2.5 HYDROLOGICAL IMPACTS OF MINING ACTIVITIES

Presented in the following subsections are summaries of the hydrological impacts of the mining activities of the Skyline project. The details backing the conclusions stated in this section and supplemental discussion can be found in the PHC evaluations included as part of this section, and within the Hydrology Section of Appendix Volume A-1 Volumes 1 and 2. Details of the consultant's flow calculations may be found in the flood plan calculations also in Appendix Volume A-1. The PHC was also updated in July 2002 October 2002, April 2003, and June 2004 by the addition of the Addendum to the PHC associated with the drilling of the wells in James Canyon, the significant inflows to Mine #2, and the ground water model prepared by HCI.

The potential hydrologic impacts discussed herein represent the latest information available and, generally, correspond to the consultant's original report. (See General Hydrologic Consideration Related to Coal Development and Subsequent Impacts, Vaughn Hansen Associates, February 1981, found in Appendix Volume A-1. Updated analyses of the "Probable Hydrologic Consequences" reflecting all current data are appended to this section.

- **Exhibit A of Section 2.5**, "Probable Hydrologic Consequences of Mining at the Skyline Mines, Carbon and Emery Counties, Utah"; prepared by Earthfax Engineering, Inc., Salt Lake City, Utah; dated September 30, 1992.
- **Addendum to the Probable Hydrologic Consequences, July 2002 (James Canyon Update - further updated in October 2002, April 2003, and June 2004)**.
- **Appendix A-1, Volume 2** (September 2002), "Investigation of Surface and Groundwater Systems in the Vicinity of the Skyline Mines, Carbon, Emery, and Sanpete Counties, Utah: Probable Hydrologic Consequences of Coal Mining at the Skyline Mines and Recommendations for Surface and Groundwater Monitoring".

2.5.1 Potentially Affected Water Rights

Surface and groundwater rights in the general project area are primarily for stockwatering and irrigation. Stockwatering rights are located almost entirely and directly on the streams. The

nearest irrigation rights are centered around the two areas of Scofield and in Flat Canyon, southwest of the permit area. Irrigated lands consist primarily of pasture. Only stockwatering rights are present in the Skyline permit area. A limited number of wells are located in the general area, none of which are located directly on the property or within the permit area. Recent large mine inflows to Mine #2 has resulted in concern voiced by local government and private interests that water entering the mine is coming from nearby Electric Lake. However, data collected and analyzed by Skyline Mine for the purpose of determining the source of the inflows strongly indicates there is no significant connection between the surface waters and the mine waters. As discussed in the July 2002 Addendum to the PHC (modified in October 2002, April 2003, and June 2004), the Star Point does not transmit water easily. Fractures within the Star Point in the mine area has allowed the sandstone to begin dewatering by discharging to the mine. The Star Point does not appear to have a significant discharge point located immediately down gradient of the mine. Indeed, the age of the water in the sandstone suggests it takes several thousand years to move through the aquifer in spite of the high transmissivity of the fractures within the sandstone. Therefore, it is unlikely any surface or ground water rights are being adversely affected. Because it is not certain that the ground water discharges into the Huntington Creek drainage, there is no evidence that water is being removed from that drainage to Eccles Creek, part of the Price River drainage. Tritium analysis of the water in the 10 Left area of Mine #2 and water from the James Canyon well JC-1 indicates a minor amount of modern water is being pumped from the well and the mine. However, this water is not necessarily originating from Electric Lake. Therefore, there does not appear to be a significant volume of surface water being transferred between drainage basins.

2.5.2 Mining Impact on Water Quantity

Due to the high shale content of the Blackhawk Formation, recharge to the deep ground water system through the Blackhawk Formation is slow. Fractures in the formation seal readily due to swelling of the bentonitic shale when wet. As a result, the impact of mining (including subsidence) on the quantity of water in the permit area will be minimal. This has been verified through the results of the subsidence study in Burnout Canyon. (A discussion of the mining impacts on the aquatic resources may be found in Section 2.8.) The Burnout Canyon study resulted in the determination that no significant impacts had occurred to the stream drainage as a result of mining induced subsidence.

While the gradient of the stream was flattened in a few locations and slightly increased in others, the overall change in the stream morphology was not significantly different than changes that occur in

similar stream systems naturally. Biweekly flow monitoring and aerial photographic surveys continue each year as mining continues in the area. Additionally, three years of macroinvertabrate studies and two years of fish population surveys have been conducted starting in 2000. These studies are described in greater detail in Section 2.8.1.

The purpose of the Burnout Canyon study was to determine the impacts of undermining perennial streams in the Skyline Mine area. The intent of the study was to determine if significant impacts would occur by undermining the Burnout stream and, if no significant impacts occurred, then the Forest would consider allowing the undermining of perennial streams with similar geologic and geomorphic conditions to occur. Skyline Mine intends to undermine Winter Quarters Canyon based on the positive results of the Burnout Canyon study. Skyline has collected or committed to collect additional baseline data necessary to adequately monitor environmental parameters possibly affected by subsiding Winter Quarters Canyon.

When subsidence occurs, the subsidence cracks tend to seal rapidly, preventing the deep percolation and subsequent loss of water previously destined for springs and other water sources. The location of a spring may change by a few feet, but no significant loss of water is anticipated. The sealing of potential cracks will be accelerated where subsidence occurs under stream bodies, due to the natural deposition of silt in the stream channel along with the swelling of the shale.

Although the Blackhawk Formation contains partially or completely saturated sandstone channels above the proposed mine workings, a relatively small quantity of water is being encountered in the mine due to the impermeable nature of the formation, which limits the recharge rate and the ability of the rock to readily yield water. Ground water within the Blackhawk formation above the mine workings was determined in the 1996 PHC to be found within highly localized perched aquifers. The 1996 PHC evaluation failed to locate a regional ground water aquifer within the immediate area. The relatively small quantity of water being encountered in the mine was believed due to 1) the general impermeable nature of the formation, which limits the recharge rate and the ability of the rock to readily yield water, and 2) the local nature of local perched aquifer systems.

The inflow to the mine had been less than 100 gallons per minute per active face, with mine entries generally dry approximately 100 to 200 feet up-dip from the face. Some roof bolt

holes, however, continued to flow up to 2 GPM for an extended period of time. However, in 2002 a fractured

channelized sandstone was encountered during mining of the southwestern permit area which produced approximately 1,400 gpm. This was repeated at several locations in areas of Mine #2 until the mine was discharging approximately 8,500 to 9,500 gpm in August 2002 and 9,000 to 10,500 gpm in October 2002. Even though the large inflows have significantly subsided since October 2002, the near future mining activities have been directed toward the North Lease area.

The PHC for the Skyline Mine was updated by an Addendum to the PHC dated July 2002 and further updated in October 2002, April 2003, and June 2004. The addendum contains significant information regarding the large inflows to the mine. To better understand the hydrologic system and the water within the Star Point Sandstone, Skyline Mine contracted with Hydrologic Consultants, Inc. of Lakewood, Colorado produce a ground water model of the Star Point Sandstone. This model endeavored to delineate the possible areal extent of the aquifer, the volume of water contained in the aquifer, and the potential sources and discharge locations of the aquifer. The model has been used to help determine what, if any, impacts are occurring to the waters available in the mine area, including State appropriated water rights. The model was completed and improved in June 2004 and a copy of the report describing the results of the modeling effort has been added to the PHC.

As described in the July 2002 Addendum to the PHC, draining of the ground water contained within the Star Point Sandstone does not appear to have a significant impact on discharges of ground water in the mine or adjacent area nor does it appear that the water entering the mine is causing a loss of surface water in the Huntington or Price River drainages. The majority of the flows into the mine enter through faults and fractures that trend generally north-south to northeast-southwest. The flows move up through the floor of the mine in almost all cases. The water is apparently stored in the Star Point Sandstone under significant potentiometric head. Ages of the water indicate that water moves very slowly through the Star Point system in spite of the fractures and faults that appear to be open enough to allow water to flow freely into the mine in isolated locations. This suggests that the aquifer does not have a discharge point that releases large volumes of water nor is the aquifer replenished at a high rate of inflow. While the

Star Point is exposed in out crop north, south, and east of the mine, significant volumes of water would need to be entering the system at an elevation great enough to create the potentiometric head encountered in the Star Point beneath the Mine #2 workings. Skyline

continues to monitor stream flows in Winter Quarters, Eccles, and Mud Creeks to identify any impacts if they occur in these drainages related to the mine inflows.

