COTTONWOOD/WILBERG
ACT/015/019

HYDROLOGIC MONITORING PROGRAM

ANNUAL REPORTS FOR 1979, 1980, 1981

MAR 20 1981
OIL, GAS & MINING

UTAH POWER & LIGHT COMPANY
HYDROLOGIC MONITORING PROGRAM
ANNUAL REPORT FOR 1979

MARCH 1980

Submitted to: United States Department of the Interior
Office of Surface Mining
Geological Survey
Utah Division of Oil, Gas and Mining

Prepared and submitted for Utah Power & Light Company by:

Hydrologic Section of the Power Operation Department;

Mining and Exploration Department

TABLE OF CONTENTS

	Page No.
Introduction	1
Climatic Observations	3
Regional Climatology	4
Local Climatology	5
Precipitation	5
Temperatures	6
Water Monitoring Program	8
Drainage Systems	8
Huntington Creek Drainage System	8
Huntington Creek	8
Deer Creek	12
Cottonwood Creek Drainage System	13
Cottonwood Creek	14
Grimes Wash	16
East Mountain Springs	17
Mine Water	21
Church Mines	21
Wilberg Mine	23
1. In-mine monitoring	26
2. In-mine quality	32
3. Discharge	35
Deer Creek Mine	38
1. In-mine monitoring	38
2. In-mine quality	40
3. Discharge	41
Drill Hole Monitoring	42
Summary and Conclusions	43

LIST OF TABLES

Table No.		Page No.
1.	Precipitation in Emery County, Utah	5
2.	Comparison of 1978 and 1979 Precipitation	6
3.	Temperatures in Emery County, Utah	6
4.	Comparison of 1978 and 1979 Temperatures	7
5.	Huntington Creek Water Flows	9
6.	Comparison of 1978 and 1979 Runoff Values	10
7.	Huntington Creek Water Quality	11
8.	Huntington Creek Water Quality, 1978-1979	12
9.	Deer Creek Surface Water Quality	13
10.	Cottonwood Creek (Straight Canyon) Water Quality	15
11.	Cottonwood Creek Water Quality	16
12.	Grimes Wash Water Quality	16
13.	East Mountain Springs Discharges	18
14.	USGS Flow Data for East Mountain Springs	19
15.	East Mountain Springs Discharges, 1978-1979	19
16.	East Mountain Springs Water Quality	20
17.	East Mountain Springs Water Quality, 1978-79	21
18.	Natural Runoff Water Quality in Vicinity of Church Mines	22
19.	Wilberg Mine Water Production and Consumption	24
20.	Wilberg Mine In-mine Flow Measurements (gpm)	30
21.	Wilberg Mine In-mine Water Quality	33
22.	Wilberg Mine Electrical Conductivity Survey	34
23.	Wilberg Mine Discharge	36
24.	Wilberg Mine Discharges, 1978-1979	36
25.	Wilberg Mine Discharge Water Quality	37
26.	Wilberg Mine Discharge Water Quality, 1978-1979	37
27.	Deer Creek Mine In-mine Water Quality	40
28.	Deer Creek Mine Discharge Water Quality	42
29.	Deer Creek Mine Discharge Water Quality, 1978-1979	42

LIST OF APPENDICES

Appendix

A. OSM and Oil, Gas and Mining Correspondence

B. Huntington Creek Stream Flows

C. Huntington Creek Water Quality

D. Deer Creek Surface Water Quality

E. Cottonwood Creek (Straight Canyon) Water Quality

F. Grimes Wash Water Quality

G. East Mountain Springs Water Quality

H. Wilberg Mine In-mine Water Quality

I. Wilberg Mine Discharge Water Quality

J. Deer Creek Mine In-mine Water Quality

K. Deer Creek Mine Discharge Water Quality

LIST OF FIGURES

Figure No.		Page No.
1.	Wilberg Mine Water Production	27
2.	Wilberg Coal Mine	28
3.	Idealized View of Mine Dewatering Process	31
4.	Deer Creek Coal Mine	39
5.	Drill Hole Water Monitoring Stations	44
6.	Elevation vs Total Dissolved Solids of Springs and Surface Streams	46

LIST OF MAPS

Map No.

1. Water Monitoring Stations ..... Map Pocket
2. Springs Map ..... Map Pocket

INTRODUCTION

This 1979 Water Monitoring Report is hereby submitted in accordance with the U.S. Department of Interior, Office of Surface Mining requirements for hydrologic monitoring in areas adjacent to coal mining operations. The specific regulations are set forth in Section 30 CFR 211 of the Coal Mine Operating Regulations of 1977.

This report is the second annual hydrologic report submitted by Utah Power & Light Company since the report entitled "Monitoring of the Water Resources in the Mining Areas of East Mountain, Emery County, Utah" was submitted to the U.S. Geological Survey and the Utah Division of Oil, Gas and Mining in December, 1977. This report addresses both flow observations as well as water quality characteristics of the water resources adjacent to Utah Power & Light Company (UP&L) mining areas in Emery County (see Map #1).

The letter dated August 31, 1979 from the Office of Surface Mining (OSM) to the Utah Division of Oil, Gas and Mining indicated federal approval of the hydrology monitoring plan which was submitted by Utah Power & Light as a portion of the December 1977 report. Subsequently, the Utah Division of Oil, Gas and Mining indicated approval of Utah Power & Light's monitoring plan in the letter to Utah Power & Light dated October 10, 1979. Both letters can be found in APPENDIX A.

OSM indicated in their letter that due to the concern of subsidence interfering with springs on East Mountain, monitoring should be conducted on a quarterly basis. Since East Mountain is inaccessable from November until May

due to heavy snows, monitoring can be conducted only during the summer and fall of each year.

Information was compiled the past year from in-house as well as from state, federal and private agencies which are shown as follows:

U.S. Geological Survey

U.S. Forest Service

U.S. Department of Commerce, National Weather Service

Utah Division of Oil, Gas and Mining

Utah Division of Environmental Health

Huntington-Cleveland Irrigation Company

Emery Water Conservancy District

Cottonwood Creek Consolidated Irrigation Company

Information from outside agencies will continue to be utilized each year for as long as their data gathering programs continue. By using this outside information, a cooperative effort is realized and duplication of effort and expense is substantially reduced.

Significant events with respect to water monitoring which occurred during 1979 are discussed as follows:

1. Difficulties in locating and identifying East Mountain springs during 1978 were essentially eliminated during 1979. An aerial survey plus extensive field observations confirmed the existence of 48 flowing springs and seeps. Further discussion of the East Mountain springs can be found after the section on surface streams.

2. A continuous flow recording device was installed at the Deer Creek Mine portal during December 1979 to monitor the discharge of water from the Deer Creek Mine. This device was installed to record the fluctuation of discharges as well as to obtain more reliable data for formulating a water budget analysis within the Deer Creek Mine.
3. The U.S. Geological Survey installed a float level recorder at drill hole EM 31 located in Cottonwood Canyon below Roans Canyon. The purpose of the recorder will be to monitor fluctuation in ground water levels during the year and to relate those levels to surface water supplies. Additional information regarding ground water observations can be found later in the report.
4. Metering devices were installed in the Wilberg Mine to monitor mine water production, mine use and to formulate a water budget analysis. Further information can be found later in the report.
5. Utah Power & Light and USGS in a cooperative effort obtained limited information regarding a regional water table in the Star Point Sandstone. It is anticipated that a better understanding of ground water conditions in this formation will be realized from this monitoring effort.

