0006

OK

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

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

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

March 12, 2002

TO: Internal File

FROM: Michael J. Suflita, Reclamation Specialist, and Hydrologist/Team Lead MJS

RE: James Canyon Road & Wells, Canyon Fuel Company, LLC., Skyline Mine, C/007/005-AM01K

SUMMARY:

On August 16, 2001 Skyline Mine encountered large groundwater inflows. The inflows were estimated to be about 4,500 gallons per minute (gpm) and required emergency actions to prevent loss of life and equipment. Subsequent pumping and pipelines resulted in expenditures of well over $ 6 million dollars to keep water from filling the mine. Part of the flooding response was to drill two wells in order to pump water to the surface. The wells pump groundwater only and are not pumping water that has been inside the mine. This was intended to relieve water pressure and decrease water inflow to the mine. The wells are located in James Canyon, on the ground surface above the water inflow location.

Among other things, this proposed amendment to the Mining and Reclamation Plan (MRP) addresses potential impacts of groundwater inflows to the mine. This includes past inflows in addition to the most recent one on August 16, 2001. The Division on November 15, 2001 received the amendment. This Technical Memo is a review of the Hydrologic aspects of the proposed amendment and there are several deficiencies.

It should be noted that the urgency of the situation necessitated two other MRP amendments, which were approved. The first, AM01H, dealt with burial of a pipeline from the James Canyon wells to discharge the well water into Electric Lake. The pipeline is buried adjacent to an old road that runs from the wells down to the lake. The pipeline is to be abandoned at the end of its life and the road has been reclaimed. The second, IB01I-1, dealt with burial of a power line to supply electricity to the wells in James Canyon. The power line is buried adjacent to the same old road as the pipeline, however, it's along the section of road leading from the mountaintop down the road to the wells. This section of road and the powerline are still in use.

TECHNICAL ANAYLSIS:

GENERAL CONTENTS

ENVIRONMENTAL RESOURCE INFORMATION

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

HYDROLOGIC RESOURCE INFORMATION

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

Analysis:

Probable Hydrologic Consequences Determination

Division Analysis of Situation

Flooding at Skyline Mine is unique compared to other groundwater inflows at Utah mines. Therefore, the Division took the initiative to begin investigating the situation before this amendment was received. The investigation used information provided in meetings with the Operator, several government sources of hydrologic information, as well as information provided in this proposed amendment. Ground water and surface water were both considered. The intent was to look at the order of magnitude of the situation with reference to the Probable Hydrologic Consequences. Further, the Division is responsible to provide a Cumulative Hydrologic Impact Assessment (CHIA). Anticipating the situation might affect the CHIA, the Division felt justified in pursuing such investigation.

Volume of Groundwater Extracted. The proposed amendment indicates the volume of Electric Lake is 31,500 acre-feet. This figure was previously obtained from Utah Power & Light along with additional information. There is water in the lake that cannot be removed, and this volume is termed "dead storage". When the dead storage is factored in, U P & L considers the "active storage" of the lake to be 30, 000 acre-feet. While this will vary with annual precipitation, this is the volume typically available for water users below the lake, every year.

Immediately after August 16, 2001, total pumping from the mine was about 8,700 gpm. Presently that has stabilized at about 8,470 gpm. This includes 6,000 gpm into Eccles Creek and 2,470 gpm into Electric Lake. When this total is converted to acre-feet per year the result is 13,

663 ac-ft/ yr. **At this pumping rate, the mine is withdrawing enough groundwater to fill 46% of Electric Lake every year**. (13,663/30,000 = 0.46) Since the inflows and pumping will continue for many years, possibly decades over the life of the mine, a great deal of water is involved. Regulations require a determination of possible impacts there may be to springs and streams in the area. For reference, a preliminary estimate of the surface area from which groundwater is being pumped is 4 miles by 4 miles or 16 square miles.

Comparison to Other Mines. Underground mines do NOT want to intercept water. To do so interrupts mining operations and costs time and money to remove the water. Mines do all they can to predict and avoid groundwater. Also, water inflow rates change considerably with time as the mining proceeds into different underground areas. The large inflows to this mine were certainly a surprise and it's believed they could not have been predicted. It was considered appropriate to put into perspective the Skyline Mine inflows as compared to other mines. Typically, underground mines in Utah produce on the order of hundreds of gallons per minute. The following table illustrates the pumping rates of some of the larger water-producing mines in Utah. While they vary with time, these are ongoing or average rates. These rates are compared to the 8,470 gpm currently pumped by Skyline Mine. The point is to demonstrate the water inflows to Skyline Mine are considerably higher than those experienced at any other Utah mine and are probably a record for such inflows.

