DEER CREEK / COTTONWOOD

ACT/015/018 ACT/015/019

DES-BEE-DOVE

ACT/015/017

HYDROLOGIC SECTION

PACIFICORP
dba UTAH POWER & LIGHT COMPANY

VOLUME 9

PLAN UPDATE REGISTER

VOLUME NUMBER 9

MINE NAME: TRAILMOUNTAIN DEERCREEK DES BEE DOVE COTTONWOOD

FILE NUMBER: ACT/015/009 ACT/015/018 ACT/015/017 ACT/015/019

			Change #	Approval Date	Page #'(s)	Plate #'(s)	Entry Date/By	Description
O Add	[X] Replace	O Remove	94E	11-7-95	1-9 Monitoring Plan Section		8/23/96 SD	Hydrologic Monitoring Program
[X] Add	O Replace	O Remove	94E	11-7-95	26.1	—	8/23/96 SD	Rilda Canyon Creek.
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						
O Add	O Replace	O Remove						

HYDROLOGY

Since 1979 UP&L has been collecting data regarding the hydrology of the permit area and surrounding vicinity including quantity and quality of both ground and surface water (see Map HM-1). This data collection program is part of a hydrologic monitoring program which has been approved by the Utah State Division of Oil, Gas and Mining and the Office of Surface Mining.

All data collected has been and will continue to be submitted to the Office of Surface Mining; the Utah State Division of Oil, Gas and Mining; the U.S. Forest Service; and the Bureau of Land Management each year in the Annual Hydrologic Monitoring reports. Described below in the order of the following outline are the conditions observed and the ongoing monitoring of the hydrology.

HYDROLOGIC OUTLINE

I. Groundwater
   - A. Groundwater Recharge
   - B. Aquifer Description by Formation
   - C. Structural Hydrologic Features
   - D. Alluvial Aquifers
   - E. East Mountain Springs
   - F. In-Mine Quality
   - G. Mine Discharge

II. Surface
   - A. Huntington Creek Drainage
      1. Huntington Creek
      2. Deer Creek

I. GROUNDWATER

A. GROUNDWATER RECHARGE

The majority of the groundwater recharge on East Mountain comes from the winter snowpack which melts and infiltrates the surface of East Mountain. The water flows down vertical fractures which intersect sandstone channel systems in the North Horn and Blackhawk formations. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the Price River Formation and Castlegate Sandstones; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it intersects the northeast trending Roans Canyon Fault Graben. In-mine long-hole drilling completed to test the hydrology of this fault system has shown that the system acts as an imperfect aquiclude to further southeast migration of water. The system acts as an aquiclude because swelling bentonitic clays along the fault prohibit most of the water from penetrating across the fault. Most of the recharge south of the Roans Canyon Fault System comes from the snow melt directly above. The same mode of water migration occurs there as to the north; but, when the water intersects the sandstone channels, it migrates toward the canyons which surround and dissect the permit area.

B. AQUIFER DESCRIPTION BY FORMATION

Data has been collected from numerous coal exploration drill holes, from within the mine workings, from surface drainages, and from the springs in the area. The data have not identified any laterally continuous aquifers present throughout the area but have identified localized perched water tables in the North Horn and Blackhawk formations. Stratigraphy is the main controlling factor restricting groundwater movement and development of regional and perched aquifer systems within the East Mountain property. The following is a description of the various formations and how they influence the groundwater systems. The description is in descending order, which parallels the general groundwater flow (see Figure HF-1).

FLAGSTAFF LIMESTONE

An erosional remnant of Flagstaff Limestone 150 feet in thickness caps the upper portions of East Mountain. This formation displays a strong joint pattern which permits good groundwater movement both vertically and horizontally through the formation.

NORTH HORN FORMATION

The North Horn Formation is a lacustrine sequence 750 feet in thickness. This formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Its permeability is variable.

Lenticular sandstone channels are oftentimes present in the upper portion of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified, and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two-thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Price River Formation or Castlegate Sandstone below. The mudstones present appear to swell when they come in contact with water. Therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays.

The depth of the aquifers in the North Horn Formation is variable due to the rugged topography. The localized perched water tables may either intersect the surface of the ground or be covered by as much as 1,000 feet of overburden. They are located at least 1,400 feet above the coal seam to be mined. Communication of water between the perched aquifers in the North Horn Formation and the water flowing into the mine is limited in quantity and occurs very slowly. The monitoring of the numerous springs located on East Mountain gives UP&L the ability to assess any effects that mining might have on the North Horn Formation perched aquifers.

With the data available it is not possible to compile a piezometric map of the water-bearing strata in the North Horn Formation.

PRICE RIVER FORMATION

The Price River Formation is a braided stream deposit 300 feet in thickness. It is comprised predominantly of sandstone but commonly contains mudstone beds between the point bar deposits. It is generally void of water because it lacks adequate recharge.

CASTLEGATE SANDSTONE

The Castlegate Sandstone is 350 feet in thickness and consists of successive sequences of point bar deposits. Generally the sandstone is medium- to fine-grained, but occasionally pebble conglomerates are present near the base of some sequences. The formation is thought to be fairly permeable but, where it has been intersected by drill holes, has never been found to be water-saturated. It is oftentimes dry or slightly damp in some zones. It is void of significant water because it lacks adequate recharge.

BLACKHAWK FORMATION

The Blackhawk Formation contains the economic coal deposits within East Mountain. The formation is 750 feet in thickness and consists of mudstones, sandstones, interbedded mudstone and sandstone, and coal. The coal deposits are located in the lower 120 feet of the Formation. The Blind Canyon Seam, which is the upper coal seam, is situated seventy (70) feet above the base of the Blackhawk Formation. The lowest coal seam present on the property is the Hiawatha Seam, which immediately overlies the Starpoint Sandstone.

The Blackhawk Formation contains only perched or limited aquifers which exist within the strata overlying the coal seams. The perched aquifers exist as fluvial channels (ancient river systems) which overlie and scour into the underlying strata (refer to maps HM-2 and HM-3). The locations of the channels shown on maps HM-2 and HM-3, are based on data collected from in-mine mapping and numerous drill holes, both in-mine and surface, that have been completed on the property. These channel systems were part of a deltaic depositional setting active during and after the coal-forming peat accumulation. The largest influx of water encountered during the mining process occurs beneath the fluvial channels. The sandstone channels are mainly composed of a fine- to medium-grained sand with similar characteristics to the Starpoint Sandstone. The semi-permeable and porous nature of the channels allows an effective route for water transport. Other constituents of the Blackhawk Formation (i.e., mudstone, carbonaceous mudstone, and interbedded material) generally act as aquicludes which impede water flow unless fracturing or faulting of the units has induced secondary permeability.

The majority of the water flowing into the mines comes from within the limited fluvial channel aquifers; however, water is also transmitted into the mine workings by way of faults, joints or fractures, and in-mine drill holes (see Figure HF-2). Since 1978, the water flowing into the mine workings has been measured. The measurement locations in the Deer Creek Mine are shown on Map HM-2, Wilberg/Cottonwood Mine locations on Map HM-3. Many locations within the mines have been monitored in the past, but a limited number of accessible long-term water monitoring locations now exists because most water-producing areas of the mines are dewatered and stop flowing shortly after initial mining in the area.

In several locations in the Deer Creek and Wilberg/Cottonwood mines, such as retreated longwall panels, water is being produced but cannot be measured because the workings are inaccessible. The water entering these areas flows into numerous low areas in the mine which act as temporary sumps. The water is then pumped to the main sump located near the mine portal. Because the pumping system in the mine is ever changing (i.e., portable pumps being moved to various locations within the mine as the need arises), it is not possible to collect meaningful data from specific areas of the mine that can be compared with data collected from years or even months past. UP&L commits to measuring long-term, area specific changes in discharge where possible. If a situation develops where post-mining dewatering can be accurately measured over a long period of time, UP&L will collect data regarding aquifer dewatering rates to further understand mining effects on the groundwater system. One possible location which is applicable to both the Deer Creek and Cottonwood mines is shown on Map HM-2.

The most accurate measurement of water flowing into the mine workings is achieved by measuring the total water leaving the mine, which is done and reported annually in the Hydrologic Monitoring Report. The total amount of water leaving the mine includes metered discharge water as well as estimated water which evaporates from the mine workings.

Based on current data, several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. Of the water-producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances the area adjacent to the active face continues to be excessively wet, and previously mined wet areas experience a decrease in flow. It appears that the water source is being dewatered since excavated areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity.

Although much of the water transfer within the Blackhawk Formation is through fractures or faults, data indicate that many of the fractures become sealed by swelling bentonitic clays which stop or limit the water transfer, confirmation of which exists along the numerous faults and fractures over the area. Very few springs are found within the Blackhawk along the extensive faults in the Wasatch Plateau. A measurable flow of water along a fault existed at only one location in the Wilberg/Cottonwood Mine -- along the Pleasant Valley Fault in Main West, Wilberg. This location produced an estimated average flow of 5 gpm from the time it was encountered to 1980 when the flow stopped. Apparently, fractures seal readily because of the ability of the shaley layers to swell and decompose to form an impervious clay, preventing significant downward percolation, collection, or conveyance of water along faults in the Blackhawk Formation.

The coal seams in the Blackhawk Formation are impermeable and are not water-saturated.

Long-term water producing areas do exist within the current mine workings. Four types of occurrences have been recognized and will be monitored by the applicant (see Figure HF-2) and include (1) structural rolls with overlying fluvial channels, (2) Pleasant Valley and Roans Canyon Fault systems, (3) fractures and joints (lineaments), and (4) surface and in-mine drill holes.

STARPOINT SANDSTONE

The Starpoint Sandstone overlies and intertongues with the Masuk Shale. The formation is approximately 150 to 200 feet in thickness and consists of at least three upward coarsening sandstone units. Mudstone units of the Masuk Shale are present above the lower two sandstone members of the Starpoint Sandstone due to the interfingering nature of the contact between the two units.

The Starpoint Sandstone, which immediately underlies the Hiawatha Coal Seam, exhibits some characteristics of an aquifer but experiences little recharge. Studies conducted by the USGS indicated that the Starpoint Sandstone is of low permeability, thus limiting its usefulness as a water-producing aquifer. Most of the water discharge from the Starpoint is where it has been intersected by the major canyons in the plateau. Drill holes completed in the Deer Creek Mine defined the piezometric gradient in the lower Blackhawk Starpoint

System and confirmed the groundwater flow to conform with the topographic relief (see Figure HF-3). This, plus the fact that the Starpoint is only slightly to moderately permeable, allows only limited flow of groundwater through the formation.

C. STRUCTURAL HYDROLOGIC FEATURES

Three important structural hydrologic features have been identified within the East Mountain permit area. They are the Roans Canyon Fault Graben, Straight Canyon Syncline, and the Deer Creek Fault (see Map HM-1).

The Roans Canyon Fault Graben separates reserves currently being mined from future reserves. In order to access coal reserves from the northern third of the property, the Deer Creek Mine Plan includes a fault crossing to be completed during 1989-91.

A hydrogeologic investigation of the Roans Canyon Fault Graben was completed during 1988 in order to develop plans for management of groundwater inflow during and after the construction of three parallel rock tunnels. The fault crossing is located in the Third North section of the Deer Creek Mine (see Map HM-4). In order to conduct the investigation five (5) test wells were developed. Selected intervals in the boreholes were tested for hydraulic properties with straddle packers. In addition, three (3) short-term and one long-term constant rate flow tests were performed to measure aquifer parameters. The packer test and flow and recovery test data were analyzed to determine static pressures and gradients through the fault system and to determine transmissivity, hydraulic conductivity, and storage coefficient for each zone tested.

The investigation defined two major hydrogeologic units which are fractured, well-sorted, medium-grained, friable, oxidized channel sandstones. The first sandstone unit is located approximately 350 feet, the second about 650 feet, horizontally from the southern bounding fault (see Map HM-4). The sandstone units are likely of limited vertical thickness but may have more extensive lateral continuity. The two sandstones are heavily oxidized and iron-stained along fractures, and in places the sandstone is totally oxidized for several feet adjacent to the fracture. The oxidation, at a depth of 2000 feet below land surface, indicates that oxygenated water is infiltrating rapidly from the surface through the fractures, suggesting that there is good hydraulic connection between the channel sandstones at the depth of the rock tunnels and the recharge at the surface primarily through fractures.

Aquifer test results indicated the horizontal flow component is the result of flow in the graben from the west toward the east where the graben intercepts the canyon walls and, presumably, the groundwater system discharges. The vertical flow component is controlled by the Starpoint Sandstone which underlies the entire graben.

The groundwater flow in the graben occurs primarily in the fractures of the two major water-producing zones with lesser flow quantities in the fractured siltstone units. Virtually no flow occurs in the mudstone between the siltstone and sandstone. The south boundary fault of the graben creates a hydrologic barrier to flow into the mine area south of the graben, whereas the north boundary fault does not have a thick fault gouge zone like the one associated with the southern fault; but, from drilling observations, it is also suspected to be a barrier to groundwater flow.

UP&L utilizes a pressure grout program to minimize the long-term groundwater inflow from the water-producing zones encountered during slope development. The grouting program will consist of drilling a series of boreholes prior to water-producing zone interception and forcing fast-setting grout material into the fractures. In zones other than the two major water-producing areas grouting will be done if the groundwater inflow exceeds 50 gpm. Experience with pressure grouting indicates that as much as seventy-five to ninety-five percent (75-95%) of the groundwater inflow was effectively stopped. Tunnel inflow rates range from 50 to 75 gallons per minute.

One factor addressed during the dewatering and grouting evaluation was the influence of the tunnels and prior dewatering on the flow in the surface springs located in the vicinity of the Roans Canyon Fault Graben. A maximum drawdown of approximately ten (10) feet at the surface of the graben was calculated using the groundwater model. Given the preexisting dominant vertical flow direction and the fact that the springs do not appear to be associated with aquifers of concern to this investigation, it is unlikely that the tunnels or the recommended dewatering systems would exert a measurable influence on the springs.

The Straight Canyon Syncline is the second structurally related hydrologic feature within the permit boundary. It parallels and lies adjacent to the Roans Canyon Fault Graben (see Map HM-1). Because the syncline forms a stratigraphic depression, groundwater is funneled into it and migrates to the southwest. Wet conditions have been experienced where mining has taken place in the base of the syncline. The significance of the Straight Canyon Syncline hydrologically is much less than that of the Roans Canyon Graben.

The third feature is the Deer Creek Fault. Mining in the Deer Creek and Wilberg mines to the west of the Deer Creek Fault had intersected wet strata while the Des-Bee-Dove Mine to the east had dry strata, indicating that the fault forms an aquiclude to water migration to the east.

D. ALLUVIAL AQUIFERS

No alluvial aquifers have been defined within the permit area; however, hydrologic investigation of Rilda Canyon will be conducted during 1990 and reported in the Annual Hydrologic Report. Alluvial aquifers are known to exist outside the permitted area and include Huntington Canyon to the northeast and along Cottonwood Creek to the south.

E. EAST MOUNTAIN SPRINGS

A number of springs and seeps contribute to the surface water bodies on and adjacent to UP&L's East Mountain property. The majority of the springs on East Mountain occur in the North Horn Formation with the major flowing springs restricted to this formation (see Table HT-1 and Map HM-5). The North Horn Formation is composed of a sedimentary sequence of variegated shales, sandstone, conglomerates, and freshwater limestone. The variability of composition of this formation causes a variation in permeability as well.

The fractured nature of the Flagstaff allows for good vertical transport of water with little lateral movement resulting in the occurrence of few springs in that formation. The majority of water percolates through the Flagstaff to the North Horn Formation. When an impermeable zone is intersected during the water's vertical movement there, a lateral migration is promoted. If the ground surface is intersected by these waters, a spring is formed. This often is the case in the North Horn Formation where a large number of springs is to be found. Some portion of the water will make its way down to the Price River Formation where a few springs are present.

Between the time UP&L began monitoring springs on East Mountain and 1986 the number of springs measured increased from less than fifty (50) to nearly seventy (70). Because we felt that more benefit could be realized by concentrating our monitoring on selective springs in the area that will be undermined within the next five years (see Map HM-5), a meeting was held on March 25, 1987 with the U.S. Forest Service and the Utah State Division of Oil, Gas and Mining to determine the most effective plan for UP&L's monitoring. A subsequent meeting was held on April 15, 1987 with the State Division of Oil, Gas and Mining to finalize the monitoring plan revisions.

During the meeting it was resolved that the following springs will be monitored (underlined in Table HT-1).

+*Burnt Tree Springs	79-40
+*Elk Springs	80-41
+*Sheba Springs	80-43
Ted's Tub	+*80-44
79-2	+*80-46
+*79-10	80-47
79-15	80-48
+*79-23	82-51
79-24	+*82-52
+*79-26	+*84-56
79-28	89-60 (Alpine Spring)
+*79-29	89-61
79-32	89-65
79-34	89-66
+*79-35	89-67
79-38	89-68

\+ Baseline analysis performed in 1986 and will be repeated every five years.

Of these springs twelve will be monitored on a monthly basis, weather permitting, and have been denoted on the above list with asterisks (*). The applicant agrees that each year a map showing the area to be mined within the next five years will be supplied in the Annual Hydrologic Monitoring report. A field verification meeting will be held each year to determine if changes in the springs monitored are required.

FLOW

The flow and sampling schedule is as follows. All springs listed above are measured during the months of July and October. In addition, a minimum of twelve (12) springs are monitored to establish a discharge recession curve. Generally, measurements are made on a monthly basis during the months of July through October if weather and reasonable access permit. But, when historical data indicate that a spring is short-lived, all efforts are made to measure discharge from that spring at least three times, equally spaced, within its flow period. Each year in the Annual Hydrologic Report spring flow rates are compared to East Mountain climatology as to how closely spring discharge follows local annual precipitation. This comparison is vital in determining mining effects on spring discharge versus general changes in annual precipitation.

QUALITY SAMPLES

All springs listed above are sampled for water quality characteristics during the months of July and October. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Operational Quality (see Hydrologic Monitoring Schedule included herein). Baseline analysis was conducted in 1986 on the recession study springs and will be repeted every five years. In addition, the twelve discharge recession springs denoted by asterisks in the above list will be monitored monthly, access permitting, each year between

July and October for the following parameters: (1) discharge quantity, (2) specific conductivity [field], (3) temperature [field], (4) pH [field], (5) total hardness, (6) carbonate, and (7) total manganese.

QUALITY

To more closely identify springs which are related one with another, water samples were analyzed to determine the percentage of cations and anions in solution. The percentages have been graphically represented as cation-anion diagrams (see Hydrologic Monitoring Report). The purpose of the cation-anion diagrams is to identify groups of related springs by water chemistry. The diagrams clearly show the similarity of water quality of springs originating in the same geologic formation. To better visualize the concept, the cation-anion diagrams are presented by the geologic formation in which they originate (see Hydrologic Monitoring Report).

A historical summary of the water quality analysis for a representative group of East Mountain Springs is presented in Table HT-2.

IN-MINE QUALITY

Due to the increased total dissolved solids (TDS) concentration, the quality of groundwater entering the East Mountain property generally decreases from the north to the south. Increased TDS concentration is mainly due to increased levels of calcium, bicarbonate, magnesium, and sulfate. The trend of increased TDS concentration from north to south has also been detected in springs which are located above the coal horizon. Changes in the dissolved solid concentrations from north to south could possibly indicate the direction to groundwater movement as indicated in the Probable Hydrologic Consequences section of the permit.

Average quality by location has remained relatively constant for each individual location (refer to 1988 Hydrologic Monitoring Report). Quality of all samples collected since 1977 is presented in Table HT-3. The samples reveal that the predominant dissolved chemical constituents are bicarbonate, calcium, magnesium, and sulfate, with minor amounts of chloride and sodium. These findings are similar to other studies conducted on the Wasatch Plateau Coal Field.

Collection procedures for groundwater quality consist of two grab samples collected and analyzed per quarter at each of the mines which produces measurable quantities of water. Sampling according to this established plan began in the first quarter of 1982. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Operational Quality except when new sites are established, in which case baseline information will be collected for two (2) years.

MINE DISCHARGE - DEER CREEK

Excess water not utilized in the mining operation or for domestic use was either pumped to storage areas or discharged from the mine. The locations of the main sump areas within the mine are shown in Figure HF-4. The largest volume of water is stored in the western part of Main West, which has not been actively mined for several years.

In-line water meters are utilized to record the amount of water discharged from the mine, after which the water passes through an oil skimmer before being piped to UP&L's Huntington Power Plant. None of the discharge water leaving the mine enters any of the natural streams in the region but instead is used in the cooling towers at the power plant.

MINE DISCHARGE - WILBERG/COTTONWOOD

Water produced in the Wilberg Mine gravity flows to the northern area of 1st North. At that point a vertical turbine located in the Deer Creek Mine picks up the water and pumps it back to the south and down to the Wilberg Mine main sump (see Figure HF-5). This process is utilized to circumvent the area sealed due to the fire in 1984. The sump, which functions as a settling basin, effectively removes settleable solids from the water. A portion of the water is redistributed to various areas of the mine to be utilized in the mining operation. Excess water is discharged into the Left Fork of Grimes Wash after passing through an oil skimmer in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-01.

In the Cottonwood Mine intermittent small quantity discharges have occurred at the Miller Canyon breakouts, developed for ventilation purposes but sealed in 1987. Discharge usually occurs during the months of June through

November with a flow rate ranging from 5 to 60 GPM. Discharge from Miller Canyon is monitored in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-04. Any water produced in the active workings not utilized in the mining process is pumped into a sealed and isolated portion of the mine which has no direct hydrologic communication with the surface (located in the southwest portion of HF-5).

Unplanned discharge after mining will be monitored for compliance with all applicable state and federal water quality regulations.

II. SURFACE WATERS

The surface drainage system on East Mountain is divided into two major drainages; the southwest portion forms part of the Cottonwood Creek drainage, and the northeast portion of East Mountain contributes to the Huntington Creek drainage (see Map HM-1). These drainage boundaries, including minor subdivisions to Cottonwood and Huntington creeks, are designated on Map HM-1. Both Huntington and Cottonwood creeks flow out of the Wasatch Plateau in a southeasterly direction. The creeks merge with Ferron Creek to form the San Rafael River, a tributary of the Green River.

A. HUNTINGTON CREEK DRAINAGE SYSTEM

1. HUNTINGTON CREEK

Huntington Creek is comprised of many smaller tributary streams that feed the main stream. Deer Creek and Meetinghouse Canyon creeks are the only tributaries to Huntington Creek that emanate from within UP&L's coal mine portal areas.

Huntington Creek flow data are recorded on a continuous basis by UP&L at two locations; one station is located near the Huntington Power Plant, the other below Electric Lake which is about twenty-two miles upstream from the Huntington Plant. Flow records are maintained by UP&L in order to determine water entitlements and reservoir storage allocation for the various users on the river.

The UP&L station near the plant was established in the fall of 1973. Prior flow records were obtained from the USGS station located about one mile downstream from UP&L's existing station. The USGS station was established in 1909 and was discontinued in 1970 after determination of available water supply for the Electric Lake Dam. The dam was completed in December 1973, and water storage commenced shortly afterward.