No springs or water production wells in the mine permit or adjacent areas have reportedly been negatively impacted by the large mine inflows. There has been some concern voiced by local government and private interests that water entering the mine is coming from nearby Electric Lake. However, data collected and analyzed by Skyline Mine for the purpose of determining the source of the inflows strongly indicates there is no significant connection between the surface waters and the mine waters. As stated previously, this is discussed at length within the July 2002 Addendum to the PHC.

Water encountered in the mine is either utilized underground as processed water or is pumped from the mine. Procedures for handling of mine water are discussed in detail in Section 3.2. Indigenous water associated with the coal will be removed from the area. This, however, will represent only a small fraction compared to the water flowing from the Wasatch Plateau. The water pumped from the mine is added to the flow of Eccles Creek and into Electric Lake and has a positive effect on the aquatic flow systems.

The construction of surface facilities utilized in conjunction with the Skyline Mines (yard areas, roads, conveyor lines, etc.) resulted in temporary increases in the suspended sediment concentration of the adjacent stream. However, because of the regulatory requirement that sediment control measures be provided for all areas of surface disturbance, concentrations of suspended material were significantly reduced. Minimization efforts, however, met with varying degrees of success.

Over long periods of time, groundwater in the Wasatch Plateau can be expected to flow towards the lowlands if not removed, passing through saline shales and emerging to augment streamflow with a dissolved solids content that significantly exceeds the concentrations found in the headwaters area. Because the Skyline Mines will act as interceptor drains, the groundwater that is brought to the surface from the mines has a much lower dissolved solids content than would have existed if the water was to continue its downward movement through shaley layers. Thus, the mines will have some beneficial impact on the chemical quality of water in the region.

The increased stream flow resulting from mine discharges, particularly during the summer low flow period, appears to benefit the Eccles Creek fishery by creating flow and temperature stabilization. The increased flows to Scofield Reservoir most likely benefitted the fish

population in the lake by maintaining a sufficient level of dissolved oxygen to avoid a general fish kill that frequently occurs in the lake during periods of drought periods, such as has been occurring in the mine area since 2000. The mine has also been discharging large volumes of water since August 2002 with TDS concentrations only slightly higher than background levels. This good quality water flows to and is

stored in Scofield Reservoir. The water stored in Scofield Reservoir is used for culinary and irrigation purposes in Helper, Price, and Wellington, Utah. The State Engineers office in Price, Utah indicated that without the additional discharge from Skyline Mine to the Price River drainage, the reservoir would have been at a dead pool level in late August of 2002, thus cutting short the irrigation season downstream.

Similarly, discharges to Electric Lake will be an overall benefit to the water users on Huntington Creek. The discharge of high quality water from mine dewatering wells JC-1 and JC-3 will increase the volume of water in Electric Lake, provide additional cooling water for the Huntington Power Plant, and provide additional irrigation water for agricultural uses in Emery County. Without the additional discharge of water to Electric Lake from the James Canyon wells, it is possible that in the summer and fall of 2003, the Huntington Power Plant would need to significantly scale back the production of electrical power due to insufficient cooling water. A reduction in power generation from the plant would have significant economic impacts on Carbon and Emery Counties from the loss of jobs and an increase in power rates for consumers of power generated by PacifiCorp.

The completion and operation of JC-3 will not result in an overall increase of mine water discharge from the Skyline Mine. Operation of the well will decrease the amount of mine water discharged to Eccles Creek and result in additional water discharged to Electric Lake.

The large volume of ground water inflow to the mine has resulted in the mine discharging significantly greater volume of water than were initially anticipated when the mine was planned and opened. The current mine UPDES permit was written when flows were expected to be less than 1000 gpm and limits on total dissolved solids (TDS) were created based on this volume of flow. A 7.1 ton/ day limit of TDS was assigned to the mine with a maximum TDS concentration of 1310 mg/l TDS. It was not unusual

for the mine, prior to March 1999, to discharge water with 1000 mg/l TDS. However, after the large inflows into the mine were encountered in March 1999, the volume of water discharged increased steadily and the concentration of TDS decreased. Also at that time, the mine began to have trouble passing the chronic Ceriodaphnia dubia toxicity test required by the UPDES

permit. It was determined through extensive testing that the toxicity test was failed due to a slight increase in the nickel concentration in the water. The toxic limit of dissolved nickel concentration appeared to be 15 ug/l or greater and the water discharged from the mine in late 1999 until the end of 2001 contained a maximum of 42 ug/l dissolved nickel. These concentrations of dissolved nickel are well below drinking water standards. The significant inflow to the mine from the 10 Left area and changes of how water was handled underground resulted in a decline in TDS and dissolved nickel over time. As a result,

the mine has been able to pass its chronic water testing.The Utah Division of Water Quality recently modified the mine's UPDES discharge permit to include a limit of 500 mg/l TDS and no total ton per day limit or the mine would discharge less than 7.1 tons per day of TDS if the water had a TDS concentration greater than 500 mg/l.

A UPDES permit was obtained by PacifiCorp to operate the JC-3 mine dewatering well in James Canyon. This well will discharge high quality mine water to Electric Lake. However, since it is mine water, Skyline will be obligated under SMCRA to assure the quality of the water discharged is within the UPDES permit limits assigned to JC-3. Skyline will submit the required DMRs to the Division as required in Section 2.3.7.

Periodically, due to difficult recovery conditions or roof collapse, mining equipment is abandoned underground. Prior to leaving equipment underground, hazardous materials and lubricating fluids are drained when possible. Since the equipment is steel and not too different compositionally from the roof support throughout the mine, contamination to ground water from abandoned equipment is not anticipated.

Mining equipment such as longwall mining machines, roof bolters, and continuous miners, is made of high quality steel containing chromium, and is highly resistant to corrosion. Calculations of the corrosion potential of the steel used in long wall mining machines have been performed by the University of Utah Metallurgy Department (BLM 1998s). They determined it would take thousands of years for the metal to corrode away. The University of Utah (BLM 1998a) report indicated that the general conditions required to hasten the corrosion of this metal do not exist in the Utah mining environment. A map illustrating the location of equipment left underground is provided as Drawing ~~2.3.6-3.~~2.5.2-1. The drawing includes a description of each piece of equipment.

Because of the high alkalinity and low acidity concentrations in the area (differing normally by two orders of magnitude), acid drainage problems do not occur as a result of mining. This is supported by the fact that coal in the area has a low sulphur content. The pyritic sulfur content within the coal is approximately 0.10 percent. Approximately 0.931 pounds of Iron are taken out of the ground for each ton of coal that is produced. Assuming Skyline produces 3 million tons of coal per year, approximately 1,400 tons of Iron is extracted from the formation each year with the mining of the coal. On typical year, metal roof support associated with mining – on the order of 1,300 tons per year – is left underground. Over 25 years of water monitoring of the natural waters surrounding the Mine does not show any degradation in water quality.

Skyline Mine anticipates potentially discharging approximately 2,800 gpm of mine water to Eccles Creek after the completion of mining and subsequent abandonment of the 11 Left, 12 Left A and B, and 6 Left B panels in 2004. However, this rate may vary with changes in the operation of JC-3 and because of the steady decline in potentiometric head within the aquifer discharging into Mine #2. Assumptions used in developing the discharge amount can be found in July 2002 Addendum to the PHC in Appendix F.

The water consumed in operating underground equipment, dust suppression, and evaporation is obtained from ground water sources within the mine. These underground water sources are not connected to the surface waters in the area. Extensive research has been performed by the mine to verify that water currently entering the mine is not coming from the surface or depleting surface waters. The recent July 2002 Addendum to the PHC presents data supporting this statement. The data suggests the water intercepted underground is at least 4,000 to 25,000 years old and, based on the results of tritium analyses from most of the mine waters, does not typically contain water that has been exposed to the atmosphere in the past 50 years. Additionally, the steady rate of decline in
ground water levels in monitoring wells within the permit area and the results of age-dating the ground water inflows to the mine indicating the water is not getting appreciably younger, suggests that the aquifer is not receiving significant recharge of "young" surface waters.. Continued monitoring by the mine of the surface waters and seeps and springs flows in the permit and adjacent areas have shown no discernable impacts due to the increased mine inflows that were encountered in March 1999 and have continued through November 2002. It is the operator's position that the water consumed in operating Skyline Mine is not depleting surface water sources. In fact, there is an overall net gain to local river systems discharging to the Colorado River as a result of Skyline Mine discharge.