Mine Name	Approximate Pumping Rate	Skyline Pumping (8,470gpm) is This Many Times Greater
SUFCO	2,430 gpm	3.5 X
Deer Creek	1,500 gpm	5.7 X
Emery Deep	418 gpm	20.3 X
Hiawatha	300 gpm	28.2 X
Cottonwood	250 gpm	33.9 X
Bear Canyon	40 gpm	211.8 X

Streamflow. Eccles Creek is a tributary of Mud Creek. The natural flows in both streams were determined and compared to flows being pumped from Skyline Mine into both streams. U.S. Geological Survey (USGS) records are available for Mud Creek from 1991 to 2000. The mean flow volume of Mud Creek, just below Winter Quarters Canyon, Scofield, UT is 9,120 acre-feet per year. The recording station is located about 1 ½ miles upstream from where Mud Creek enters Scofield Reservoir. The years of record are generally in a wet to very wet weather regime as shown by the Palmer Hydrologic Index for the same 1991 to 2000 time period. Therefore, that flow was reduced 5% to more accurately reflect average conditions. For the purposes of this analysis, Mud Creek flows of 8,664 acre-feet per year are used. (0.95 X 9,120 = 8,664)

The only U.S. Geological Survey records available for Eccles Creek were for the years 1980 to 1984. These records were not used since they are not the same time period, are half the length of Mud Creek records, and occur during the most prolonged and most wet period of time since records were begun in 1895. Thus, they are not representative of typical flows and it would not be appropriate to compare these records to those for Mud Creek. Since Eccles Creek is a tributary to Mud Creek, and their watershed drainage characteristics are similar, their drainages areas were compared. USGS records indicate the Mud Creek drainage above the recording station is 29.1 square miles. Using topographic maps it was determined that the Eccles Creek drainage is about 5.3 square miles or 18% (5.3/29.1= 0.18) of the drainage area of Mud Creek. Thus, the streamflow in Eccles Creek would be about 1,587 acre-feet per year. (0.18 X 8,664 = 1,587)

Converting acre-feet per year to gallons per minute shows the mean or average flows to be: Mud Creek 5,371 gpm and Eccles Creek 984 gpm. These flows can be visualized as the constant flow all year long if the naturally varying flows were evened out over the whole year. These flows are compared to the 6,000 gpm pumped from Skyline Mine. Since the pumped quantities are in addition to natural flows, the two are added together.

Stream	Mean Natural Flow	Mean Natural Flow + Mine Pumping	Times Greater Than Natural Flow
Eccles Creek	984 gpm	6,984 gpm	7.1 X
Mud Creek	5,371 gpm	11,371 gpm	2.1 X

With the flow in Eccles Creek 7.1 times the natural flow, stream erosion rates will be much greater than natural rates. While the stream is naturally armored and withstands spring flood flows larger than the combination of mean natural flows and mine pumping, those flows only last about 30- 40 days. The pumped flows continue every day of the year and are added to both high spring runoff and low summer flows. For reference, Eccles Creek slopes about 5% below the mine, and it's about 2.5 miles from the mine to the mouth of Eccles Creek at Mud Creek.

Similarly, with the flow in Mud Creek 2.1 times the natural flow, stream erosion rates would be greater than natural rates. This stream is NOT armored and flows through farmlands having silt soils. The stream meanders a great deal and is quite susceptible to erosion. Importantly, as indicated in the other sections of this Technical Analysis, the Mud Creek valley below the White Oak mine loadout has been determined to be an Alluvial Valley Floor. The Office of Surface Mining made this determination in 1984. Further, this valley is also determined to be Prime Farmland. While the stream withstands spring flood flows larger than the combination of mean natural flows and mine pumping, those flows only last about 30- 40 days. The pumped flows continue every day of the year and are added to both high spring runoff and low summer flows. For reference, Mud Creek slopes about 1% below Eccles Creek, and it's

about 2.9 miles from the mouth of Eccles Creek to the gauging station below Winter Quarters Creek.

The mine Operator is responsible to quantify and prevent potential damage to streams outside the Permit area. The mine-pumped waters should be controlled to prevent such damage. A buried pipeline was used in James Canyon to prevent damage to that stream. Similarly, the amendment indicates, "Several tens of miles of 12 to 22-inch HDPE pipe were laid within the mine to pump water to other active and inactive workings as well as to the surface and Eccles Creek." All this suggests a pipeline be used to carry the pumped water from the mine to Scofield Reservoir. Just as pipelines are used to protect the mine and it's resources, such a pipeline would protect Eccles Creek and Mud Creek. Piping the mine-pumped water would allow only natural flows in the stream. For reference, the total distance from the mine to Scofield Reservoir along the road is about 6.8 miles.