The calculated natural flow rates, which consider actual flow recorded at the plant, plant diversions, Electric Lake storage, and lake evaporation along with yearly comparisons, are reported annually in the Hydrologic Monitoring Report.

Huntington Creek water quality information is compiled on a monthly basis for stations above and below the Huntington Plant, while samples for Huntington Creek below Electric Lake and the Right Fork are taken quarterly. The location of water quality sampling stations on Huntington Creek that were considered for this report are listed below (refer to Map HM-1).

a. Below Electric Lake*

b. Above the Forks*

c. Below the Power Plant Diversion

d. Below the Power Plant

* Not listed on map due to scale

Specific water quality data as well as yearly comparisons are reported annually in the Hydrologic Monitoring Report. This practice will continue throughout the life of the permit.

In general, the water shows a gradual increase in concentration of dissolved minerals as the flow proceeds down Huntington Canyon.

The values at the station below Electric Lake do not express the actual natural drainage water quality characteristics because of the lake effect, but it appears that the surface flow in Huntington Canyon is of very high quality in the upper reaches with some natural degradation occurring as the flow proceeds to the canyon mouth.

2. DEER CREEK

Deer Creek is a tributary of Huntington Creek and flows from the same canyon in which the Deer Creek Mine is located. The permittee shall monitor the characteristics of Deer Creek according to the following flow and sampling schedule (see Hydrologic Monitoring Schedule included herein).

a. Locations:

   1). Above the Mine

   2). Below the Mine (see Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in March 1988. Field measurements, including pH, specific conductivity, and temperature will be performed monthly in conjunction with quantity measurements.

As stated above, flow information is collected monthly throughout the year with the use of three Parshall flumes (see Map HM-1). Hydrographs comparing yearly flows are reported in the Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality samples collected from Deer Creek at the sites above the Deer Creek Mine and below the Mine are summarized in Table HT-4. It is apparent from the table that the quality of the Deer Creek run-off degradates slightly from the upper to the lower sampling point. The quality of the lower sampling point is thought to be affected by the Mancos Shale which causes the increase in TDS.

3. MEETINGHOUSE CANYON CREEK

Meetinghouse Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule included herein).

a. Location: South Fork of Meetinghouse Canyon (see Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in March 1988. Field measurements, including pH, specific conductivity, and temperature, will be performed monthly in conjunction with quantity measurements. Data regarding flow in Meetinghouse Canyon Creek is presented in the annual Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1986; results of the samples collected are presented in Table HT-5 and in the Hydrologic Monitoring Report.

4. RILDA CANYON CREEK

Rilda Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule included herein).

a. Locations:

(1). Right Fork of Rilda - RCF1

(2). Rilda Canyon - RCF3

(3). Rilda Canyon - RCW4 (See Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM

4). RILDA CANYON CREEK

Rilda Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule included herein).

a). Locations:

(1). Right Fork of Rilda - RCF1

(2). Left Fork of Rilda - RCLF1 (Field data only)

(3). Left Fork of Rilda - RCLF2 (Field data only)

(4). Rilda Canyon - RCF2 (Field data only)

(5). Rilda Canyon - RCF3

(6). Rilda Canyon - RCW4 (see Map HM-1)

b). Flow information is collected during the first or second week of each month.

c). Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in June 1989. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, i.e., RCF3 and RCW4, monthly in conjunction with quantity measurements. Data regarding flow in Rilda Canyon Creek is presented in the annual Hydrologic Monitoring Report.

Guidelines for Surface Water Operational Quality. The program was initiated in June 1989. Field measurements , including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, i.e., RCF3 and RCW4, monthly in conjunction with quantity measurements. Data regarding flow in Rilda Canyon Creek is presented in the annual Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis will be for a two-year period, 1989-90. Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1989; results of the samples collected are presented in Table HT-6 and in the Hydrologic Monitoring Report.

B. COTTONWOOD CREEK DRAINAGE SYSTEM

The southern portion of East Mountain is intersected by Cottonwood Creek and its associated tributaries, including Cottonwood Canyon Creek and Grimes Wash. The Cottonwood Creek drainage is about equal in size to the Huntington drainage, with total discharge from each drainage about 70,000 acre feet per year. The major cultural feature on Cottonwood Creek is the Joe's Valley Reservoir, located about twelve miles west of the town of Orangeville. The 63,000 acre foot reservoir was constructed by the U.S. Bureau of

Reclamation and provides storage water for irrigation, industrial, and municipal needs in the Emery County area.

1. COTTONWOOD CANYON CREEK

An extensive baseline study conducted on Cottonwood Canyon Creek to determine water characteristics prior to mining at the proposed Cottonwood Mine began in 1979. A property acquisition in 1981 resulted in mine plan changes; therefore, the baseline study was terminated as of January 1, 1984. As agreed upon with DOGM, UP&L will continue to monitor the flow and water quality field measurements at the USGS flume location on a monthly basis.

2. GRIMES WASH

Grimes Wash is a tributary of Cottonwood Creek and flows in the same canyon in which the Wilberg/Cottonwood Mine is located. Three permanent runoff sampling sites were established in 1980 and are sampled as listed below (see Hydrologic Monitoring Schedule included herein).

a. Locations

   1.) Right Fork

   2.) Left Fork

   3.) Below the Mine (see Map HM-1)

b. Flow information is collected during the first or second week of each month.

c. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in March 1988. Field measurements, including pH, specific conductivity, and temperature, will be performed monthly in conjunction with quantity measurements.

As stated above, flow information is collected monthly throughout the year with the use of two Parshall flumes (see Map HM-1 for flume locations). Hydrographs comparing yearly flows are shown in the Hydrologic Monitoring Report.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality samples collected in Grimes Wash are shown in Table HT-7. Specific data is shown in the Hydrologic Monitoring Report.

Grimes Wash drainage quality is greatly affected by the influx of the Right Fork. The Right Fork originates in the North Horn Formation (interbedded shales, siltstones, and sandstones) which is abundant in calcareous material. As a result, the Right Fork contributes a relatively high amount of suspended solids to the Grimes Wash drainage, particularly during high runoff periods.

C. USES OF SURFACE WATERS

Nine springs have been developed in Huntington Canyon to provide for domestic, industrial, and commercial water needs. Currently Huntington City utilizes two springs in Huntington Canyon, Big Bear Canyon Springs and Little Bear Canyon Springs. The North Emery Water Users Association also utilizes springs in Huntington Canyon to provide for domestic and industrial water needs in areas outside of Huntington City. The Association is currently utilizing water from three springs in Rilda Canyon as well as from four other springs in the general area (see Map HM-1).

Some of the springs on East Mountain have been developed for watering livestock by installing troughs, and Elk Springs has limited use as a culinary water source for cabins in the area. A summary of the springs within the permit area, their location and any claims placed on the water they produce is made in Table HT-8.

D. ALTERNATIVE WATER SUPPLY INFORMATION

The mining completed in the Deer Creek Mine may alter or disrupt the flow of water on the surface of East Mountain. Currently these waters are put to limited use for livestock and wildlife or, in a few cases, for culinary water for cabins.

If the mining activities affect the surface waters, water from adjacent springs may be diverted to flow into the areas where other springs may have stopped flowing. Many springs which could be diverted are present in the area.

III. CLIMATOLOGICAL INFORMATION

A. PRECIPITATION

The climate of the permit area has been described by the U.S. Geological Survey, which states that it is semi-arid to subhumid and precipitation generally increases with altitude. The average annual precipitation ranges from about ten (10) inches in the lowest parts of the permit area (southeast) to more than twenty-five (25) inches in the highest parts (northwest). UP&L's weather station, located adjacent to the permit area, has provided data which shows that the summer precipitation in the form of thundershowers averages about the same as the winter precipitation in the form of snowfall. Because much of the summer precipitation runs off without infiltration, the winter precipitation has the greatest impact on groundwater.

Precipitation amounts have been and will continue to be recorded at the Hunter and Huntington power plants, at Electric Lake Dam, and on East Mountain. Precipitation data can be found in the annual Hydrologic Monitoring Report (see Table HT-9 for East Mountain data).

B. TEMPERATURES

Air temperatures vary considerably both diurnally and annually throughout the permit area. Midsummer daytime temperatures in lower areas commonly exceed 100 degrees Fahrenheit, and midwinter nighttime temperatures throughout the area commonly are well below zero degrees Fahrenheit.

The summer temperatures are accompanied by large evaporation rates. Although not recorded, there probably also is significant sublimation of the winter snowpack, particularly in the higher plateaus which are unprotected from dry winds common to the region. Temperature information is collected at the UP&L weather stations at each power plant, at Electric Lake, and on East Mountain. These data will continue to be included in the annual Hydrologic Monitoring Report (see Table HT-9 for East Mountain data).

IV. HYDROLOGIC MONITORING PLAN

Utah Power & Light Company has collected a great deal of data which has broadened our understanding of the hydrologic conditions of East Mountain. UP&L has made a commitment to collect the data needed to bring about a complete understanding of the hydrologic conditions of East Mountain, including an understanding of the effects mining has on the hydrology and the potential consequences of mining. The following is a schedule for our Hydrologic Monitoring Program which will be followed throughout the permit life.

PACIFICORP
ENERGY WEST
HYDROLOGIC MONITORING PROGRAM
DEER CREEK, WILBERG/COTTONWOOD, and DES-BEE-DOVE
TRAIL MOUNTAIN MINES

I. Monitoring Locations

A. Surface Water Hydrology (see Map HM-1 for East Mountain / Map 7-1 and 7-2 for Trail Mountain locations listed below)

1. Cottonwood Creek Drainage System

a. Cottonwood Canyon Creek

(1) SW-1 - Above Trail Mtn. Mine
(Approximately 5000 feet upstream from the inlet culvert for the disturbed area.) 2150 feet South, 2000 feet East of the Northwest corner of Section 24, Township 17 South, Range 6 East.

(2) SW-2 - Below Trail Mtn. Mine
(Approximately 200 feet downstream from the outlet culvert for the disturbed area.) 1300 feet South, 1750 feet West of the Northeast corner of Section 25, Township 17 South, Range 6 East.

(3) CCC01 - USGS Flume:
(Approximately 7800 feet downstream from the outlet culvert for the disturbed area.)1500 feet North, 200 feet East of the Southwest corner of Section 31, Township 17 South, Range 7 East.

(4) SW-3 - Below Trail Mtn. Mine
(Approximately 3800 feet above confluence with Straight Canyon) 2400 feet South, 2400 feet East of the Northeast corner of Section 6, Township 18 South, Range 6 East.

b. Unnamed Drainage off Straight Canyon

(1) T-19
(Approximately 200 feet upstream from the from confluence with Straight Canyon) 2500 feet South, 1100 feet East of the Northeast corner of Section 3, Township 18 South, Range 6 East

c. Grimes Wash

(1) GWR01 - Right Fork:
(Approximately 1500 feet upstream from the inlet culvert for the disturbed area.) 550 feet North, 1500 feet West of the Southwest corner of Section 22, Township 17 South, Range 7 East.

(2) GWR02 - Left Fork:
(Approximately 50 feet upstream from the inlet culvert for the disturbed area.) 200 feet South, 2350 feet East of the Northwest corner of Section 27, Township 17 South, Range 7 East.

(3) GWR03 - Below the mine:
(Approximately 500 feet downstream from the outlet culvert below the disturbed area.) 1770 feet South, 1820 feet West of the Northeast corner of Section 27, Township 17 South, Range 7 East.

2. Huntington Creek Drainage System

a. Huntington Creek

(1) HCC01 - Above Deer Creek Confluence:
1400 feet north, 2200 feet west of the southeast corner of Section 36, Township 16 South, Range 7 East.

(2) HCC02 - Below Deer Creek Confluence:
300 feet north, 300 feet west of the southwest corner of Section 31, Township 16 South, Range 8 East.

(3) HCC03 - Below Huntington Power Plant:
2500 feet north, 1500 feet east of the southeast corner of Section 6, Township 17 South, Range 8 East.

(4) HCC04 - @ Research Farm*
800 feet north, 200 feet east of the southwest corner of Section 5, Township 17 South, Range 8 East.

* Not listed on map due to scale.

b. Deer Creek

(1) DCR01 - Above the mine:
(Approximately 600 feet upstream from the mine facility.) 200 feet North, 800 feet West of the Southeast corner of Section 10, Township 17 South, Range 7 East.

(2) DCR04 - Near C1/C2 Belt Intersection:
(Approximately 5,000 feet downstream from the mine facility.) 300 feet North, 2000 feet East of the Southeast corner of Section 2, Township 17 South, Range 7 East.

(3) DCR06 - @ Huntington Creek Confluence:
(Approximately 15,000 feet downstream from the facility)
1400 feet north, 1100 feet east of the southeast corner of Section 36, Township 16 South, Range 7 East.

c. Meetinghouse Canyon - South Fork:
(Approximately 200 feet upstream from the north and south convergence.) 800 feet North, 1500 feet East of the Southwest corner of Section 35, Township 16 South, Range 7 East.

d. Rilda Canyon:

(1) RCF-1 - Rilda Canyon - Right Fork:
(Approximately 4000 feet upstream from the Right and Left fork convergence.) 400 feet South, 200 feet West of the Northeast corner of Section 30, Township 16 South, Range 7 East.

(2) RCLF1 - Rilda Canyon - Left Fork, below Rilda Canyon Portals: (Approximately 200 feet upstream from the Right and Left fork convergence.) 2400 feet North, 2100 feet West of the Southeast corner of Section 29, Township 16 South, Range 7 East.

(3) RCLF2 - Rilda Canyon - Left Fork, above Rilda Canyon Portals: (Approximately 1600 feet upstream from the Right and Left fork convergence.) 1600 feet North, 2300 feet West of the Southwest corner of Section 29, Township 16 South, Range 7 East.

(4) RCF2 - Rilda Canyon - Above NEWUA springs: 2500 feet South, 400 feet West of the Northeast corner of Section 29, Township 16 South, Range 7 East.

(5) RCF3 - Rilda Canyon - Below NEWUA springs: 2550 feet South, 1000 feet East of the Northeast corner of Section 28, Township 16 South, Range 7 East.

(6) RCW4 - Rilda Canyon: (Approximately 1000 feet upstream from the confluence with Huntington Creek.) 850 feet North, 1900 feet West of the Southeast corner of Section 26, Township 16 South, Range 7 East.

3. Reclamation Monitoring: Following stage 1 final reclamation backfilling and grading monitoring will be conducted at points immediately above and below the last sediment pond(s). Cottonwood Fan Portal: reclamation monitoring will occur at points above and below the two sediment basins (see Map 3-14).

B. Groundwater Hydrology

1. East Mountain Springs (see maps HM-4 and HM-5)

Burnt Tree *+
Elk Spring *+
Sheba Springs *+
Ted's Tub
79-2
79-10 *+
79-15
79-23 *+
79-24
79-26 *+
79-28 (Flag Lake)

79-29 *+
79-32
79-34
79-35 *+
79-38
79-40
80-41
80-43
80-44 *+
80-46 *+
80-47
80-48
82-51
82-52 *+
84-56 *+
89-60 (Alpine Spring)
89-61
89-65
89-66
89-67
89-68

* Recession Study Springs (Flow August & September)
\+ Baseline analysis performed in 1991 and will be repeated every five years.

2. Trail Mountain Springs (see Trail Mountain Spring Map 7-1)
T-6
T-8
T-9
T-10
T-14
T-14A
T-15
T-16

3. Piezometric Data
   a. Surface
      (1) Rilda Canyon (see Map HM-1 for locations)
          P1
          P5
          P6
          P7
          EM-47
      (2) Cottonwood Canyon Creek
          EM-31
          CCCW-1A

CCCW-1S
CCCW-2A
CCCW-3A
CCCW-3S U
CCCW-3S L
TM-1B
TM-3

b. Underground: In-Mine
   (1) Deer Creek Mine (Refer to Annual Hydrologic Reports for Locations : HM-2)

4. In-Mine Water Quality
   a. Deer Creek Mine (Refer to Annual Hydrologic Reports for Locations : HM-2)
   b. Wilberg/Cottonwood Mines (Refer to Annual Hydrologic Reports for Locations : HM-3)
   c. Trail Mountain Mine (Refer to Annual Hydrologic Reports for Locations : HM-6)
5. Waste Rock Wells (see Map HM-1 for locations)
   a. Deer Creek
   b. Cottonwood

II. Monitoring Schedule

A. Field Measurements collected during quality sampling: Listed below are the sites which will be monitored by PacifiCorp - Energy West in accordance with the guidelines established by DOGM; i.e.,

- Date and Time
- Flow
- pH
- Temperature
- Conductivity
- Dissolved oxygen (perennial streams only)

1. Cottonwood Canyon Creek
   a. (1) SW-1
      (2) SW-2
      (3) Cottonwood Canyon Creek - USGS Flume
      (4) SW-3
   b. Grimes Wash
      (1) GWR01
      (2) GWR02
      (3) GWR03
   c. Straight Canyon
      (1) T-18 (Oliphant Mine Discharge)
      (2) T-19 (Unnamed Side Drainage)
2. Huntington Canyon Drainage
   a. Deer Creek

INCORPORATED
EFFECTIVE:
NOV 07 1995
94E
UTAH DIVISION OIL, GAS AND MINING

(1) DCR01
(2) DCR04
(3) DCR06

b. Huntington Creek
(1) HCC01
(2) HCC02
(3) HCC04

c. Meetinghouse Canyon - South Fork

d. Rilda Canyon
(1) RCF1
(2) RCLF 1
(3) RCLF 2
(4) RCF2
(5) RCF3
(6) RCW4

3. East Mountain Springs (see monitoring location list)
4. Trail Mountain Springs (see monitoring location list)
5. In-Mine
   a. Deer Creek
   b. Wilberg/Cottonwood
   c. Trail Mountain
6. Waste Rock Wells
   a. Deer Creek
   b. Cottonwood

All sites will be monitored quarterly except for East/Trail Mountain Springs. East/Trail Mountain Springs will be field tested during the months of July and October. In addition, the East Mountain Recession Study Springs (denoted by asterisks in the Monitoring Location section) and Trail Mountain Springs will be field tested for flow from July through October. In-mine locations will be field tested quarterly for all field parameters except pH, conductivity, and dissolved oxygen. Flow in Huntington Creek is measured only at HCC01 by Utah Power & Light, and will be reported in the Annual Hydrologic Report.

INCORPORATED
EFFECTIVE:
NOV 07 1995
94E
UTAH DIVISION OIL, GAS AND MINING

B. Quality Sampling (Laboratory Measurements)

1. Surface Water Hydrology: Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Quality (see Table #1). Quarterly sampling was initiated during March 1988 and will continue throughout the year; i.e., June, September, and December. Baseline analysis was performed in 1991 and will be repeated every five years thereafter.

   a. Cottonwood Creek Drainage
      (1)Cottonwood Canyon Creek
         (a) SW-1
         (b) SW-2
         (c) SW-3
      (2)Grimes Wash
         (a)GWR01
         (b)GWR02
         (c)GWR03
      (3) Straight Canyon
         (a) T-18
         (b) T-19
   b. Huntington Creek Drainage
      (1) Deer Creek
         (a) DCR01
         (b) DCR04
         (c) DCR06
      (2) Huntington Creek
         (a) HCC01
         (b) HCC02
         (c) HCC04
      (3) Meetinghouse Canyon - South Fork: MCH01
      (4) Rilda Canyon
         (a) RCF1
         (b) RCF3
         (c) RCW4

2. Groundwater Hydrology
   a. East/Trail Mountain Springs: Water samples will be collected and analyzed during the months of July and October. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

b. In-Mine: Two water samples will be collected and analyzed per mine quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

c. Waste Rock Wells: One water sample will be collected and analyzed per location quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

III. Annual Reports

All data collected regarding the hydrology of East/Trail Mountain will be summarized by the applicant in an annual Hydrologic Monitoring Report. Copies of the report will be submitted to the OSM; U.S. Forest Service; and the Utah State Division of Oil, Gas and Mining. In addition, any raw data collected will be submitted to the Utah State Division of Oil, Gas and Mining on a quarterly basis.

