18 inches deep with shanks placed at 7-foot intervals to achieve parallel slots 4 to 10 inches wide. These areas will be mulched. Additionally, in Section 3.5.4.2 the Applicant indicates the grading and placement of overburden and topsoil will be done along the contour, and in Section 3.5.4.4, the Applicant indicates disturbed areas will be loosened by ripping to allow easier backfill and grading operations and compacted zones will be eliminated by deep chiseling. Prior to placement of topsoil the area will be scarified.

In Section 3.5.4.3, it is stated that slopes 2 ½ :1 or greater will be matted and all areas will be mulched during seeding. Slopes greater than 10 percent will have erosion control matting installed. The Applicant has indicated in Section 3.5.5 if revegetation is delayed a sterile cover crop will be planted. The Applicant has not indicated whether mulch will be used also at this time. Since mulching is part of the proposed BTCA practice for erosion control it should also be applied at this time. Although these are accepted practices the BTCA for most Utah sites is to provide gouging (deep pocking) as the roughening factor. The Applicant has also considered gouging to be used. The Applicant must eliminate the conflicting information concerning matting and gouging in Chapters 3 and 7.

The Applicant's plan is not detailed enough to allow removal of the sedimentation pond prior to establishment of vegetation. The Applicant should detail the construction activities to show the measures taken to minimize sediment transport from the site. This detail should include timing and sequencing for the removal of the culvert system. All regrading, placement of the topsoil, mulching and, erosion control matting in Portal Canyon should be completed prior to removal of the Jewkes Creek Bypass Culvert. A design for transporting drainage from the Portal Canyon area during reclamation to the pond during this phase must be included. A commitment to obtain an onsite inspection by a Division Hydrologist and to receive Division approval prior to pond removal must be provided in the plan.

The Applicant has stated that during short periods when reclamation construction activities will be suspended the site will be left in a condition which minimizes impact if a rainfall event were to occur. Specific measures to be employed must be discussed.

The Texas Department of Transportation has analyzed the effectiveness of Erosion Control Blankets. The following testing criteria were used for this site situation a rainfall rates, slopes, effectiveness of vegetation establishment and soils. From these comparison tests there were overall effectiveness ratings developed. Literature such as this provides for an assessment of Best Technology Currently available. The Applicant must provide a commitment in the plan to obtain approval from the Division prior to commencing with reclamation for a specific erosion control matting that will be used for reclamation and, stating that the Applicant will supply current information that demonstrates the proposed matting is one of the Best Technologies

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Currently available. Additionally, the Applicant should commit to install erosion control matting according to the manufacturer's directions.

Estimated erosion production for the proposed methods are compared with erosion production expected from an established vegetative cover of 50 %. This analyses must be re-evaluated to include the current vegetation standard and include the 71% riparian area standard. Additionally the standard presented assumes that 50 % vegetation will control erosion. However, this has not been demonstrated.

**Siltation Structures.**

According to the agreement under Section 3-5, Sweets Pond will be reclaimed to a postmining land use as a private fishing pond. Mountain Coal Company would be responsible for liability until reclamation bond is released for the Gordon Creek 2/7/8 mine and five shares of MCC water rights were assigned to E. E. Pierce. No sedimentation ponds, discharge structures, impoundments or other treatment facilities are proposed or approved for retention as a postmining land use.

**Sedimentation Ponds.**

The sedimentation pond will be removed during Phase II of final reclamation and replaced with alternative sediment control measures. The Applicant has indicated sediment control following removal of the sedimentation pond will be provided as outlined in Section 3.5.4.3. Section 3.5.4.3 indicates the pond will be removed at the end of backfilling and grading procedures and conflicts with the proposal for removal at Phase II bond release. The Applicant should correct this conflict and include reference to information provided in Section 7.2.3.2, which also conflicts with the reclamation time table.

**Other Treatment Facilities.**

No treatment facilities are proposed to be constructed at this site.

