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 ~~and,~~ October 2002, and April 2003 by the addition of the Addendum to the PHC associated with the drilling of the wells in James Canyon and the significant inflows to Mine #2.

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.

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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 and April 2003), 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 study which is 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 induce 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.

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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 1400 gpm. This was repeated at several locations in areas of Mine #2 until the mine was discharging approximately 8500 to 9500 gpm in August 2002 and 9000 to 10500 gpm in October 2002. Due to these large inflows of groundwater, 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 and April 2003. 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 will endeavor 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 will be used to help determine what, if any, impacts are occurring to the waters available in mine area including State appropriated water rights. It is anticipated the model should be completed by ~~the end of 2002~~mid-2003 and a copy of the report describing the results of the modeling effort will be 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 discharge 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. However, while the mine has been producing water with a TDS concentration less than 500 mg/l, the total volume of water discharged results in more than 7.1 tons/day of TDS released to Eccles Creek. The mine and the Utah Division of Water Quality are currently working on modifying the mine's UPDES discharge permit to limit the water discharged to a 500 mg/l concentration of TDS and no total ton per day limit.

A second UPDES permit is being obtained to operate the JC-3 mine dewatering well in James Canyon. This well will discharge high quality mine water to Electric Lake. PacifiCorp has seeked to obtain the UPDES permit from the Utah Division of Water Quality by May 1, 2003 and will act as the UPDES permit operator. 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. A map illustrating the location of equipment left

underground is provided as Drawing 2.3.6-2. 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 amount of water that is discharged from the mine will equal the inflow minus that which is consumed in the mining operation (dust suppression and evaporation). Based on experience at Skyline Mine, the rate of water to be consumed is estimated to be 51,870,720 gallons per year (approximately 271 gpm). 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. ~~The projected discharged for Skyline during development and longwall mining of the North Lease and development of West Mains in Mine #2 is 2,800 g.p.m.~~ 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. ~~and is very slowly moving through the ground water system~~. 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.

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, 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 Lakewatershed, 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.

In 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. ~~It is anticipated this rate of discharge will continue at least for the next year.~~ The rate of discharge

from JC-1 dropped to approximately 3,900 gpm in March of 2003 and should be sustained at that rate through 2003. 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 stabilized or is slightly decreasing, ranging between 1.83 and 1.71 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 1.83 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 6 to 22 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 234 gpm to 858 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 still 3,800 gpm, the inflow rate of modern water to 10 Left might be between 228 gpm and 836 gpm. Combining the calculated inflow rates of modern water from JC-1 and the 10 Left area results in a range of 462 gpm to 1,694 gpm of a total of 7,700 gpm of water removed from the ground from JC-1 and the mine.

JC-3 will produce approximately 4,700 gpm upon completion in May 2003. This well will discharge water flowing into the mine in the 10 Left area as well as water piped from the 11 Left and 12 Left A and B panel areas to the 10 Left area. 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 water from 10 Left, 11 Left, and 12 Left A and B 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 panels 11, 12A and 12B Left and to maintain the West Mains, any potential mitigation for the loss of water has been and continues to be accomplished.

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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 1400 gpm. This was repeated at several locations in areas of Mine #2 until the mine was discharging approximately 8500 to 9500 gpm in August 2002 and 9000 to 10500 gpm in October 2002. Due to these large inflows of groundwater, 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 and April 2003. 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 will endeavor 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 will be used to help determine what, if any, impacts are occurring to the waters available in mine area including State appropriated water rights. It is anticipated the model should be completed by mid-2003 and a copy of the report describing the results of the modeling effort will be 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 discharge 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. However, while the mine has been producing water with a TDS concentration less than 500 mg/l, the total volume of water discharged results in more than 7.1 tons/day of TDS released to Eccles Creek. The mine and the Utah Division of Water Quality are currently working on modifying the mine's UPDES discharge permit to limit the water discharged to a 500 mg/l concentration of TDS and no total ton per day limit.

A second UPDES permit is being obtained to operate the JC-3 mine dewatering well in James Canyon. This well will discharge high quality mine water to Electric Lake. PacifiCorp has seeked to obtain the UPDES permit from the Utah Division of Water Quality by May 1, 2003 and will act as the UPDES permit operator. 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. A map illustrating the location of equipment left underground is provided as Drawing 2.3.6-2. 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 amount of water that is discharged from the mine will equal the inflow minus that which is consumed in the mining operation (dust suppression and evaporation). Based on experience at Skyline Mine, the rate of water to be consumed is estimated to be 51,870,720 gallons per year (approximately 271 gpm). 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.