PACIFICORP
ENERGY WEST MINING COMPANY
HYDROLOGIC MONITORING PROGRAM
DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE\TRAIL MOUNTAIN MINES

SURFACE HYDROLOGY - OPERATIONAL SAMPLING (Table 1)

Drainage System	Drainage	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cottonwood Creek Drainage System	*Cottonwood Canyon Creek*	SW1	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		SW2	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		CCC01	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		SW3	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Grimes Wash	GWR01	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		GWR02	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		GWR03	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Straight Canyon	T-19	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
Huntington Drainage System	*Deer Creek*	DCR01	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		DCR04	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		DCR06	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Huntington Creek	HCC01	Flow *	Flow *	Operational	Flow *	Flow *	Operational	Flow *	Flow *	Operational	Flow *	Flow *	Operational
		HCC02			Operational			Operational			Operational			Operational
		HCC04			Operational			Operational			Operational			Operational
	Meetinghouse Canyon	MCH01	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Rilda Canyon	RCF1	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		RCLF1	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCLF2	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCF2	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		RCF3	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		RCW4	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational

* Flow in Huntington Creek is measured @ HCC01 by Utah Power, and will be reported in the Annual Hydrologic Report

PACIFICORP
ENERGY WEST MINING COMPANY
HYDROLOGIC MONITORING PROGRAM
DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE\TRAIL MOUNTAIN MINES

GROUNDWATER HYDROLOGY - OPERATIONAL SAMPLING (Table 2)

Groundwater Type		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Springs	*East Mountain*							Operational	Flow *	Flow *	Operational		
	Trail Mountain							Operational	Flow	Flow	Operational		
In-Mine	*Cottonwood*			Operational			Operational			Operational			Operational
	Deer Creek			Operational			Operational			Operational			Operational
	Trail Mountain			Operational			Operational			Operational			Operational
Waste Rock Wells	*Cottonwood*			Operational			Operational			Operational			Operational
	Deer Creek			Operational			Operational			Operational			Operational

* Recession Springs

UPDES SAMPLING - (Table 1)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mine Water Discharge	*Cottonwood*	WMD01	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
		Miller	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	DCD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mountain	TMD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Sediment Pond Discharge	*Cottonwood*	3 Outfalls	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Des-Bee-Dove	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mtn	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational

PACIFICORP

ENERGY WEST MINING COMPANY

HYDROLOGIC MONITORING PROGRAM

DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE\TRAIL MOUNTAIN MINES

SURFACE HYDROLOGY - BASELINE SAMPLING (Table 1) - 1996

Drainage System	Drainage	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cottonwood Creek Drainage System	*Cottonwood Canyon Creek*	SW1	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		SW2	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		CCC01	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		SW3	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Grimes Wash	GWR01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		GWR02	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		GWR03	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Straight Canyon	T-19	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
Huntington Drainage System	*Deer Creek*	DCR01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		DCR04	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		DCR06	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Huntington Creek	HCC01	Flow *	Flow *	Baseline	Flow *	Flow *	Baseline	Flow *	Flow *	Baseline	Flow *	Flow *	Baseline
		HCC02			Baseline			Baseline			Baseline			Baseline
		HCC04			Baseline			Baseline			Baseline			Baseline
	Meetinghouse Canyon	MCH01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Rilda Canyon	RCF1	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		RCLF1	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCLF2	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCF2	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		RCF3	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		RCW4	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline

* Flow in Huntington Creek is measured @ HCC01 by Utah Power, and will be reported in the Annual Hydrologic Report

PACIFICORP

ENERGY WEST MINING COMPANY

HYDROLOGIC MONITORING PROGRAM

DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE\TRAIL MOUNTAIN MINES

GROUNDWATER HYDROLOGY - BASELINE SAMPLING (Table 2)

Groundwater Type

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Springs	*East Mountain*							Operational	Flow *	Flow *	Operational		
									* Recession Springs				
	Trail Mountain							Operational	Flow	Flow	Operational		
In-Mine	*Cottonwood*			Baseline			Baseline			Baseline			Baseline
	Deer Creek			Baseline			Baseline			Baseline			Baseline
	Trail Mountain			Baseline			Baseline			Baseline			Baseline
Waste Rock Wells	*Cottonwood*			Baseline			Baseline			Baseline			Baseline
	Deer Creek			Baseline			Baseline			Baseline			Baseline

UPDES SAMPLING - (Table 1)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mine Water Discharge	*Cottonwood*	WMD01	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
		Miller	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	DCD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mountain	TMD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Sediment Pond Discharge	*Cottonwood*	3 Outfalls	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Des-Bee-Dove	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mtn	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational

TABLE 1
SURFACE WATER (UPDES Monitoring) BASELINE, OPERATIONAL, POSTMINING
WATER QUALITY PARAMETER LIST

Field Measurements:

	*	-	Water Level or Flow
	*	-	pH
	*	-	Specific Conductivity (umhos/cm)
	*	-	Dissolved Oxygen (ppm) (Perennial Streams Only)
	*	-	Temperature

Laboratory Measurements: (mg/l)

#	*	-	Total Settleable Solids (UPDES Only)
#	*	-	Total Suspended Solids
	*	-	Total Dissolved Solids
	*	-	Total Hardness ($CaCO_3$)
		-	Acidity ($CaCO_3$)
		-	Aluminum (Al) - Total
		-	Arsenic (As) - Total
		-	Boron (B) - Total (Waste Rock Sites Only)
	*	-	Carbonate (CO_3^{-2})
	*	-	Bicarbonate (HCO_3^-)
		-	Cadmium (Cd) - Total
	*	-	Calcium (Ca) - Total
	*	-	Chloride (Cl^-)
		-	Copper (Cu) - Total
	*	-	Iron (Fe) - Total & Dissolved
		-	Lead (Pb) - Total
	*	-	Magnesium (Mg) - Total
	*	-	Manganese (Mn) - Total
		-	Molybdenum (Mo) - Total
		-	Nitrogen: Ammonia (NH_3) - reported as N
		-	Nitrite (NO_2) - reported as N
		-	Nitrate (NO_3^-) - reported as N
	*	-	Potassium (K) - Total
	*	-	Oil & Grease (UPDES & Above & Below Mine Sites Only)
		-	Ortho Phosphate (PO_4^{-3}) - reported as P
		-	Selenium (Se) - Total (Waste Rock Sites Only)
	*	-	Sodium (Na) - Total
	*	-	Sulfate (SO_4^{-2})
		-	Zinc (Zn) - Total
	*	-	Cation-Anion Balance

Construction
* Operational
- Baseline

TABLE 2
GROUND WATER BASELINE, OPERATIONAL, POSTMINING WATER QUALITY PARAMETER LIST

Field Measurements:

*	-	Water Level or Flow
*	-	pH
*	-	Specific Conductivity (umhos/cm)
*	-	Temperature

Laboratory Measurements: (mg/l)

*	-	Total Dissolved Solids
*	-	Total Hardness ($CaCO_3$)
	-	Acidity ($CaCO_3$)
	-	Aluminum (Al) - Total
	-	Arsenic (As) - Total
	-	Boron (B) - Total (Waste Rock Sites Only)
*	-	Carbonate (CO_3^{-2})
*	-	Bicarbonate (HCO_3^-)
	-	Cadmium (Cd) - Total
*	-	Calcium (Ca) - Total
*	-	Chloride (Cl^-)
	-	Copper (Cu) - Total
*	-	Iron (Fe) - Total & Dissolved
	-	Lead (Pb) - Total
*	-	Magnesium (Mg) - Total
*	-	Manganese (Mn) - Total
	-	Molybdenum (Mo) - Total
	-	Nitrogen: Ammonia (NH_3) - reported as N
	-	Nitrite (NO_2) - reported as N
	-	Nitrate (NO_3^-) - reported as N
*	-	Potassium (K) - Total
	-	Ortho Phosphate (PO_4^{-3}) reported as P
	-	Selenium (Se) - Total (Waste Rock Sites Only)
*	-	Sodium (Na) - Total
*	-	Sulfate (SO_4^{-2})
	-	Zinc (Zn) - Total
*	-	Cation-Anion Balance

* Operational
\- Baseline

WATER SAMPLE DOCUMENTATION

The following information will be included on the lab sheets:

1. Sample time and date
2. Individual taking sample
3. Field parameters (except in-mine)
    - Temperature
    - Flow
    - pH (units)
    - Conductivity (umhos/cm)
    - Dissolved Oxygen (PPM), depending on location
4. Precipitation date if applicable
5. Date and time each parameter is analyzed at the lab

ANALYTICAL METHOD AND DETECTION LIMIT

Parameter	MDL	UNITS	Method
Acidity	10	mg/l $CaCO_3$	SM2310-B(4a)
Alkalinity, Bicarbonate	5	mg/l HCO_3^-	EPA 310.1
Alkalinity, Carbonate	5	mg/l CO_3^{-2}	EPA 310.1
Alkalinity, Total	5	mg/l $CaCO_3$	EPA 310.1
Aluminum	1	mg/l	EPA 202.1
Anions	----	meq/l	-------------
Arsenic	.01	mg/l	EPA 206.2
Barium	.05	mg/l	EPA 208.1
Boron	.1	mg/l	EPA 212.3
Cadmium	.01	mg/l	EPA 213.1
Calcium	1	mg/l	EPA 215.1
Cations	----	meq/l	-------------
Chloride	1	mg/l	SM4500 C1-B
Chromium	0.1	mg/l	EPA 218.1
Conductivity	1	umhos/cm	EPA 120.1
Copper	0.1	mg/l	EPA 220.1
Fluoride	0.1	mg/l	SM4500 F-C
Hardness, Total	10	mg/l $CaCO_3$	-------------
Iron	0.1	mg/l	EPA 236.1
Iron, Dissolved	0.1	mg/l	EPA 236.1
Lead	0.1	mg/l	EPA 239.1
Magnesium	1	mg/l	EPA 242.1
Manganese	0.1	mg/l	EPA 243.1
Mercury	.001	mg/l	EPA 245.1
Nickel	0.1	mg/l	EPA 249.1
Nitrogen, Ammonia	0.5	mg/l	EPA 350.3
Nitrogen, Nitrate	0.1	mg/l	EPA 353.3
Nitrogen, Nitrite	0.01	mg/l	EPA 354.1
Oil & Grease	5	mg/l	EPA 413.1
Oxygen, Dissolved	0.1	mg/l	EPA 360.1
pH	----	Units	EPA 150.1
Phosphorus, Total	.05	mg/l	SM4500 P-B,E
Potassium	1	mg/l	EPA 258.1
Selenium	.01	mg/l	EPA 270.3
Sodium	1	mg/l	EPA 273.1
Solids, Settleable	.5	ml/l	EPA 160.5
Solids, Total Dissolved	10	mg/l	EPA 160.1
Solids, Total Suspended	10	mg/l	EPA 160.2
Sulfate	1	mg/l	EPA 375.4
Sulfide	1	mg/l	EPA 376.1
Turbidity	.1	NTU	EPA 180.1
Zinc	.01	mg/l	EPA 289.1

INCORPORATED
EFFECTIVE:
NOV 07 1995
UTAH DIVISION OIL, GAS AND MINING

TABLE 1

SURFACE WATER BASELINE, OPERATIONAL, AND POSTMINING WATER QUALITY PARAMETER LIST

FIELD MEASUREMENTS:

*	-	Water Levels or Flow
*	-	pH
*	-	Specific Conductivity (umhos/cm)
*	-	Temperature (degrees Centigrade)
*	-	Dissolved Oxygen (ppm) [perennial streams only]

LABORATORY MEASUREMENTS: (mg/l) [Major, minor ions and trace elements are to be analyzed in total and dissolved forms.]

	*	-	Total Dissolved Solids
#	*	-	Total Settleable Solids
#	*	-	Total Suspended Solids
	*	-	Total Hardness (as $CaCO_3$)
	*		Acidity ($CaCO_3$)
	*	-	Alkalinity - Total
		-	Aluminum (Al)
		-	Arsenic (As)
		-	Barium (Ba)
		-	Boron (B)
	*	-	Carbonate (CO_3^{-2})
	*	-	Bicarbonate (HCO_3^-)
		-	Cadmium (Cd)
	*	-	Calcium (Ca)
	*	-	Chloride (Cl^-)
		-	Chromium (Cr)
	*	-	Conductivity
		-	Copper (Cu)
	*	-	Dissolved Oxygen
		-	Fluoride (F^-)
	*	-	Iron (Fe) - Total and Dissolved
		-	Lead (Pb)
	*	-	Magnesium (Mg)
	*	-	Total Manganese (Mn)
		-	Mercury (Hg)
		-	Molybdenum (Mo)
		-	Nickel (Ni)
		-	Nitrogen: Ammonia (HN_3)
		-	Nitrate (NO_2)
		-	Nitrite (NO_3)
	*	-	Oil and Grease
	*	-	pH
	*	-	Potassium (K)
		-	Phosphate (PO_4^{-3})
		-	Selenium (Se)
	*	-	Sodium (Na)
	*	-	Sulfate (SO_4^{-2})
		-	Sulfide (S^-)
		-	Zinc (Zn)
	*	-	Cation-Anion Balance

Sampling Period:

- Baseline
* Operational, Postmining
# Construction

<u>Sampling Locations</u>:

Deer Creek	1)	Above Mine
	2)	Below Mine
Grimes Wash	1)	Right Fork
	2)	Left Fork
	3)	Below Mine
Meetinghouse Canyon -		Left Fork
Rilda Canyon	1)	RCF1
	2)	RCF3
	3)	RCW4

TABLE 2

GROUNDWATER BASELINE, OPERATIONAL, AND POSTMINING WATER QUALITY PARAMETER LIST

FIELD MEASUREMENTS:

	*	-	Water Levels or Flow
	*	-	pH
	*	-	Specific Conductivity (umhos/cm)
	*	-	Temperature (degrees Centigrade)

LABORATORY MEASUREMENTS: (mg/l) [Major, minor ions and trace elements are to be analyzed in dissolved form only.)

	*	-	Total Dissolved Solids
	*	-	Total Suspended Solids
+	*	-	Total Hardness (as $CaCO_3$)
	*	-	Alkalinity - Total
		-	Aluminum (Al)
		-	Arsenic (As)
		-	Barium (Ba)
		-	Boron (B)
+	*	-	Carbonate (CO_3^{-2})
	*	-	Bicarbonate (HCO_3)
		-	Cadmium (Cd)
	*	-	Calcium (Ca)
	*	-	Chloride (Cl^-)
		-	Chromium (Cr)
	*	-	Conductivity
		-	Copper (Cu)
	*	-	Dissolved Oxygen
		-	Fluoride (F^-)
	*	-	Iron (Fe)
		-	Lead (Pb)
	*	-	Magnesium (Mg)
+	*	-	Manganese (Mn)
		-	Mercury (Hg)
		-	Molybdenum (Mo)
		-	Nickel (Ni)
		-	Nitrogen: Ammonia (NH_3)
		-	Nitrate (NO_2)
		-	Nitrite (NO_3)
	*	-	pH
	*	-	Potassium (K)
		-	Phosphate (PO_4^{-3})
		-	Selenium (Se)
	*	-	Sodium (Na)
	*	-	Sulfate (SO_4^{-2})
		-	Sulfide (S^-)
		-	Zinc (Zn)
	*	-	Cation/Anion Balance

Sampling Period:

- Baseline
* Operational, Postmining
+ Modified Operational

Sampling Locations:

In-Mine
  Deer Creek
  Wilberg/Cottonwood
East Mountain Springs
Waste Rock Wells
  Deer Creek
  Wilberg/Cottonwood

TABLE 3

MINE DISCHARGE AND SEDIMENT POND

FIELD MEASUREMENTS:

*	x	-	Water Levels or Flow
*	x	-	pH
*	x	-	Specific Conductivity (umhos/cm)
*	x	-	Temperature

LABORATORY MEASUREMENTS: (mg/l) [Major, minor ions and trace elements are to be analyzed in dissolved form only.)

*	x	-	Total Dissolved Solids
*		-	Total Settleable Solids
*	x	-	Total Suspended Solids
*	x	-	Total Hardness (as $CaCO_3$)
*	x	-	Acidity ($CaCO_3$)
*	x	-	Alkalinity - Total
		-	Aluminum (Al)
		-	Arsenic (As)
		-	Barium (Ba)
		-	Boron (B)
*	x	-	Carbonate (CO_3^{-2})
*	x	-	Bicarbonate (HCO_3^-)
		-	Cadmium (Cd)
*	x	-	Calcium (Ca)
*	x	-	Chloride (Cl^-)
		-	Chromium (Cr)
*	x	-	Conductivity
		-	Copper (Cu)
*	x	-	Dissolved Oxygen
		-	Fluoride (F^-)
*	x	-	Iron (Fe) - Total and Dissolved
		-	Lead (Pb)
*	x	-	Magnesium (Mg)
*	x	-	Total Manganese (Mn)
		-	Mercury (Hg)
		-	Molybdenum (Mo)
		-	Nickel (Ni)
		-	Nitrogen: Ammonia (NH_3)
		-	Nitrate (NO_2)
		-	Nitrite (NO_3)
*	x	-	Oil and Grease
*	x	-	pH
*	x	-	Potassium (K)
		-	Phosphate (PO_4^{-3})
		-	Selenium (Se)
*	x	-	Sodium (Na)
*	x	-	Sulfate (SO_4^{-2})
		-	Sulfide (S^-)
		-	Zinc (Zn)
*	x	-	Cation/Anion Balance

Sampling Period:

- \- Baseline
- * Sediment Pond Discharge
- x Mine Discharge

Sampling Locations:

Mine Discharge
  Deer Creek
  Wilberg/Cottonwood
    1) Grimes Wash
    2) Miller Canyon
Sediment Ponds
  Deer Creek
  Des-Bee-Dove
  Wilberg/Cottonwood

YEAR -- 1989-1990

		LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SURFACE HYDROLOGY	COTTONWOOD CREEK DRAINAGE SYSTEM	COTTONWOOD CANYON CREEK	field	field	field	field	field	field	field	field	field	field	field	field
		GRIMES WASH	TABLE 1											
		RIGHT FORK	field	field	operational	field	field	operational	field	field	operational	field	field	operational
		LEFT FORK	field	field	operational	field	field	operational	field	field	operational	field	field	operational
		BELOW MINE	field	field	operational	field	field	operational	field	field	operational	field	field	operational
	HUNTINGTON CREEK DRAINAGE SYSTEM	DEER CREEK	TABLE 1											
		ABOVE MINE	field	field	operational	field	field	operational	field	field	operational	field	field	operational
		@ PERMIT	field	field	field	field	field	field	field	field	field	field	field	field
		BELOW MINE	field	field	operational	field	field	operational	field	field	operational	field	field	operational
		MEETINGHOUSE	TABLE 1											
		CANYON	field	field	operational	field	field	operational	field	field	operational	field	field	operational
		RILDA CANYON	TABLE 1											
		FLUME 1 RCF1	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		FLUME 2 RCF2	field	field	field	field	field	field	field	field	field	field	field	field
		FLUME 3 RCF3	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		WEIR 4 RCW4	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		RCL1	field	field	field	field	field	field	field	field	field	field	field	field
GROUNDWATER HYDROLOGY		EAST MOUNTAIN SPRINGS							operational *			operational *		
		RECESSION STUDY SPRINGS								modified operational	modified operational			
		IN-MINE												
		DEER CREEK			operational			operational			operational			operational
		WILBERG/ COTTONWOOD			operational			operational			operational			operational

* includes recession study springs

YEAR -- 1991
(Baseline monitoring preceding repermitting)

		LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SURFACE HYDROLOGY	COTTONWOOD CREEK DRAINAGE SYSTEM	COTTONWOOD CANYON CREEK	field	field	field	field	field	field	field	field	field	field	field	field
		GRIMES WASH												
		RIGHT FORK	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		LEFT FORK	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		BELOW MINE	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
	HUNTINGTON CREEK DRAINAGE SYSTEM	DEER CREEK												
		ABOVE MINE	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		@ PERMIT	field	field	field	field	field	field	field	field	field	field	field	field
		BELOW MINE	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		MEETINGHOUSE CANYON	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		RILDA CANYON	TABLE 1											
		FLUME 1 RCF1	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		FLUME 2 RCF2	field	field	field	field	field	field	field	field	field	field	field	field
		FLUME 3 RCF3	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		WEIR 4 RCW4	field	field	operational	field	field	baseline	field	field	operational	field	field	baseline
		RCL1	field	field	field	field	field	field	field	field	field	field	field	field
GROUNDWATER HYDROLOGY		EAST MOUNTAIN SPRINGS							operational *			operational *		
		RECESSION STUDY SPRINGS								modified operational	modified operational			
		IN-MINE												
		DEER CREEK			operational			baseline			operational			operational
		WILBERG/ COTTONWOOD			operational			baseline			operational			operational

YEAR -- 1989-1990

LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINE DISCHARGE												
TABLE 3 DEER CREEK	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
TABLE 3 - WILBERG/COTTONWOOD												
Grimes Wash	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
Miller Canyon	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
SEDIMENT PONDS												
TABLE 3 DEER CREEK	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
TABLE 3 - DES-BEE-DOVE		Sampled on an as-needed basis										
TABLE 3 - WILBERG/COTTONWOOD												
Wilberg Mine	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
Cottonwood Canyon		Sampled on an as-needed basis										
WASTE ROCK WELLS												
TABLE 3 - DEER CREEK												
DCWR 1			baseline			operational			baseline			operational
TABLE 3 - WILBERG/COTTONWOOD												
WCWR 1			baseline			operational			baseline			operational

YEAR -- 1991

LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINE DISCHARGE												
TABLE 3 DEER CREEK	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
TABLE 3 - WILBERG/COTTONWOOD												
Grimes Wash	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
Miller Canyon	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
SEDIMENT PONDS												
TABLE 3 DEER CREEK	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
TABLE 3 - DES-BEE-DOVE	Sampled on an as-needed basis											
TABLE 3 - WILBERG/COTTONWOOD												
Wilberg Mine	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational	operational
Cottonwood Canyon	Sampled on an as-needed basis											
WASTE ROCK WELLS												
TABLE 3 - DEER CREEK												
DCWR 1			baseline			operational			baseline			operational
TABLE 3 - WILBERG/COTTONWOOD												
WCWR 1			baseline			operational			baseline			operational

EAST MOUNTAIN PERMIT AREA

PROBABLE HYDROLOGIC CONSEQUENCES

DESCRIPTION OF THE MINING OPERATION:

The Utah Power & Light Co. mine permit areas are located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah. Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. Much data has been collected regarding the geology and the hydrology of the East Mountain property. In all, over 120 drill holes have been completed from the surface, over 500 from within the mines; and a comprehensive hydrologic data collection program is ongoing, all of which have provided data used in this PHC. The most applicable data have been included in this document. For a review of additional data it is suggested that the reader refer to the annual Hydrologic Monitoring Report.

Two mineable coal seams exist and will be mined using underground longwall methods. The longwall panels will be oriented with their length in either an east-west or northeast-southwest direction. The chemical and physical properties of the overburden have been identified and described in the permit but, because this is an underground operation, will have little effect on the hydrologic consequences.

DESCRIPTION OF THE SURFACE WATER SYSTEM:

The surface drainage system on East Mountain is divided into two major drainages; the southwest portion forms part of the Cottonwood Creek drainage, and the northeast portion contributes to the

Huntington Creek drainage. The Huntington Creek drainage covers seventy-three percent (73%) of the East Mountain leases held by UP&L. Both of these perennial streams are located adjacent to but not within the permit boundaries. UP&L has observed that all of the streams emanating from within the permit boundary with the exception of Rilda Canyon Creek cease flowing in the fall or winter, suggesting that they are not perennial but ephemeral. Rilda Canyon Creek is perennial below the springs located along the western border of Section 28, Township 16 South, Range 7 East, as it flows year round there. Most of the streams are spring fed. UP&L has monitored all of the surface waters since 1979 and will continue to monitor them in the future. The data collected is included in each annual Hydrologic Monitoring Report.

The locations of the major springs and ponds on East Mountain are shown on the attached spring map. The springs have been monitored for several years, providing the baseline data, and operational data is currently being collected. The data is included in the Hydrologic Monitoring reports. The water is used for power generation, irrigation in Castle Valley, livestock, and wildlife. The quantity and quality of surface waters measured are shown in Tables HT-4 through HT-7 and Figures HF-6 through HF-13.

DESCRIPTION OF THE GROUNDWATER SYSTEM:

Seven wells are located within the vicinity of the East Mountain (see Map HM-1). All were constructed for potentiometric surface studies, and none of the wells flow at the surface or are pumped for domestic water supplies.

The majority of all natural groundwater discharge points located on the East Mountain property are in the form of seeps and springs.

UP&L has mapped approximately seventy-five (75) springs ranging in discharge from less than one GPM to as high as 450 GPM (see Map HM-5).

UP&L has collected an extensive database of information pertaining to the groundwater quality and quantities of the East Mountain region and adjacent areas. Included in the database is long-term quality and flow information both for springs and for groundwater intercepted by mining.

The USGS has conducted extensive studies to determine the regional groundwater system for the central Wasatch Plateau Coal Field. The studies indicate a regional aquifer exists in the coal-bearing sequence of the Blackhawk and the underlying Starpoint Sandstone formations. The studies have also concluded that several isolated or perched aquifers existed above the Blackhawk-Starpoint aquifer. UP&L agrees with conclusions of the USGS studies concerning the perched aquifers above the coal-bearing sequence of the Blackhawk Formation but has some reservations about the significance of the Blackhawk-Starpoint aquifer which will be discussed below. The majority of the groundwater is discharged from the perched aquifers which occur along the base of the North Horn Formation in the form of seeps and springs (see Map HM-5 and Table HT-1). Several other perched aquifers exist mainly along the formational contacts with the North Horn Formation, including the upper contact with the Flagstaff Limestone and the lower contact with the Price River Formation.

The majority of the groundwater recharge on East Mountain comes from the winter snowpack which melts and infiltrates into the surface of East Mountain. The water flows down vertical fractures which intersect sandstone channel systems in the North Horn and Blackhawk formations.