**Exemptions for Siltation Structures.**

No areas exempt from BTCA are proposed or granted for the applicable portions of the reclamation plan.

**Discharge Structures.**

The sedimentation pond and its associated discharge structure will be removed during reclamation.

### **Impoundments.**

The only impoundment proposed at this site is the sedimentation pond, the reclamation of which is discussed under **Sedimentation ponds** above.

### **Casing and Sealing of Wells.**

The final casing and sealing of wells is discussed in more detail under **MINE OPENINGS** above.

### **Findings:**

The Applicant has met the minimum requirements for this section, except for the following requirements which will be stipulated as part of permit approval. The permittee is subject to compliance with the following conditions in accordance with the requirements of:

#### **R645-301-742.300**

Within 60 days of permit issuance, the Permittee must provide reclamation designs which show the surface topography graded to drain to the channels, particularly in Portal Canyon.

#### **R645-301-742**

Within 60 days of permit issuance, the Permittee must: 1) correct all statements in the plan which are not consistent with a commitment to remove the sediment pond at Phase II Bond Release; 2) provide appropriate designs for silt fences and straw bale dikes which are used for sediment control in ditches and drainages (designs should take into account anchoring, height relative to heights of ditch tops, and spillways); 3) provide a clear and accurate plan between Chapters 3 and 7 for soil roughening and for the application of erosion control matting (especially important on slopes greater than 2h:1v); 4) provide a commitment in the plan to implement adequate erosion control measures, and to have the Division inspect and approve those measures, prior to removal of the sediment pond; 5) provide a detailed plan of the construction activities which shows the measures taken to minimize sediment transport from the site during reclamation. This plan should include timing and sequencing for the removal of the culvert system and must discuss regrading, topsoil placement, mulching and erosion control matting, and must include a commitment to complete reclamation of the Portal Canyon area prior to removal of the Jewkes Creek bypass culvert; 6) provide a discussion in the plan of the specific measures to be used to protect the site during a storm event if, during reclamation, there are short periods when construction is suspended; 7) provide a demonstration in the plan that, upon the establishment of the required vegetative cover, erosion will be controlled (the analysis should include the erosion production evaluated from the current vegetation standard as well as from the 71% riparian area standard).

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### CONTEMPORANEOUS RECLAMATION

**Regulatory Reference:** 30 CFR Sec. 785.18, 817.100; R645-301-352, -301-553, -302-280, -302-281, -302-282, -302-283, -302-284.

#### **Analysis:**

The Applicant commits to contemporaneous reclamation. When disturbed areas are no longer needed they will be backfilled, graded, retopsoiled, and revegetated (page 3-24). Because the site is so small all available space will be used and no reclamation will occur until the mine closes and final reclamation activities occur.

#### **Findings:**

The Applicant is in compliance with this section.

### REVEGETATION

**Regulatory Reference:** 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.

#### **Analysis:**

##### **General Requirements.**

A reclamation schedule has been illustrated in Table 3-4. The schedule details each major step in the revegetation plan as required in R645-301-341.100. The schedule illustrates seed, plant and other material ordering with adequate lead times for procurement.

All seeds to be planted on site will comply with all state and federal seed laws (page 3-32).

The seed mixture to be used for permanent seeding is designated on page 3-38 through 3-41. The seed mixture is comprised of species native to the area and desirable for wildlife use, in particular big game use. The seed mixture includes the Gordon Creek variety of Wyoming big sagebrush which is preferred if available. A separate seed mixture has been designated for the .43 acres of wetlands to be recreated along Jewkes Creek.

The seed will be broadcast seeded (page 3-34) and then raked to ensure proper seed to soil contact. A commitment has been made in the plan to leave the site in a roughened state. This roughened state has proven to be very important to the success of the reclamation project.

### **Timing.**

The plan commits to a fall planting (page 3-33). This is the normally accepted time of year to be seeding in the region. The plan provides for a contingency if seeding is not completed by November 30, then a quick growing ground cover, such as Regreen will be planted until the next growing season.