CLIMATIC OBSERVATIONS

In general, runoff and subsequent water supplies are a direct function of the climatic conditions in any given area. Furthermore, the significance of the weather affecting the flow characteristics of the East Mountain springs cannot be overemphasized. Consequently, weather observations will be addressed with respect to resulting spring discharges and associated runoff which occurred

in the vicinity of East Mountain, not only for 1979 but for all water monitoring reports submitted in the future.

Most of the water supply in the Western United States originates in the high mountain ranges as snowfall during winter periods. Snowmelt augmented by spring precipitation produces runoff which is utilized downstream. Fall precipitation influences soil moisture conditions prior to snowpack accumulation and has a bearing upon runoff the following year.

REGIONAL CLIMATOLOGY

Winter precipitation during 1978-79 was extremely variable throughout the Western United States. Generally Arizona, New Mexico, Southern California and the Southern half of Nevada, Colorado and Utah received tremendous amounts of precipitation in excess of 150 percent of normal. Northern intermountain states received much less precipitation with areas in Washington receiving only 25% to 50% of normal winter precipitation.

The excessive winter moisture in Southern Utah resulted in streamflows above average during the 1979 runoff period. The runoff was not as great as expected however, and can probably be attributed in part to the extremely deficient precipitation and resulting soil moisture deficit in the fall of 1978.

Deficient summer and fall precipitation during 1979 did little to add to the water supply and resulted in a significant soil moisture deficit throughout Utah.

Temperatures during the year were generally much colder than normal during the winter and much warmer than normal during the summer and fall of 1979. The above normal summer and fall temperatures further magnified the soil moisture deficit which will certainly influence the 1980 spring runoff.

LOCAL CLIMATOLOGY

PRECIPITATION

Precipitation in Emery County during 1979 followed a pattern similar to the southern intermountain area, being characterized by heavy winter snowfall and light summer and fall rainfall.

Precipitation amounts recorded at the Hunter (Emery) Plant, Huntington Plant and Electric Lake for the 1979 water year (October 78 - September 79) will be presented since these sites include low elevation, intermediate elevation and high elevation observation sites in the immediate vicinity of mining activities. The values are shown in the following Table.

TABLE 1: Precipitation in Emery County, Utah

	Hunter Plant (Elev. 5800')		Huntington Plant (Elev. 6500')		Electric Lake (Elev. 8350')	
Month	Precip (in)	% of Normal	Precip (in)	% of Normal	Precip (in)	% of Normal
Oct. 1978	.03	4	.02	3	.40	19
Nov.	2.22	435	2.65	449	3.18	171
Dec.	.22	41	.25	53	2.66	92
Jan. 1979	1.43	333	1.21	228	2.90	144
Feb.	.53	129	.52	153	2.18	125
Mar.	2.43	579	2.50	403	2.53	132
Apr.	.24	56	0	0	.72	43
May	.47	80	.84	147	1.67	112
June	0	0	.05	12	.19	23
July	0	0	.09	9	.96	82
Aug.	.79	78	3.32	488	2.29	269
Sept.	0	0	.20	38	.32	30
Oct. - Sept.	8.36	120	11.65	156	20.00	102
Mean Monthly	.70	-	.97	-	1.67	-

A comparison of precipitation received at the three locations for 1978 and 1979 merits consideration in this study. The intent is to develop a correlation between yearly precipitation and spring discharges on East Mountain.

The comparison of 1978-1979 precipitation recorded at the three locations is presented in Table 2 on the following page.

TABLE 2: Comparison of 1978 and 1979 Precipitation

Station	1978 Amount	1978 % of Normal	1979 Amount	1979 % of Normal	1979 % of 1978
Hunter Plant	6.84	98	8.36	120	122
Huntington Plant	8.73	127	11.65	156	133
Electric Lake	21.40	109	20.00	102	93
Average %		111		126	116

Table 2 indicates that normal to above normal precipitation was recorded at the three stations for 1978 and 1979. Precipitation was greater during 1979 however, as depicted by the higher percent of normal in the Table.

TEMPERATURES

Temperature variations have a great influence on water supplies from the standpoint of peak flows as well as for duration of runoff from a watershed area. Accordingly, temperature information has been incorporated into this report.

Temperatures were highly variable during 1979 in Emery County. Winter temperatures were much colder than normal while summer temperatures were much warmer than normal. The average monthly temperatures and departures from normal during the 1979 water year are presented in Table 3.

TABLE 3: Temperatures in Emery County, Utah

Month	Hunter Plant Average Temp. (°F)	Hunter Plant Departure from Normal	Huntington Plant Average Temp. (°F)	Huntington Plant Departure from Normal	Electric Lake Average Temp. (°F)	Electric Lake Departure from Normal
Oct.	53.4	+5.0	55.2	+5.8	43.4	+5.9
Nov.	37.8	+2.6	38.7	+2.7	27.4	+1.7
Dec.	17.4	-9.3	22.1	-5.3	12.4	-3.4
Jan.	13.4	-10.7	17.5	-6.1	11.8	-2.8
Feb.	20.1	-8.3	24.1	-6.1	17.9	-1.4
Mar.	35.5	-0.3	36.8	-0.9	25.1	+4.3
Apr.	45.9	+1.3	46.0	+0.9	31.7	+3.0
May	56.9	+4.8	55.9	+1.0	38.9	-0.1
June	68.0	+6.6	66.1	+0.3	49.8	+1.2

TABLE 3: Temperatures in Emery County, Utah - contd.

Month	Hunter Plant Average Temp. (°F)	Hunter Plant Departure from Normal	Huntington Plant Average Temp. (°F)	Huntington Plant Departure from Normal	Electric Lake Average Temp. (°F)	Electric Lake Departure from Normal
July	75.4	+7.0	73.5	+1.8	59.0	+3.3
Aug.	71.3	+4.9	67.2	-2.2	56.0	+2.2
Sept.	69.5	+10.8	65.6	+5.2	53.2	+5.7
Oct. - Sept.	47.1	+1.2	47.4	-0.2	35.6	+1.7

A comparison of 1978 and 1979 temperatures for the three stations is addressed since temperatures also influence water supplies from year to year. Table 4 depicts the variation from 1978 to 1979.

TABLE 4: Comparison of 1978 and 1979 Temperatures

Station	1978 Average Temp. (°F)	1978 Departure form Normal	1979 Average Temp. (°F)	1979 Departure from Normal	Departure from 1978
Hunter Plant	47.6	+1.7	47.1	+1.2	-0.5
Huntington Plant	49.3	+1.7	47.4	-0.2	-1.9
Electric Lake	34.9	+1.0	35.6	+1.7	+0.7
Average Departure from Normal		+1.5		+0.9	-0.6

It can be concluded that temperatures were above normal for both 1978 and 1979 with the exception Huntington Plant in 1979. Daily average temperatures were 0.6° lower in 1979 than those occurring in 1978.

WATER MONITORING PROGRAM

Utah Power & Light Company collected flow and water quality data pertaining to (1) drainage systems; (2) East Mountain springs; (3) and from the Utah Power & Light Company coal mines. These data have been collected and interpreted in the following sections of this report. All raw data are included in Appendices B through K.