The following information is supplied as required by the Windy Gap process as it applies to existing coal mines in the Upper Colorado River basin:

Mine Consumption: (culinary well - Water Right 91-5010) =41.69 ac-ft (2004 consumption)

Ventilation Consumption / Evaporation:

(assumes 70 deg. F, 60 total days annually, 20% humidity air intake, 95% humidity air out-take; air density difference of 0.001 lbs/ft)

(353,312 cu-ft/min) (.001)(0.1198) = 42 gal/min.

= 11.21 ac-ft annually

Coal Producing Consumption / Coal Moisture Loss:

- 6.1% Inherent moisture
- 8.54 % run-of-mine moisture
- 2.44% moisture added to coal by cutting (8.54-6.1)

Projected 2005 Tonnage 237, 500 tons

Projected 5 yr Average 1,898,672 tons

Tons water/year = (1,898,672)(0.0244)= 46,328 tons water/year

Lbs water/year = 92,656,000

Gallons/year = 92,565,000 (0.1198)=11,100,189 gallons/year

=34.06 ac-ft annually

Sediment Pond Evaporation:

Evaporation estimate calculation uses evaporation data from Pacificorp evaporation pan located at Electric Lake spillway. Data was from 1998 through 2003.

Pond 001 (Mine Site) - 0.39 acre (surface area)

- 0.15 ac-ft/month (ET)
- 345,715 (gallons/year)
- 1.06 ac-ft/yr

Pond 002 (Rail Loadout) - 0.44 acre (surface area)
- 0.15 ac-ft/month (ET)
- 390,037 gallons/year
- 1.20 ac-ft/yr

Pond 003 (Refuse Pile) - 0.27 acre (surface area)
- 0.15 ac-ft/month (ET)
- 239,341 gallons/year
- 0.73 ac-ft/yr

Total Annual Pond Evaporation = 2.99 ac-ft

Springs and Seeps Effects From Subsidence - Not Applicable

Alluvial Aquifer Abstractions into Mine - Not Applicable

Deep Aquifer Pumpage - Not Applicable

Postmining Inflow - (0)

Direct Diversions - Not Applicable

Dust Suppression - 5,000 gallons/truck load. Data based on 2003 use; last fully active year.

= 3.7 ac-ft/yr

Mine Discharge - last 6 month average = 3,757 gpm

=
6,059
ac-ft/yr

Using the Windy Gap Process at the Mine site, water depletions include Mine Consumption, Ventilation Consumption, Coal Producing Consumption, Sediment Pond Evaporation, and Dust Suppression totaling approximately 94 acre-feet per year. The only addition to the system, as defined by the Windy Gap process is the mine discharge which is currently averaging approximately 6,060 acre-feet per year, indicating the Skyline Mine has a net gain of approximately 5,966 acre-feet year to the Colorado River drainage system.

2.5.3 Alternative Water Supply

OSM Regulation 30 CFR 783.17 requires that alternative sources of water supply be identified if mining impacts will result in the contamination, diminution, or interruption of existing sources.

Because no significant adverse hydrologic impacts are expected as a result of mining in the Skyline permit area, no individual or collective source of alternative water supply has been identified.

However, the Permittee presently owns approximately 556 acre-feet of water rights in the Scofield Reservoir. Of these water rights, water sufficient for the Permittee's needs has been exchanged for rights from wells located near the mine site and at the mouth of Eccles Canyon for use in culinary and dust suppression water systems. Of this 556 acre-feet, a 148 acre-foot exchange has already been approved by the State Engineer of Utah.

It is recognized that seeps and springs are important to wildlife, particularly to small, less mobile species, and that flow reduction could potentially negatively impact these species. While flow reduction from mining related activities, including subsidence, is not expected to cause a problem, however, should such a loss be documented, mitigation measures will be taken after consultation with the Division of Oil, Gas and Mining and the Division of Wildlife Resources.

The Permittee will replace the water supply of any land owner if such a water supply proves to be contaminated, diminished or interrupted as a result of the Skyline mining operations. First, a determination will be made by the Division in accordance with R645 - 301- 731.800 as to whether or not material damage has occurred. Then, in accordance with Regulation R645-301-525.510, Skyline will correct any material damage resulting from subsidence caused to surface lands (which includes water rights), to the extent technologically and economically feasible, by restoring the land to a condition capable of maintaining the value and reasonably foreseeable uses that it was capable of supporting before subsidence damage. Negotiations will be held immediately with the impacted party to determine the appropriate mitigation activities. The restoration of water flows to impacted sources will be accomplished using the Best Technology Currently Available (BTCA). These activities may include, but not necessarily be limited to: piping or trucking water to the location of the loss; sealing surface fractures to prevent further losses (i.e., stream floors on bed rock or in shallow alluvium), and; construction of a ground water well and the installation of pumps to restore flows. If the above efforts are not successful, then Skyline will explore the transferring water rights to the injured party in flow equal to the determined loss and/or monetary reimbursement for proven material damages.

Historically, the mining activities at Skyline Mine have not resulted in the loss of surface waters or significant changes in the discharge of seeps and springs within the permit area. While significant volumes of ground water have been encountered while mining in the west and southwest portions of the permit area, no impacts to surface discharges of seeps and springs, the flow of streams, or bodies of water have been found. Age-dating of samples of water obtained from the mine indicate the water has been in place for several thousands of years. This suggests that ground water is moving very slowly through the area strata and does not discharge at a significant rate down gradient of the mine.

Very little ground water was encountered while mining in the northern portion of the existing permit area prior to the addition of the North Lease. The same geologic and hydrogeologic conditions are anticipated to occur in the North Lease as occurred in the northern portion of the existing permit area (Mine 3). Therefore, no significant inflows of ground water are anticipated as mining progresses into the North Lease area. Selected surface discharges of ground water and stream flows in the areas that could be impacted by mining activities will be monitored. Mining related subsidence is the only surface impact anticipated since no new surface facilities are currently planned for the North Lease area. If impacts to the waters within the permit area are determined to have occurred, mitigation will be implemented immediately using BTCA as described previously.

There has been some concern that Electric Lake has been impacted by the inflows of ground water to the Skyline Mine since 1998. As presented in the Addendum to the Probable Hydrologic Consequences, July 2002 and updated in October 2002, April 2003, and June 2004, a direct connection between the water in Electric Lake and the mine

inflows cannot be found. However, the water flowing into the 10 Left area of the mine and discharging from the James Canyon JC-1 well contains a slight percentage of tritium. No other significant inflows of ground water into the mine contained tritium levels that would suggest a modern component of recharge. As stated by Petersen (Appendix A, Addendum to the Probable Hydrologic Consequences, July 2002, Updated October 2002):

> "It is calculated that the maximum modern component in the fault-related system could range from approximately 6.9 to 12.4 percent. It is also apparent that since routine sampling of the 10 Left groundwater system began in May 2002, the percentage of modern recharge in the groundwater system has not increased. Based on the potential modern recharge percentage calculations presented above, it is determined that of the total inflow to the 10 Left region (approximately 3,800 gpm), a maximum of approximately 262 to 471 gpm could have originated as modern recharge. Inasmuch as Canyon Fuel has been pumping approximately 2,200 gpm from the 10 Left groundwater system into Electric Lake since September 2001, the potential net impact to the Electric Lake watershed, were it occurring, would be completely mitigated by the current pumping. Additionally, groundwater that would not otherwise be available for use without the pumping activity is being added to the watershed. Since October 2002, PacifiCorp has increased the pumping rate at JC-1 to more than 4,000 gpm. Thus, currently, the amount of groundwater being pumped into Electric Lake from JC-1 represents

> a volume approximately one order of magnitude greater than that which could potentially be derived from modern sources. It should be noted that there is currently **no** information that would indicate that the potential modern component in the fault-related mine inflows is directly or indirectly related to losses from Electric Lake."

Based on the above information and assuming the same percentages of modern versus ancient water applies to the water pumped from the JC-1 well at a rate of 2,200 gpm, a maximum of approximately 152 gpm to 273 gpm could have originated as modern recharge. The maximum estimated volumes of modern recharge water being discharged to the mine and from the James Canyon well would have been 744 gallons. This volume is still less than the approximately 2,200 gpm that JC-1 discharged to Electric Lake from September 2001 through September 2002.