The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the Price River Formation and Castlegate sandstones; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. The remaining water then flows downdip (to the southeast) from the northern reaches of East Mountain until it intersects the northeast trending Roans Canyon Fault Graben. In-mine long-hole drilling completed to test the hydrology of this fault system has shown that the system acts as an imperfect aquiclude to further southeast migration of water. Figure HF-14 shows the hydrologic gradient measured by the drill holes completed across the fault system. The system acts as an aquiclude because swelling clays along the fault prohibit most of the water from penetrating across the fault. Most of the recharge south of the Roans Canyon Fault System comes from the snow melt directly above. The same mode of water migration occurs there as to the north; but, when the water intersects the sandstone channels, it migrates toward canyons which surround and disect the permit area.

Several vertical drill holes completed in the Deer Creek Mine were developed into water monitoring holes to test the piezometric gradient of the Starpoint-Blackhawk aquifer. Data collected from the holes was included in the annual Hydrologic Monitoring Report and identifies the hydrologic gradient.

CLIMATIC CONDITIONS:

The climate of the permit area has been described by the U. S. Geological Survey, which states that it is semiarid to subhumid, and precipitation generally increases with altitude. As shown on Figure

HF-15, average annual precipitation ranges from about ten (10) inches in the lowest parts of the permit area (southeast) to more than twenty-five (25) inches in the highest parts (northwest). UP&L's weather station, located adjacent to the permit area, has provided data which shows that the summer precipitation, in the form of thundershowers, averages about the same as the winter precipitation, in the form of snowfall. The winter precipitation has the greatest impact on groundwater, however, because much of the summer precipitation runs off without infiltration. The data collected at UP&L's East Mountain weather station is included in the annual Hydrologic Monitoring reports.

Throughout the permit area air temperatures vary considerably both diurnally and annually. Midsummer daytime temperatures in lower areas commonly exceed 100°F and midwinter nighttime temperatures throughout the area commonly are well below 0°F. The summer temperatures are accompanied by large evaporation rates. Although not recorded, there probably also is significant sublimation of the winter snowpack, particularly in the higher plateaus which are unprotected from dry winds common in the region. The volume of water flowing into the major streams within and adjacent to the permit area has been characterized by monitoring. Discharge recession curves for these streams are included herein as Figures HF-6 through HF-13.

GEOMORPHIC DESCRIPTION OF THE MINE PLAN AND ADJACENT AREA:

Sediment load concentrations in the area of the permit vary dramatically depending on the percentage of disturbed areas, ruggedness of the terrain, geologic formations present, the amount of precipitation the areas receive, and stream flow volume. In work conducted after the Deer Creek Mine began production, the USGS identified the sediment yield in Deer Creek Canyon to be 3.1 tons/day. Huntington Creek was measured at 1.8 to 66 tons/day. Other creeks adjacent to the permit area were tested and found to have similar sediment loads.

UP&L has collected samples on a quarterly basis from the streams within and adjacent to the permit area. Samples taken at periods of both high and low flow have been tested for total suspended solids (TSS) to identify stream stability and are reported annually in the Hydrologic Monitoring Report. Tables HT-4 through HT-7 show the TSS values reported in the 1988 monitoring report.

Several conditions present within the permit area contribute to the sediment yield of the streams or stream instability. Several of the canyons in the area are very steep with very limited vegetative cover. During periods of high precipitation the amount of sediment introduced into the streams from these areas is significant. Samples taken in Deer Creek Canyon above the disturbed area during high run-off demonstrate how much sediment can be introduced from the undisturbed areas. The areas of the Deer Creek Mine Portal and access road are also prone to producing sediment yield in the stream; however, the flow of these surface waters through a sediment pond prior to discharge effectively removes settleable solids from the water.

OVERBURDEN:

UP&L has collected data which identified the nature and chemical composition of the overburden. Because the mine is an underground mine, the overburden chemical composition will affect the hydrologic consequences only at the portal site. The nature and chemical composition of the material is shown in the PAP in section 2-65 and will not be presented here.

When the disturbed areas are reclaimed as proposed in the PAP, it is not anticipated that the chemical composition of the material removed at the portal site and then moved back into place will impact the surface hydrology.

SURFACE WATER:

UP&L has conducted baseline monitoring of surface waters within and adjacent to the permit area. Additional sampling sites will be included in the future prior to disturbance in that area which may potentially impact the surface hydrology. Water samples are and will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the "DOGM Guidelines for Surface Water Quality." All of the long-term monitoring sites have been equipped with Parshall style flumes to facilitate monitoring. Water quality data collected from the surface water systems is shown in Tables HT-4 through HT-7.

GROUNDWATER:

UP&L has conducted baseline and operational monitoring of springs and in-mine water sources in and adjacent to the permit area. The springs located within or immediately adjacent to areas overlying coal to be mined in the next five (5) years or areas overlying previously mined areas will be monitored (except that the discharge recession curve springs will be monitored in the future regardless of their position relative to mining). The data collected has provided information useful in the understanding of potential hydrologic consequences of mining. The quality discharge data collected is shown in Table HT-2.

The water intersected in the mine is monitored to facilitate understanding of the groundwater hydrology of the area. UP&L has installed measuring devices on water lines which transport water from long-term water producing areas. Both quality and quantity data have been and will continue to be collected from these locations. Additional long-term water monitoring sites will be added when the conditions of the water intersected meet the criteria for long-term water monitoring sites. The data has identified the amount of water captured by the mine workings. It does not identify how the discharge will change in the future during mining and in the post-mining period. In order to better understand these issues UP&L will continue to monitor, where possible, the discharge in previously mined areas to establish the discharge recession from a given area, making it possible to more accurately project mine discharge volumes into future mining and post-mining periods.

No domestic water wells are located within the permit area; however, North Emery Water Users' Association (NEWUA) has developed springs (see Map HM-5) in Rilda Canyon into a water supply for its culinary water system. Because of NEWUA's use, UP&L places high emphasis on studying the springs to identify from where the water source is derived and what effects, if any, mining will place on the springs.

In early 1989 UP&L outlined a fourfold approach to investigating the hydrologic occurrence of the springs. The plan was approved by the NEWUA board and included 1) the installation of Parshall flumes on Rilda Canyon Creek above and below the springs [completed in May, 1989]; 2) the completion of a resistivity geophysical survey to determine alluvial depth and locate fracture systems [data collected in September, 1989 - interpretation in progress]; 3) installation of flow meters on the NEWUA water collection system; and 4) conducting a pump test using well P-2 as a pump well to determine hydrologic gradient, transmissivity, and other pertinent information. Because of the unusually dry conditions present in the summer and fall of 1989, the water output of the springs was barely meeting NEWUA demands, and its board felt that at that time we could not interfere with its collection system in order to install meters or conduct a drawdown test. As a result steps 3 and 4 listed above were postponed until 1990, assuming drought conditions diminish. UP&L commits to conduct the pump and recovery test of the well located in the area to collect additional information. The test will be accomplished at the earliest date which meets NEWUA approval. It is anticipated that the data collected will broaden our understanding of the source conditions of the springs and how mining can be accomplished with minimal or no effect on the springs.

Even without data from the proposed pump test UP&L has collected data which indicate the nature of the source of the springs. Rilda Canyon Creek receives most of its water at its upper reaches from springs that emanate in the North Horn Formation (located outside of the permit area). It is known that the creek loses water to the groundwater system along its entire length above the location of the Rilda Canyon Springs. At and below the springs the creek receives water from the alluvium. At that point the alluvium is known to be about seventy-five (75) feet thick as interpreted from the resistivity survey conducted in 1989. Data collected in 1989 indicate that the springs contribute about 40 GPM flow to the creek. The source of water is believed to be through migration of groundwater down the canyon in the alluvial gravel present. The quantity of groundwater moving through the alluvium is interrupted, possibly by a north-south trending fracture that is present at the spring's location, forcing the water to the surface. The resistivity survey conducted in 1989 offers additional confirmation of the presence of the fracture located up Side Canyon (previously identified by West Appa Coal Co. in its VLF work). A study performed on the system by Von Hansen and Associates for West Appa indicates that the waters migrate in a north-south direction along the fracture and then to the surface forming the springs.

Mining of coal within the permit area should not affect the ultimate water source for the Rilda Canyon springs. Where mining occurs under the alluvium in the North Fork of Rilda Canyon subsidence could occur without loss of water as long as the majority of the strata overlying the coal seam is mudstone or siltstone. Based on our previous mining experience on the property, fractures in the mudstone which overlie the coal seam would be sealed by swelling clays. If the majority of the strata were sandstone, it is possible that water could migrate down fractures in the sandstone and into the mine workings, thereby diminishing the amount of water reaching the springs. Because of the lenticular nature of the sandstone and mudstones in the immediate overburden which result in frequent and rapid facies change, a complete evaluation of the lithologies present can only be made upon development mining by drilling up-holes from the mine workings. UP&L commits to identifying in detail the nature of the strata beneath the Rilda Canyon alluvial system prior to second mining so that a detailed appraisal of hydrologic consequences can be made.

Seven (7) water monitoring wells (including the Rilda Canyon wells) which are located around the perimeter of the permit area have been monitored for several years for the piezometric water level. The data has been included in our interpretations of the possible hydrologic consequences of mining. The data regarding the quality of water intersected in the mine is summarized in Table HT-3.

SOIL LOSS AND SEDIMENT YIELD:

As described above (soil loss and sediment yield) several areas outside of the disturbed area of the mine portals are susceptible to erosion and were identified by water quality samples taken at both high and low flows in the streams within and adjacent to the permit area. The susceptibility to erosion is a condition typical of the Wasatch Plateau and the arid western states.

The locations of all of the streams within and adjacent to the permit area are shown on the Hydrologic Data Map (see Map HM-1). The sediment load in samples collected is summarized in the annual Hydrologic Monitoring Report. Riparian zones are usually adjacent to the streams and springs which emanate from the permit area. The Riparian zones are located adjacent to the springs and streams shown on the Spring Map (see Map HM-5).

No alluvial valley floors are present within or immediately adjacent to the permit area.

The soil types within the permit area have been identified by the U. S. Department of Agriculture (Soil Survey Carbon-Emery Area, Utah 1970). The study was used in conjunction with in-house studies to understand the soils present in the permit area. The data has been presented in section 2-131 of the PAP.

The stability of the reclaimed soil slopes is always a concern in a disturbed area. Soil studies have identified the type of material available for reclamation, and reclamation procedures and methods of sediment control have been geared around the available soil data.

The suspended solid content of surface water samples taken at medium and high flow have been presented in the Surface Water section of this document.

The field measurements of the channel gradients, bank materials, and channel cross-sections have been presented in the PAP.

PREDICTION OF MINING IMPACTS (SURFACE WATER):

Data collected by UP&L indicates mining has had only minor impact on surface water quality and quantity. During periods of high runoff changes in quality are insignificant; however, in low flow conditions some degradation is likely due to the fact that the mine discharge waters are higher in total dissolved solids (TDS) than the surface waters. It is difficult to assess the degradation because it is not known from where or how much of the water discharged from the mine would naturally have been discharged into the receiving stream by springs and seeps. The water discharged from the Deer Creek Mine will not affect the quality of Deer Creek throughout the life of the mine due to the fact that the water is transferred directly to the power plant through a pipeline. Post-mining conditions will likely cause water to be discharged from portals in Deer Creek Canyon, Grimes Wash, North Fork of Meetinghouse Canyon, Miller Canyon, and Rilda Canyon. The quantity of discharge will be discussed in the Groundwater section of this document. The cumulative effect of discharge waters on post mine use is thought to be insignificant because the volume of water to be discharged is negligible in comparison to the volume which flows in Cottonwood and Huntington creeks.

The most significant impact of the discharge on the receiving stream quality will take place when the stream is at its lowest flow (about 15-30 CFS), at which time the total discharge into either Cottonwood or Huntington Creek will be small in proportion to the volume of water flowing in the creeks. The TDS levels of either Huntington or Cottonwood Creek are about 300 to 350 mg/l, while the discharge water TDS levels are 500 to 1000 mg/l. Even with the differential in quality, the effect the discharge waters will have on the stream water quality will be minimal due to the difference in flow volume.

PREDICTION OF MINING IMPACTS (GROUNDWATER):

The water discharge rates from the mines are variable and dependent on several factors. One of the most significant is that when the mine enters virgin country a significant amount of water is liberated. In virtually all cases the amount of water which flows into the mine exceeds the recharge and, in time, the water inflow decreases in volume. If new areas are not mined, the discharge from the mine will decrease accordingly.

Water discharged from the Deer Creek Mine is currently transported directly to the Huntington Power Plant by way of an underground pipeline. The volume of water discharged from the mine has increased at a significant rate over the past several years. The increased discharge is due to at least five factors. First, in previous years water discharged was measured with a Stevens Recorder installed in a Parshall Flume. Calibration of the recorder was difficult to maintain, and in 1985 in-line flow meters (totalizer and instantaneous flow) were installed, allowing for a more accurate measurement of discharge. Second, mining has progressed into areas largely dominated by sandstone roof. The inflow from these areas is greater per acre of exposed area than areas of mudstone top. Third, mining has progressed into the bottom of the Straight Canyon Syncline, the lowest part of the mine, where a significant amount of water has been intersected. Fourth, mining has intersected the Roans Canyon Fault, releasing additional water into the mine workings. Last, prior to 1985 water used in mining was pumped directly from the in-mine sumps. Since 1985 all water is pumped from the mine through the metering system. Mining water is then pumped back into the mine through a high-pressure steel line to the mining faces where it is utilized.

Since January 1985 water discharges from the Cottonwood Mine have been limited to a minor amount, less than 15 GPM, from the Miller Canyon Breakout. Water discharged from that point comes from sealed portions of the Wilberg Mine and a limited amount intersected in the active Cottonwood Mine workings which is transmitted by pipeline to the sealed workings.

The monitoring of in-mine water sources has shown that the long-term water flow from a given area is much less than ten percent (10%) of the initial flow from the area. Most of the current inflow into the mine workings is from areas where the water storage has not been depleted. After the storage has been depleted, the flow will reduce to roughly equal the recharge rate which is expected to be less than ten percent (10%) (historical data) of the current discharge rate. The current discharge rate from all UP&L mines combined is approximately 1400 to 1600 GPM; therefore, the post-mining discharge rate is expected to be approximately 140 to 160 GPM. For verification purposes UP&L will, where possible, monitor select areas of the mine to formulate discharge recession curves over time, enabling a better understanding of the ratio of initial discharge rates and long-term post mining discharge values. There is no reason to assume that the post-mining discharge water quality will differ from that currently being discharged (see Groundwater Monitoring section).

Because the permit area is divided between the Huntington Creek Drainage Basin and the Cottonwood Creek Drainage Basin, 73% and 27% respectively, the amount of interbasin water transfer that occurs must be considered. The average annual flows of Huntington and Cottonwood creeks are 96.3 and 97.6 CFS, respectively. The current discharge rate from UP&L's total permit areas ranges from 1400 to 1600 GPM, less than 3.5% of either of the creeks' average flows. Because a limited portion of the Deer Creek mine workings (less than 27%) intersects water that would normally migrate toward the Cottonwood Basin but is discharged out Deer Creek Canyon, the interbasin water transfer from the Cottonwood drainage to Huntington Creek will probably never exceed 0.8% of the average annual discharge of either system.

Water intersected by the Cottonwood/Wilberg Mine workings currently comes from areas underlying the Cottonwood Creek drainage. Future mining, however, will undermine areas of the Huntington Creek drainage and previously mined areas of the Deer Creek Mine. It is expected that water normally intercepted by the Deer Creek workings will migrate down into the Cottonwood workings, thus reducing the post-mining discharge of the Deer Creek Mine. Of all the portals in UP&L's permit areas, the Miller Canyon portal of the Cottonwood Mine is at the lowest elevation and will probably experience the greatest post-mining discharge of all of the portals in the southern portion of the permit areas.

Previous investigation by UP&L has suggested that the Roans Canyon Fault System contains significant amounts of water. In 1988 a comprehensive drilling and hydrologic testing program was conducted on the fault system. From the data collected it was determined that most of the water present in the two zones identified can be effectively dewatered by utilizing horizontal wells from in the mine. If additional sustained inflows are encountered during the graben crossing, an attempt will be made to seal the water-producing zones with pressure grouting seals. If the grouting is effective, it is not expected that significant quantities of water will flow into the mine workings for long term periods. Given the preexisting dominant vertical flow direction and the fact that the overlying springs do not appear to be associated with aquifers of concern, it is unlikely that the tunnels or the recommended dewatering system will exert a measurable influence on the springs.

The hydrologic monitoring on East Mountain has provided data to support a hydrologic model. The data supports the fact that the majority of the groundwater is transported through fracture systems. As previously discussed, snow melt from the higher reaches of East Mountain to the north percolates into the subsurface along vertical fractures, allowing the water to intersect sandstone channels which form perched aquifers in the North Horn Formation. The water continues its southeast migration until the flow is stopped at the Roans Canyon Fault. Water then flows downward as well as laterally along the fault.

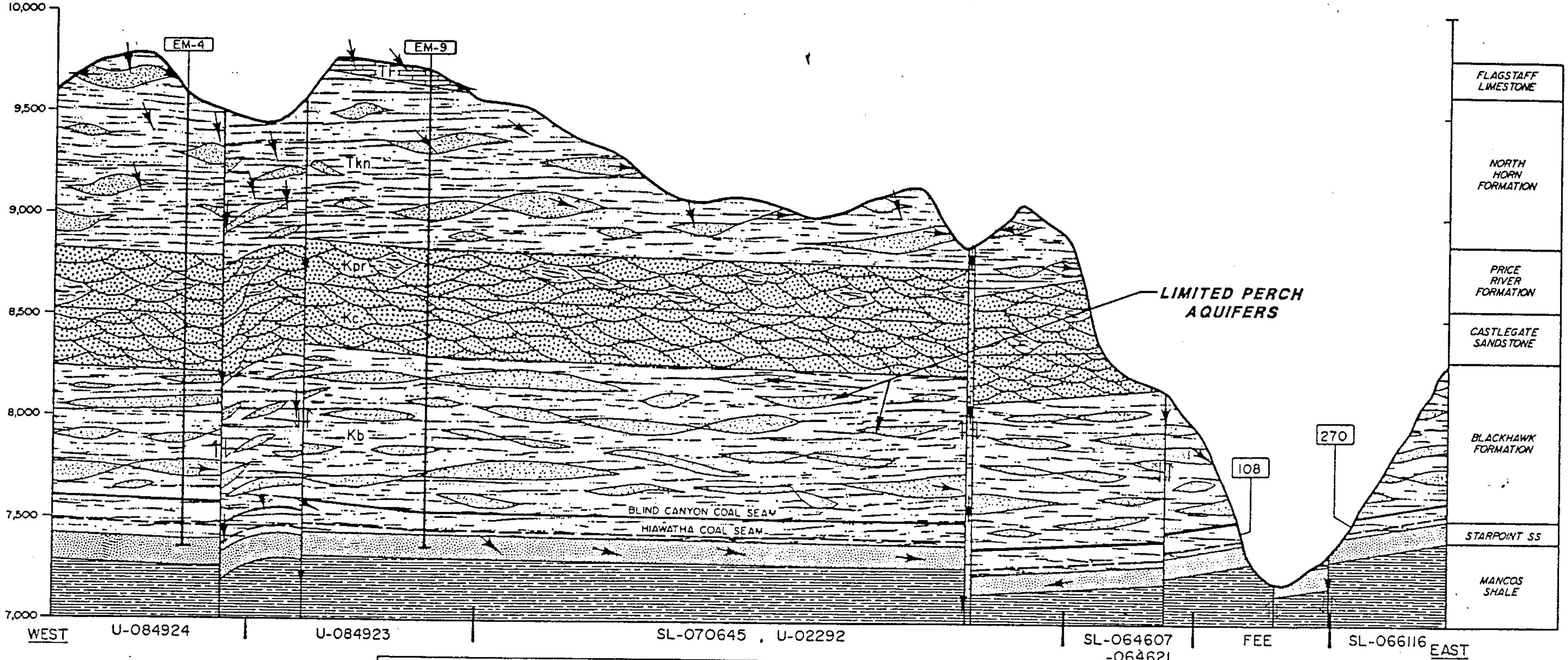
The groundwater on the southern two-thirds of East Mountain finds its recharge in the highest portions of the plateau to the south of the Roans Canyon Fault. The groundwater model is best depicted as shown in Map HM-1.

The spring monitoring has not identified any mining related impacts. Most of the springs are located in the North Horn Formation which is known to contain clays that heal when fractured. Mining impacts to the springs located in the North Horn Formation will probably not be experienced either during mining or post-mining.

SUMMARY:

Based on the data currently available, the hydrologic consequences of mining will probably be very slight in comparison to the magnitude of the entire hydrologic system. Hydrologic monitoring has identified the quality and quantity of surface and groundwater present within the permit area and has identified where slight impacts of mining may occur in the hydrologic regime. Monitoring has also identified areas requiring further data collection in order to fully understand and qualify/quantify the mining related impacts both in mining and post-mining time frames. UP&L recognizes the importance of fully understanding the hydrologic setting of the area and commits to collecting additional data which will support or justify model modifications. Only after additional data is collected can a precise calculation of the hydrologic impacts be made.