DRAINAGE SYSTEMS

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 #1). These drainage boundaries including minor subdivisions to Cottonwood and Huntington Creeks are designated on the accompanying map. 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 which is a tributary to the Green River.

HUNTINGTON CREEK DRAINAGE SYSTEM

The Huntington Creek is comprised of many smaller tributary streams that feed the main stream. Deer Creek is the only tributary to Huntington Creek that eminates from within Utah Power & Light's coal mine areas. Data concerning Huntington Creek is addressed followed by a discussion of Deer Creek.

Huntington Creek flow data are recorded on a continuous basis by Utah Power & Light at two locations; one station is located near the Huntington Power Plant, the other being below Electric Lake which is about 22 miles upstream from the Huntington Plant.

Flow records are maintained by Utah Power & Light Company in order to determine water entitlements and reservoir storage allocation for the various users on the river.

The Utah Power & Light station near the plant was established in the fall of 1973. Prior flow records were obtained from the U.S. Geological Survey Station located about one mile downstream from Utah Power & Light's existing station. The U.S. Geological Survey Station was established in 1909, was discontinued in 1970 and was re-established in 1978. The Utah Power & Light station below Electric Lake was established in 1970 in order to determine available water supply for Electric Lake Dam. The dam was completed in December 1973 and water storage commenced shortly afterward.

The following table (Table 5) shows a summary of actual Huntington Creek flows below Electric Lake, at Huntington Plant, and calculated natural flow at Huntington Plant. The calculated natural flow considers actual flow recorded at the plant, plant diversions, Electric Lake storage change and lake evaporation. The average daily discharges for the 1979 water year (October 1978 - September 1979) at the two stations plus the calculated natural flow are found in Appendix B.

TABLE 5: Huntington Creek Water Flows

	Huntington Creek Below Electric Lake	Huntington Creek at Plant	Calc. Natural Flow at Plant
Total Yearly Flow (Ac. Ft.)	10,880	54,640	68,931
% of Normal	50*	78*	98
Average Discharge in Cubic Feet per Second (CFS)	15	76	95
Peak Discharge (CFS)	152	360	592
Date of Peak Discharge	August 8, 1979	May 28, 1979	May 28, 1979
Minimum Discharge in CFS	12	13	10
Date of Minimum Discharge	Oct. 14, 1978	Nov. 27, 1978	Nov. 27, 1978

*Due to upstream storage in Electric Lake.

During the 1979 spring runoff period approximately 10,000 acre feet of water was impounded behind Electric Lake Dam. On June 27, 1979 the lake reached the maximum contents of 28,221 acre feet which is about 94% of full capacity. Fishery releases, power plant water needs and lake evaporation dropped the lake volume to about 25,000 acre feet by September 30, 1979 (end of water year).

A comparison of runoff values from 1978 and 1979 is presented in Table 6 to demonstrate the great fluctuation in surface discharges from year to year.

TABLE 6: Comparison of 1978 and 1979 Runoff Values

	1978		1979		
	Amount	% of Normal	Amount	% of Normal	% of 1978
Runoff Stored in Electric Lake (Ac. Ft.)	14,000	150	10,000	107	71
Calculated Natural Flow at Plant (Ac. Ft.)	86,000	123	69,000	98	80
Actual Peak* Discharge at Plant (CFS)	585 (June 11, 1978)	-	360 (May 28, 1979)	-	62

An examination of Table 2 shows that although precipitation was much greater in 1979 the resulting 1979 runoff was significantly less than that which occurred in 1978. Interestingly, the 1979 precipitation for the three stations averaged 116% of the 1978 values while the 1979 runoff amounted to only 80% of the 1978 values. This can be explained in part by the deficient fall precipitation prior to the 1978-79 winter plus excessively hot temperatures which occurred during the summer and fall of 1979.

*Peak flow is the maximum recorded for a 24 hour period.

Water quality information on Huntington Creek was compiled on a monthly basis during 1979. Vaughn Hansen Associates conducted the sampling program and the analyses were performed by Ford Chemical Laboratory. The location of water quality sampling stations on Huntington Creek that were considered for this report are listed below (refer to Map #2).

1. Below Electric Lake
2. Above the Forks
3. Above the Power Plant Diversion
4. Below the Power Plant

Specific water quality constituents which were analyzed are shown in Table 7. Values are in milligrams per liter unless otherwise noted. Raw data can be found in APPENDIX C.

TABLE 7: Huntington Creek Water Quality

Parameter	Below Electric Lake			Right Fork Above Left Fork			Above Power Plant			Below Power Plant		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
pH (N.U.)	7.6	8.5	7.0	8.0	8.7	7.1	7.4	8.6	7.4	8.1	8.7	7.5
Diss. Oxy.	8.8	10.4	7.6	9.1	11.8	7.9	9.5	12.3	8.1	9.3	10.7	8.1
Sulfate	53	194	14	13	19	10	25.3	52	8.2	52	108	21
T. Susp. Solids	3.3	8.0	1.0	20	114	4.0	81	227	8.0	79	166	6.0
T. Diss. Solids	197	400	120	203	250	140	232	310	148	281	399	179
Spec. Cond. (umhos)	279	430	220	317	380	240	364	470	230	437	610	280
Turbidity (FTU)	3.6	10	0.5	5.5	30	0.4	-	-	-	-	-	-
Alkalinity (TOT.)	135	142	124	195	218	178	154	220	134	194	232	142
T. Hardness	153	170	138	196	222	174	202	250	136	233	298	158

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 occuring as the flow proceeds to the canyon mouth.

The comparison of water quality characteristics within the Huntington drainage for 1978 and 1979 is presented in Table 8. This comparison merits consideration in order to evaluate the changes in water quality from year to year. Average values are presented in milligrams per liter.

TABLE 8: Huntington Creek Water Quality 1978-1979

Parameter	Below Electric Lake		Right Fork Above Left Fork		Above Power Plant		Below Power Plant	
	1978	1979	1978	1979	1978	1979	1978	1979
pH (N.U.)	7.6	7.6	7.9	8.0	8.0	7.4	8.0	8.1
Diss. Oxy.	9.2	8.8	9.4	9.1	9.5	9.5	9.6	9.3
Sulfate	17	53	27	13	25.2	25.3	42.4	52
T. Susp. Solids	-	3.3	-	20	27.5	81	74.2	79
T. Diss. Solids	160	197	215	203	214	232	246	281
Spec. cond. (umhos)	245	279	330	317	329	364	380	437
Turbidity (FTU)	1.6	3.6	4.2	5.5	18.8	-	28.4	-
Alkalinity (TOT.)	133	135	176	195	182	154	186	194
T. Hardness	142	153	187	196	195	202	214	233

An examination of Table 8 indicates that the values for 1978 and 1979 are fairly consistent and uniform in comparison. TDS, specific conductance, turbidity, alkalinity and total hardness values were somewhat higher in 1979 while other constituents were about the same.

Deer Creek is a tributary to Huntington Creek and flows from the same canyon in which the Deer Creek Mine is located. Two water samples were obtained during the year at locations above and below the mine. Ford Chemical Laboratory and Standard Laboratories conducted the analyses. No flow data were obtained. The results of the analysis and the comparison with a sample obtained in 1978 are shown in Table 9. Values are in milligrams per liter unless otherwise noted. Where two samples were obtained, the values represent the average of two samples. Additional raw data can be found in APPENDIX D.