### **Mulching and Other Soil Stabilizing Practices.**

Two thousand pounds per acre straw mulch will be applied over the seeded areas and then incorporated while the surface is being roughened before seeding (page 3-33). The permit states that at the time of reclamation the most beneficial type of mulch to be used will be determined by the Division and Applicant. The Division's experience in the area has been to place 2 tons per acre alfalfa on the soil surface and incorporate this while the surface is being roughened and then seed broadcasted. This commitment is acceptable to the Division. All slopes 2.5h:1v or steeper will have erosion control matting installed. The matting will provide the additional protection needed on these steeper slopes.

### **Standards for Success.**

As previously stated all, if not most, of the entire operational area has been previously disturbed by mining and not reclaimed to the requirements of the Utah Coal Mining rules. Therefore, the revegetation success standard for bond release is that the vegetative ground cover will be not less than the ground cover existing before redisturbance and adequate to control erosion.

Several vegetative studies have been conducted within the area of the proposed disturbance. Two studies, 1991 and 1995, are presented and included in Appendix 9-1 of the application to use as a bond release standard for the Portal Canyon area of the disturbance. Total vegetative cover averaged 48 and 55 percent cover in 1991 and 1995, respectively. Perennial, nonweedy cover averaged 45 and 49 percent vegetative cover in 1991 and 1995, respectively. Unpaired, nonparametric comparisons of two samples based on rank showed that the 1991 and 1995 nonweedy, perennial cover was not significantly different; however, the 1991 and 1995 total cover were significanty different. Two sample comparisons using the normal distribution showed no significant difference in either total or perennial cover. Raw data is presented in Appendix 9-1.

The locations of the transects are illustrated on Plate 9-1. Transects B and D are shown as going outside of the disturbed area. Original photographs of the transects indicate that the transects are actually within the disturbed area and this is acceptable to the Division.

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The Applicant proposes to use the 1995 baseline study as the standard for success for all areas except the wetland/riparian area. Since the 1991 and 1995 nonweedy, perennial cover was not significantly different then this success standard is acceptable to the Division. Page 9-8 also commits to the same diversity of shrubs, forbs, and grasses as the 1995 study. A commitment is made for the 80/60 tree and shrub standard rule, although this is not required for a prelaw site. However, this commitment will ensure that the postmining landuse standard is being met.

Another study to establish baseline data was conducted in the wetland/wet meadow/riparian area in 1996 (Appendix 9-2). Total living cover was 71%, which will be considered the success standard for bond release. Other standards to be met are diverse, effective and permanent vegetative cover which are compatible with the postmining land use. Therefore, the plant species established along Jewkes Creek wet meadow area will have to have wetland characteristic to be considered successful. The reclaimed channel for Jewkes Creek shown in Figure 7-12 provides for a 12 foot wide 100 year flood plain. In places the wet meadow/riparian area is 50 feet wide and will likely never meet the bond release standards for this area. Therefore, the Jewkes Creek channel will have to be redesigned in order to have a reasonable chance of meeting this standard prior to permit approval.

The period of intended responsibility will be ten years. Vegetation will be quantitatively measured in years 2, 3, 5, 9, and 10 following revegetation (page 9-10).

This is a previously-mined site and although some areas are considered severely disturbed, the Applicant has committed to clean and remove the old spoil material from the site. Some areas were less severely impacted and the topsoil has remained in place with minimal surface disturbance. Adequate topsoil will be salvaged from these areas to use on the more severely impacted areas. The proposed mine site is located in a canyon bottom at approximately 7600 feet elevation with average annual precipitation between 16 and 20 inches. All of these factors, along with the revegetation efforts, should allow the Applicant to meet and exceed the performance standards in all areas except for the wet meadow/riparian area.