MONSEN ENGINEERING CO. 122483



GEOLOGIC CROSS SECTION FROM EM-4 TO EM-9, AND THROUGH MEASURED SECTIONS 108 - 270 IN DEER CREEK CANYON

DATE	REVISIONS	MARK

UTAH POWER AND LIGHT CO.
MINING DIVISION
HUNTINGTON, UTAH 84528

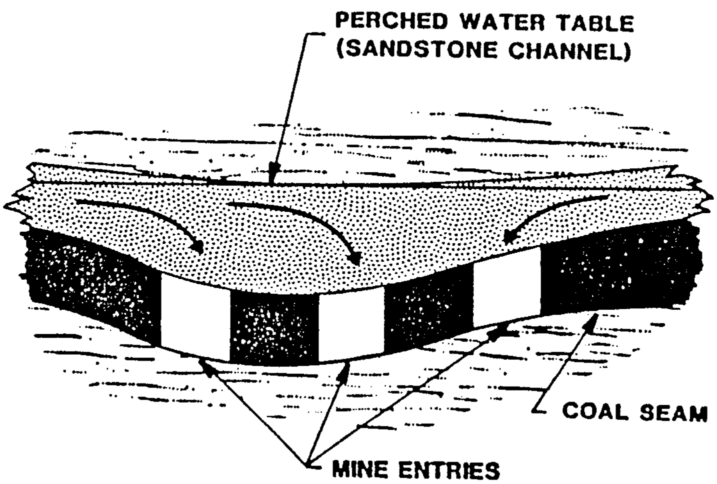
TYPICAL GROUNDWATER MOVEMENT EAST MOUNTAIN PERMIT AREA

DRAWN BY: K. LARSEN	APPROVED BY:	HF-1
SCALE:	DATE: JAN. 23, 1989	

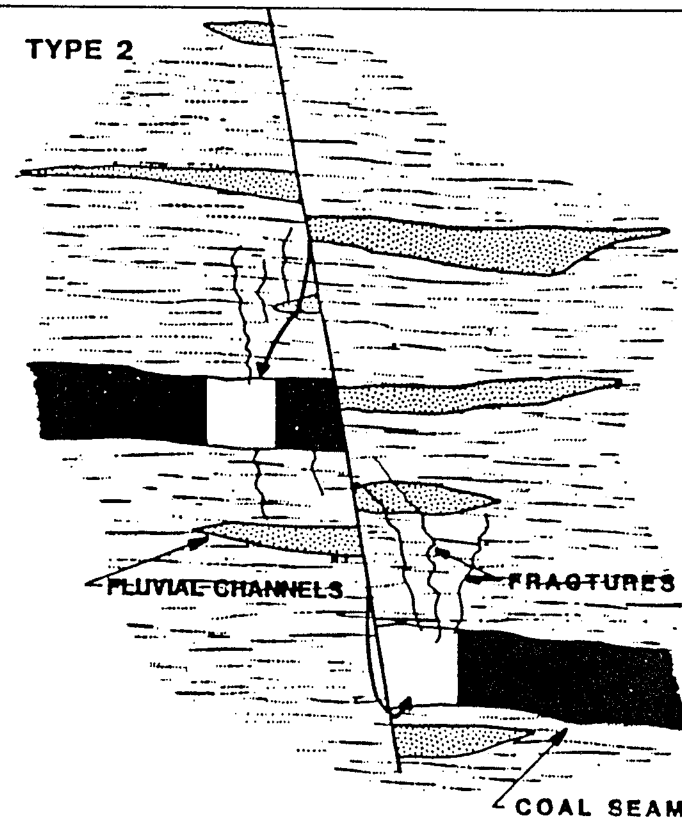
HF–2

LONG TERM WATER SOURCES

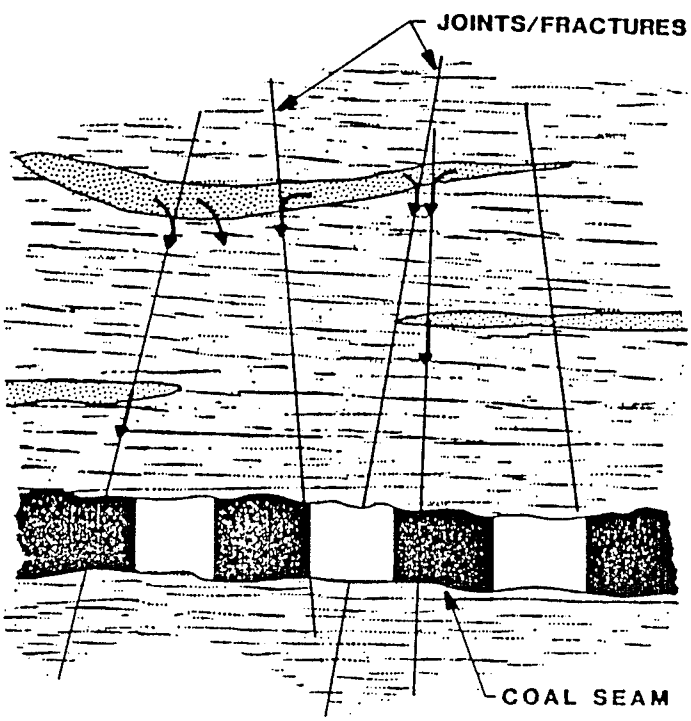
TYPE 1



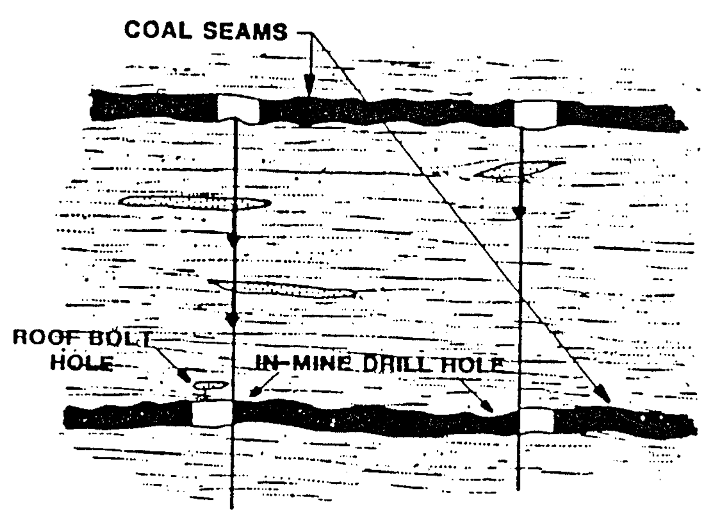
TYPE 2

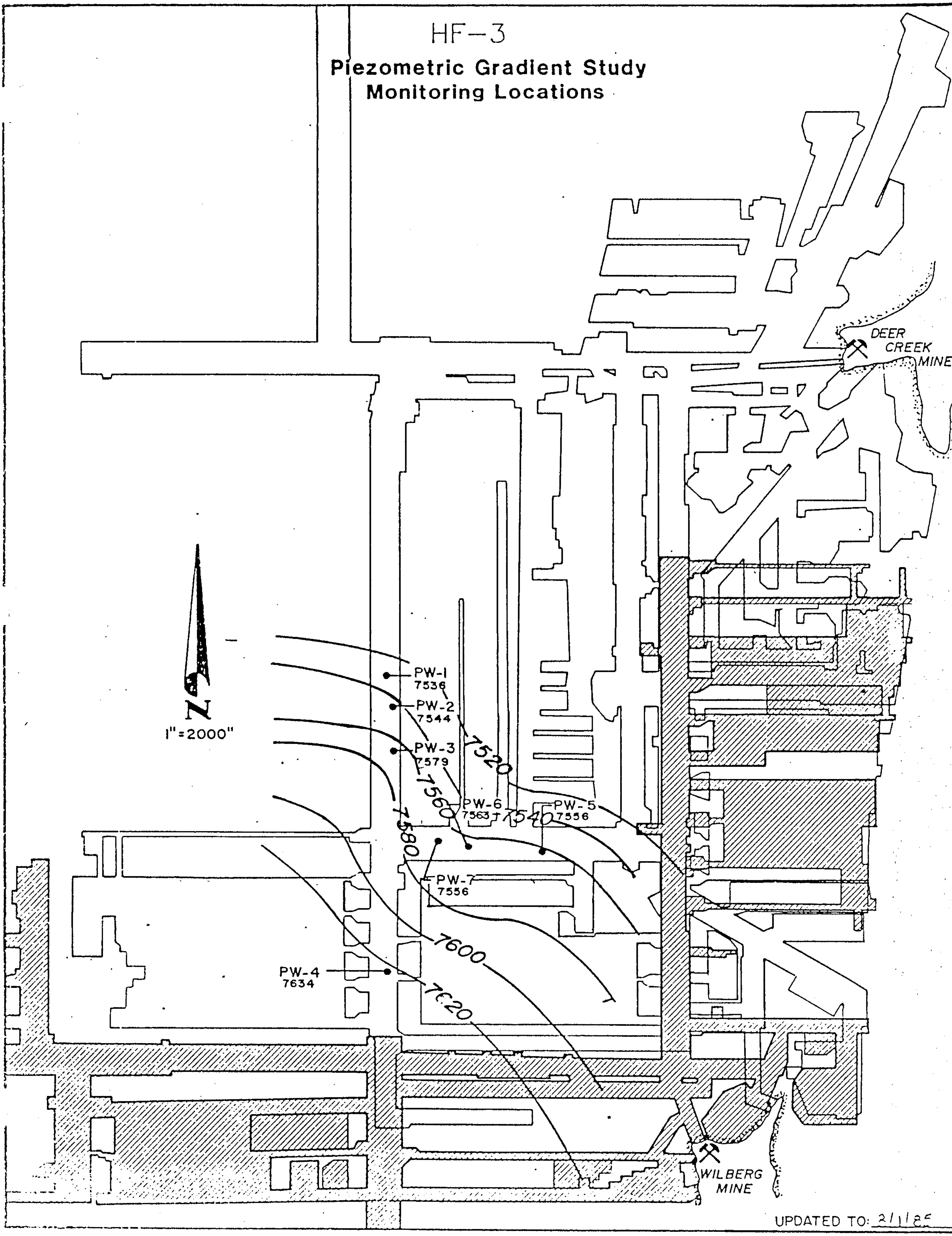


TYPE 3

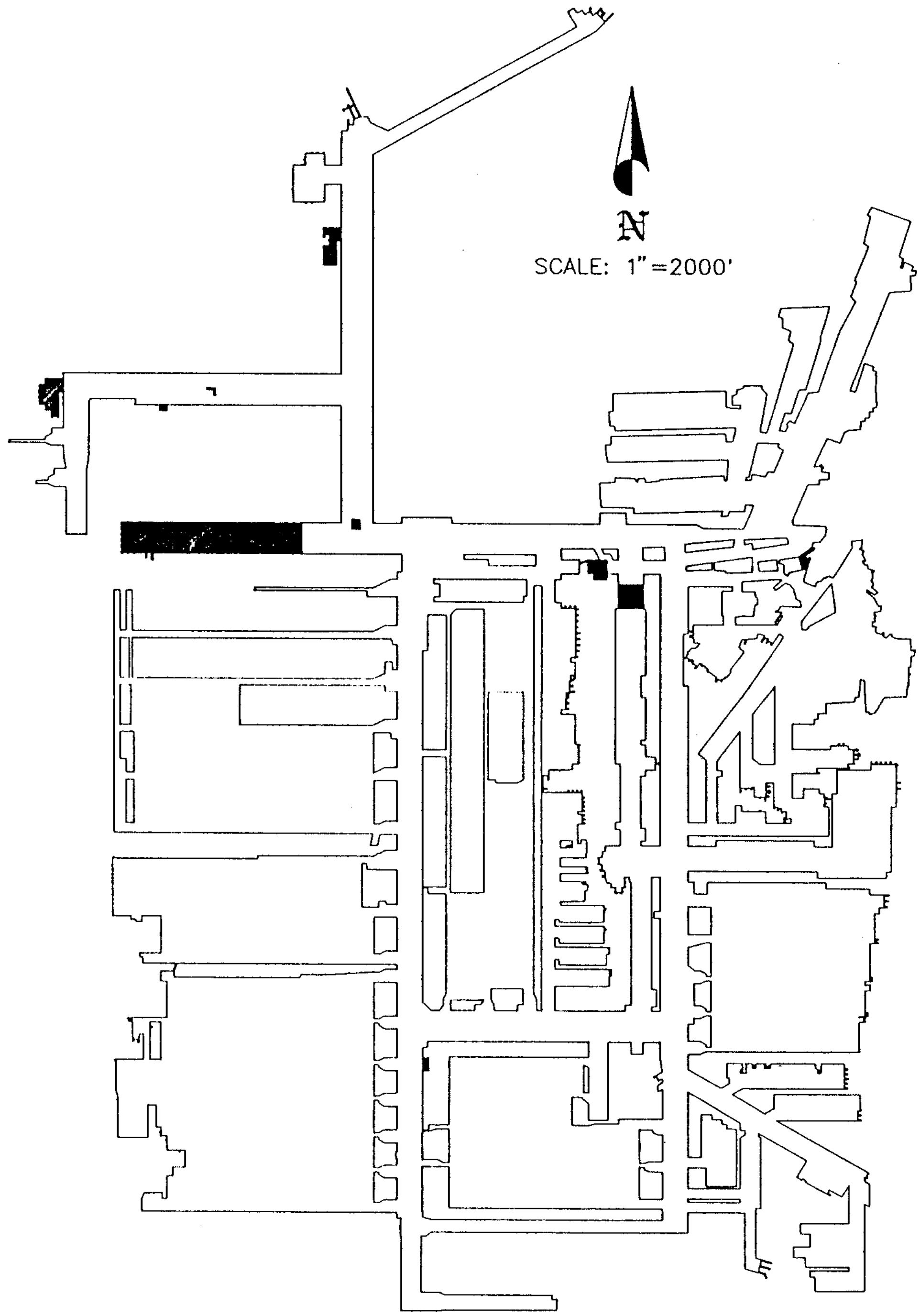


TYPE 4




HF-3
Piezometric Gradient Study
Monitoring Locations
DEER
CREEK
MINE
N
1"=2000"
PW-1
7536
PW-2
7544
PW-3
7579
PW-4
7634
PW-5
7556
PW-6
7563
PW-7
7556
7520
7540
7560
7580
7600
7620
WILBERG
MINE
UPDATED TO: 2/1/85

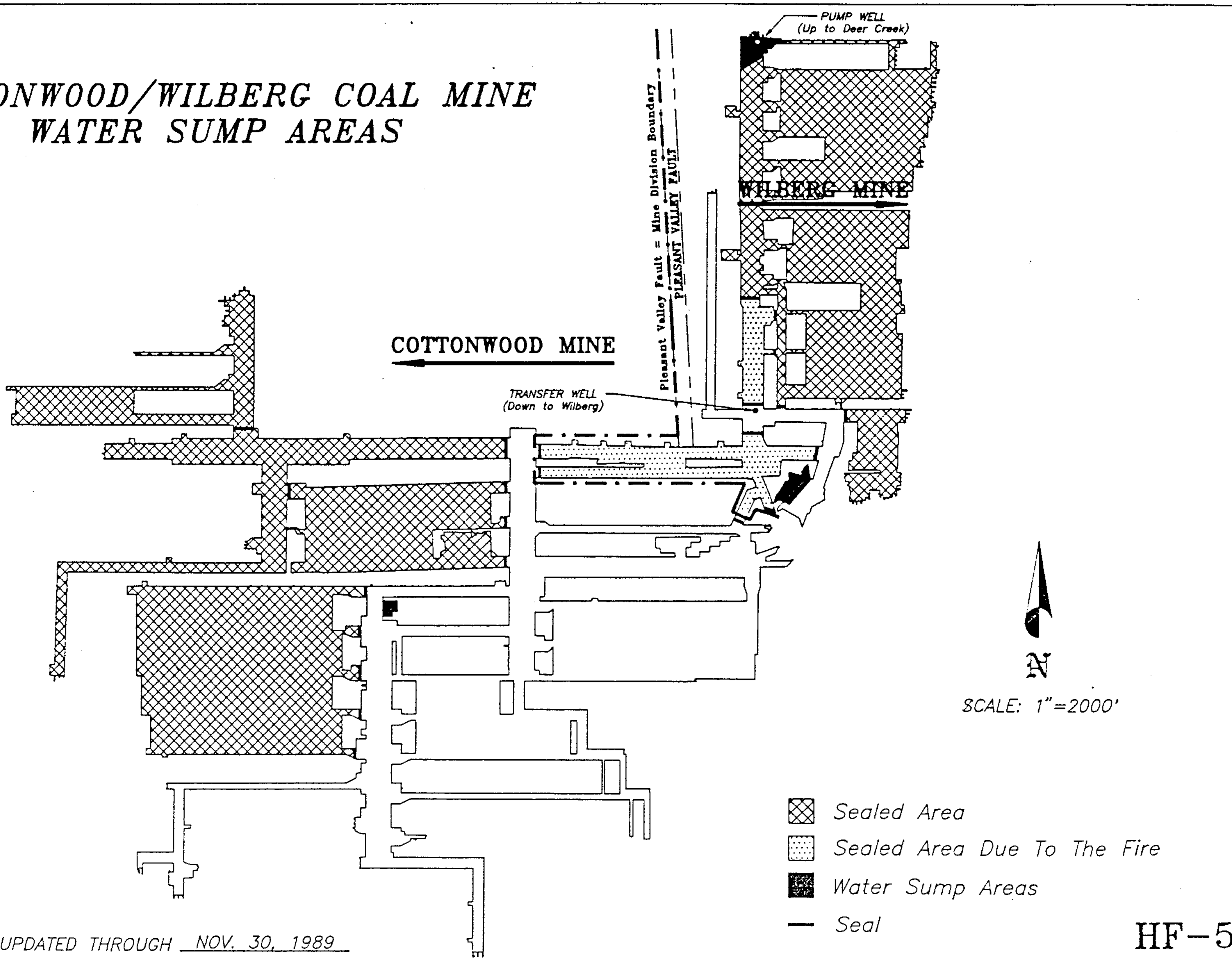
DEER CREEK COAL MINE
WATER SUMP AREAS



MINE WORKINGS UPDATED THROUGH NOV. 30, 1989

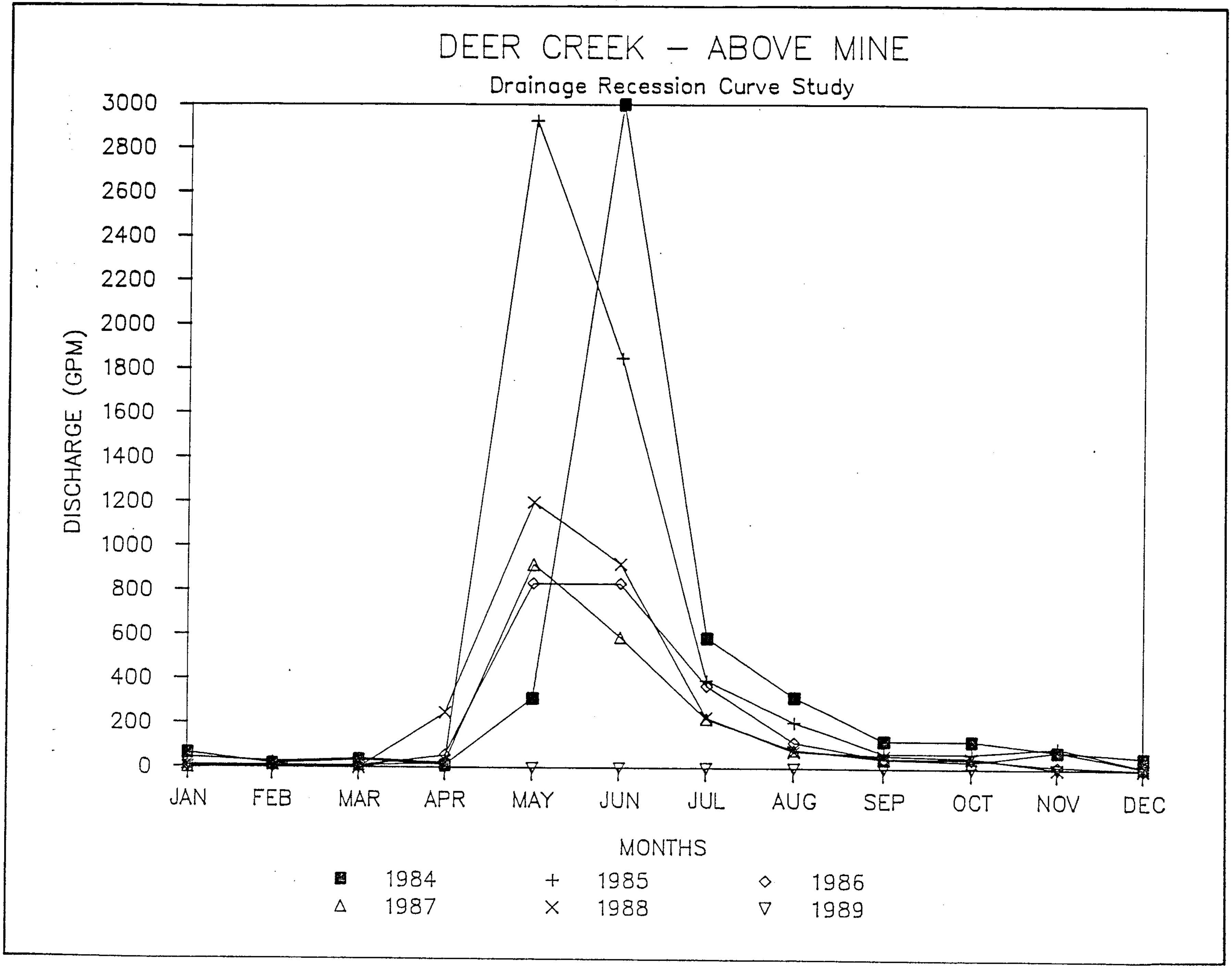
HF-4

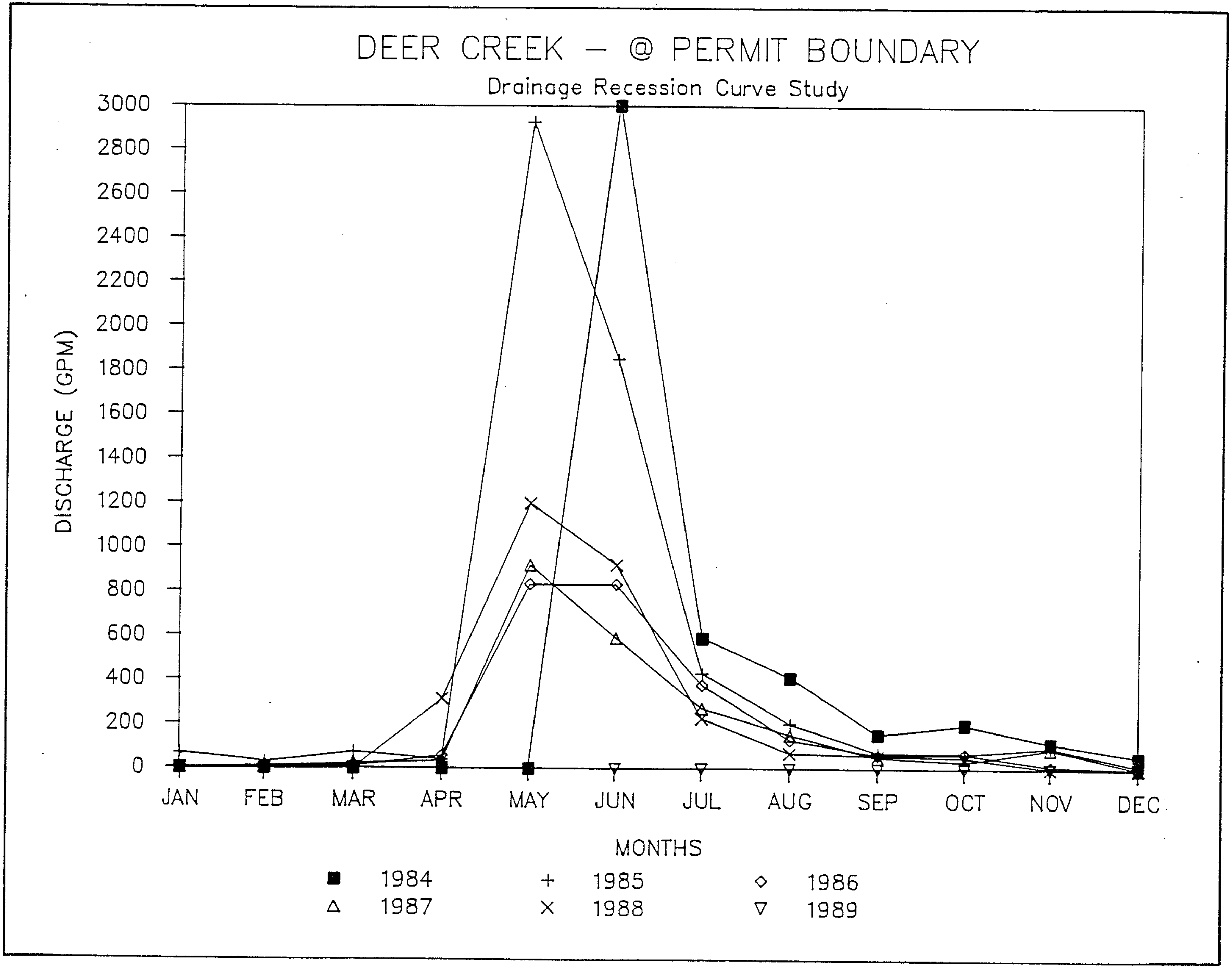
COTTONWOOD/WILBERG COAL MINE
WATER SUMP AREAS