TABLE 9: Deer Creek Surface Water Quality

Parameter	1979 # of Samples	1979 Above the Mine	1979 Below the Mine	1978 Above the Mine	1978 Below the Mine
Acidity ($CaCO_3$)	1	12	14		
Alkalinity ($CaCO_3$)	2	248	283		
Chloride	1	12	22		
Conductivity (umhos)	1	470	730	360	420
Dissolved Oxygen	1	10.0	8.84		
Iron (total)	1	40.1	170		
Iron (dissolved)	1	.32	.65	.289	.390
Oil & Grease	2	.9	.9		
Sulfate	2	13.3	127		
Suspended Solids	2	702	10,290	521	1,124
Total Dissolved Solids	2	285	459	235	273
Flouride	1	.25	.31		
pH	2	8.1	7.9	6.97	6.92

An examination of Table 9 shows that a greater number of parameters were analyzed during 1979. The most significant difference in constituent concentration is indicated by the suspended solids parameter at the point of sampling below the mine workings. The average value for two samples (10,290 Mg/l) is about 9 times greater than the 1978 value of 1,124 Mg/l. The sample taken during may 1979 (see Appendix D) shows that the suspended sediment concentration was 20,540 Mg/l, about 18 times the 1978 concentration. Both the 1978 and 1979 samples were obtained during the spring runoff event. The high concentration of suspended solids indicates a highly eroding condition present at this time.

During 1979, Utah Power & Light constructed a large containment pond at the lower end of the surface workings which will substantially reduce water quality degradation due to erosion from surface disturbances at the mine.

COTTONWOOD CREEK DRAINAGE SYSTEM

The western and southern portions of East Mountain are intersected by Cottonwood Creek and its associated tributaries, including Grimes Wash. The

Cottonwood Creek drainage is about equal in size to the Huntington drainage and total discharge from each drainage is about 70,000 acre feet per year. The major structural feature on Cottonwood Creek is the Joe's Valley Reservoir which is located about 12 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.

Limited flow information for 1979 was acquired from the Emery Water Conservancy District and the Cottonwood Consolidated Irrigation Company. Joe's Valley storage on September 30, 1978 was 48,530 acre feet. Total storage on September 30, 1979 was equal to 45,040 acre feet, or a net decrease of 3,490 acre feet for the water year.

Joe's Valley filled on June 4, 1979 and spill occurred until July 2. A peak flow of 585 CFS was observed below Joe's Valley Dam on June 15. About 68,000 acre feet of water was delivered for irrigation during the year and net runoff from the Cottonwood Creek drainage was approximately 64,000 acre feet, or 90% of normal. By comparison, the Cottonwood drainage yielded about 85,000 acre feet of water during 1978, indicating that 1979 runoff amounted to 76% of 1978.

Water quality information for Cottonwood Creek (Straight Canyon) was acquired from the U.S. Geological Survey. The sampling station is located at the USGS stream gauging station site and is shown on Map #1. Table 10 shows the water quality characteristics of the samples obtained during 1979 plus a comparison with 1978 values. Additional quality data can be found in APPENDIX E.

TABLE 10: Cottonwood Creek (Straight Canyon) Water Quality

Parameter	1979 Ave.	1979 Max.	1979 Min.	1978 Ave.	1978 Max.	1978 Min.
pH	8.2	8.8	7.5	7.9	8.5	7.5
Sulfate	57.0	110	24	49	110	21
Total Dissolved Solids	283	353	215	271	372	203
Specific Conductance (umhos)	468	610	380	447	635	360

An analysis of the preceding table and lower Huntington Creek water quality indicates that both creeks have similar water quality characteristics. It would appear that the presence of Joe's Valley Reservoir would likely affect the characteristics of upstream runoff in a manner similar to Electric Lake on Huntington Creek. However, no water quality information is available to support that assumption.

The concentrations of the parameters shown in the table were somewhat higher in 1979 than the 1978 values. Water supplies were lower in 1979, which may account for higher mineral concentrations in the reduced water supply.

Utah Power & Light obtained water samples in two of the tributaries of the Cottonwood Creek drainage system; Cottonwood Creek and Grimes Wash (see Map #1). These sample data are discussed below.

Cottonwood Creek was sampled by Utah Power & Light in 1979 in the vicinity of the UP&L proposed portal (located near the Trail Mountain Mine) which is presently in the early exploratory stage. Five samples were obtained by Utah Power & Light during the period August through November, 1979. The average values of the sample analyses are shown in Table 11. Complete inorganic analyses of Utah Power & Light samples as well as water quality information furnished by the USGS can be found in Appendix E. Location of the sample stations is shown in the Appendix Map.

TABLE 11: Water Quality of Cottonwood Creek

Parameter	Above Trail Mtn. Mine	Below Trail Mtn. Mine	At USGS Flume	Above Straight Canyon
Alkalinity	262	266	244	272
Iron	0.14	0.20	0.23	0.18
Oil & Grease	1.05	2.48	0.40	0.64
Sulfate	53	50	50	76
Suspended Solids	8.25	9.0	16.0	8.0
Total Dissolved Solids	386	356	332	391
pH	7.5	7.7	7.6	7.8

Limited flow information at the USGS flume on Cottonwood Creek shows that summer discharges vary from 250 to 350 gallons per minute or about 0.67 cubic feet per second on the average. It is assumed that spring runoff is much greater but USGS flow data was not available to support that assumption.

Grimes Wash flow information was not obtained during 1979, however, water quality data was obtained by Utah Power & Light personnel. Samples were analyzed by Ford Chemical Laboratory and Standard Laboratories. Table 12 shows the average results of 1979 sampling in Grimes Wash. Raw Data can be found in APPENDIX F.

TABLE 12: Grimes Wash Water Quality

Parameter	Right Fork Above Mine (4 Samples)	Right Fork Below Mine (3 Samples)	Left Fork Above Mine (1 Sample)
Alkalinity	317	252	263
Iron	3.4	6.8	0.8
Oil & Grease	1.9	1.4	0.1
Sulfate	90	128	30
Suspended Solids	677	407	28
Total Dissolved Solids	523	308	327
pH	8.0	8.0	8.7

Of particular interest in Table 12 are the extremely high suspended sediment values from the Right Fork of Grimes Wash. The samples were obtained during May and June which coincides with the 1979 spring runoff period. It is expected that these high values would be reduced to nearly zero during low flow conditions occurring in late summer, fall and winter.

EAST MOUNTAIN SPRINGS

The 1979 water reconnaissance program of East Mountain Springs was initiated on June 27th with an aerial survey of East Mountain properties via helicopter. The locations of 102 possible springs were plotted on aerial photographs during the survey. Subsequent field work confirmed the location of 48 springs producing measurable amounts of water. The remaining sightings proved to be minor seeps, dry or runoff from other springs. The lesser known springs were given a number designation to avoid confusion due to varying nomenclature. Refer to Map #2 for spring locations.

The initial flow measurements and water quality sampling took place during the months of July and August. A small number of springs representing a wide range of flows and locations were sampled a second time in October.