October 2002, PacifiCorp negotiated with Skyline Mine to install a higher capacity pump in JC-1 well. The discharge after the new pump was installed was approximately 4,200 gpm. The rate of discharge from JC-1 dropped to approximately 3,900 gpm in March of 2003 and should be sustained at approximately that rate through 2004. The cause of the decline in the pumping rate is unknown but may be related to changes in well or pump efficiency.

After the new pump was installed in JC-1, the tritium concentrations in the water discharged from the well increased slightly. It appears that since January 7, 2003 the tritium concentration in the JC-1 well water has slightly increased, ranging between 1.83 and 2.34 TU. This suggests that between 6 and 22 percent of the water now being pumped from the JC-1 well has a component of water that could be considered younger than 50 years old (The percentages are based on a comparison of 2.34 TU in the well water with tritium concentrations measured in water samples from area springs and Electric Lake that range between 8.6 and 30 TU. Table 2 of Appendix G). Assuming the

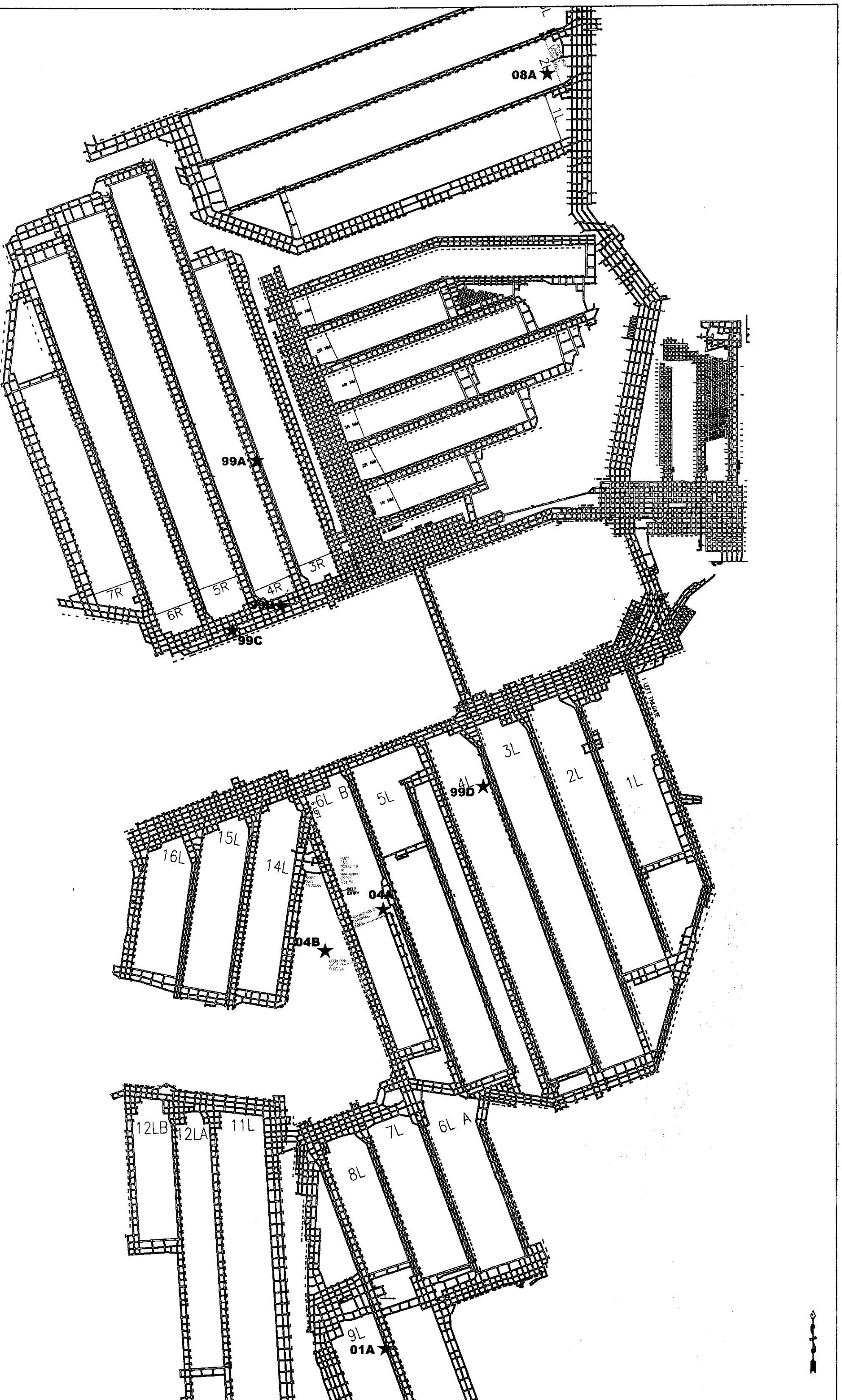
calculated range of 7.8 to 27.2 percent represents the portion of young water discharged from JC-1 when the well is operated at a pumping rate of 3,900 gpm, the range of modern water discharged from JC-1 is between 304 gpm to 1,061 gpm.

The 10 Left area of the mine was sealed in October 2002 and additional uncontaminated samples of the water inflows in that area can no longer be obtained. Calculations of the percentage of modern water in the 10 Left inflows can no longer be based on actual sample data. If it is assumed the JC-1 water is representative of the 10 Left inflows, the JC-1 well water is not being "contaminated" with

modern water from sources that do not normally flow into the mine, and the inflow rate of ground water to 10 Left is approximately 3,000 gpm (as estimated in March 2004), the inflow rate of modern water to 10 Left might be between 234 gpm and 816 gpm. Combining the calculated inflow rates of modern water from JC-1 and the 10 Left area results in a range of 538 gpm to 1,877gpm of a total of 6,900 gpm of water removed from the ground from JC-1 and the mine.

JC-3 pumps water from the flooded portions of the mine that include the 6 Left through 12 Left A and B panel areas. Water from the 11 Left and 12 Left A and B areas do not appear to contain modern waters. Without the JC-3 well, the from these flooded portion of the mine would be pumped to Eccles Creek and not Electric Lake. The pumping of the JC-3 well could be considered to further mitigate for the maximum possible inflow of modern water to the mine. The JC-3 well is expected to be operated for at least several years or until the persistent drought conditions end.

If a determination were made that Skyline Mine impacted Electric Lake and upper Huntington Creek waters, the JC-1 and JC-3 wells would continue to be operated by the mine to discharge water into the Huntington Creek drainage. Thus, through the mine's effort to dewater the Star point Sandstone to allow for the continuation of mining in the southwest portions of Mine 2, specifically to maintain the West Mains, any potential mitigation for the loss of water has been and continues to be accomplished.



99A ★ EQUIPMENT DESCRIPTION:
SINGLE SHIELD. RAMS AND HOSES REMOVED. NO REMAINING FLUIDS. ABANDONED 6/95.

99B ★ EQUIPMENT DESCRIPTION:
CONVEYOR BELT TAIL. STEEL AND RUBBER ONLY. NO REMAINING FLUIDS. ABANDONED 12/98.

99C ★ EQUIPMENT DESCRIPTION:
LONGWALL EMULSION TANK, 3000 GAL. CAPACITY. NO REMAINING FLUIDS. ABANDONED 12/98.

99D ★ EQUIPMENT DESCRIPTION:
FOUR LONGWALL SHIELDS, USEABLE PARTS REMOVED. EMULSION REMOVED. NO REMAINING FLUIDS. ABANDONED 12/98.

01A ★ EQUIPMENT DESCRIPTION:
LONGWALL FACE CONVEYOR. 160 PAN SECTIONS. NO FLUIDS OF HOSES REMAIN. STEEL ONLY. ABANDONED 4/01

04A ★ EQUIPMENT DESCRIPTION:
121 EACH DOWTY AND K-B ROOF SUPPORTS (SHIELDS). LONGWALL FACE CONVEYOR COMPLETE WITH LINE PANS, SPECIAL PANS, TAILGATE DRIVE, AND STAGELOADER.