**Findings:**

The Applicant has met the minimum requirements for this section, except for the following requirements which will be stipulated as part of permit approval. The permittee is subject to compliance with the following conditions in accordance with the requirements of:

**R645-301-353**

Within 60 days of permit issuance, the Permittee must amend the reclamation plan to show a reclaimed drainage through the Jewkes Creek area which will allow a reasonable likelihood of reestablishing the riparian/wet meadow vegetation which currently exists on site.

At minimum the vegetative community must be of the extent shown on the maps in Appendix 9-2.

## **STABILIZATION OF SURFACE AREAS**

**Regulatory Reference:** 30 CFR Sec. 817.95; R645-301-244.

### **Analysis:**

All final grading and placement of topsoil will be done along the contour to minimize erosion and instability. The Applicant has committed to fill, regrade, seed and otherwise stabilize any rills or gullies which develop (page 3-31). The commitment is also made to plant a soil stabilizing cover crop such as Regreen if erosion work is done during that portion of the year in which final seeding is not optimal.

### **Findings:**

The information provided meets the regulatory requirements of this section.

## **CESSATION OF OPERATIONS**

**Regulatory Reference:** 30 CFR Sec. 817.131, 817.132; R645-301-515, -301-541.

### **Analysis:**

As soon as it is known that operations are to temporarily cease for 30 days or more, the Applicant will submit to the Division a notice of intention to cease or abandon the operation. In accordance with 645-301-529.210, each mine entry that has further projected usefulness will be protected by barricades, fenced, and posted with signs to prevent access by unauthorized persons and wildlife. These closure devices will, from time to time, be inspected and maintained by the Applicant (page 3-17).

### **Findings:**

The plan fulfills the requirements of 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:**

All of the plates in the plan, including the reclamation 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 Horizon operation. They were last revised in 1990 to include the proposed permit and disturbed area boundaries, the proposed surface facilities, additional geologic information, the final surface configuration, and other information relevant to that operation. All were certified in 1990, after their latest revision, by Joe E. Shoemaker, a land surveyor registered in the state of Utah. Horizon Coal incorporated the plates into the present mine plan without change in 1995.

### **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. It is shown on Plate 1-1--Permit Area.

### **Bonded Area Map.**

The total bonded area at this site comprises 10.77 acres (page 2-6). Plate 3-1--Surface Facilities shows the boundary of the bonded area in relation to the operational facilities, and Plate 3-7--Post Mining Topography shows the boundary of the bonded area in relation to the reclamation plan and the postmining surface configuration. These maps were certified in 1996, after their latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

### **Reclamation Backfilling and Grading Maps.**

The final surface configuration is shown by contours on Plate 3-7--Postmining Topography. The final surface configuration is also shown by cross sections, as it relates to the operational surface configurations, on Plate 3-7A--Postmining and Operational Cross Sections. These maps were certified in 1996, after their latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

### **Reclamation Facilities Maps.**

All surface facilities and structures will be removed during final reclamation. The only permanent features will be the restored drainage channels and that portion of the Main Access Road which now crosses the lower end of the disturbed area. These features are shown in plan view on Plate 3-7--Postmining Topography and in cross section on Plate 3-7A--Postmining and Operational Cross Sections.

The sediment pond will be retained until all backfilling and grading are completed, at which time it too will be backfilled and eliminated. Erosion control during the remaining period of final reclamation will be provided by erosion control matting, by silt fences placed along the restored drainage channels, and eventually, of course, by the reestablished vegetation.

### **Final Surface Configuration Maps.**

The final surface configuration is shown by contours on Plate 3-7--Postmining Topography. The final surface configuration is also shown by cross sections, as it relates to the operational surface configuration, on Plate 3-7A--Post Mining and Operational Cross Sections. These maps were certified in 1996, after their latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

### **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

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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.