Table 13 is a tabulation of flow data and a listing of the formations from which these springs flow. The majority of springs on East Mountain occur in the North Horn Formation with the major flowing springs restricted to this formation. The North Horn Formation is composed of a sedimentary sequence of variegated shales, sandstone, conglomerates and fresh water limestone. The variability of composition of this formation would likewise lead to a variation in permeability.

Overlying the North Horn Formation is the Flagstaff Limestone, a highly fractured unit. The fractured nature of the Flagstaff allows for good vertical transport of water with little lateral movement resulting in the occurrence of few springs. The majority of water percolates down to the North Horn Formation. When an impermeable zone is intersected during the water's vertical movement, 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

TABLE 13: EAST MOUNTAIN SPRINGS DISCHARGES

Spring	Elevation	Formation	Sample Date	Flow (GPM)	Sample Date	Flow (GPM)
Sheba Spring	9740	TKN-TF	7/10/79	12.0	10/22/79	0.95
Pine Spring	9940	TF	7/10/79	4.1	10/22/79	Dry
Pine Spring Trough	9920	TF	7/10/79	6.6	10/22/79	Dry
Upper Elk Spring	9350	TKN	7/10/79	1000.0 ?	10/22/79	75.0
Lower Elk Spring	9300	TKN	*7/10/79	350.0		
Ted's Tub	9250	TKN	7/10/79	65.0	10/22/79	12.0
Cove North Spring	8980	KPR	7/10/79	0.67		
Burnt Tree Spring	9260	TKN	7/10/79	12.0	10/22/79	1.9
79-1	9650	TKN-TF	7/10/79	40.0	10/22/79	5.0
79-2	9290	TKN	7/10/79	0.5		
79-3	9340	TKN	7/10/79	2.6		
79-4	9910	TF	7/11/79	2.4		
79-5	9910	TF	7/11/79	3.1		
79-6	9720	TKN-TF	7/11/79	0.86		
79-7	9710	TKN-TF ✓	7/11/79	0.53		
79-8	9490	TKN	7/12/79	2.0		
79-9	9650	TKN	7/12/79	4.1		
79-10	9430	TKN	7/12/79	6.0		
79-11	9220	TKN	7/12/79	6.0		
79-12	9320	TKN	*7/12/79	8.5		
79-13	9290	TKN	7/12/79	6.0		
79-14	9340	TKN	7/12/79	1.5		
79-15	9290	TKN	7/13/79	2.0		
79-16	9600	TKN	7/13/79	12.0		
79-17	9450	TKN	7/13/79	0.5		
79-18	9500	TKN	7/14/79	4.0		
79-19	9460	TKN	7/14/79	3.0		
79-20	9500	TKN	7/14/79	40.0		
79-21	9340	TKN	7/14/79	20.0		
79-22	9340	TKN	7/14/79	14.0		
79-23	9030	TKN-KPR	7/14/79	8.5		
79-24	8870	KPR	*7/14/79	34.0	10/22/79	2.4
79-25	8910	TKN-KPR	7/15/79	10.0		
79-26	9340	TKN	7/15/79	8.0		
79-27	9330	TKN	7/15/79	10.0		
79-28	9340	TKN ✓	*7/15/79	3.0	10/22/79	3.0
79-29	9350	TKN	7/26/79	4.0		
79-30	8900	TKN-KPR	7/26/79	1.5		
79-31	9270	TKN	7/26/79	0.6		
79-32	8850	KPR	7/26/79	1.4		
79-33	8710	KPR	7/26/79	1.4	10/22/79	1.3
79-34	9160	TKN	7/26/79	10.0		
79-35	9590	TKN-TF	7/26/79	20.0		
79-36	9080	TKN-KPR	7/27/79	1.3		
79-37	9140	TKN	7/27/79	1.4		
79-38	9070	TKN-KPR	7/27/79	2.0		
79-39	9270	TKN	8/23/79	14.0		
79-40	9030	KPR	8/23/79	0.4		

* No sample collected from these locations
TF - Flagstaff Limestone
TKN - North Horn Formation
KPR - Price River Formation

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 located.

A review of the flow measurements presented in Table 13 reflects the influence of seasonal melt waters on spring water production. The large producing springs experienced a decrease in flow from 82% to 93% from July to October. The smaller springs which are flowing from less permeable strata showed little or no difference in flow rates. These springs have a greater lag time thus responding to variations in recharge supplies more slowly.

The USGS conducted an extensive flow monitoring program on East Mountain during 1979. The results of flow monitoring for specific springs are presented in Table 14.

TABLE 14: USGS Flow Data for East Mountain Springs

Spring	Elevation	# of Measurments	Flow (gpm) Ave.	Max.	Min.
Sheba Spring (Roans Canyon)	9,740	5	10.1	27	2.2
Pine Spring	9,940	5	11.8	49	0
Elk Spring	9,350	5	235	566	63
Burnt Tree	9,260	5	17.2	30	10
Jerk Water	-	5	2.3	3.8	1.2
Ted's Tub	9,250	5	51.3	167	3.3

A comparison of 1978 and 1979 discharges from East Mountain Springs is presented in Table 15. The numbers shown represent average values for each year.

TABLE 15: East Mountain Springs Discharges, 1978-1979

Spring	1978 Flow in gpm	1979 Flow in gpm	1979 Expressed as % of 1978
Sheba Spring	4.9	10.1	206
Pine Spring	2.0	11.8	590
Elk Spring	164	235	143
Burnt Tree Spring	7.8	17.2	220
Jerk Water Spring	1.8	2.3	128
Total	180.5	276.4	153

An examination of the table reveals that discharges from East Mountain Springs were greater in 1979 for the five springs listed. Total average flow for 1979 amounted to 153 percent of the 1978 flows. Interestingly, surface discharges in Cottonwood and Huntington Creeks were lower in 1979 while East Mountain Spring discharges were significantly higher.

Flow data from Huntington City shows that average discharge from Little Bear and Big Bear Springs amounted to about 390 gallons per minute (gpm) during 1979. Average flows during 1978 were about 350 gpm, which computes to an increase of about 10% in 1979 over 1978 levels.

The East Mountain Springs will be carefully monitored in the future to enable Utah Power & Light personnel to evaluate changes in spring flows from year to year. Flow monitoring will be accomplished at the same time each year to insure comparability of the data.

No marked changes in water quality are evident for 1979. The water continues to be highly mineralized but of good quality. Again, calcium carbonate derived from the dissolution of calcareous strata contributed to the high concentration of dissolved solids and alkalinity. A summary of the average values obtained for specific East Mountain Springs is presented in Table 16. Raw data for individual springs can be found in APPENDIX G.

TABLE 16: East Mountain Springs Water Quality

Parameter	Sheba	Pine	Elk	Ted's Tub	Cove North	Burnt Tree
pH	8.1	8.4	8.2	7.9	8.3	7.8
Alkalinity	223	392	241	272	256	278
Suspended Solids	0.2	32	1.9	2.3	0.1	0.1
Total Dissolved Solids	250	227	250	295	304	291
Sulfate	7.0	8.2	15.1	20.4	10.7	7.8
Iron	0.4	1.8	0.16	0.1	0.03	0.07
Oil & Grease	0.6	0.1	0.6	2.2	0.1	0.7
Turbidity (NTU)	0.4	6.3	0.6	1.5	5.0	1.2

A comparison of water quality characteristics for 1978 and 1979 for Elk Spring, Burnt Tree Spring and Sheba Spring are presented in Table 17. The values represent averages for each year.