04B ★ EQUIPMENT DESCRIPTION:
APPROXIMATELY 82 K-B ROOF SUPPORT SHIELDS BETWEEN XCUTS 22 AND 37, 6L B PANEL. NO FLUIDS REMAIN. STEEL ONLY. ABANDONED 3/04

08A ★ EQUIPMENT DESCRIPTION:
148 EACH GULLICK DOBSON SUPPORTS - SHIELDS ONLY (EMULSION WAS DILUTED TO 97-100% WATER, ELECTRONICS, LIGHTS, AND BATTERIES WERE REMOVED). ABANDONED 05/08

REVISIONS		
DATE:	BY:	REVISION:
6/10/03	DEJ	
4/12/04	CDH	
6/02/04	CDH	
4/14/08	G.G.	Added 08A, Changed Plate No from 2.3.8-3 Changed Equipment Cataloging, deleted 04A Mining

MINE 3 LEVELS 2 & 3
ABANDONED MINING EQUIPMENT LOCATIONS

Canyon Fuel Company, LLC
Skyline Mines

DATE: 6/09/03	CK.BY: G GGALECKI	REVISION: 4
SCALE: NO SCALE	DR.BY: B. REES	
DWG. NO.: 2.5.2-1		

2.5 HYDROLOGICAL IMPACTS OF MINING ACTIVITIES

Presented in the following subsections are summaries of the hydrological impacts of the mining activities of the Skyline project. The details backing the conclusions stated in this section and supplemental discussion can be found in the PHC evaluations included as part of this section, and within the Hydrology Section of Appendix Volume A-1 Volumes 1 and 2. Details of the consultant's flow calculations may be found in the flood plan calculations also in Appendix Volume A-1. The PHC was also updated in July 2002 October 2002, April 2003, and June 2004 by the addition of the Addendum to the PHC associated with the drilling of the wells in James Canyon, the significant inflows to Mine #2, and the ground water model prepared by HCI.

The potential hydrologic impacts discussed herein represent the latest information available and, generally, correspond to the consultant's original report. (See General Hydrologic Consideration Related to Coal Development and Subsequent Impacts, Vaughn Hansen Associates, February 1981, found in Appendix Volume A-1. Updated analyses of the "Probable Hydrologic Consequences" reflecting all current data are appended to this section.

- **Exhibit A of Section 2.5**, "Probable Hydrologic Consequences of Mining at the Skyline Mines, Carbon and Emery Counties, Utah"; prepared by Earthfax Engineering, Inc., Salt Lake City, Utah; dated September 30, 1992.
- **Addendum to the Probable Hydrologic Consequences, July 2002 (James Canyon Update - further updated in October 2002, April 2003, and June 2004).**
- **Appendix A-1, Volume 2** (September 2002), "Investigation of Surface and Groundwater Systems in the Vicinity of the Skyline Mines, Carbon, Emery, and Sanpete Counties, Utah: Probable Hydrologic Consequences of Coal Mining at the Skyline Mines and Recommendations for Surface and Groundwater Monitoring".

2.5.1 Potentially Affected Water Rights

Surface and groundwater rights in the general project area are primarily for stockwatering and irrigation. Stockwatering rights are located almost entirely and directly on the streams. The

nearest irrigation rights are centered around the two areas of Scofield and in Flat Canyon, southwest of the permit area. Irrigated lands consist primarily of pasture. Only stockwatering rights are present in the Skyline permit area. A limited number of wells are located in the general area, none of which are located directly on the property or within the permit area. Recent large mine inflows to Mine #2 has resulted in concern voiced by local government and private interests that water entering the mine is coming from nearby Electric Lake. However, data collected and analyzed by Skyline Mine for the purpose of determining the source of the inflows strongly indicates there is no significant connection between the surface waters and the mine waters. As discussed in the July 2002 Addendum to the PHC (modified in October 2002, April 2003, and June 2004), the Star Point does not transmit water easily. Fractures within the Star Point in the mine area has allowed the sandstone to begin dewatering by discharging to the mine. The Star Point does not appear to have a significant discharge point located immediately down gradient of the mine. Indeed, the age of the water in the sandstone suggests it takes several thousand years to move through the aquifer in spite of the high transmissivity of the fractures within the sandstone. Therefore, it is unlikely any surface or ground water rights are being adversely affected. Because it is not certain that the ground water discharges into the Huntington Creek drainage, there is no evidence that water is being removed from that drainage to Eccles Creek, part of the Price River drainage. Tritium analysis of the water in the 10 Left area of Mine #2 and water from the James Canyon well JC-1 indicates a minor amount of modern water is being pumped from the well and the mine. However, this water is not necessarily originating from Electric Lake. Therefore, there does not appear to be a significant volume of surface water being transferred between drainage basins.

2.5.2 Mining Impact on Water Quantity

Due to the high shale content of the Blackhawk Formation, recharge to the deep ground water system through the Blackhawk Formation is slow. Fractures in the formation seal readily due to swelling of the bentonitic shale when wet. As a result, the impact of mining (including subsidence) on the quantity of water in the permit area will be minimal. This has been verified through the results of the subsidence study in Burnout Canyon. (A discussion of the mining impacts on the aquatic resources may be found in Section 2.8.) The Burnout Canyon study resulted in the determination that no significant impacts had occurred to the stream drainage as a result of mining induced subsidence.

While the gradient of the stream was flattened in a few locations and slightly increased in others, the overall change in the stream morphology was not significantly different than changes that occur in

similar stream systems naturally. Biweekly flow monitoring and aerial photographic surveys continue each year as mining continues in the area. Additionally, three years of macroinvertabrate studies and two years of fish population surveys have been conducted starting in 2000. These studies are described in greater detail in Section 2.8.1.

The purpose of the Burnout Canyon study was to determine the impacts of undermining perennial streams in the Skyline Mine area. The intent of the study was to determine if significant impacts would occur by undermining the Burnout stream and, if no significant impacts occurred, then the Forest would consider allowing the undermining of perennial streams with similar geologic and geomorphic conditions to occur. Skyline Mine intends to undermine Winter Quarters Canyon based on the positive results of the Burnout Canyon study. Skyline has collected or committed to collect additional baseline data necessary to adequately monitor environmental parameters possibly affected by subsiding Winter Quarters Canyon.

When subsidence occurs, the subsidence cracks tend to seal rapidly, preventing the deep percolation and subsequent loss of water previously destined for springs and other water sources. The location of a spring may change by a few feet, but no significant loss of water is anticipated. The sealing of potential cracks will be accelerated where subsidence occurs under stream bodies, due to the natural deposition of silt in the stream channel along with the swelling of the shale.

Although the Blackhawk Formation contains partially or completely saturated sandstone channels above the proposed mine workings, a relatively small quantity of water is being encountered in the mine due to the impermeable nature of the formation, which limits the recharge rate and the ability of the rock to readily yield water. Ground water within the Blackhawk formation above the mine workings was determined in the 1996 PHC to be found within highly localized perched aquifers. The 1996 PHC evaluation failed to locate a regional ground water aquifer within the immediate area. The relatively small quantity of water being encountered in the mine was believed due to 1) the general impermeable nature of the formation, which limits the recharge rate and the ability of the rock to readily yield water, and 2) the local nature of local perched aquifer systems.

The inflow to the mine had been less than 100 gallons per minute per active face, with mine entries generally dry approximately 100 to 200 feet up-dip from the face. Some roof bolt

holes, however, continued to flow up to 2 GPM for an extended period of time. However, in 2002 a fractured

channelized sandstone was encountered during mining of the southwestern permit area which produced approximately 1,400 gpm. This was repeated at several locations in areas of Mine #2 until the mine was discharging approximately 8,500 to 9,500 gpm in August 2002 and 9,000 to 10,500 gpm in October 2002. Even though the large inflows have significantly subsided since October 2002, the near future mining activities have been directed toward the North Lease area.

The PHC for the Skyline Mine was updated by an Addendum to the PHC dated July 2002 and further updated in October 2002, April 2003, and June 2004. The addendum contains significant information regarding the large inflows to the mine. To better understand the hydrologic system and the water within the Star Point Sandstone, Skyline Mine contracted with Hydrologic Consultants, Inc. of Lakewood, Colorado produce a ground water model of the Star Point Sandstone. This model endeavored to delineate the possible areal extent of the aquifer, the volume of water contained in the aquifer, and the potential sources and discharge locations of the aquifer. The model has been used to help determine what, if any, impacts are occurring to the waters available in the mine area, including State appropriated water rights. The model was completed and improved in June 2004 and a copy of the report describing the results of the modeling effort has been added to the PHC.