Electric Lake. A lengthy and in-depth analysis was made to try to establish whether the mine inflow waters were coming from Electric Lake. The point at which water entered the mine on August 16, 2001 is about 2,300 feet east of the east shoreline of Electric Lake. Such a large water body close to the mine naturally led to such an investigation.

Since the major inflow of 4,500 gpm began on 8/16/01, the time of study was 6/7/2001 to 9/6/2001. The end date was the time of the study. Water surface elevation was compared to lake discharge flows over that time period. The mine discharge was then plotted on the same graph as the above parameters. A cross section from the lake to the wells in James Canyon was drawn to illustrate the physical aspects of the situation. Water surface elevation and lake discharge data was derived from spreadsheets provided by Utah Power & Light; their assistance is greatly appreciated. Although considerable time and effort were expended, the conclusion of the study was, " The overall conclusion of this analysis, both review of curves and slope analysis, appears to be that there's no definitive evidence one way or the other. That is, there's no evidence to suggest or conclude that Skyline Mine flooding IS or IS NOT affecting the rate at which the water surface of Electric Lake declines. As of 9/10/01." This analysis was shared with all stakeholders including the mine Operator, U P & L, water users, and the Forest Service.

Since the analysis results were inconclusive, a method was developed to continue the study. This involved comparing total water volumes in and out of the lake to the total water volume decrease in the lake over the same time period. This would be a kind of " account balance" of water for the lake. It would involve all stream inflows, rainfall, lake discharge, and evaporation. If the account did not balance, this would show a volume of water was unaccounted for and this could be compared to the water volume that came into the mine. Since the Division has limited resources, and several other projects were delayed to get as far as we did in the analysis, the Division did not continue the study. The Division suggested and encouraged Utah Power and Light and the mine Operator continue with the "account balance" analysis. So far, they have not.

Summary. The Division analysis of the above categories indicates, 1) Significant quantities of groundwater are being withdrawn and impacts inside and outside the permit area are unknown, 2) The pumping flows from the mine probably sets a record for Utah coal mines, 3) Mine-pumped water flows in Eccles Creek and Mud Creek pose a risk of damage to those streams, and 4) Whether mine inflows are derived from Electric Lake has not been proved or disproved. All of these suggest the situation has the potential to cause harm to the Hydrologic Balance within, and adjacent to, the permit area.

Division Analysis of This Amendment

An Addendum to the PHC, November 2001 is part of the submittal. Also included is Dwg. No. PHC A-1, James Canyon Wells and Monitoring Well Locations. Generally speaking, the addendum is inadequate for the Division to make the Findings required by the regulations. Details of the inadequacies are provided below. Please reference the entire R645-301-728 Probable Hydrologic Consequences (PHC) Determination. In addition, the Division made several calculations independent of this submittal that suggest the situation has the potential to cause harm to the Hydrologic Balance within, and adjacent to, the permit area. See the previous section of this Technical Analysis. Therefore, the Division will require the Operator to provide additional information in several areas. Details of the additional information are provided below. The basis for these Division requirements is contained in three regulations. R645-301-728.335 states "The PHC determination will include findings on: Other characteristics as required by the Division." Similarly, R645-301-731 states, " The Division may require additional preventative, remedial, or monitoring measures to assure that material damage to the hydrologic balance outside the permit area is prevented." Also, R645-301-731.760 states, "Cross Sections and Maps. Each application will contain for the proposed permit area: Other relevant cross sections and maps required by the Division…"

By making these requirements the Division is not suggesting the Operator limit or in any way confine their analysis and evaluation of the flooding situation. The Division is confident in the Operators abilities and understands they have the best and most in-depth understanding of their mine. Skyline Mine has a very good record of regulatory compliance and the Division expects that to continue. The Operator is strongly encouraged to investigate in any manner they deem appropriate to understand the situation and come up with any needed mitigation plans should they be indicated.