TABLE 17: East Mountain Springs Water Quality, 1978-1979

Parameter	Elk Spring		Burnt Tree Spring		Sheba Spring	
	1978	1979	1978	1979	1978	1979
pH	7.7	8.2	7.1	7.8	7.3	8.1
Suspended Solids	9.0	1.9	6.0	0.1	4.5	0.2
Total Dissolved Solids	249	250	274	291	227	250
Iron	0.03	0.16	0.03	0.07	0.25	0.4
Sulfate	8.0	15.1	9.5	7.8	6.8	7.0
Oil & Grease	1.0	0.6	1.0	0.7	1.0	0.6

The table indicates that the water quality characteristics are very similar for 1978 and 1979. The suspended solids values were higher in 1978 while total dissolved solids concentrations were lower.

MINE WATER

The intensive water monitoring program initiated by Utah Power & Light in 1977 within its coal mines was continued throughout 1979. A single occurrence of water was encountered during mining advance within the Church Mines during 1979 and is discussed below. The results of water monitoring within the Wilberg and Deer Creek Mines will be addressed with respect to in-mine flows as well as mine discharge which occurred during 1979. The relative location of each mine is shown on Map #1.

Church Mines

The Church Mines continued to be dry in 1979 with the exception of an isolated occurrence in the Beehive Mine. During mining advance in the month of April, a pocket of water was encountered in 2nd North off 8th West in what appeared to be a burnt zone. Initially water flowed from this area at the rate of 75 gpm which eventually decreased to a trickle. All water was completely

contained within the mine workings. A review of the water analysis points to a standing body of meteoric water. The water (18°C) had equilibrated with the temperature of the enclosing strata. The low concentration of suspended solids and the extremely high concentrations of sulfate and dissolved solids indicates that the water may have been impounded which would allow substantial contact time for the dissolution of rock material and the settling of the particulate matter. The water analysis is as follows:

Temperature	18.0°C
pH	6.97
Total Alkalinity	464.3
Total Sulfate	2757.5
Filterable Solids	0.2
TDS	4680.0
Oil & Grease	0.0
Turbidity	0.17
Flouride	1.37
Iron	0.04

A program to monitor the runoff in the wash below the Church Mines was initiated in mid 1979. Below is a listing of sampling dates and related water quality information.

Date	Flow
5-4-79	Dry
5-18-79	Dry
7-25-79	Dry
8-13-79	Storm Runoff 0.8 gpm
10-29-79	0.6 gpm
11-28-79	Dry
12-10-79	Dry

TABLE 18: Natural Runoff Water Quality in Vicinity of Church Mines

Parameter	8-13-79	10-29-79
pH	8.2	8.0
Total Alkalinity	280.9	322.6
TSS	8393.3	529.6
TDS	4356.0	3912.0
Settleable Solids	140.0	ND
Total Sulfate	2622.9	2451.3
Total Flouride	0.62	0.49
Total Dissolved Iron	0.01	1.74
Oil & Grease	0.6	0.5
Turbidity	7000	155
Temperature	16°C	6°C

An examination of Table 18 indicates that total dissolved solids and total suppended solids concentrations are extremely high, indicating excessive surface erosion at the time of sampling.

Wilberg Mine

The Wilberg Mine water monitoring program consisted of measuring flows and collecting water samples for quality analyses of in-mine and discharge waters. In order to obtain quantitative figures, three flow meters were installed on water flow circuits in the Wilberg Mine on March 17, 1979. One meter measured the water being pumped into the sump from the mine workings, one measured the water being pumped out of the sump and back into the mine for dust suppression, and the third measured the amount of water being discharged out of the mine. Table 19 is a tabulation of water production on a monthly basis from information supplied by the meters. The meter measuring the water pumped into the sump gives an indication of the amount of water being produced within the mine. It should be noted that this number is only an estimate of the actual mine production since some portion of the water pumped out of the sump for dust suppression will make its way back into the sump, while some water will be lost due to percolation into the floor rock and evaporation. These conditions constitute a short circuit in the monitoring program but probably do not interfere with the expression of monthly mine water production trend since these errors remain relatively constant.

When examining the mine water production trend, it is important to keep in mind the variables which could effect a change in water quantity. If the aquifer responsible for water within the mine is being recharged from a surface source, a seasonal variation in water production would be noted in the form of an increase in flow after some lag time as spring meltwaters percolate

TABLE 19: Wilberg Mine Water Production and Consumption

	Total Gallons	GPD	GPM
April 12 - 30			
Into Sump	7,361,200 Gallons	408,956 GPD	284 GPM
Out of Sump	2,523,100 Gallons	140,172 GPD	97 GPM
Discharge	6,293,900 Gallons	331,258 GPD	230 GPM
May			
Into Sump	11,872,100 Gallons	382,971 GPD	266 GPM
Out of Sump	4,166,200 Gallons	134,394 GPD	93 GPM
Discharge	10,181,500 Gallons	328,435 GPD	228 GPM
June			
Into Sump	10,481,100 Gallons	361,417 GPD	251 GPM
Out of Sump	4,347,300 Gallons	149,907 GPD	104 GPM
Discharge	3,710,700 Gallons	127,955 GPD	89 GPM
July			
Into Sump	12,328,400 Gallons	385,263 GPD	268 GPM
Out of Sump	2,912,100 Gallons	91,003 GPD	63 GPM
Discharge	6,345,600 Gallons	186,635 GPD	130 GPM
August			
Into Sump	15,430,800 Gallons	497,768 GPD	346 GPM
Out of Sump	4,518,800 Gallons	145,768 GPD	101 GPM
Discharge	5,437,400 Gallons	175,400 GPD	122 GPM

TABLE 19: Wiberg Mine Water Production and Consumption - contd.

	Total Gallons	GPD	GPM
September			
Into Sump	15,463,800 Gallons	572,733 GPD	398 GPM
Out of Sump	4,011,900 Gallons	148,589 GPD	103 GPM
Discharge	10,246,500 Gallons	394,096 GPD	274 GPM
October			
Into Sump	20,134,500 Gallons	592,191 GPD	411 GPM
Out of Sump	4,968,700 Gallons	146,138 GPD	101 GPM
Discharge	12,627,700 Gallons	360,791 GPD	251 GPM
November			
Into Sump	17,879,000 Gallons	595,967 GPD	414 GPM
Out of Sump	4,611,500 Gallons	153,717 GPD	107 GPM
Discharge	11,073,200 Gallons	335,552 GPD	233 GPM
December			
Into Sump	16,697,600 Gallons	556,587 GPD	387 GPM
Out of Sump	4,809,600 Gallons	145,745 GPD	101 GPM
Discharge	4,844,200 Gallons	146,794 GPD	102 GPM