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, 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 Lakewatershed, 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.

In 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 that rate through 2003. 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 stabilized or is slightly decreasing, ranging between 1.83 and 1.71 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 1.83 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 6 to 22 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 234 gpm to 858 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 still 3,800 gpm, the inflow rate of modern water to 10 Left might be between 228 gpm and 836 gpm. Combining the calculated inflow rates of modern water from JC-1 and the 10 Left area results in a range of 462 gpm to 1,694 gpm of a total of 7,700 gpm of water removed from the ground from JC-1 and the mine.

JC-3 will produce approximately 4,700 gpm upon completion in May 2003. This well will discharge water flowing into the mine in the 10 Left area as well as water piped from the 11 Left and 12 Left A and B panel areas to the 10 Left area. 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 water from 10 Left, 11 Left, and 12 Left A and B 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 panels 11, 12A and 12B Left and to maintain the West Mains, any potential mitigation for the loss of water has been and continues to be accomplished.

TABLE 2.3.7-3
MONITORING STATION IDENTIFICATION

ECCLES CANYON/MUD CREEK DRAINAGES

STREAM STATIONS - 18 Stations

CS-1	CS-2	CS-3	CS-4	CS-6	CS-9	
CS-11	CS-15	VC-6	VC-9	VC-10	MC-1	MC-2
MC-3	MC-4	MC-5	MC-6	CS-19	CS-20	CS-21

MINE DISCHARGE STATIONS - 4 Stations

CS-12 (Mine #3) CS-14 (Mine #1) MD-1 (Composite CS-12 & CS-14)
SRD-1 (Total Mine Site Discharge to Eccles Creek/Scofield Reservoir)*

FRENCH DRAIN STATIONS - 1 Station

CS-13

HUNTINGTON CANYON

STREAM STATIONS - 14 Stations

CS-7 (F-5)	CS-8	CS-1	CS-16	CS-17
CS-18	UPL-3*	UPL-10	F-9	F-10

*Discontinued Spring, 1989

WASTEROCK DISPOSAL SITE

STREAM STATIONS - 4 Stations

WRDS #1 WRDS #2 WRDS #3 WRDS #4

GROUNDWATER STATIONS

SPRINGS - 24 Stations

S10-1	S12-1	S13-2	S13-7	S14-4	S15-3	S17-2
S22-5	S22-11	S23-4	S24-12	S26-13	S34-12	S35-8
S36-12	2-413	3-290	WQ1-39	WQ3-6	WQ3-26	WQ3-41
WQ3-43	WQ4-12					

WELLS (MONITORING) - 18 Well Stations

W79-101A	W79-10-1B	W79-14-2A	W79-26-1	W79-35-1A
W79-35-1B	92-91-03	W2-1(98-2-1)	W20-4-1	W20-4-2
W99-4-1	W99-21-1	W99-28-1	W20- 28-1	JC-1
JC-3	ELD-1 (Total of JC-1 and JC-3)*	91-26-1	91-35-1	

WELLS, CULINARY -Referenced but not monitored

W13-1 W13-2 W17-1 W17-3 W24-1

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES)

001 Portal Area 002 Loadout Area 003 Waste Rock Area JC-3 James Canyon

* Sites are monitored for total flow only and the results are reported to the Division on a monthly basis.

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MINE DISCHARGE STATIONS - 4 Stations

CS-12 (Mine #3) CS-14 (Mine #1) MD-1 (Composite CS-12 & CS-14)
SRD-1 (Total Mine Site Discharge to Eccles Creek/Scofield Reservoir)*

FRENCH DRAIN STATIONS - 1 Station

CS-13

HUNTINGTON CANYON

STREAM STATIONS - 14 Stations

CS-7 (F-5)	CS-8	CS-1	CS-16	CS-17
CS-18	UPL-3*	UPL-10	F-9	F-10

*Discontinued Spring, 1989

WASTEROCK DISPOSAL SITE

STREAM STATIONS - 4 Stations

WRDS #1 WRDS #2 WRDS #3 WRDS #4

GROUNDWATER STATIONS

SPRINGS - 24 Stations

S10-1	S12-1	S13-2	S13-7	S14-4	S15-3	S17-2
S22-5	S22-11	S23-4	S24-12	S26-13	S34-12	S35-8
S36-12	2-413	3-290	WQ1-39	WQ3-6	WQ3-26	WQ3-41
WQ3-43	WQ4-12					