The PHC Addendum begins with a History of Recent Inflows section. The discussion covers the beginning of mine inflows in March 1999 and continues to the latest inflow in August 2001. Locations of the inflows are provided as well as the rates of inflow. Unfortunately the narrative is rather confusing and the Division was not able to sort out just what happened and when. It's not possible to accurately determine just what the flows were on a given date, origin of the flows, nor where those flows were discharged. The Operator must provide a table listing 1) the approximate date each mine inflow and pumping began, 2) each inflow and pumping rate in gpm, 3) source of the water (in-mine location such as 10L, or surface location such as James

Canyon wells), 4) destination of the pumped water (such as Mine 1 & 3 abandoned workings, Eccles Creek, or Electric Lake), and 5) cumulative pumping rate for the whole mine over time. The time period covered includes the same time period as the proposed amendment, from before January 1999 to the present. This chart would be similar to the one provided in the amendment for the pumping of water from the James Canyon wells into Electric Lake. Using data in the above table, the Operator, must provide a graph showing the cumulative pumping rate for the whole mine (vertical axis) and dates for those pumping rates (horizontal axis). The text narrative in the history section will need to be consistent with, and clearly explain the table contents and the graph.

The second section of the addendum is Effects on Ground Water. The section begins with a discussion of spring S35-8, which is located about 3,800 feet North of the James Canyon wells. See Dwg. No. 2.3.6-1, Location of Hydrologic Monitoring Stations and Dwg. No. PHC A-1, James Canyon Wells and Monitoring Well Locations. The amendment states, " Specifically, quarterly flow monitoring of seeps and springs in both the James Canyon and Burnout Canyon areas indicate the significant inflows of ground water to the mine and pumping of the wells in James Canyon has not had an observable effect on ground water discharges in these areas." It is not possible to determine that based on the information presented. The discussion to substantiate this centers around comparison of the Palmer Hydrologic Drought Index for the area (Figure PHC A-2) and the flow rate of spring S35-8 (Figure PHC A-1, Spring S35-8). It's very difficult to compare the two graphs since they are on different pages, at different scales, and one is a line graph while the other is a bar chart. Figure PHC A-1 scale is 1 year = 0.41 inch while Figure PHC A-2 scale is 1 year = 0.29 inch. The Operator must provide one graph showing the drought index and S35-8 spring flow at the same time scale and using a line graph for both parameters. The time period would be from 6/1982 to the present. Then provide a text discussion accurately analyzing what the comparison shows.

There are several springs and wells in the mine's Groundwater Monitoring Plan which are likely to shed light on the response of groundwater due to flooding in the mine. Some of these are located along the north-south trending fault complex where all four major water inflows to the mine are located. Others are located west of the permit area in the Flat Canyon Tract where future mining is anticipated. Still others are east of the mine inflow areas. Since only one of the springs has data presented, the Operator must provide one graph for each of the following springs showing the drought index and spring flow at the same time scale and using a line graph for both parameters. The time period would be from 6/1982 to the present. Then provide a text discussion accurately analyzing what the comparison shows.

S22-11	S34-12	S15-3	S36-12
S26-13	2-413	S24-12	

The Operator must provide one graph for each of the following wells showing the drought index and water level elevation at the same time scale and using a line graph for both parameters. The time period would be from 6/1982 to the present. Some of the wells do not have records that

far back. In those cases, just provide all the available data. Then provide a text discussion accurately analyzing what the comparison shows.

W22-2 (W79-22-1 & 2)	99-21-1	20-4-2
W26-1 (W79-26-1)	99-28-1	
W35-1 (W79-35-1A & 1B)	W10-1 (W79-10-1A & 1B)	
W2-1 (W98-2-1)	W-14-2 (S79-14-2A & 2B)	

Quarterly monitoring does not provide sufficient data to detect possible impacts to the groundwater from in-mine flows. The 3-month time interval between samples is just too long. There are several springs and wells in the mine's Groundwater Monitoring Plan which are likely to shed light on the response of groundwater due to flooding in the mine. For example, springs S34-12 and 2-413 are closer to the mine inflow area in 10L than is S35-8, and they're east and west of the fault complex believed to be conducting the water. The only spring reported so far is S35-8, and it's on a quarterly basis. Reviewing Dwg. No. 2.3.6-1, Location of Hydrologic Monitoring Stations and locating where the water inflows to the mine have occurred shows several monitoring wells and springs should be monitored on a weekly basis. Chemical testing of the wells and springs water should give an indication of the formations through which the water has been flowing.

The Operator must provide weekly monitoring of the water level in the following wells, starting immediately. For all wells that have already been monitored more often than quarterly, provide all monitoring data collected. Plot the water level versus time on a graph for such wells. Also provide a one-time water chemistry analysis of these well waters as defined by Laboratory Measurements on Table 2.3.7-2 Abbreviated Water Quality Analytical Schedule in the MRP. Provide Stiff Diagrams based on these chemical analyses. Sample the well water after purging at least three times the well casing volume and not more than five times the well casing volume. Also provide a text discussion accurately analyzing what the chemical analysis and monitoring data shows.