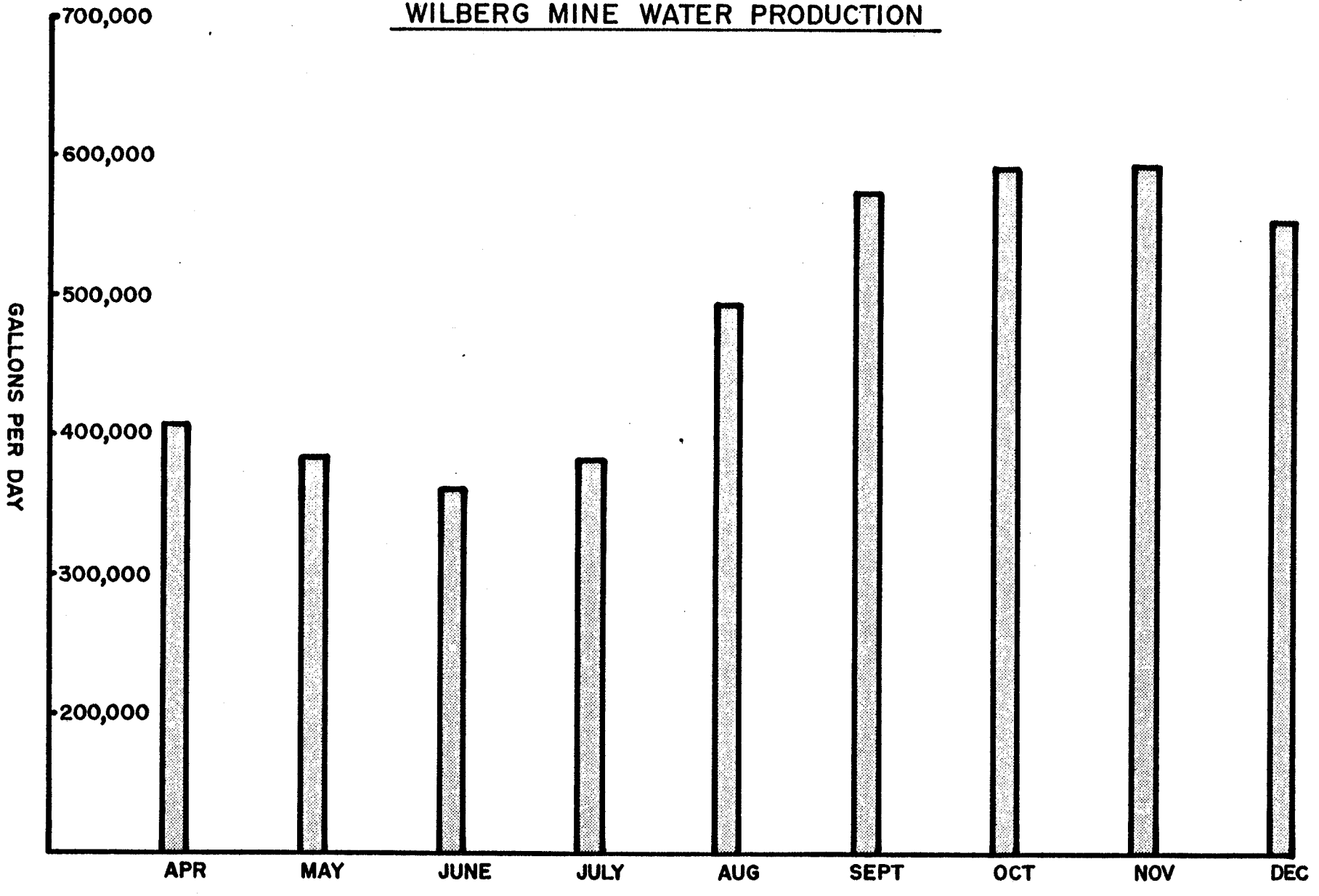
into the strata recharging the aquifer. A change in the mine environment itself will be manifested in the mine water production expression. The development of additional mining sections and variations in roof lithologies in existing sections can have a significant influence. Upgrading the mine drainage system for more efficient water removal from miner sections can also affect the expression of the water production curve.

A dramatic increase in Wilberg Mine water flow is evident from the curve presented in Figure 1. An interpretation of this change should be withheld until such time that a complete year of data has been collected to include seasonal influence as a possible variable causing fluctuation. Care must be taken in making steadfast interpretations of total mine water production since a dynamic environment is in question.

In-mine Monitoring: Water samples and flow measurements were collected on a monthly basis with most activity being concentrated in the 1st North section of the Wilberg Mine (Figure 2). This section in general is typical of other water producing sections and also affords easy access.

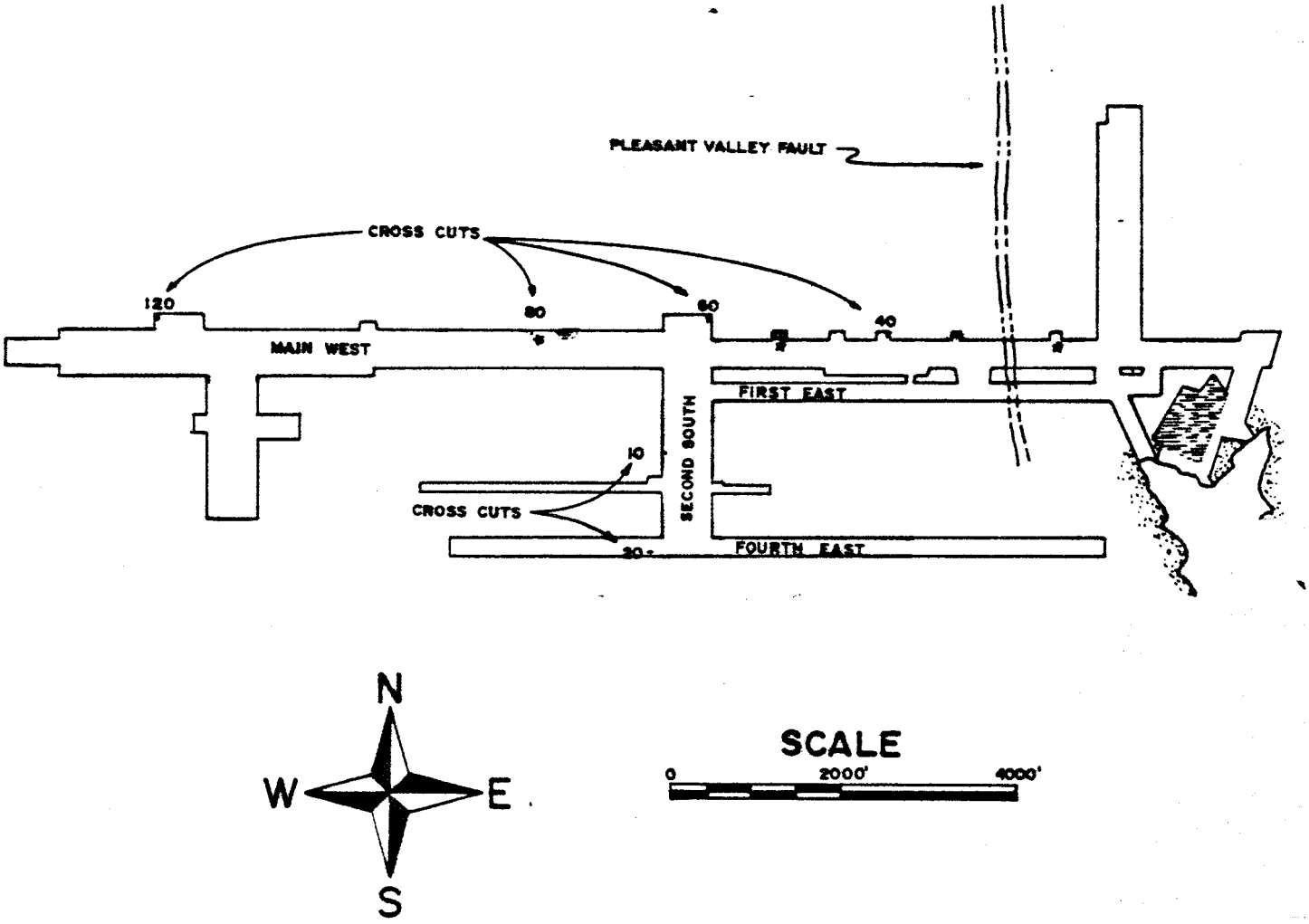
The majority of water produced within the mine emanates from roof bolt drill holes with minor amounts being issued from the floor. The most noticeable source of floor water occurs where the Pleasant Valley Fault intersects the mine workings in Main West (Figure 2). This location continues to produce an estimated average flow of 5 gpm. Another possible source of floor water is of secondary nature, that being water produced from roof bolt holes that have percolated into the semi-permeable floor (Starpoint Sandstone) and resurfaced in adjacent mining areas where its flow was impeded by impermeable strata. A third possible source is the intersection of the water table