**Reclamation Surface and Subsurface Manmade Features Maps.**

All surface and subsurface manmade features within and adjacent to the permit area are shown on Plate 3-1--Surface Facilities and Plate 4-1--Land Use. 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 manmade surface features associated with mining and reclamation operations will be removed during final reclamation. The only permanent manmade features will be the restored drainage channels and that portion of the Main Haul Road which now crosses the lower end of the disturbed area (page 3-39). These features are shown in plan view on Plate 3-7--Postmining Topography and in cross section on Plate 3-7A--Post Mining and Operational Cross Sections. These plates were certified in 1996, after their latest revision, by Richard B. White, a professional engineer registered in the state of Utah.

**Reclamation Treatments Maps.**

The general features of the reclamation plan, as they relate to the actual mining operation, are shown on Plate 3-7--Post Mining Topography. This map includes the disturbed area and all operational surface features and facilities, as well as reclamation information such as the locations of cuts and fills, the locations of reestablished drainage channels, and the location of the retained portion of the Main Haul Road.

**Findings:**

The plan fulfills the requirements of this section.

## BONDING AND INSURANCE REQUIREMENTS

Regulatory Reference: 30 CFR Sec. 800; R645-301-800, et seq.

### Analysis:

#### Form of Bond (Reclamation Agreement).

In accordance with R645-301-830, after this permit application has been approved, but before the permit is issued, the Applicant will file a surety bond with the Division. The surety bond will be made payable to the Division and the amount thereof will be determined by the Division using, as a basis, the reclamation cost estimate provided in the plan (page 2-5).

#### Determination of Bond Amount.

The reclamation costs were estimated using the earthwork volume estimates derived from the cross sections found on Plates 3-2 and 3-7A, the respective predicted tonnages of stockpiled coal and refuse of 2,000 tons and 500 tons, the machinery, labor, demolition and earthwork information from *Means Site Work Cost Data*, 11th Annual Edition, 1992, and the equipment and labor costs from the *Rental Rate Blue Book for Construction Equipment*, Volume 1, April 1991. The process by which the cost estimates were made is as follows (see Appendix 3-7).

- 1) The equipment and personnel needed for each step were determined. These determinations were made using the activity scenarios in *Means Site Work Cost Data*, 11th Annual Edition, 1992, which specify equipment and labor requirements for various activities such as demolition, grading, loading and hauling.
- 2) The time required for each step was estimated. These estimates were also made using the activity scenarios in *Means Site Work Cost Data*, 11th Annual Edition, 1992, together with the dimensions of the surface facilities and the earthwork volume estimates found on page 3-30 of the plan. The activity scenarios include expected productivities in units of area per unit of time, in the case of activities such as demolition or ripping or seeding and mulching, and in units of volume per unit of time, in the case of activities such as earthwork or loading and hauling.
- 3) The estimated cost for each step was calculated. These costs were made using the time estimates made in step 2) above, together with the equipment and personnel costs per unit of time found in the *Rental Rate Blue Book for Construction Equipment*, Volume 1, April 1991.

The cost estimates for the various steps of the reclamation plan were totaled. A flat mobilization cost was then added, along with a 10% contingency and a 5.5% agency inspection

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**TECHNICAL ANALYSIS**

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and supervision sum. The resulting total, which is in 1992 dollars, was then escalated through the year 2000, using escalation factors provided by the Division, to obtain a total reclamation cost estimate of \$209,195, in 2000 dollars.

The 10% contingency represents the standard contingency rate used by the Division. The 5.5% agency inspection and supervision sum was determined from Graph 3, page 19 of the *OSM Handbook for Calculation of Reclamation Bond Amounts*, 1987.

The time estimates for the various steps in the reclamation plan were summarized and compiled to create a detailed timetable for final reclamation. This timetable begins on page A3-7-1 of Appendix 3-7. The total time estimate for final reclamation is 64 days, or approximately 13 weeks. The actual time required will probably be less, however, since several of the reclamation steps will be carried out concurrently.

#### **Terms and Conditions for Liability Insurance.**

In accordance with R645-301-890, after this permit application has been approved, but before the permit is issued, the Applicant will obtain the required liability insurance and submit the required documentation thereof to the Division (page 2-5).

#### **Findings:**

The plan fulfills the requirements of this section.