- W22-2 (W79-22-1 & 2)
- W26-1 (W79-26-1)
- W35-1 (W79-35-1A & 1B)
- W2-1 (W98-2-1)
- JC-1 & JC-2, both James Canyon wells

The Operator must provide weekly monitoring of spring flow rates for the following springs, starting immediately. For all springs that have already been monitored more often than quarterly, provide all monitoring data collected. Plot the spring flow versus time on a graph for the springs. Also provide one-time water chemistry analysis of these spring waters as defined by Laboratory Measurements on Table 2.3.7-2 Abbreviated Water Quality Analytical Schedule in the MRP. Provide Stiff Diagrams based on these chemical analyses. Also provide a text

discussion accurately analyzing what the chemical analysis and monitoring data shows.

- S22-11
- S26-13
- S35-8
- S34-12
- 2-413

The next part of the Effects on Ground Water section discusses flows in Burnout Creek and compares them to the drought index. It's very difficult to compare the two graphs since they are on different pages, at different scales, and one is a line graph while the other is a bar chart. . The Operator must provide one graph showing both the drought index and Burnout Creek flows at the same time scale and using a line graph for both parameters. Then provide a text discussion of accurately analyzing what the comparison shows.

Also included in the Addendum is FIGURE PHC A-4, BURNOUT CANYON WELLS, W79-35-1A & W79-35-1B, which shows the water levels versus time for the two wells. Also included is FIGURE PHC A-5, MONITOR WELL 98-2-1M, which shows the water level versus time for that well. The title of Figure PHC A-5 probably should not contain the letter "M" as there is no such reference in the text. Also, the text describes the water levels in W2-1 (98-2-1) beginning in October 1998 while FIGURE PHC A-5, MONITOR WELL 98-2-1M shows the well water elevations beginning on 5/29/01. The Operator needs to provide an additional graph showing the water levels of W2-1 (98-2-1) from October 1998 to the present time. While the two graphs of the monitoring wells provide good information, it's important to simultaneously show how the water levels in all three monitoring wells vary with time. The Operator needs to provide a graph showing the water levels in all three monitoring wells from 7/15/1982 to the present. The discussion on page PHC A-10 indicates, "the water level in W2-1 is dropping at a rate of approximately 0.3 feet per day." Examination of FIGURE PHC A-5, MONITOR WELL 98-2-1M shows the rate to be 0.53 feet per day. The discrepancy between the text slope of 0.3 feet per day and the Figure PHC A-5 slope of 0.53 feet per day needs to be resolved.

The next part of the Effects on Ground Water section, pages PHC A-7 & PHC A-8, is a lengthy text description of the monitoring wells, initial and subsequent water levels in those wells, the geologic formations and characteristics, fault systems, water inflow locations to the mine, and several other characteristics of the situation. Similarly, page PHC A-2 has text describing the same features related to the wells in James Canyon. The use of text only to describe the physical layout of these characteristics is simply too confusing. It's not possible to see any item in relation to other items, much less reason out any connection or cause and effect to the relationships. Also, various portions of the text and the figures use different designations for the same well. This adds to the confusion. The Operator must use a consistent naming convention in the text and on all figures and maps to designate all monitoring wells. Preferably, this would include all designations for a well being used each time.

Monitoring wells W2-1 and W79-35-1 A & B, and the James Canyon wells lay along a straight line that runs north-south between them. Further, they are coincident with known and projected fault systems believed to be conducting the water. Comparing the text and Dwg. No. PHC A-1 shows the location of the four mine water inflow points all lie along that line and its extension to the north-northwest. Given the above considerations, the Operator must provide a cross section drawing along the monitoring wells and the James Canyon wells. The drawing should be at least the size of Dwg. No. PHC A-1 and show the elements listed below. Then provide a text discussion accurately analyzing what the cross section shows in terms of groundwater sources for each of the mine inflows. Include potential impacts to the groundwater, springs, and streams due to water inflows to the mine and pumping in James Canyon.