WELLS (MONITORING) - 18 Well Stations

W79-101A	W79-10-1B	W79-14-2A	W79-26-1	W79-35-1A
W79-35-1B	92-91-03	W2-1(98-2-1)	W20-4-1	W20-4-2
W99-4-1	W99-21-1	W99-28-1	W20- 28-1	JC-1
JC-3	ELD-1 (Total of JC-1 and JC-3)*	91-26-1	91-35-1	

WELLS, CULINARY -Referenced but not monitored

W13-1 W13-2 W17-1 W17-3 W24-1

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES)

001 Portal Area 002 Loadout Area 003 Waste Rock Area JC-3 James Canyon

* Sites are monitored for total flow only and the results are reported to the Division on a monthly basis.

HCI has been working on a model of the aquifer within the Star Point Sandstone. One purpose of the model is to help the mine define the recharge and discharge locations of the Star Point Sandstone aquifer and determine potential impacts, if any, to surface waters and their beneficial uses. Several assumptions have been made on the volume, porosity, and transmissivity of the aquifer. ~~The results of the modeling could provide the mine with rates and volumes of water that must be removed from the aquifer to lower the potentiometric head to a point below the coal seam in the western portion of the permit area.~~ However, to construct an accurate ground water model, several ground water monitoring points are needed. No additional monitoring wells in the permit area are planned at this time. Thus the model that HCI attempts to produce will contain a number of assumed aquifer parameters and the aquifer geometry. If a suitable ground water model can be produced by HCI, it is anticipated a copy of the results will be forwarded to the Division as an update to this PHC Addendum.

Currently, Skyline Mine believes the available data suggests the water entering the mine is sourced by the Star Point Sandstone. The water in the Star Point is under potentiometric head and is forced up through faults and fractures encountered during development mining. Water moves slowly out of the sandstone formation into the fractures and faults and then along the fractures and faults toward the mine (Petersen October 2002, pages 11 through 13). Vertical movement above the Star Point Sandstone is limited by the tight, impermeable beds of the Blackhawk Formation. The current mine inflows are depressing the potentiometric surface of the aquifer in the mine area (HCI Figure 6, Appendix C and Petersen Figure 4 Appendix G). The size of the aquifer is unknown at this time but appears to have limits as demonstrated by the steady decrease in the potentiometric head measured in the mine monitoring wells.

Recharge to the Star Point Sandstone appears to be slow as evidenced by the continued draw down of the aquifer and the age of the in-mine water. The drawdown rate of 0.08 feet per day in W79-35-1A was calculated for the time period between April 17, 2002 and July 1, 2002 (6 feet of drawdown over 74 days) and suggests that the potentiometric head of the ground water in the area at the head of the 9 Left panel will be at or near the elevation of the coal seam (a drop of 85 feet) in approximately 1060 days. It is reasonable to assume that mine inflows will

As discussed previously, water from the James Canyon wells is piped directly to Electric Lake. Initially, when the pipeline was laid, the end of the pipe was beneath the surface of the lake. This allowed water to be discharged without disturbing lake sediments. However, as the lake level dropped throughout the late summer and fall of 2001, the end of the pipe was exposed. This resulted in the slow erosion of the accumulated lake sediments in the immediate area of the pipeline discharge. The erosion of the sediments resulted in the moving of the material a short distance away from the pipeline to the standing lake level where they were redeposited. The pre-lake ground surface has been exposed and it consists of sands, gravels and cobbles. This area appears to be naturally well armored and no further erosion is expected to occur. As the lake level rises, the end of the pipe will again be under water.

The capacity of Electric Lake is 31,500 acre feet of water. The reservoir was constructed and is operated by ~~Utah Power & Light~~PacifiCorp to maintain a reliable source of cooling water to the Huntington Power Plant. Assuming the James Canyon ~~wells continue to~~JC-1 and JC-3 wells pump at a combined rate of ~~4,200~~8,600 gpm (a current rate of 3,900 gpm from JC-1 and an anticipated rate of 4,700 gpm from JC-3), a daily average of approximately ~~18.4~~38 acre feet of water would enter the lake. During low flow periods, the volume of water entering Electric Lake from all its tributaries is about 4,000 gpm or less. During high flow periods, inflows ~~can~~ may be many times this rate, but accurate inflow records have never been kept. The discharge of the wells to Electric Lake represents ~~0.06%~~0.12% of the total maximum daily storage capacity of the lake~~ and currently about 81% of the total inflow to the lake~~. Since low flow periods generally occur when the lake is at or near its lowest annual level, the well water discharge volume should not significantly affect the daily operation of the reservoir. Indeed, in times of drought, the well water is a significant benefit to both the power company and downstream water users.