As described in the July 2002 Addendum to the PHC, draining of the ground water contained within the Star Point Sandstone does not appear to have a significant impact on discharges of ground water in the mine or adjacent area nor does it appear that the water entering the mine is causing a loss of surface water in the Huntington or Price River drainages. The majority of the flows into the mine enter through faults and fractures that trend generally north-south to northeast-southwest. The flows move up through the floor of the mine in almost all cases. The water is apparently stored in the Star Point Sandstone under significant potentiometric head. Ages of the water indicate that water moves very slowly through the Star Point system in spite of the fractures and faults that appear to be open enough to allow water to flow freely into the mine in isolated locations. This suggests that the aquifer does not have a discharge point that releases large volumes of water nor is the aquifer replenished at a high rate of inflow. While the

Star Point is exposed in out crop north, south, and east of the mine, significant volumes of water would need to be entering the system at an elevation great enough to create the potentiometric head encountered in the Star Point beneath the Mine #2 workings. Skyline

continues to monitor stream flows in Winter Quarters, Eccles, and Mud Creeks to identify any impacts if they occur in these drainages related to the mine inflows.

No springs or water production wells in the mine permit or adjacent areas have reportedly been negatively impacted by the large mine inflows. There has been some concern voiced by local government and private interests that water entering the mine is coming from nearby Electric Lake. However, data collected and analyzed by Skyline Mine for the purpose of determining the source of the inflows strongly indicates there is no significant connection between the surface waters and the mine waters. As stated previously, this is discussed at length within the July 2002 Addendum to the PHC.

Water encountered in the mine is either utilized underground as processed water or is pumped from the mine. Procedures for handling of mine water are discussed in detail in Section 3.2. Indigenous water associated with the coal will be removed from the area. This, however, will represent only a small fraction compared to the water flowing from the Wasatch Plateau. The water pumped from the mine is added to the flow of Eccles Creek and into Electric Lake and has a positive effect on the aquatic flow systems.

The construction of surface facilities utilized in conjunction with the Skyline Mines (yard areas, roads, conveyor lines, etc.) resulted in temporary increases in the suspended sediment concentration of the adjacent stream. However, because of the regulatory requirement that sediment control measures be provided for all areas of surface disturbance, concentrations of suspended material were significantly reduced. Minimization efforts, however, met with varying degrees of success.

Over long periods of time, groundwater in the Wasatch Plateau can be expected to flow towards the lowlands if not removed, passing through saline shales and emerging to augment streamflow with a dissolved solids content that significantly exceeds the concentrations found in the headwaters area. Because the Skyline Mines will act as interceptor drains, the groundwater that is brought to the surface from the mines has a much lower dissolved solids content than would have existed if the water was to continue its downward movement through shaley layers. Thus, the mines will have some beneficial impact on the chemical quality of water in the region.

The increased stream flow resulting from mine discharges, particularly during the summer low flow period, appears to benefit the Eccles Creek fishery by creating flow and temperature stabilization. The increased flows to Scofield Reservoir most likely benefitted the fish

population in the lake by maintaining a sufficient level of dissolved oxygen to avoid a general fish kill that frequently occurs in the lake during periods of drought periods, such as has been occurring in the mine area since 2000. The mine has also been discharging large volumes of water since August 2002 with TDS concentrations only slightly higher than background levels. This good quality water flows to and is

stored in Scofield Reservoir. The water stored in Scofield Reservoir is used for culinary and irrigation purposes in Helper, Price, and Wellington, Utah. The State Engineers office in Price, Utah indicated that without the additional discharge from Skyline Mine to the Price River drainage, the reservoir would have been at a dead pool level in late August of 2002, thus cutting short the irrigation season downstream.

Similarly, discharges to Electric Lake will be an overall benefit to the water users on Huntington Creek. The discharge of high quality water from mine dewatering wells JC-1 and JC-3 will increase the volume of water in Electric Lake, provide additional cooling water for the Huntington Power Plant, and provide additional irrigation water for agricultural uses in Emery County. Without the additional discharge of water to Electric Lake from the James Canyon wells, it is possible that in the summer and fall of 2003, the Huntington Power Plant would need to significantly scale back the production of electrical power due to insufficient cooling water. A reduction in power generation from the plant would have significant economic impacts on Carbon and Emery Counties from the loss of jobs and an increase in power rates for consumers of power generated by PacifiCorp.

The completion and operation of JC-3 will not result in an overall increase of mine water discharge from the Skyline Mine. Operation of the well will decrease the amount of mine water discharged to Eccles Creek and result in additional water discharged to Electric Lake.

The large volume of ground water inflow to the mine has resulted in the mine discharging significantly greater volume of water than were initially anticipated when the mine was planned and opened. The current mine UPDES permit was written when flows were expected to be less than 1000 gpm and limits on total dissolved solids (TDS) were created based on this volume of flow. A 7.1 ton/ day limit of TDS was assigned to the mine with a maximum TDS concentration of 1310 mg/l TDS. It was not unusual

for the mine, prior to March 1999, to discharge water with 1000 mg/l TDS. However, after the large inflows into the mine were encountered in March 1999, the volume of water discharged increased steadily and the concentration of TDS decreased. Also at that time, the mine began to have trouble passing the chronic Ceriodaphnia dubia toxicity test required by the UPDES

permit. It was determined through extensive testing that the toxicity test was failed due to a slight increase in the nickel concentration in the water. The toxic limit of dissolved nickel concentration appeared to be 15 ug/l or greater and the water discharged from the mine in late 1999 until the end of 2001 contained a maximum of 42 ug/l dissolved nickel. These concentrations of dissolved nickel are well below drinking water standards. The significant inflow to the mine from the 10 Left area and changes of how water was handled underground resulted in a decline in TDS and dissolved nickel over time. As a result,

the mine has been able to pass its chronic water testing.The Utah Division of Water Quality recently modified the mine's UPDES discharge permit to include a limit of 500 mg/l TDS and no total ton per day limit or the mine would discharge less than 7.1 tons per day of TDS if the water had a TDS concentration greater than 500 mg/l.

A UPDES permit was obtained by PacifiCorp to operate the JC-3 mine dewatering well in James Canyon. This well will discharge high quality mine water to Electric Lake. However, since it is mine water, Skyline will be obligated under SMCRA to assure the quality of the water discharged is within the UPDES permit limits assigned to JC-3. Skyline will submit the required DMRs to the Division as required in Section 2.3.7.

Periodically, due to difficult recovery conditions or roof collapse, mining equipment is abandoned underground. Prior to leaving equipment underground, hazardous materials and lubricating fluids are drained when possible. Since the equipment is steel and not too different compositionally from the roof support throughout the mine, contamination to ground water from abandoned equipment is not anticipated.

Mining equipment such as longwall mining machines, roof bolters, and continuous miners, is made of high quality steel containing chromium, and is highly resistant to corrosion. Calculations of the corrosion potential of the steel used in long wall mining machines have been performed by the University of Utah Metallurgy Department (BLM 1998s). They determined it would take thousands of years for the metal to corrode away. The University of Utah (BLM 1998a) report indicated that the general conditions required to hasten the corrosion of this metal do not exist in the Utah mining environment. A map illustrating the location of equipment left underground is provided as Drawing ~~2.3.6-3.~~2.5.2-1. The drawing includes a description of each piece of equipment.

Because of the high alkalinity and low acidity concentrations in the area (differing normally by two orders of magnitude), acid drainage problems do not occur as a result of mining. This is supported by the fact that coal in the area has a low sulphur content. The pyritic sulfur content within the coal is approximately 0.10 percent. Approximately 0.931 pounds of Iron are taken out of the ground for each ton of coal that is produced. Assuming Skyline produces 3 million tons of coal per year, approximately 1,400 tons of Iron is extracted from the formation each year with the mining of the coal. On typical year, metal roof support associated with mining – on the order of 1,300 tons per year – is left underground. Over 25 years of water monitoring of the natural waters surrounding the Mine does not show any degradation in water quality.

Skyline Mine anticipates potentially discharging approximately 2,800 gpm of mine water to Eccles Creek after the completion of mining and subsequent abandonment of the 11 Left, 12 Left A and B, and 6 Left B panels in 2004. However, this rate may vary with changes in the operation of JC-3 and because of the steady decline in potentiometric head within the aquifer discharging into Mine #2. Assumptions used in developing the discharge amount can be found in July 2002 Addendum to the PHC in Appendix F.