- Make the cross-section along lines connecting wells W22-2 (W79-22-1&2), W35-1 (W79-35-1A&1B), JC-1, JC-2, and W2-1 (W98-2-1)
- Exaggerated vertical scale with elevations and distances shown on both scales.
- The topographic ground surface shape.
- All geologic formations, including thickness, name, and other relevant information. Show strike and dip for each formation as it is along the cross section.
- All known faults and all inferred/suspected faults.
- Coal seams, showing their thickness and name. Number the mines in each seam.
- All mine water inflow locations with an approximate horizontal distance from the cross section east or west to actual mine inflow location. Include inflow elevations in the mine.
- Springs S35-8, S22-1, S26-13, & S34-12, locations with an approximate horizontal distance from the cross section east or west to the actual spring location.
- All monitoring wells including surface elevation and completion elevation.
- Both James Canyon wells including surface elevation and completion elevation.
- Approximate potentiometric surface elevation before elevated mine inflows occurred. That is, before January 1999. See the MRP, Dwg. No. 2.3.4-2 and Dwg. No. 2.3.4-1 Fence Diagram: Water Monitoring Wells Skyline Mine, which has water elevations of the wells as of 12/13/91. Include the approximate dates along that surface
- Approximate potentiometric surface, as it exists at the latest well elevation readings. Include the approximate dates along that surface.
- Other elements, features, and information that would help define past and present ground water conditions as they relate to the in-mine flooding situation.

Dwg. No. PHC A-1, James Canyon Wells and Monitoring Well Locations shows numerous green circles that lie along the cross section described above. They have designations such as 74-35-1, 75-34-2, 75-27-1, and 83-22-1 and are believed to be exploration holes. The Operator must provide all information from these holes that could aid in determining the geology and groundwater conditions.

Pages 2.99 (a) and PHC A-14 of the amendment indicates the wells in James Canyon "may be operated for the life of the mine". Further, it states, "the wells may be operated … until the

potentiometric surface of the aquifer has dropped below the mined coal seams." Otherwise the amendment contains no indication if or when water pumping from the mine and James Canyon will end. As indicated by the Division Analysis of Situation described earlier, very large quantities of water are involved and there is potential for damage to the Hydrologic Balance. As required by regulation, the Operator must determine "whether adverse impacts may occur to the Hydrologic Balance" and the effect on "Ground-water and surface-water availability". This should include an estimate of if and when mine inflows will decrease and to what levels.

The amendment includes an excellent record of the waters pumped from the two wells in James Canyon. Table PHC A-1 lists the Day (Date) Hours, GPM, Daily Gallons, Cumulative Gallons, and Cumulative Acre-Feet for those wells. Unfortunately, no such record is available for the discharges being made into Eccles Creek. In order to have a complete record of water volumes discharged by the mine, the Operator must implement a method of monitoring the water flow volumes discharged by in-mine pumping into Eccles Creek. The daily monitoring and tracking should be the same as that done for the James Canyon wells.

Page PHC A-12 and 13 indicate, " The quality of the (James Canyon well) water is similar to the water of James, Huntington, Swen's and Little Swen's Creeks, the major tributaries to Electric Lake." No data is provided to substantiate this statement. The Operator needs to provide water quality data to compare the water from these sources.

During meetings with the Division, the Operator committed to test the mine inflow waters to determine their age. That is, to determine whether they were of geologically old origin or recent meteoric origin. This will provide an indication of the source of the inflow waters. Later conversations indicated such tests were performed. No water age data was included in the amendment. The Operator must provide age date testing of the mine inflow waters. This should include all inflow points in the mine (16L, 14L, 9L, & 10L) and the water being pumped from both James Canyon wells (JC-1 & JC-2).

Before drilling the wells in James Canyon the Operator had to make preliminary calculations to determine the size of the well casing and the pump capacity. Often wells are subjected to drawdown tests to confirm the pumps are working as intended. The Operator must provide the Division with all information developed for the James Canyon wells which provide insight to the drawdown of the well, transmissivity of the water-bearing strata and fault system, and other information related to groundwater flow at the wells location.

Findings:

The proposed amendment does not meet regulatory requirements. Accordingly, the Permittee must address those deficiencies as found within this Draft Technical Analysis and provide the following, prior to approval, in accordance with the requirements of:

R645-301-728 and -731, The information provided in the submittal is not adequate for the Division to make the Findings required by the regulations. Therefore, additional information needs to be submitted. The Operator is free to, and is strongly encouraged to investigate in any manner they deem appropriate to understand the flooding and Probable Hydrologic Consequences situation and come up with any needed mitigation plans should they be indicated. In addition to the information requested below, the Operator may wish to provide other equivalent data and analysis.