The recent drought conditions in the Huntington Creek drainage have resulted in historic low water levels in Electric Lake. This has raised concerns of many of the downstream water

HCI and mine personnel have attempted to determine the geometry of the aquifer that lies beneath the mine. Most of the coal exploration drill holes in the mine area do not penetrate more than a couple hundred feet into the Star Point Sandstone. However, logs from oil and gas exploration drill holes in the general permit area have been obtained and studied. From these drill hole logs, the thickness of the Star Point Sandstone is estimated to be approximately 900 to 1,000 feet thick in the permit area. The sandstone appears to thicken to the west. The Star Point is not one continuous unit of sandstone but is comprised of interbedded sandstone, siltstone, and shale. While the sandstone fraction dominates the overall formation in the area, many of the sandstone tongues of the formation are separated by thin units of less permeable siltstone and shale. This relationship is illustrated on Plate III of HCI report (Appendix C).

HCI has been working on a model of the aquifer within the Star Point Sandstone. One purpose of the model is to help the mine define the recharge and discharge locations of the Star Point Sandstone aquifer and determine potential impacts, if any, to surface waters and their beneficial uses. Several assumptions have been made on the volume, porosity, and transmissivity of the aquifer. However, to construct an accurate ground water model, several ground water monitoring points are needed. No additional monitoring wells in the permit area are planned at this time. Thus the model that HCI attempts to produce will contain a number of assumed aquifer parameters and the aquifer geometry. If a suitable ground water model can be produced by HCI, it is anticipated a copy of the results will be forwarded to the Division as an update to this PHC Addendum.

Currently, Skyline Mine believes the available data suggests the water entering the mine is sourced by the Star Point Sandstone. The water in the Star Point is under potentiometric head and is forced up through faults and fractures encountered during development mining. Water moves slowly out of the sandstone formation into the fractures and faults and then along the fractures and faults toward the mine (Petersen October 2002, pages 11 through 13). Vertical movement above the Star Point Sandstone is limited by the tight, impermeable beds of the Blackhawk Formation. The current mine inflows are depressing the potentiometric surface of

slightly from the numbers given in Appendix F, but the overall downward trend of the rates is expected to continue.

As discussed previously, water from the James Canyon wells is piped directly to Electric Lake. Initially, when the pipeline was laid, the end of the pipe was beneath the surface of the lake. This allowed water to be discharged without disturbing lake sediments. However, as the lake level dropped throughout the late summer and fall of 2001, the end of the pipe was exposed. This resulted in the slow erosion of the accumulated lake sediments in the immediate area of the pipeline discharge. The erosion of the sediments resulted in the moving of the material a short distance away from the pipeline to the standing lake level where they were redeposited. The pre-lake ground surface has been exposed and it consists of sands, gravels and cobbles. This area appears to be naturally well armored and no further erosion is expected to occur. As the lake level rises, the end of the pipe will again be under water.

The capacity of Electric Lake is 31,500 acre feet of water. The reservoir was constructed and is operated by PacifiCorp to maintain a reliable source of cooling water to the Huntington Power Plant. Assuming the James Canyon JC-1 and JC-3 wells pump at a combined rate of 8,600 gpm (a current rate of 3,900 gpm from JC-1 and an anticipated rate of 4,700 gpm from JC-3), a daily average of approximately 38 acre feet of water would enter the lake. During low flow periods, the volume of water entering Electric Lake from all its tributaries is about 4,000 gpm or less. During high flow periods, inflows may be many times this rate, but accurate inflow records have never been kept. The discharge of the wells to Electric Lake represents 0.12% of the total maximum daily storage capacity of the lake. Since low flow periods generally occur when the lake is at or near its lowest annual level, the well water discharge volume should not significantly affect the daily operation of the reservoir. Indeed, in times of drought, the well water is a significant benefit to both the power company and downstream water users.

The recent drought conditions in the Huntington Creek drainage have resulted in historic low water levels in Electric Lake. This has raised concerns of many of the downstream water users,

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.

POTENTIOMETRIC SURFACE MAP 11/03 DWG NO. 2.3.4-2

LOCATION OF HYDROLOGIC MONITORING STATIONS
DWG NO. 2.3.6-1

MINE INFLOW MAP DWG NO. PHC A-2