The water consumed in operating underground equipment, dust suppression, and evaporation is obtained from ground water sources within the mine. These underground water sources are not connected to the surface waters in the area. Extensive research has been performed by the mine to verify that water currently entering the mine is not coming from the surface or depleting surface waters. The recent July 2002 Addendum to the PHC presents data supporting this statement. The data suggests the water intercepted underground is at least 4,000 to 25,000 years old and, based on the results of tritium analyses from most of the mine waters, does not typically contain water that has been exposed to the atmosphere in the past 50 years. Additionally, the steady rate of decline in
ground water levels in monitoring wells within the permit area and the results of age-dating the ground water inflows to the mine indicating the water is not getting appreciably younger, suggests that the aquifer is not receiving significant recharge of "young" surface waters.. Continued monitoring by the mine of the surface waters and seeps and springs flows in the permit and adjacent areas have shown no discernable impacts due to the increased mine inflows that were encountered in March 1999 and have continued through November 2002. It is the operator's position that the water consumed in operating Skyline Mine is not depleting surface water sources. In fact, there is an overall net gain to local river systems discharging to the Colorado River as a result of Skyline Mine discharge.

The following information is supplied as required by the Windy Gap process as it applies to existing coal mines in the Upper Colorado River basin:

Mine Consumption: (culinary well - Water Right 91-5010) =41.69 ac-ft (2004 consumption)

Ventilation Consumption / Evaporation:

(assumes 70 deg. F, 60 total days annually, 20% humidity air intake, 95% humidity air out-take; air density difference of 0.001 lbs/ft)

(353,312 cu-ft/min) (.001)(0.1198) = 42 gal/min.

= 11.21 ac-ft annually

Coal Producing Consumption / Coal Moisture Loss:

- 6.1% Inherent moisture
- 8.54 % run-of-mine moisture
- 2.44% moisture added to coal by cutting (8.54-6.1)

Projected 2005 Tonnage 237, 500 tons

Projected 5 yr Average 1,898,672 tons

Tons water/year = (1,898,672)(0.0244)= 46,328 tons water/year

Lbs water/year = 92,656,000

Gallons/year = 92,565,000 (0.1198)=11,100,189 gallons/year

=34.06 ac-ft annually

Sediment Pond Evaporation:

Evaporation estimate calculation uses evaporation data from Pacificorp evaporation pan located at Electric Lake spillway. Data was from 1998 through 2003.

Pond 001 (Mine Site) - 0.39 acre (surface area)

- 0.15 ac-ft/month (ET)
- 345,715 (gallons/year)
- 1.06 ac-ft/yr

Pond 002 (Rail Loadout) - 0.44 acre (surface area)
- 0.15 ac-ft/month (ET)
- 390,037 gallons/year
- 1.20 ac-ft/yr

Pond 003 (Refuse Pile) - 0.27 acre (surface area)
- 0.15 ac-ft/month (ET)
- 239,341 gallons/year
- 0.73 ac-ft/yr

Total Annual Pond Evaporation = 2.99 ac-ft

Springs and Seeps Effects From Subsidence - Not Applicable

Alluvial Aquifer Abstractions into Mine - Not Applicable

Deep Aquifer Pumpage - Not Applicable

Postmining Inflow - (0)

Direct Diversions - Not Applicable

Dust Suppression - 5,000 gallons/truck load. Data based on 2003 use; last fully active year.

= 3.7 ac-ft/yr

Mine Discharge - last 6 month average = 3,757 gpm

=
6,059
ac-ft/yr

Using the Windy Gap Process at the Mine site, water depletions include Mine Consumption, Ventilation Consumption, Coal Producing Consumption, Sediment Pond Evaporation, and Dust Suppression totaling approximately 94 acre-feet per year. The only addition to the system, as defined by the Windy Gap process is the mine discharge which is currently averaging approximately 6,060 acre-feet per year, indicating the Skyline Mine has a net gain of approximately 5,966 acre-feet year to the Colorado River drainage system.

2.5.3 Alternative Water Supply

OSM Regulation 30 CFR 783.17 requires that alternative sources of water supply be identified if mining impacts will result in the contamination, diminution, or interruption of existing sources.

Because no significant adverse hydrologic impacts are expected as a result of mining in the Skyline permit area, no individual or collective source of alternative water supply has been identified.

However, the Permittee presently owns approximately 556 acre-feet of water rights in the Scofield Reservoir. Of these water rights, water sufficient for the Permittee's needs has been exchanged for rights from wells located near the mine site and at the mouth of Eccles Canyon for use in culinary and dust suppression water systems. Of this 556 acre-feet, a 148 acre-foot exchange has already been approved by the State Engineer of Utah.

It is recognized that seeps and springs are important to wildlife, particularly to small, less mobile species, and that flow reduction could potentially negatively impact these species. While flow reduction from mining related activities, including subsidence, is not expected to cause a problem, however, should such a loss be documented, mitigation measures will be taken after consultation with the Division of Oil, Gas and Mining and the Division of Wildlife Resources.

The Permittee will replace the water supply of any land owner if such a water supply proves to be contaminated, diminished or interrupted as a result of the Skyline mining operations. First, a determination will be made by the Division in accordance with R645 - 301- 731.800 as to whether or not material damage has occurred. Then, in accordance with Regulation R645-301-525.510, Skyline will correct any material damage resulting from subsidence caused to surface lands (which includes water rights), to the extent technologically and economically feasible, by restoring the land to a condition capable of maintaining the value and reasonably foreseeable uses that it was capable of supporting before subsidence damage. Negotiations will be held immediately with the impacted party to determine the appropriate mitigation activities. The restoration of water flows to impacted sources will be accomplished using the Best Technology Currently Available (BTCA). These activities may include, but not necessarily be limited to: piping or trucking water to the location of the loss; sealing surface fractures to prevent further losses (i.e., stream floors on bed rock or in shallow alluvium), and; construction of a ground water well and the installation of pumps to restore flows. If the above efforts are not successful, then Skyline will explore the transferring water rights to the injured party in flow equal to the determined loss and/or monetary reimbursement for proven material damages.

Historically, the mining activities at Skyline Mine have not resulted in the loss of surface waters or significant changes in the discharge of seeps and springs within the permit area. While significant volumes of ground water have been encountered while mining in the west and southwest portions of the permit area, no impacts to surface discharges of seeps and springs, the flow of streams, or bodies of water have been found. Age-dating of samples of water obtained from the mine indicate the water has been in place for several thousands of years. This suggests that ground water is moving very slowly through the area strata and does not discharge at a significant rate down gradient of the mine.

Very little ground water was encountered while mining in the northern portion of the existing permit area prior to the addition of the North Lease. The same geologic and hydrogeologic conditions are anticipated to occur in the North Lease as occurred in the northern portion of the existing permit area (Mine 3). Therefore, no significant inflows of ground water are anticipated as mining progresses into the North Lease area. Selected surface discharges of ground water and stream flows in the areas that could be impacted by mining activities will be monitored. Mining related subsidence is the only surface impact anticipated since no new surface facilities are currently planned for the North Lease area. If impacts to the waters within the permit area are determined to have occurred, mitigation will be implemented immediately using BTCA as described previously.

There has been some concern that Electric Lake has been impacted by the inflows of ground water to the Skyline Mine since 1998. As presented in the Addendum to the Probable Hydrologic Consequences, July 2002 and updated in October 2002, April 2003, and June 2004, a direct connection between the water in Electric Lake and the mine

inflows cannot be found. However, the water flowing into the 10 Left area of the mine and discharging from the James Canyon JC-1 well contains a slight percentage of tritium. No other significant inflows of ground water into the mine contained tritium levels that would suggest a modern component of recharge. As stated by Petersen (Appendix A, Addendum to the Probable Hydrologic Consequences, July 2002, Updated October 2002):

> "It is calculated that the maximum modern component in the fault-related system could range from approximately 6.9 to 12.4 percent. It is also apparent that since routine sampling of the 10 Left groundwater system began in May 2002, the percentage of modern recharge in the groundwater system has not increased. Based on the potential modern recharge percentage calculations presented above, it is determined that of the total inflow to the 10 Left region (approximately 3,800 gpm), a maximum of approximately 262 to 471 gpm could have originated as modern recharge. Inasmuch as Canyon Fuel has been pumping approximately 2,200 gpm from the 10 Left groundwater system into Electric Lake since September 2001, the potential net impact to the Electric Lake watershed, were it occurring, would be completely mitigated by the current pumping. Additionally, groundwater that would not otherwise be available for use without the pumping activity is being added to the watershed. Since October 2002, PacifiCorp has increased the pumping rate at JC-1 to more than 4,000 gpm. Thus, currently, the amount of groundwater being pumped into Electric Lake from JC-1 represents

> a volume approximately one order of magnitude greater than that which could potentially be derived from modern sources. It should be noted that there is currently **no** information that would indicate that the potential modern component in the fault-related mine inflows is directly or indirectly related to losses from Electric Lake."