R645-728.335, -731, and -731.760, 1) The Operator must provide a table listing A) the approximate date each mine inflow and pumping began, B) each inflow and pumping rate in gpm, C) source of the water (in-mine location such as 10L, or surface location such as James Canyon wells), D) destination of the pumped water (such as Mine 1 & 3 abandoned workings, Eccles Creek, or Electric Lake), and E) cumulative pumping rate for the whole mine over time. **2)** Using data in the above table, the Operator, must provide a graph showing the cumulative pumping rate for the whole mine (vertical axis) and dates for those pumping rates (horizontal axis). The text narrative in the history section will need to be consistent with, and clearly explain the table contents and the graph. **3)** The Operator must provide one graph showing the drought index and S35-8 spring flow at the same time scale and using a line graph for both parameters. The time period would be from 6/1982 to the present. Then provide a text discussion accurately analyzing what the comparison shows.
4) The Operator must provide one graph for each of the following springs showing the drought index and spring flow at the same time scale and using a line graph for both parameters. The time period would be from 6/1982 to the present. Then provide a text discussion accurately analyzing what the comparison shows.

S22-11	S34-12	S15-3	S36-12
S26-13	2-413	S24-12	

5) The Operator must provide one graph for each of the following wells showing the drought index and water level elevation at the same time scale and using a line graph for both parameters. The time period would be from 6/1982 to the present. Some of the wells do not have records that far back. In those cases, just provide all the available data. Then provide a text discussion accurately analyzing what the comparison shows.

W22-2 (W79-22-1 & 2)	99-21-1	20-4-2
W26-1 (W79-26-1)	99-28-1	
W35-1 (W79-35-1A & 1B)	W10-1 (W79-10-1A & 1B)	
W2-1 (W98-2-1)	W-14-2 (S79-14-2A & 2B)	

6) The Operator must provide weekly monitoring of the water level in the following wells, starting immediately. For all wells that have already been monitored more often than quarterly, provide all monitoring data collected. Plot the water level versus time on a graph for such wells.

Also provide a one-time water chemistry analysis of these well waters as defined by Laboratory Measurements on Table 2.3.7-2 Abbreviated Water Quality Analytical Schedule in the MRP. Sample the well water after purging at least three times the well casing volume and not more than five times the well casing volume. Provide Stiff Diagrams based on these chemical analyses. Also provide a text discussion accurately analyzing what the chemical analysis and monitoring shows.

- W22-2 (W79-22-1 & 2)
- W26-1 (W79-26-1)
- W35-1 (W79-35-1A & 1B)
- W2-1 (W98-2-1)
- JC-1 & JC-2, both James Canyon wells

7) The Operator must provide weekly monitoring of spring flow rates for the following springs, starting immediately. For all springs that have already been monitored more often than quarterly, provide all monitoring data collected. Plot the spring flow versus time on a graph for such springs. Also provide one-time water chemistry analysis of these spring waters as defined by Laboratory Measurements on Table 2.3.7-2 Abbreviated Water Quality Analytical Schedule in the MRP. Provide Stiff Diagrams based on these chemical analyses. Also provide a text discussion accurately analyzing what the chemical analysis and monitoring shows.

- S22-11
- S26-13
- S35-8
- S34-12
- 2-413

8) The Operator must provide one graph showing both the drought index and Burnout Creek flows at the same time scale and using a line graph for both parameters. Then provide a text discussion of accurately analyzing what the comparison shows. **9)** The title of Figure PHC A-5 probably should not contain the letter "M" as there is no such reference in the text. **10)** The Operator needs to provide an additional graph showing the water levels of W2-1 (98-2-1) from October 1998 to the present time. **11)** The Operator needs to provide a graph showing the water levels in all three monitoring wells, W79-35-1A & W79-35-1B, & 98-2-1, from 7/15/1982 to the present. **12)** The discrepancy between the text slope of 0.3 feet per day and the Figure PHC A-5 slope of 0.53 feet per day needs to be resolved. **13)** The Operator must use a consistent naming convention in the text and on all figures and maps to designate all monitoring wells. Preferably, this would include all designations for a well being used each time.
14) The Operator must provide a cross section drawing along the monitoring wells and the James Canyon wells. The drawing should be at least the size of Dwg. No. PHC A-1 and show the elements listed below. Then provide a text discussion accurately analyzing what the cross

section shows in terms of groundwater sources for each of the mine inflows. Include potential impacts to the groundwater, springs, and streams due to water inflows to the mine and pumping in James Canyon.