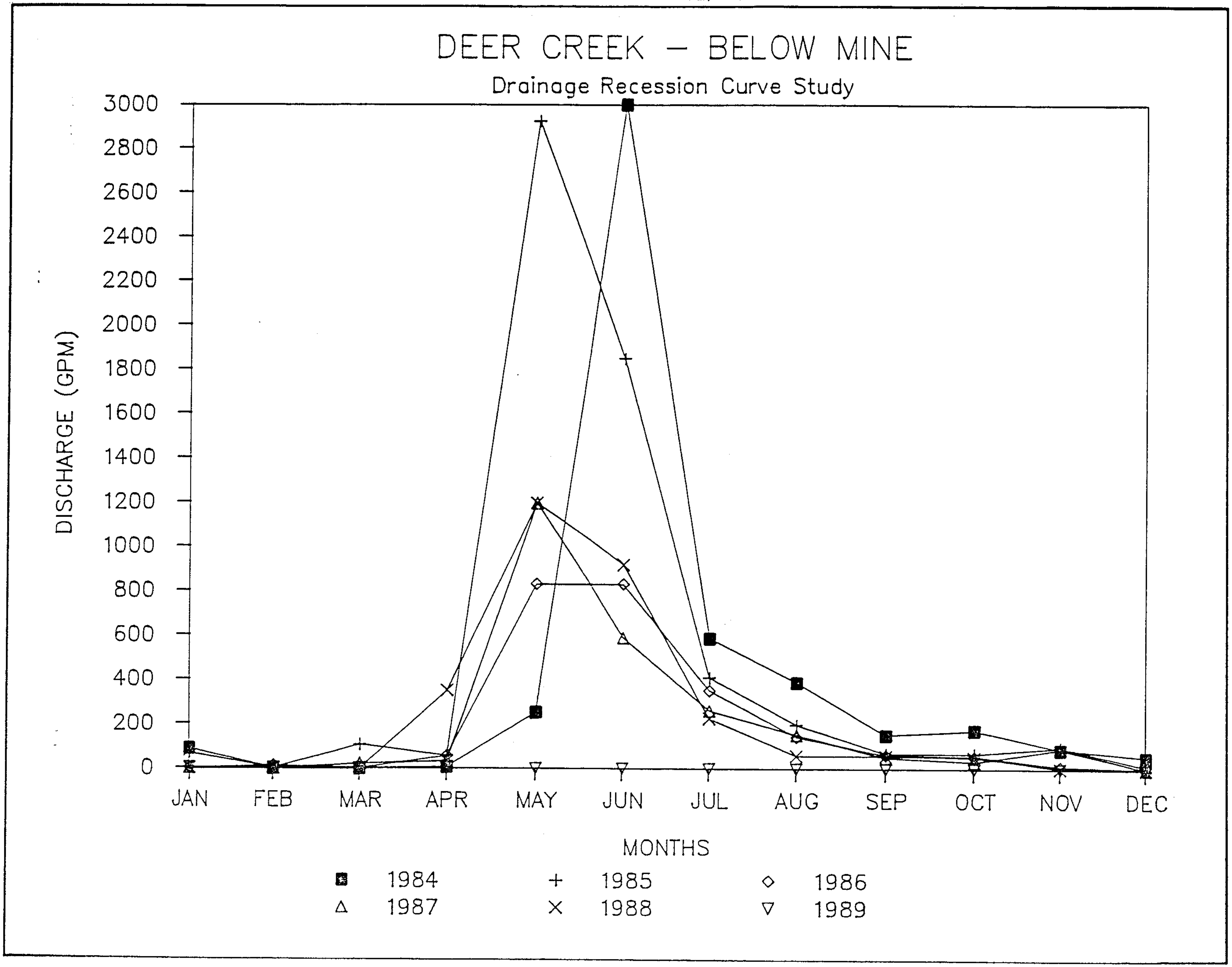


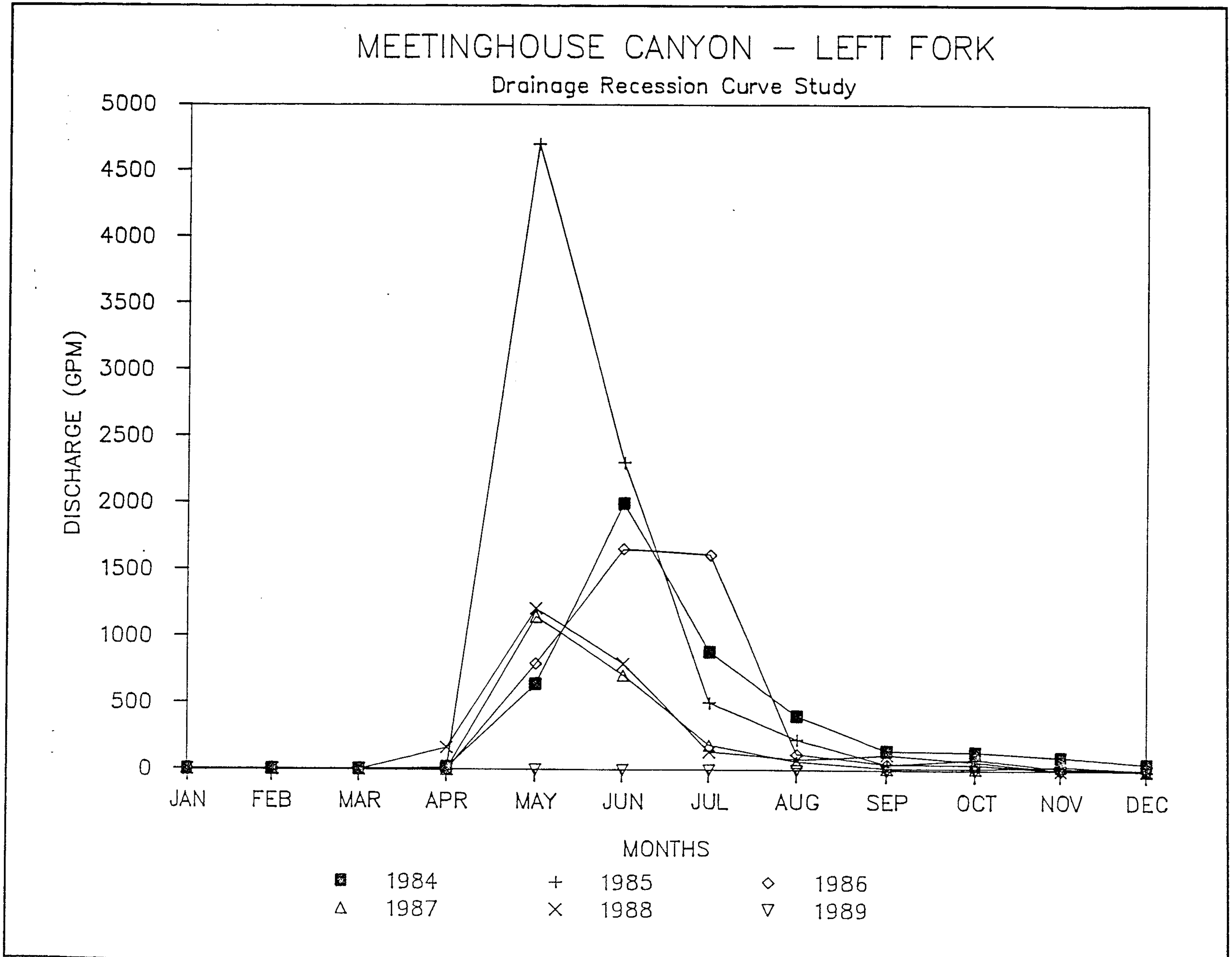
MINE WORKINGS UPDATED THROUGH NOV. 30, 1989

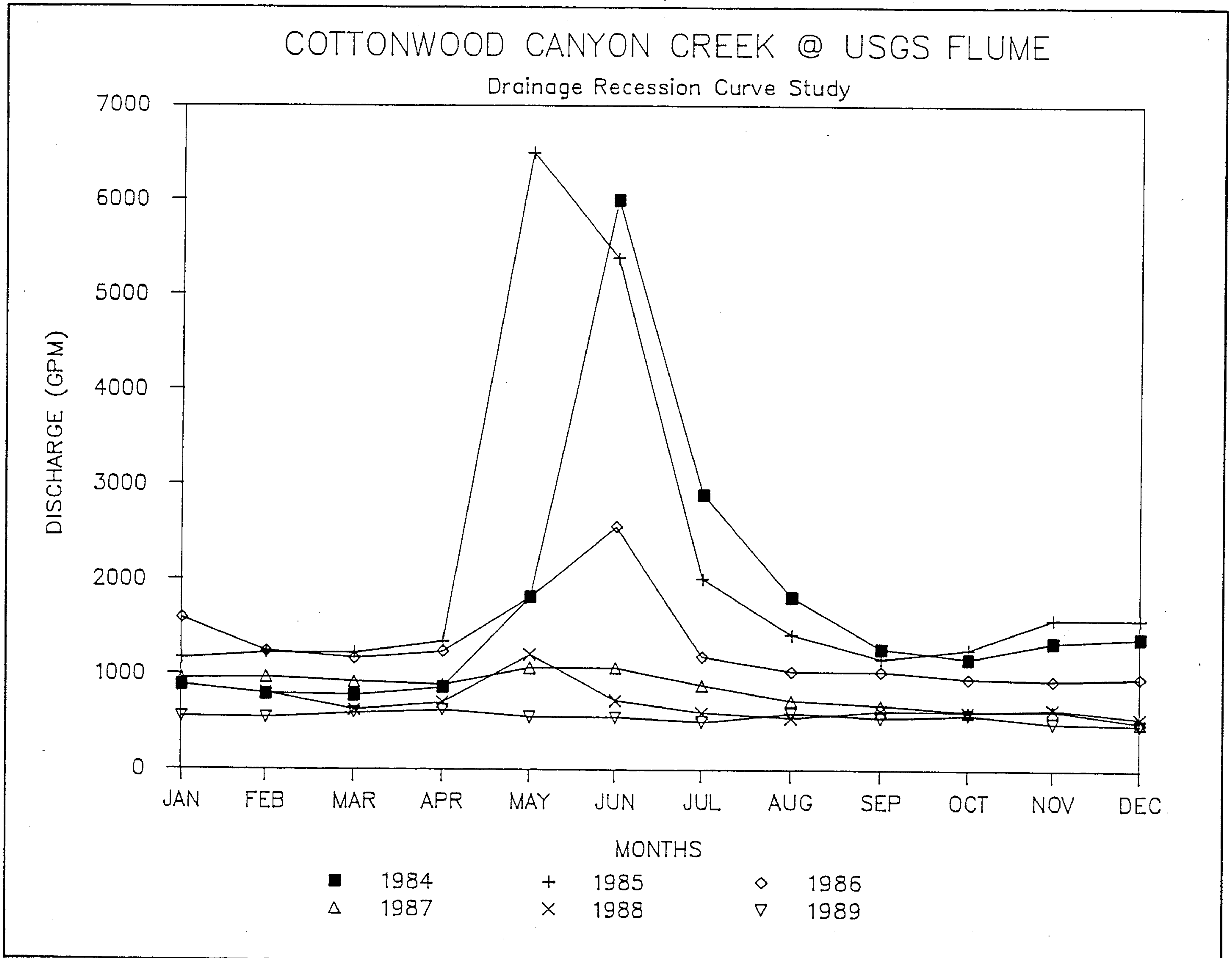
HF-5

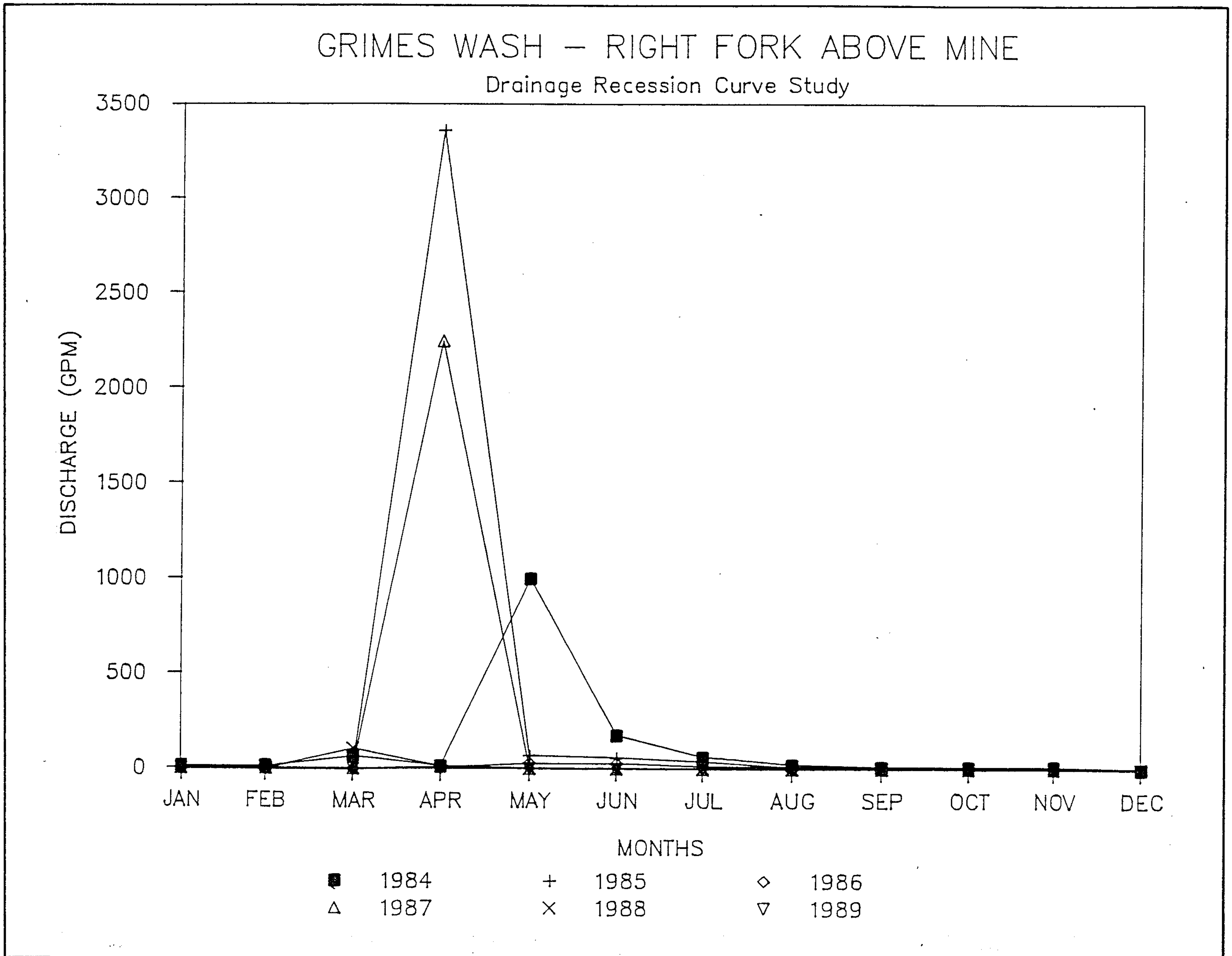

DEER CREEK – ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989

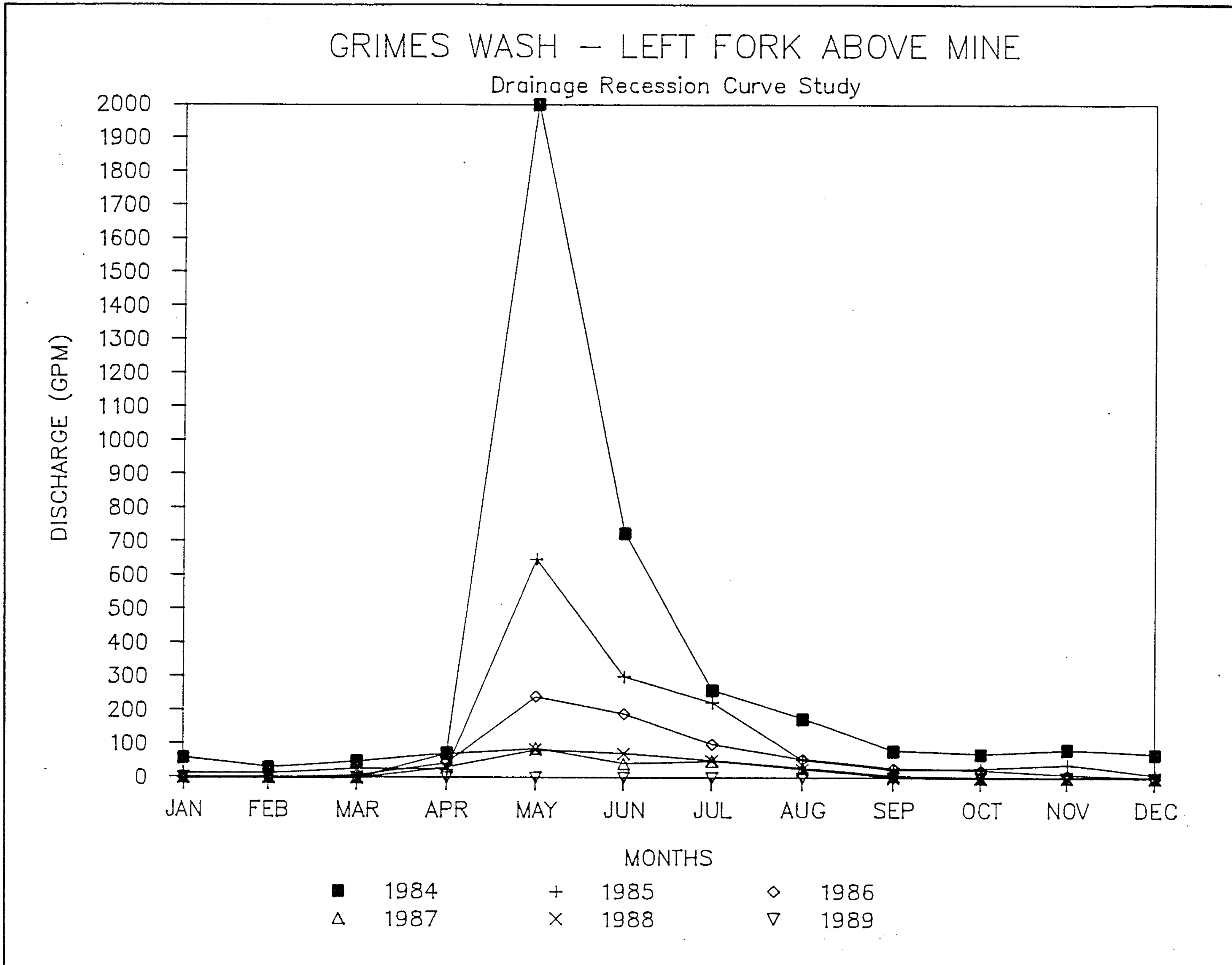

DEER CREEK – @ PERMIT BOUNDARY
Drainage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989