Based on the above information and assuming the same percentages of modern versus ancient water applies to the water pumped from the JC-1 well at a rate of 2,200 gpm, a maximum of approximately 152 gpm to 273 gpm could have originated as modern recharge. The maximum estimated volumes of modern recharge water being discharged to the mine and from the James Canyon well would have been 744 gallons. This volume is still less than the approximately 2,200 gpm that JC-1 discharged to Electric Lake from September 2001 through September 2002.

October 2002, PacifiCorp negotiated with Skyline Mine to install a higher capacity pump in JC-1 well. The discharge after the new pump was installed was approximately 4,200 gpm. The rate of discharge from JC-1 dropped to approximately 3,900 gpm in March of 2003 and should be sustained at approximately that rate through 2004. The cause of the decline in the pumping rate is unknown but may be related to changes in well or pump efficiency.

After the new pump was installed in JC-1, the tritium concentrations in the water discharged from the well increased slightly. It appears that since January 7, 2003 the tritium concentration in the JC-1 well water has slightly increased, ranging between 1.83 and 2.34 TU. This suggests that between 6 and 22 percent of the water now being pumped from the JC-1 well has a component of water that could be considered younger than 50 years old (The percentages are based on a comparison of 2.34 TU in the well water with tritium concentrations measured in water samples from area springs and Electric Lake that range between 8.6 and 30 TU. Table 2 of Appendix G). Assuming the

calculated range of 7.8 to 27.2 percent represents the portion of young water discharged from JC-1 when the well is operated at a pumping rate of 3,900 gpm, the range of modern water discharged from JC-1 is between 304 gpm to 1,061 gpm.

The 10 Left area of the mine was sealed in October 2002 and additional uncontaminated samples of the water inflows in that area can no longer be obtained. Calculations of the percentage of modern water in the 10 Left inflows can no longer be based on actual sample data. If it is assumed the JC-1 water is representative of the 10 Left inflows, the JC-1 well water is not being "contaminated" with

modern water from sources that do not normally flow into the mine, and the inflow rate of ground water to 10 Left is approximately 3,000 gpm (as estimated in March 2004), the inflow rate of modern water to 10 Left might be between 234 gpm and 816 gpm. Combining the calculated inflow rates of modern water from JC-1 and the 10 Left area results in a range of 538 gpm to 1,877gpm of a total of 6,900 gpm of water removed from the ground from JC-1 and the mine.

JC-3 pumps water from the flooded portions of the mine that include the 6 Left through 12 Left A and B panel areas. Water from the 11 Left and 12 Left A and B areas do not appear to contain modern waters. Without the JC-3 well, the from these flooded portion of the mine would be pumped to Eccles Creek and not Electric Lake. The pumping of the JC-3 well could be considered to further mitigate for the maximum possible inflow of modern water to the mine. The JC-3 well is expected to be operated for at least several years or until the persistent drought conditions end.

If a determination were made that Skyline Mine impacted Electric Lake and upper Huntington Creek waters, the JC-1 and JC-3 wells would continue to be operated by the mine to discharge water into the Huntington Creek drainage. Thus, through the mine's effort to dewater the Star point Sandstone to allow for the continuation of mining in the southwest portions of Mine 2, specifically to maintain the West Mains, any potential mitigation for the loss of water has been and continues to be accomplished.

the mine has been able to pass its chronic water testing.The Utah Division of Water Quality recently modified the mine's UPDES discharge permit to include a limit of 500 mg/l TDS and no total ton per day limit or the mine would discharge less than 7.1 tons per day of TDS if the water had a TDS concentration greater than 500 mg/l.

A UPDES permit was obtained by PacifiCorp to operate the JC-3 mine dewatering well in James Canyon. This well will discharge high quality mine water to Electric Lake. However, since it is mine water, Skyline will be obligated under SMCRA to assure the quality of the water discharged is within the UPDES permit limits assigned to JC-3. Skyline will submit the required DMRs to the Division as required in Section 2.3.7.

Periodically, due to difficult recovery conditions or roof collapse, mining equipment is abandoned underground. Prior to leaving equipment underground, hazardous materials and lubricating fluids are drained when possible. Since the equipment is steel and not too different compositionally from the roof support throughout the mine, contamination to ground water from abandoned equipment is not anticipated.

Mining equipment such as longwall mining machines, roof bolters, and continuous miners, is made of high quality steel containing chromium, and is highly resistant to corrosion. Calculations of the corrosion potential of the steel used in long wall mining machines have been performed by the University of Utah Metallurgy Department (BLM 1998s). They determined it would take thousands of years for the metal to corrode away. The University of Utah (BLM 1998a) report indicated that the general conditions required to hasten the corrosion of this metal do not exist in the Utah mining environment. A map illustrating the location of equipment left underground is provided as Drawing ~~2.3.6-3.~~2.5.2-1. The drawing includes a description of each piece of equipment.

Because of the high alkalinity and low acidity concentrations in the area (differing normally by two orders of magnitude), acid drainage problems do not occur as a result of mining. This is supported by the fact that coal in the area has a low sulphur content. The pyritic sulfur content within the coal is approximately 0.10 percent. Approximately 0.931 pounds of Iron are taken out of the ground for each ton of coal that is produced. Assuming Skyline produces 3 million tons of coal per year, approximately 1,400 tons of Iron is extracted from the formation each year with the mining of the coal. On typical year, metal roof support associated with mining – on the order of 1,300 tons per year – is left underground. Over 25 years of water monitoring of the natural waters surrounding the Mine does not show any degradation in water quality.

Skyline Mine anticipates potentially discharging approximately 2,800 gpm of mine water to Eccles Creek after the completion of mining and subsequent abandonment of the 11 Left, 12 Left A and B, and 6 Left B panels in 2004. However, this rate may vary with changes in the operation of JC-3 and because of the steady decline in potentiometric head within the aquifer discharging into Mine #2. Assumptions used in developing the discharge amount can be found in July 2002 Addendum to the PHC in Appendix F.

The water consumed in operating underground equipment, dust suppression, and evaporation is obtained from ground water sources within the mine. These underground water sources are not connected to the surface waters in the area. Extensive research has been performed by the mine to verify that water currently entering the mine is not coming from the surface or depleting surface waters. The recent July 2002 Addendum to the PHC presents data supporting this statement. The data suggests the water intercepted underground is at least 4,000 to 25,000 years old and, based on the results of tritium analyses from most of the mine waters, does not typically contain water that has been exposed to the atmosphere in the past 50 years. Additionally, the steady rate of decline in
ground water levels in monitoring wells within the permit area and the results of age-dating the ground water inflows to the mine indicating the water is not getting appreciably younger, suggests that the aquifer is not receiving significant recharge of "young" surface waters.. Continued monitoring by the mine of the surface waters and seeps and springs flows in the permit and adjacent areas have shown no discernable impacts due to the increased mine inflows that were encountered in March 1999 and have continued through November 2002. It is the operator's position that the water consumed in operating Skyline Mine is not depleting surface water sources. In fact, there is an overall net gain to local river systems discharging to the Colorado River as a result of Skyline Mine discharge.

The following information is supplied as required by the Windy Gap process as it applies to existing coal mines in the Upper Colorado River basin:

Mine Consumption: (culinary well - Water Right 91-5010) =41.69 ac-ft (2004 consumption)

Ventilation Consumption / Evaporation:

(assumes 70 deg. F, 60 total days annually, 20% humidity air intake, 95% humidity air out-take; air density difference of 0.001 lbs/ft)

(353,312 cu-ft/min) (.001)(0.1198) = 42 gal/min.

= 11.21 ac-ft annually

Coal Producing Consumption / Coal Moisture Loss:

- 6.1% Inherent moisture
- 8.54 % run-of-mine moisture
- 2.44% moisture added to coal by cutting (8.54-6.1)

Projected 2005 Tonnage 237, 500 tons

Projected 5 yr Average 1,898,672 tons

Tons water/year = (1,898,672)(0.0244)= 46,328 tons water/year

Lbs water/year = 92,656,000

Gallons/year = 92,565,000 (0.1198)=11,100,189 gallons/year

=34.06 ac-ft annually

Sediment Pond Evaporation:

Evaporation estimate calculation uses evaporation data from Pacificorp evaporation pan located at Electric Lake spillway. Data was from 1998 through 2003.

Pond 001 (Mine Site) - 0.39 acre (surface area)