- Include wells W22-2 (W79-22-1&2), W35-1 (W79-35-1A&1B), JC-1, JC-2, and W2-1 (W98-2-1)
- Exaggerated vertical scale with elevations and distances shown on both scales.
- The topographic ground surface shape.
- All geologic formations, including thickness, name, and other relevant information. Show strike and dip for each formation as it is along the cross section.
- All known faults and all inferred/suspected faults.
- Coal seams, showing their thickness and name. Number the mines in each seam.
- All mine water inflow locations with an approximate horizontal distance from the cross section east or west to actual mine inflow location.
- Springs S35-8, S22-1, S26-13, & S34-12, locations with an approximate horizontal distance from the cross section east or west to actual mine inflow location.
- All monitoring wells including surface elevation and completion elevation.
- Both James Canyon wells including surface elevation and completion elevation.
- Approximate potentiometric surface elevation before elevated mine inflows occurred. That is, before January 1999. See the MRP, Dwg. No. 2.3.4-2 and Dwg. No. 2.3.4-1 Fence Diagram: Water Monitoring Wells Skyline Mine, which has water elevations of the wells as of 12/13/91. Include the approximate dates along that surface
- Approximate potentiometric surface, as it exists at the latest well elevation readings. Include the approximate dates along that surface.
- Other elements, features, and information that would help define past and present ground water conditions as they relate to the in-mine flooding situation.

15) The Operator must provide all information from holes, 74-35-1, 75-34-2, 75-27-1, and 83-22-1, that could aid in determining the geology and groundwater conditions. **16)** The Operator must determine "whether adverse impacts may occur to the Hydrologic Balance" and the effect on "Ground-water and surface-water availability". This should include an estimate of if and when mine inflows will decrease and to what levels. **17)** The Operator needs to provide water quality data from James, Huntington, Swen's and Little Swen's Creeks and the James Canyon wells to compare the water from these sources. **18)** The Operator must implement a method of monitoring the water flow volumes discharged by in-mine pumping into Eccles Creek. The monitoring and tracking should be the same as that done for the James Canyon wells. **19)** The Operator must provide age date testing of the mine inflow waters. This should include all inflow points in the mine (16L, 14L, 9L, & 10L) and the water being pumped from both James Canyon wells (JC-1 & JC-2). **20)** The Operator must provide the Division with all information developed for the James Canyon wells which provide insight to the drawdown of the well, transmissivity of the water-bearing strata and fault system, and other information related to groundwater flow at the wells location. **21)** Report all weekly monitoring data to the Division on

a quarterly basis, submitting the data in the first week of the following quarter. **22)** For all data submittals outlined in this Technical Analysis, provide paper copies of the graphs, charts, and tables AND also provide an electronic copy (magnetic disk or CD) of those data submittals.

OPERATION PLAN

HYDROLOGIC INFORMATION

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

Analysis:

Diversions

The undisturbed drainage ditch above the drill pad is designed using the appropriate 10-year, 6-hour storm. It has 2:1 side slopes and 0.30 foot of freeboard. With a water velocity below 5 feet per second, it does not require riprap. The 18-inch culvert at the east end of the drill pad was designed to handle the same storm. The ditch flows into the culvert. There is no indication of riprap or other erosion control methods at the culvert outlet and this must be provided to prevent sediment from being added to James Creek.

Sediment control measures

Page 3-72 (c) describes Alternate Sediment Control Area 35 & 36 in a confusing manner. The reclaimed buried pipeline area below the James Canyon wells is quite unlike the active road above the wells. They should each have a separate designation and a separate description. The description should include a design for the ditch carrying the water along the active road.

Sedimentation ponds.

The sediment pond at the lower end of the drill pad has been designed as a full containment pond. The 10-year, 24-hour design storm is appropriate. It has a volume of 0.08 acre-feet while the pond has a capacity of 0.24 acre-feet. The pond is fully lined with a sheet material.

Findings:

The proposed amendment does not meet regulatory requirements. Accordingly, the Permittee must address those deficiencies as found within this Draft Technical Analysis and provide the following, prior to approval, in accordance with the requirements of:

R645-301-742, There is no indication of riprap or other erosion control methods at the culvert outlet on the east side of the James Canyon well pad and this must be provided to prevent sediment from being added to James Creek.

R645-301-121.300, Page 3-72 (c) describes Alternate Sediment Control Area 35 & 36 in a confusing manner. The reclaimed buried pipeline area below the James Canyon wells is quite unlike the active road above the wells. They should each have a separate designation and a separate description. The description should include a design for the ditch carrying the water along the active road.

RECOMENDATIONS:

The amendment should not be approved in its present form.

O:\007005.SKY\FINAL\mjs01K.DOC