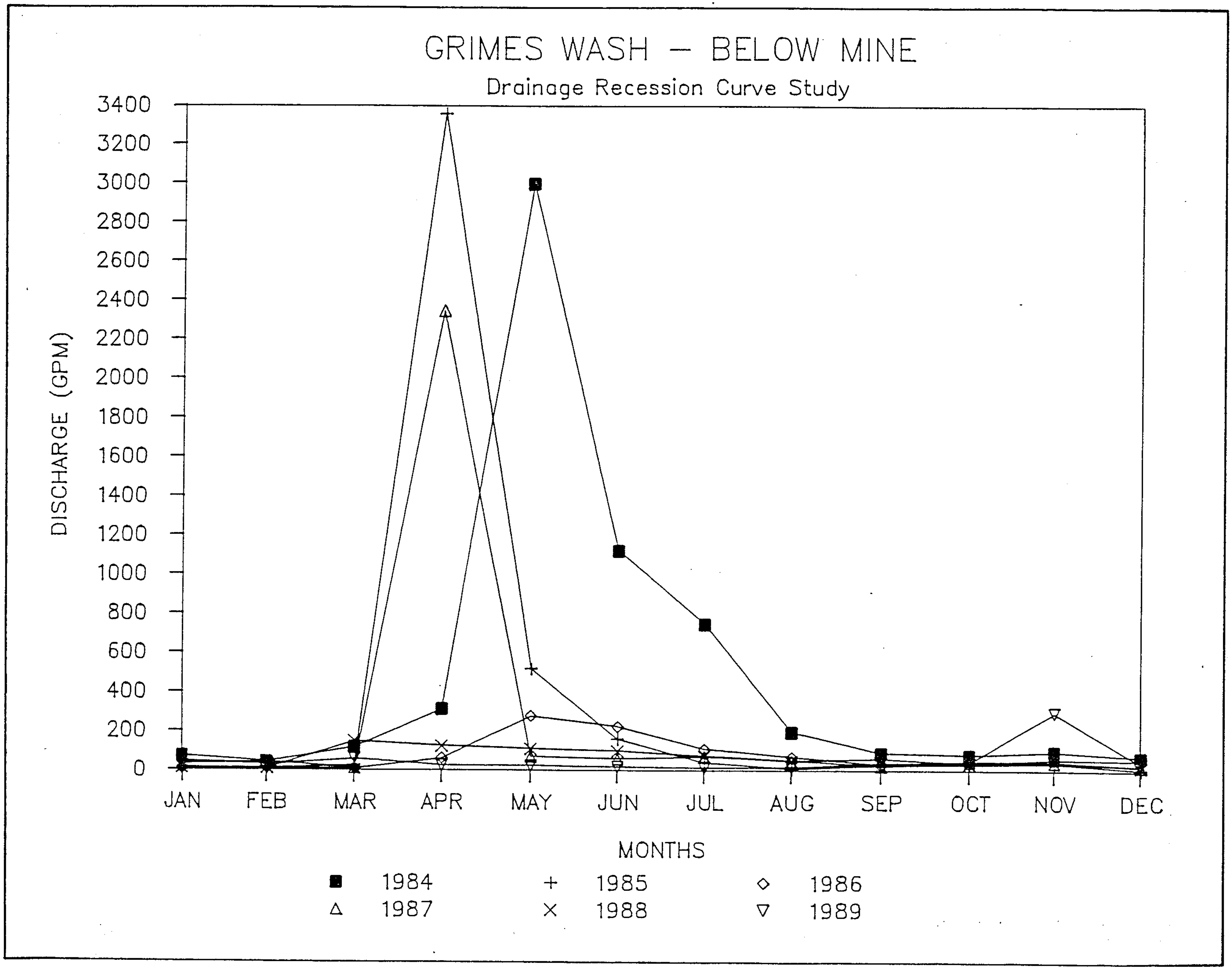

DEER CREEK – BELOW MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989

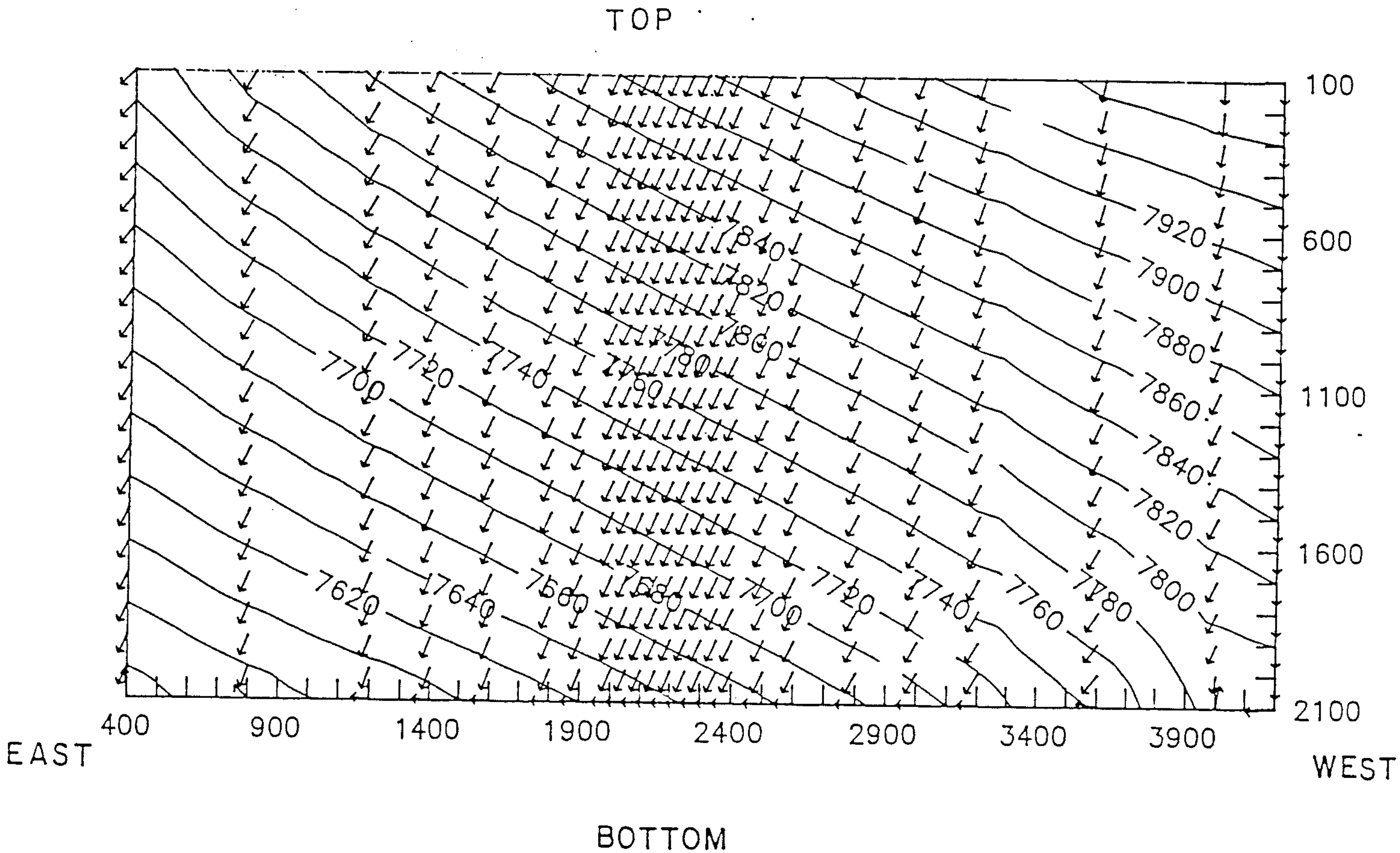

MEETINGHOUSE CANYON — LEFT FORK
Drainage Recession Curve Study
DISCHARGE (GPM)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


COTTONWOOD CANYON CREEK @ USGS FLUME
Drainage Recession Curve Study
DISCHARGE (GPM)
0
1000
2000
3000
4000
5000
6000
7000
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


GRIMES WASH - RIGHT FORK ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3500
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


GRIMES WASH – LEFT FORK ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


GRIMES WASH – BELOW MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989



SCALE 1:600

KEY:

Contours in feet

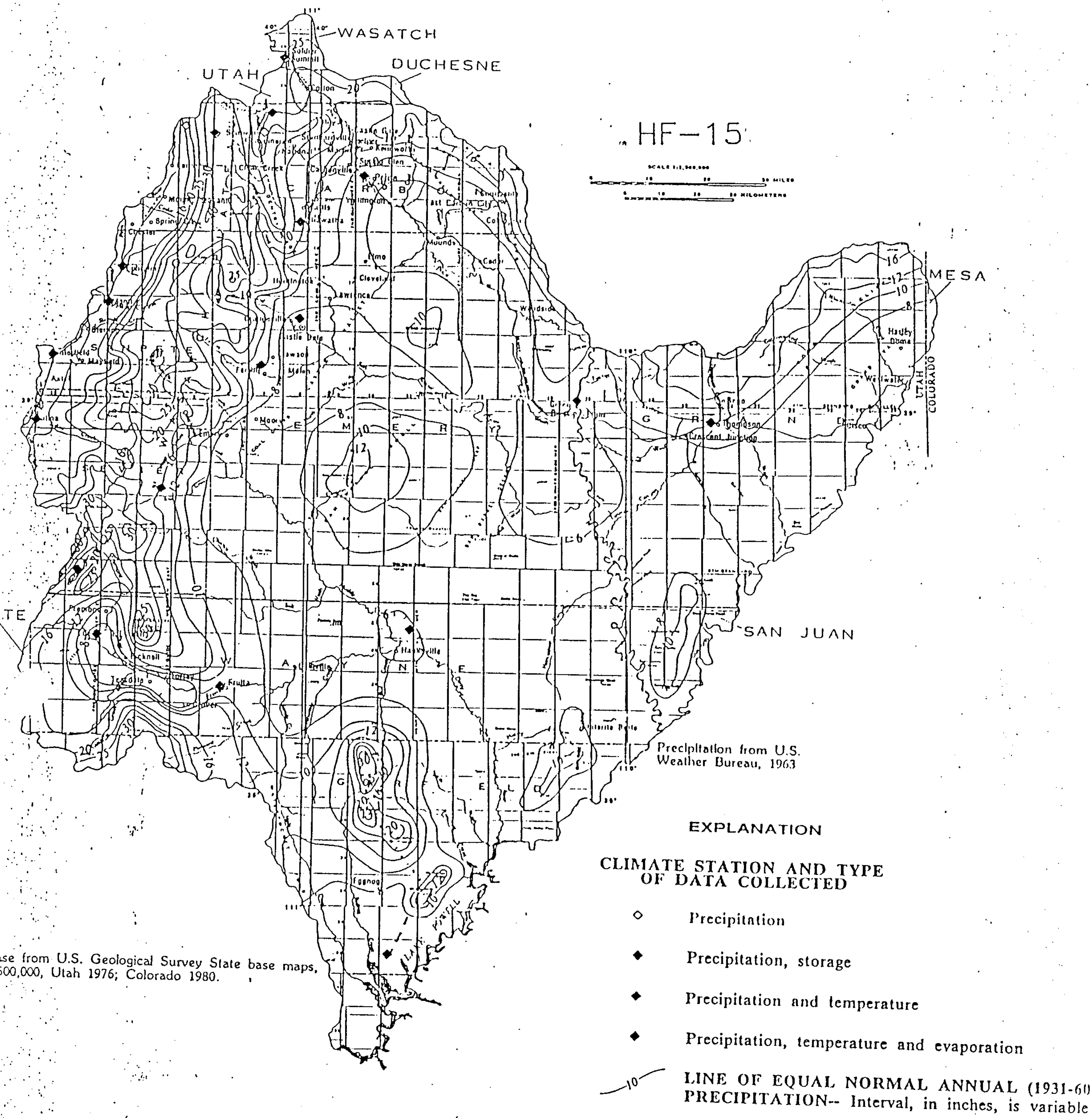
Contour Interval 20 feet

PROJECT	REVISIONS
DATE	

Hydro-Search, Inc.
CONSULTING HYDROLOGISTS-GEOLOGISTS
Milwaukee • Denver • Reno

HF-14

Fault Graben Base Case



Normal annual (1931-60) precipitation and location of climate stations.

FIGURE HF-25

RILDA CANYON

MONITORING WELLS
PIEZOMETRIC DATA

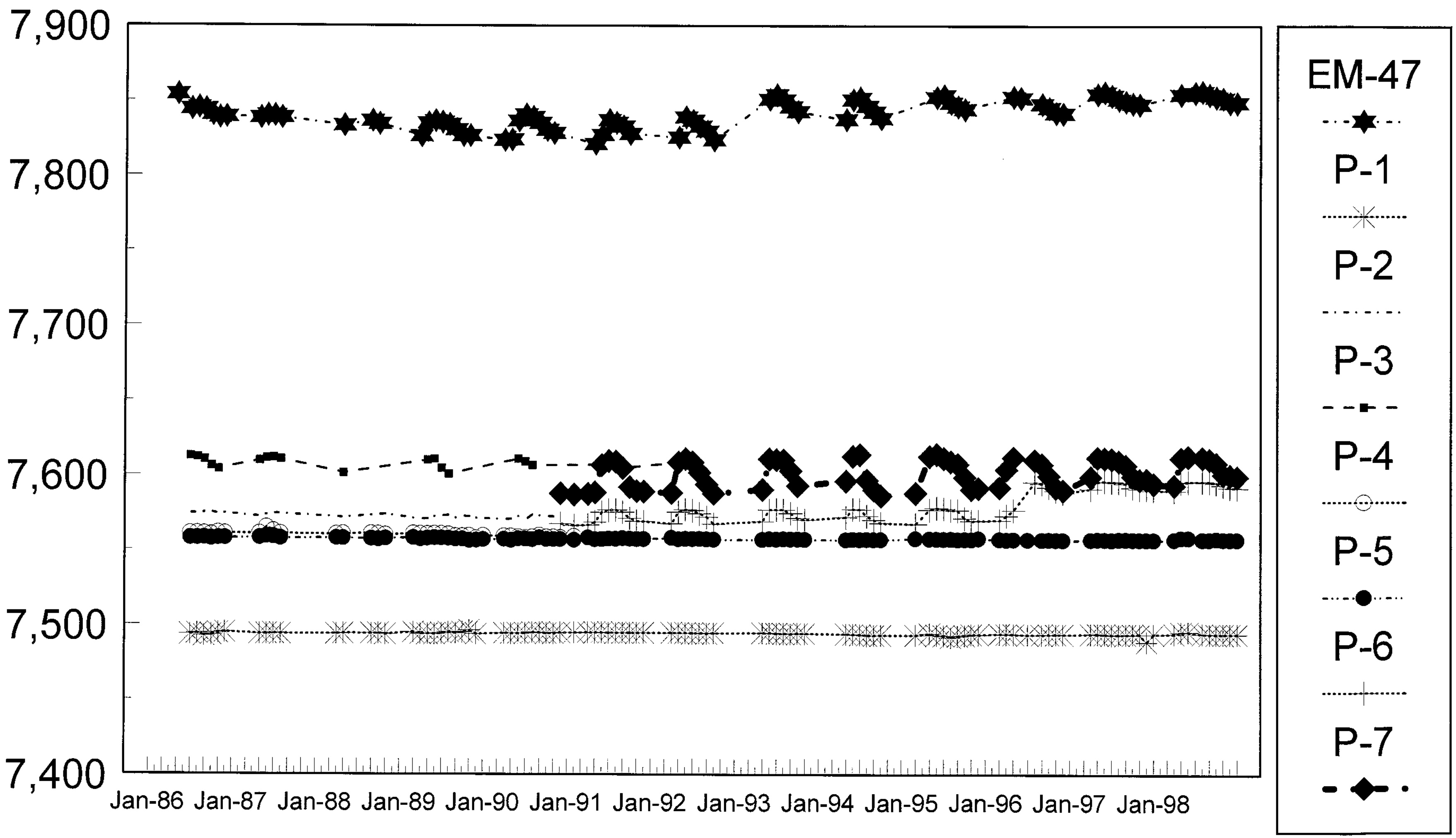


TABLE HT-1: MODES OF OCCURRENCE - EAST MOUNTAIN SPRINGS

Stratigraphic Location	Occurrences Permeable fluvial channels that intersect the land surface	Flow along permeable strata underlain by impermeable mudstone which intersects the land surface	Contact of permeable beds and the Roans Canyon Fault zone	Mode of occurrence not identified
Base of Flagstaff Limestone		79-6, 79-7, 79-35, 86-58	Sheba Springs 79-1	
North Horn Formation	Teds Tub, Burnt Tree, 79-2, 79-3, 79-8, 79-9, 79-11, 79-12, 79-13, 79-14, 79-15, 79-16, 79-17, 79-21, 79-22, 79-26, 79-27, 79-28, 79-29, 79-34, 79-39, 80-42, 80-43, 80-46, 80-47, 80-48, 84-53, 84-56, 86-59, 89-62, 89-63, 89-64, 89-65, 89-66, 89-67, 89-68		Elk Springs, 79-10, 79-18, 79-19, 79-20, 84-54, 89-61	
Base of North Horn Formation		79-23, 79-25, 79-32, 79-36, 79-37, 79-38, 84-55	79-30, 79-31	
Other Stratigraphic Horizons	Blackhawk Formation 80-50, 84-57		80-49 (Price River) Bear Canyon Fault Zone 82-51 (Price River)	Flagstaff Limestone 79-4, 79-5, Pine Springs Trough, Price River Formation 79-24, 79-33, 79-40, 80-41, 80-44, 80-45, 82-52, Jerk Water, 89-60 (Alpine)

TABLE HT-2: EAST MOUNTAIN SPRINGS WATER QUALITY

HISTORICAL (1979-89)

Parameter	Burnt Tree	Elk Spring	Sheba Spring	79-10	79-23	79-26	79-29	79-35	80-44	80-46	82-52	84-56
Elevation	9260	9350	9740	9350	9035	9310	9410	9585	8980	9350	8995	9335
Geologic Formation	TKn	TKn	Tf	Kpr	TKn	TKn	TKn	Tf	Kpr	TKn	Kpr	TKn
Bicarbonate	335.00	290.00	290.00	312.00	413.00	335.00	317.00	303.00	451.00	365.00	414.00	345.00
Calcium	64.30	66.80	90.60	73.20	79.60	70.60	52.90	92.40	101.90	64.10	79.40	63.30
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	5.10	4.70	3.30	5.40	11.30	8.10	17.90	3.60	11.10	4.90	9.70	8.30
Conductivity	505.00	436.00	443.00	479.00	691.00	520.00	554.00	467.00	876.00	561.00	661.00	545.00
Hardness	268.00	241.00	249.00	276.00		284.00	245.00	271.00	377.00	304.00	318.00	297.00
Iron	0.21	0.11	0.14	0.12	0.09	0.17	0.11	0.13	0.12	0.27	0.06	0.04
Magnesium	26.59	21.84	9.88	22.35	38.30	26.10	32.78	13.93	41.48	28.57	33.60	32.15
Manganese	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	<0.01	0.01	0.01	0.01
pH	7.50	7.70	7.55	7.59	7.72	7.89	7.75	7.60	7.79	7.43	7.54	7.56
Potassium	1.13	2.36	1.62	2.54	1.54	2.07	3.21	0.82	2.76	0.83	1.51	0.88
Sodium	13.91	9.92	5.86	5.79	14.90	16.76	30.73	8.50	35.17	9.90	23.62	17.42
Sulfate	26.90	34.90	35.20	23.60	27.20	41.00	60.40	43.60	138.70	19.00	44.40	28.90
TDS	298.00	261.00	269.00	272.00	364.00	316.00	341.00	274.00	524.00	311.00	373.00	344.00

TABLE HT-3: IN-MINE WATER QUALITY

HISTORICAL (1977-1989)

PARAMETER	MAXIMUM	MINIMUM	AVERAGE	NO. OF ANALYSES
DEER CREEK				
Bicarbonate	499	292	423	38
Calcium	245.0	10.0	103.9	69
Carbonate	1.0	1.0	1.0	31
Chloride	85.0	3.9	10.5	76
Conductivity	1700	470	855	75
Hardness	532	292	422	40
Iron, Dissolved	0.54	0.01	0.13	28
Magnesium	79.50	4.42	46.91	70
Manganese	0.06	0.01	0.02	46
pH	7.93	6.80	7.27	91
Potassium	10.00	1.00	3.43	69
Sodium	66.00	10.22	20.69	69
Sulfate	915.2	16.0	140.6	83
TDS	982	256	513	91
WILBERG/COTTONWOOD				
Bicarbonate	648	259	475	44
Calcium	416.9	11.2	192.1	74
Carbonate	1.0	1.0	1.0	28
Chloride	130.0	0.9	16.4	98
Conductivity	5000	620	1516	76
Hardness	2022	125	859	55
Iron, Dissolved	1.26	0.01	0.16	84
Magnesium	238.20	4.90	95.94	74
Manganese	0.08	0.01	0.02	52
pH	8.50	6.55	7.39	137
Potassium	21.00	1.00	6.70	74
Sodium	183.80	6.40	38.06	74
Sulfate	1700	78.0	400.5	127
TDS	2595	419	876	138

TABLE HT-4: DEER CREEK SURFACE WATER QUALITY

HISTORICAL (1978-1989)

		ALKALINITY					DISSOLVED		---- IRON ----				OIL &					------- SOLIDS ----------		
	ACIDITY	BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	OXYGEN	HARDNESS	DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	GREASE	pH	POTASSIUM	SODIUM	SULFATE	TDS	TSS	SETTLEABLE
ABOVE THE MINE																				
MIN	<1.0	262	2.2	0.6	3.5	360	5.3	225	<0.02	0.03	24.8	<0.01	<0.5	7.0	0.5	13.4	10.0	231	<0.5	<0.1
MAX	137.0	397	107	8.0	176.0	1580	10.2	599	0.09	40.10	83.9	0.24	2.6	8.5	4.33	111.6	255.0	897	3592.0	<0.5
MEAN	13.5	262	55.9	1.7	24.1	593	8.1	306	0.05	0.84	39.0	0.04	0.8	7.89	1.3	28.9	28.9	347	116.9	0.23
BELOW THE MINE																				
MIN	<1.0	244	1.4	<1.0	22.0	420	5.4	284	0.03	0.04	34.5	<0.01	<0.5	6.9	1.0	32.6	65.0	273	<0.5	<0.1
MAX	90.0	442	129.1	11.0	420.0	2300	11.0	815	0.64	170.00	122.8	0.27	9.0	8.6	7.6	233.8	500.0	1544	20,540.0	1.5
MEAN	9.3	310	72.4	2.1	119.9	1153	8.4	502	0.12	3.49	66.4	0.04	1.6	7.98	4.05	110.4	233.7	692	470.5	0.3

TABLE HT-5: MEETINGHOUSE CANYON WATER QUALITY - LEFT FORK SURFACE WATER QUALITY

HISTORICAL (1986-1989)

	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
MIN	<1.0	215	2.2	<1.0	3.0	300	5.4	195	0.04	<0.05	22.50	<0.01	0.1	7.25	0.60	3.8	20.0	190	0.1	0.05
MAX	49.0	307	71.1	8.0	47.5	500	10.3	350	0.30	0.90	36.50	0.04	10.9	8.55	1.62	13.1	100.0	304	74.0	<1.00
MEAN	7.8	247	45.3	2.1	8.7	415	7.9	247	0.11	0.18	28.81	0.02	1.4	7.87	1.18	8.9	42.8	255	20.9	0.16

TABLE HT-6: RILDA CANYON SURFACE WATER QUALITY

HISTORICAL (1989)

	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
RCF1																				
MIN	<1.0	227	49.8	<1.0	10.0	300	7.1	201	<0.02	<0.02	18.6	<0.01	<1.0	8.15	0.6	5.6	23.0	222	12.0	0.05
MAX	<1.0	227	49.8	<1.0	10.0	300	7.1	201	<0.02	<0.02	18.6	<0.01	<1.0	8.15	0.6	5.6	23.0	222	12.0	0.05
MEAN	<1.0	227	49.8	<1.0	10.0	300	7.1	201	<0.02	<0.02	18.6	<0.01	<1.0	8.15	0.6	5.6	23.0	222	12.0	0.05
RCF3																				
MIN	<1.0	338	81.7	<1.0	10.0	500	7.0	379	<0.02	0.08	42.5	<0.01	<1.0	7.9	1.7	10.4	70.0	372	4.0	<0.05
MAX	5.0	500	97.8	<1.0	15.0	855	7.5	460	<0.05	0.51	52.5	0.02	1.7	8.0	2.5	15.9	150.0	513	23.0	0.05
MEAN	3.3	416	91.8	<1.0	11.7	720	7.4	429.3	0.04	0.23	48.6	0.01	1.2	7.95	2.2	13.2	115.0	460	16.0	0.05
RCW4																				
MIN	<1.0	320	63.0	<1.0	15.0	450	7.6	336	0.10	<0.02	43.4	<0.01	<1.0	8.1	1.9	13.9	85.0	413	6.0	<0.05
MAX	<1.0	410	72.5	<1.0	15.0	800	8.7	403	0.10	0.12	54.0	<0.01	1.5	8.3	2.8	17.1	95.0	477	7.0	<0.05
MEAN	<1.0	365	67.8	<1.0	15.0	653.3	8.0	369.5	0.10	0.07	48.7	<0.01	1.25	8.2	2.4	15.5	90.0	445	6.5	<0.05

TABLE HT-7: GRIMES WASH SURFACE WATER QUALITY

HISTORICAL (1979-1989)

	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
RIGHT FORK																				
MIN	0.1	104	30.0	<1.0	3.0	190	6.8	112	0.61	0.01	6.30	<0.01	<0.5	7.2	1.60	1.85	20.0	115	0.5	<0.1
MAX	39.0	320	52.0	<1.0	26.4	750	9.8	320	3.31	20.60	46.20	0.30	9.0	8.7	7.64	20.44	161.7	700	7116.0	3.3
MEAN	5.6	238	41.0	<1.0	11.3	560	8.6	238	1.36	1.96	32.96	0.06	1.9	8.1	3.40	14.10	64.4	339	376.3	0.6
LEFT FORK																				
MIN	<1.0	188	2.3	<1.0	6.0	410	5.0	196	0.02	0.02	23.80	<0.01	0.1	7.3	1.0	11.1	30.4	212	<0.5	0.05
MAX	34.0	482	71.5	15.0	156.0	790	9.6	460	0.12	0.81	68.50	0.15	3.5	8.7	3.0	34.0	115.0	570	1428.0	<0.50
MEAN	3.4	309	44.6	2.0	19.7	627	7.7	289	0.06	0.15	41.26	0.03	1.1	8.0	1.6	28.5	73.8	363	52.1	0.13
BELOW THE MINE																				
MIN	<0.1	117	5.1	<1.0	12.0	220	4.5	146	0.04	0.01	10.70	<0.01	<0.5	7.1	0.48	9.0	46.0	152	<0.5	0.05
MAX	127.0	410	274.0	3.0	4531.0	12,000	11.45	1165	2.25	22.60	116.80	0.90	27.0	8.5	12.50	3181.0	593.0	7160	9702.0	4.00
MEAN	15.1	342	123.0	1.1	329.2	1,432	7.8	639	0.31	1.00	78.07	0.07	3.3	7.9	5.69	258.8	329.4	851	262.0	0.46

TABLE HT-8
UTAH POWER & LIGHT COMPANY
EAST MOUNTAIN SPRING OWNERSHIP

Spring	Location	Resource	Owner
Sheba Spring	T17S, R7E, S7	TROUGH WR# 93-1617	FS
Elk Springs	T17S, R7E, S5	POND	PL
Burnt Tree Spring	T17S, R7E, S16	TROUGH & POND	FS
Jerk Water Spring	T17S, R7E, S16	TROUGH	FS
Pines Springs	T17S, R7E, S16	TROUGH & POND	FS
Pine Springs Trough	T17S, R6E, S1	TROUGH	FS
Ted's Tub	T17S, R7E, S17		PL
79-1	T17S, R7E, S7	TROUGH	FS
79-2 (Surging Spring)	T17S, R7E, S21		PL
79-3	T17S, R7E, S20		PL
79-4	T17S, R6E, S12		FS
79-5	T17S, R6E, S12		FS
79-6	T17S, R6E, S12	WR# 93-1622	FS
79-7	T17S, R6E, S12		FS
79-8	T17S, R6E, S12		FS
79-9	T17S, R6E, S12	TROUGH WR# 93-1616	FS
79-10	T17S, R6E, S12		FS
79-11	T17S, R7E, S18		PL
79-12	T17S, R7E, S17	WILDLIFE	PL
79-13	T17S, R7E, S8		PL
79-14	T17S, R7E, S8		PL
79-15	T17S, R7E, S8		PL
79-16	T17S, R7E, S6	POND	PL
79-17	T17S, R7E, S6		PL
79-18	T17S, R7E, S5		PL
79-19	T17S, R7E, S5		PL
79-20	T17S, R7E, S5		PL
79-21	T17S, R7E, S20	POND	PL
79-22	T17S, R7E, S20	POND	PL
79-23	T17S, R7E, S15	LIVESTOCK USE WR# 93-1421	FS
79-24	T17S, R7E, S22	TROUGH WR# 93-1608	FS
79-25	T17S, R7E, S18	WR# 93-1615	FS
79-26	T17S, R7E, S18	POND	PL
79-27	T17S, R7E, S18	POND	PL
79-28 (Flag Lake)	T17S, R7E, S20	POND	PL
79-29	T17S, R7E, S18	POND	PL
79-30	T17S, R6E, S13		FS
79-31	T17S, R6E, S13		FS
79-32	T17S, R7E, S19	WILDLIFE	PL
79-33	T17S, R7E, S19		PL
79-34	T17S, R7E, S8		PL
79-35	T17S, R7E, S8		PL
79-36	T17S, R7E, S8		PL
79-37	T17S, R7E, S8		PL
79-38	T17S, R7E, S16	TROUGH	FS

TABLE HT-8
UTAH POWER & LIGHT COMPANY
EAST MOUNTAIN SPRING OWNERSHIP

Spring	Location	Resource	Owner
79-39	T17S, R7E, S20		PL
79-40	T17S, R7E, S21		PL
80-41	T17S, R7E, S21		PL
80-42	T17S, R7E, S21		PL
80-43	T17S, R7E, S20		PL
80-44	T17S, R7E, S21	WILDLIFE	PL
80-45	T17S, R7E, S21		PL
80-46	T17S, R7E, S21		PL
80-47	T17S, R7E, S21		PL
80-48	T16S, R7E, S33	TROUGH	FS
80-49	T16S, R7E, S33	TROUGH	FS
80-50	T16S, R7E, S29	LIVESTOCK	FS
82-51	T17S, R7E, S26	TROUGH WR# 93-1605	FS
82-52	T17S, R7E, S15		PL
84-53	T17S, R7E, S20		PL
84-54	T17S, R7E, S5		PL
84-55	T17S, R7E, S20		PL
84-56	T17S, R7E, S28		FS
84-57	T17S, R7E, S10	WILDLIFE	PL
86-58	T17S, R6E, S12		FS
86-59	T17S, R7E, S8		PL
89-60	T17S, R7E, S16		FS
89-61	T17S, R7E, S5		
89-62	T16S, R6E, S36		
89-63	T16S, R6E, S36	LIVESTOCK WR# 93-717	ST
89-64	T16S, R7E, S31		
89-65	T16S, R7E, S31		
89-66	T17S, R7E, S5	LIVESTOCK WR# 93-275	PL
89-67	T16S, R7E, S32	LIVESTOCK WR# 93-562	ST
89-68	T16S, R7E, S32	LIVESTOCK WR# 93-562	ST
89-69	T16S, R6E, S1		
89-70	T16S, R6E, S36		
89-71	T16S, R6E, S1		
North Springs	T16S, R7E, S28	DEVELOPED	FS
South Spring	T16S, R7E, S28	DEVELOPED	FS
Side Canyon Springs	T16S, R7E, S28	DEVELOPED	FS
East Mtn. Tank	T17S, R6E, S1	TROUGH	FS

FS = Forest Service
PL = Private Land

TABLE HT-9

EAST MOUNTAIN TEMPERATURES - HISTORICAL SUMMARY

OCTOBER SUMMARY

	HIGH	LOW
AVG.	45.8	30.1
MAX.	59.6	41.7
MIN.	22.3	9.5

NOVEMBER SUMMARY

	HIGH	LOW
AVG.	34.1	21.2
MAX.	48.4	36.1
MIN.	13.0	1.9

DECEMBER SUMMARY

	HIGH	LOW
AVG.	29.4	13.3
MAX.	43.6	27.1
MIN.	2.7	-8.8

JANUARY SUMMARY

	HIGH	LOW
AVG.	29.8	14.6
MAX.	45.3	28.6
MIN.	2.0	-15.2

FEBRUARY SUMMARY

	HIGH	LOW
AVG.	32.1	15.2
MAX.	46.3	30.1
MIN.	-2.3	-14.7

MARCH SUMMARY

	HIGH	LOW
AVG.	37.0	19.7
MAX.	50.3	31.0
MIN.	13.3	0.1

APRIL SUMMARY

	HIGH	LOW
AVG.	46.0	26.3
MAX.	62.1	40.8
MIN.	12.7	-0.3

MAY SUMMARY

	HIGH	LOW
AVG.	52.2	32.6
MAX.	69.9	45.6
MIN.	15.8	3.4

JUNE SUMMARY

	HIGH	LOW
AVG.	66.2	43.4
MAX.	78.5	58.1
MIN.	27.7	13.1

JULY SUMMARY

	HIGH	LOW
AVG.	72.4	51.0
MAX.	83.5	59.4
MIN.	48.5	20.4

AUGUST SUMMARY

	HIGH	LOW
AVG.	70.2	50.2
MAX.	80.4	58.4
MIN.	47.6	32.7

SEPTEMBER SUMMARY

	HIGH	LOW
AVG.	59.7	41.0
MAX.	75.1	53.4
MIN.	31.6	20.0

HISTORICAL SUMMARY

PARAMETER	DATE	TEMP
AVERAGE HIGH		47.9
MAXIMUM HIGH	04-Jul-85	86.9
AVG. MAX. HIGH		84.2
MINIMUM HIGH	05-Feb-89	-2.3
AVG. MIN. HIGH		6.6
AVERAGE LOW		30.2
MAXIMUM LOW	03-Jun-89	67.0
AVG. MAX. LOW		61.5
MINIMUM LOW	31-Jan-85	-15.2
AVG. MIN. LOW		-6.5

DOCUMENT No.: 1168k

Des Bee Dove Mine

Permit No.: UT-0023591

STATE OF UTAH
DEPARTMENT OF HEALTH
BUREAU OF WATER POLLUTION CONTROL
P.O. BOX - 16690
SALT LAKE CITY, UTAH 84116-0690

AUTHORIZATION TO DISCHARGE UNDER THE

UTAH POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with provisions of the "Utah Water Pollution Control Act", Title 26 Chapter 11 Utah Code Annotated 1953, as amended, the "Act",

Utah Power and Light Company, Des-Bee Dove Coal Mine,

is authorized to discharge from its wastewater treatment facility located at Section 36, Township 17 South, Range 7 East, Emery County, Utah,

to receiving waters named Grimes Wash, a tributary to Cottonwood Creek,

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective February 11, 1988.

This permit and the authorization to discharge shall expire at midnight, October 31, 1992.

Signed this 11th day of February, 1988.

[signature]

Authorized Permitting Official
Executive Secretary
Water Pollution Control Committee

PERMITTEE NAME/ADDRESS (*Include Facility Name/Location if different*)

NAME Utah Power & Light Co.
ADDRESS Mining Division
P.O. Box 310
Huntington, Utah 84528
FACILITY Des-Bee-Dove Mine
LOCATION Orangeville, UT
Attn: Ray Christensen

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

(2-16) UT-0023591 PERMIT NUMBER

(17-19) 001 DISCHARGE NUMBER

Sediment Pond Outfall

Form Approved.
OMB No. 2040-0004
Approval expires 9-30-86

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
FROM	(20-21)	(22-23)	(24-25)	TO	(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		QUANTITY OR LOADING (3 Card Only) AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	QUALITY OR CONCENTRATION (4 Card Only) MINIMUM (38-45)	AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Flow	SAMPLE MEASUREMENT			gpd	***	***	***	* *		Once/ month	GRAB
00056 1 0	PERMIT REQUIREMENT	Report 30-Day Avg	Report Daily Max		***	[illegible]	***				
pH	SAMPLE MEASUREMENT	***	***	* *		***		s.u.		Once/ week	GRAB
00400 1 0	PERMIT REQUIREMENT	***	***		6.5 Minimum	[illegible]	9.0 Maximum				
Total Suspended Solids	SAMPLE MEASUREMENT	***	***	* *				mg/l		Once/ month	GRAB
00530 1 0	PERMIT REQUIREMENT	***	***		25 30-Day Avg	[illegible] 7-Day Avg	70 Daily Max				
Total Iron	SAMPLE MEASUREMENT	***	***	* *	***			mg/l		Once/ month	GRAB
01045 1 0	PERMIT REQUIREMENT	***	***		***	Report 30-Day Avg	2.0 Daily Max				
Total Dissolved Solids	SAMPLE MEASUREMENT			lbs/ day	***			mg/l		Once/ month	GRAB
70296 1 0	PERMIT REQUIREMENT	Report 30-Day Avg	2000 Daily Max		***	Report 30-Day Avg	Report Daily Max				
Oil and Grease	SAMPLE MEASUREMENT	***	***	* *	***			mg/l		Once/ month	GRAB
00556 1 0	PERMIT REQUIREMENT	***	***		***	Report 30-Day Avg	10 Daily Max				
Total Settleable Solids	SAMPLE MEASUREMENT	***	***	* *	***			ml/l		Contin- gent	GRAB
00545 1 0	PERMIT REQUIREMENT	***	***			Report 30-Day Avg	[illegible] Daily Max				

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	CERTIFICATION	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE AREA CODE	NUMBER	DATE YEAR	MO	DAY
TYPED OR PRINTED	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (*Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years*)						

COMMENT AND EXPLANATION OF ANY VIOLATIONS (*Reference all attachments here*)

For intermittent discharges, the duration of the discharge shall be reported. Settleable solids need only be measured during periods of precipitation, instead of Suspended solids-report "NR" where value is not required.

DES-BEE-DOVE MINE

UPDES PERMIT

NUMBER UT-0023591

TABLE OF CONTENTS

I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. The "30-day (and monthly) average", other than for fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria and total coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.

2. The "7-day (and weekly) average", other than for fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria and total coliform bacteria. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains the Saturday.

3. "Daily Maximum" ("Daily Max.") is the maximum value allowable in any single sample or instantaneous measurement.

4. "Composite samples" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

   a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

   b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;

   c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,

d. Continuous collection of sample, with sample collection rate proportional to flow rate.

5. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

6. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

7. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

8. "Bypass" means the diversion of waste streams from any portion of a treatment facility.

9. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. "Executive Secretary" means Executive Secretary of the Utah Water Pollution Control Committee.

11. "EPA" means the United States Environmental Protection Agency.

12. "Active mining area" means the areas on and beneath land used or disturbed in activity related to the extraction, removal, or recovery of coal from its natural deposits. This term excludes coal preparation plants, coal preparation plant associated areas and post-mining areas.

13. "Reclamation area" means the surface area of a coal mine which has been returned to required contour and on which revegetation (specifically, seeding or planting) work has commenced.

14. The term "10-year, 24-hour precipitation event" shall mean the maximum 24-hour precipitation event with a probable reoccurrence interval of once in 10 years as defined by the National Weather Service and Technical Paper No. 40, "Rainfall Frequency Atlas of the U.S.", May 1961, and subsequent amendments or equivalent regional or rainfall probability information developed therefrom.

15. The term "coal preparation plant" means a facility where coal is crushed, screened, sized, cleaned, dried, or otherwise prepared and loaded for transit to a consuming facility.

16. The term "coal preparation plant associated areas" means the coal preparation plant yards, immediate access roads, coal refuse piles, and coal storage piles and facilities.

17. The term "settleable solids" is that matter measured by the volumetric method specified below:

    The following procedure is used to determine settleable solids:

    Fill an Imhoff cone to the one-liter mark with a thoroughly mixed sample. Allow to settle undisturbed for 45 minutes. Gently stir along the inside surface of the cone with a stirring rod. Allow to settle undisturbed for 15 minutes longer. Record the volume of settled material in the cone as milliliters per liter. Where a separation of settleable and floating material occurs, do not include the floating material in the reading.

B. Specific Limitations and Self-Monitoring Requirements.

1. During the period beginning immediately and lasting through the duration of this permit the permittee is authorized to discharge from all point sources associated with active mining operations indicated on the area maps submitted and approved pursuant to Part IV, P.1. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations a/			Monitoring Requirements	
	Average		Daily	Measurement	Sample
	30-day	7-Day	Maximum	Frequency	Type
Flow, gpd	N/A	N/A	N/A	Monthly	Measured b/
Suspended Solids,mg/L	25	35	70	Monthly	Grab
Total Iron, mg/L	N/A	N/A	2.0	Monthly	Grab
Dissolved Solids,mg/L	N/A	N/A	N/A c/	Monthly	Grab

Oil and Grease shall not exceed 10 mg/L and shall be monitored monthly by a grab sample.

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units and shall be monitored weekly by a grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge of sanitary wastes or process water.

a/ See Definitions, Part I. A. for definition of terms.

b/ For the intermittent discharges, the duration of the discharge shall be reported along with the flow.

c/ The total amount of Total Dissolved Solids (TDS) discharged from outfall 001 decant operations is limited to one ton (2,000 pounds) per day of TDS.

2. Samples taken in compliance with the monitoring requirements specified above shall be taken of the following location(s): at any point which is representative of each discharge prior to its mixing with the receiving stream and as indicated by the solid triangles on the current area maps submitted pursuant to Part IV, P. 1.

B. Specific Limitations and Self-Monitoring Requirements (Active Mining Operations) (Continued).

3. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) at Outfall(s) 001 may comply with the following limitation instead of the Total Suspended Solids limitations contained in Part I, B.1:

Effluent Characteristic	Daily Maximum
Settleable Solids	0.5 ml/L

In addition to the monitoring requirements specified under Part I, B.1, all effluent samples collected during storm water discharge events shall also be analyzed for settleable solids. Such analyses shall be conducted on grab samples.

4. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within a 24-hour period greater than the 10-year, a 24-hour precipitation event (or snowmelt of equivalent volume) at Outfall 001 may comply with the following limitations instead of the otherwise applicable limitations:

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units. However, as stated under Part I., B.1, all effluent samples collected at Outfall 001 during storm water discharge events shall be analyzed for settleable solids and the parameters identified under Part I,B.1.

5. The operator shall have the burden of proof that the discharge or increase in discharge was caused by the applicable precipitation event described in Parts I,B.3 and B.4. The alternate limitations in Parts I, B.3 and B.4 shall not apply to treatment systems that treat underground mine water only.

6. Best Management Practices. The company shall implement and maintain best management practices for the control of road salt storage runoff and for the prevention of the discharge of process water.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under Utah Administrative Code (UAC) Section R448-2-10, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Reporting of Monitoring Results. Monitoring results obtained during the previous quarter shall be summarized on separate Discharge Monitoring Report Forms (DMR, EPA No. 3320-1). All three DMRs for the quarter shall be postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on April 28, 1988. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the requirements of Signatory Requirements (see Part IV), and submitted to the Executive Secretary, Utah Bureau of Water Pollution Control and to EPA at the following addresses:

original to: Utah Department of Health
Bureau of Water Pollution Control
P.O. Box 16690
Salt Lake City, Utah 84116-0690

Attention: Compliance and Monitoring Program

copy to: United States Environmental Protection Agency
Region VIII
Denver Place
999 18th Street, Suite 500
Denver, Colorado 80202-2405

Attention: Water Management Division
Compliance Branch (8WM-C)

E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under UAC Section R448-2-10 as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated.

G. Records Contents. Records of monitoring information shall include:
1. The date, exact place, and time of sampling or measurements:
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Secretary at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of this UPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall (orally) report any noncompliance which may seriously endanger health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Utah Bureau of Water Pollution Control, (801) 538-6146, or 24 hour answering service (801) 538-6333.

2. The following occurrences of noncompliance shall be reported by telephone to the Utah Bureau of Water Pollution Control, Permits and Compliance Section at (801) 538-6146 by the first workday (8:00 a.m. - 5:00 p.m. Mountain Time) following the day the permittee became aware of the circumstances:

   a. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G, Bypass of Treatment Facilities.);

   b. Any upset which exceeds any effluent limitation in the permit (See Part III.H, Upset Conditions.); or,

   c. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit.

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

   e. Steps taken, if any, to mitigate the adverse impacts on the environment and human helath during the noncompliance period.

4. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Permits and Compliance Section, Utah Bureau of Water Pollution Control (801) 538-6146.

5. Reports shall be submitted to the addresses in <u>Part II.D, Reporting of Monitoring Results.</u>

J. <u>Other Noncompliance Reporting</u>. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D are submitted. The reports shall contain the information listed in Part II.I.2.

K. <u>Inspection and Entry</u>. The permittee shall allow the Executive Secretary, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Executive Secretary of the Water Pollution Control Committee of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The Act (UWPCA) provides that any person who violates a permit condition implementing provisions of the Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine not exceeding $25,000 per day of violation. Any person convicted under Section 26-11-16(2) UWPCA a second time shall be punished by a fine not exceeding $50,000 per day. Except as provided in permit conditions on Part III.G, Bypass of Treatment Facilities and Part III.H, Upset Conditions, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process, whether or not this process is needed to achieve permit effluent compliance.

F. Removed Substances. Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be buried or disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digestor supernatant and filter backwash shall not directly enter either the final effluent or waters of the state by any other direct route.

G. Bypass of Treatment Facilities.

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2 and 3 of this section. Return of removed substances, as described in Part III.F, to the discharge stream shall not be considered a bypass under the provisions of this paragraph.

2. Notice:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 60 days before the date of the bypass.

   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I, Twenty-four Hour Reporting.

3. Prohibition of bypass.

   a. Bypass is prohibited and the Executive Secretary may take enforcement action against a permittee for a bypass, unless:

      (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage ;

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

      (3) The permittee submitted notices as required under paragraph 2 of this section.

b. The Executive Secretary may approve an anticipated bypass, after considering its adverse effects, if the Executive Secretary determines that it will meet the three conditions listed above in paragraph 3.a of this section.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2. of this section are met. The Executive Secretary's administrative determination regarding a claim of upset cannot be judiciously challenged by the permittee until such time as an action is taken for noncompliance.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated;

   c. The permittee submitted notice of the upset as required under Part II.I, Twenty-four Hour Notice of Noncompliance Reporting; and,

   d. The permittee complied with any remedial measures required under Part III.D, Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Federal Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

J. <u>Changes in Discharge of Toxic Substances</u>. Notification shall be provided to the Executive Secretary as soon as the permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. One hundred micrograms per liter (100 ug/L);

   b. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

   c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with UAC Section R448-8-3.4 (7) or (10); or,

   d. The level established by the Executive Secretary in accordance with UAC Section R448-8-4.2(6).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. Five hundred micrograms per liter (500 ug/L);

   b. One milligram per liter (1 mg/L) for antimony:

   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with UAC Section R448-8-3.4(9); or,

   d. The level established by the Executive Secretary in accordance with UAC Section R448-8-4.2(6).

IV. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as defined in UAC Section R448-8-1.5; or,

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Part IV.A.1.

B. Anticipated Noncompliance. The permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Executuive Secretary shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer;

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,

   b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2. must be submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential under UAC Section R448-8-3.2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Executive Secretary. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the permittee of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Federal Clean Water Act or the Utah Water Pollution Control Act.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Executive Secretary at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Executive Secretary does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 26-11-19 of the Act.

O. Water Quality Standard Requirement - Reopener Provision
This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.

3. A revision to the current 208 plan is approved and adopted which calls for different effluent limitations than contained in this permit.

P. OTHER REQUIREMENTS

1. General Requirements

a. Area Maps (Active Mining Operations)

(1) Facilities which have already identified the location of each discharge need not submit an area map.

(2) The permittee shall submit revised Area Map(s) to show any changes, corrections, or other modifications or adjustments of the location of the point source discharges. The purpose of this requirement is to assure that the State and EPA are kept fully advised as to the current location of such discharges.

(3) The revised Area Map(s) shall be submitted in the form specified below and shall be made from USGS topographical maps (7.5 or 15-minute series) or other appropriate sources as approved by the Executive Secretary. Each revised Area Map shall be 8 1/2 inches by 11 inches and shall be in black and white suitable to produce readable copies by rapid printing methods. (xerox, Dennison, Offset printing, etc.) or as approved by the Executive Secretary. Where additional 8 1/2 inch by 11 inch maps are required to show the area of operation, they shall be numbered and a key shall be shown on the first map. The first map section shall have the company name, mine/job name, address, and UPDES number clearly printed theron. Also, one line of latitude and one line of longitude shall be marked on each map section. The Area Map(s) shall delineate the following, using the graphics as indicated:

(a) Existing Area of Operation ____________ (Solid Outline)

(b) Existing point source ▲ (Solid Triangle)

(c) The projected area of operation for the next five years ----------- (Dashed Outline)

(d) Project Point source for the next five years △ (Opened Triangle)

(e) The monitoring reports must indicate the active-inactive status of all discharge points which are listed on the current area maps. These discharge points shall be assigned numbers 001, 002, 003, etc.

b. Monitoring of a discharge may be terminated if either:

   (1) Sufficient data has been accumulated to show to the satisfaction of the Executive Secretary or his designee that the untreated discharge from an area where active mining has ceased will meet the limitations herein; or,

   (2) The discharge emanates from an area on which the State of Utah has released the grading bond or has taken other similar action.