FIGURE 1
WILBERG MINE WATER PRODUCTION



WILBERG COAL MINE

EMERY COUNTY, UTAH



MAIN WATER STORAGE AREAS

SUMP

FIGURE 2

present within the Starpoint Sandstone. The occurrence of this water table will be discussed in the Drill Hole Monitoring section of this report.

The largest influx of water originates from the roof when mining advances beneath a sandstone top. The sandstone, which is semi-permeable and porous, affords an effective route of water transport. Mudstone, siltstone and interbedded materials generally act as aquicludes which impede water flow unless fracturing of the formation has allowed for secondary permeability. 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. Data collected in 1979 confirms the 1978 data that indicates a 90% reduction in water flows from roof sampling sites over a five month period (or less) as the mining face is advanced (Table 20). It has also been noted that the outermost entries of a multiple entry system remain wet for a longer period of time than the inner entries. It appears that the water source is being dewatered since excavated areas of the mine do not continue to produce water indefinately. The water source must be either of limited extent, i.e., a perched aquifer or have a limited recharge capacity, i.e., poor horizontal permeability. Figure 3 depicts an idealized view of the dewatering process.

Table 20: Wilberg In-Mine Flow Measurements (gpm)

Location	3/21/79	5/24/79	6/19/79	7/6/79	8/21/79	10/8/79	11/28/79
1st North							
5, 1L-2L	1.5	----	----	----	----	----	----
6-7, 1L	1.5	----	----	----	----	----	----
8-9, 2R	---	2.9	1.0	----	0.34	0.15	<0.1
10-11,2L	---	1.3	0.95	----	0.3	0.1	<0.1
11,3R	---	6.0	4.6	4.0	2.0	1.2	1.2
17,1L	---	----	----	----	----	6.0	----

	6/19/79	7/6/79	8/22/79
4th East			
42, 1R	20.0	15.0	7.0
43, 1L	1.5	----	0.9
44-45, B	1.9	----	0.1
44-45, 1R	0.8	0.25	---

	3/21/79	8/9/79	10/11/79
Main West			
127, 3L	0.1	----	----
139, 2L	----	0.2	----
145, 1R			15.0

	3/21/79
1st East	
27, B	1.0

	9/26/79
3rd East	
17, 1R	0.85

FIGURE 3: IDEALIZED VIEW OF MINE DEWATERING PROCESS

Illustration 1: Cross Sectional View Along Length of Entry

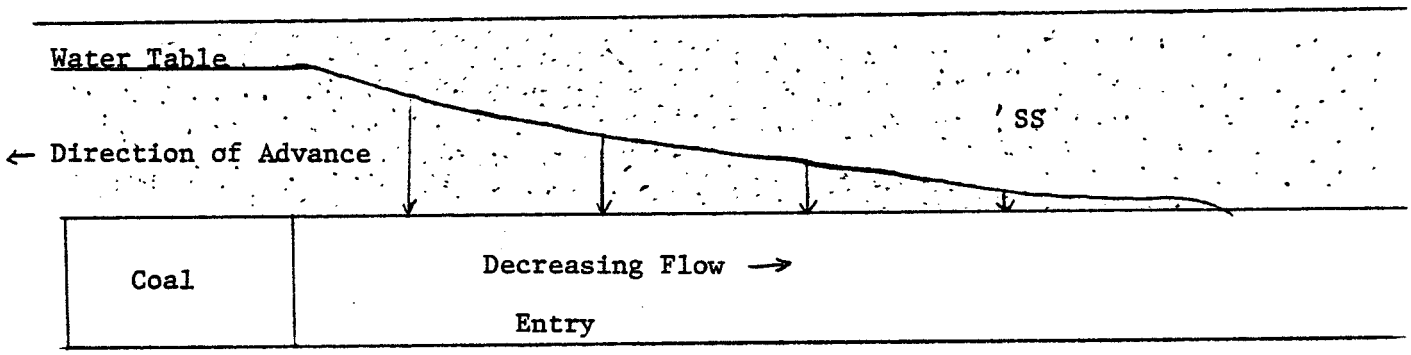
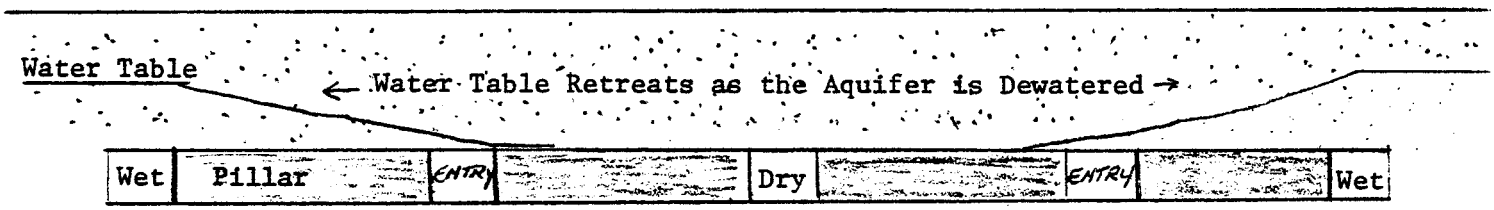


Illustration 2 Cross Sectional View Perpendicular to Entries



Advancement into the Plane of the Paper

Illustrations not drawn to scale

The following paragraph was taken from the text of the 1978 Water Monitoring Report. "Another area that is of interest is the First East area (see Figure 2) where flows on the order of four gpm characterize the section. It is interesting to note that the steady flow rate that was in evidence at cross-cut 40 in Main West declined rapidly once mining activities were introduced to the adjacent area in First East." This observation lends supporting evidence to the dewatering theory.

In-mine Quality: A number of water samples were collected from various locations within the mine throughout 1979 to determine the variability of water quality. All sampling was limited to roof locations to avoid possible contamination. No significant change in water quality has been noted from 1978 to 1979 (Table 21). All areas of the mine show relatively uniform water quality except for the section designated 4th East. This is the only section within the mine producing water below the recommended drinking water standards. High concentrations of total dissolved solids and sulfate are present in these waters. Individual chemical reports can be found in APPENDIX H.

An electrical conductivity survey of mine waters was conducted with representatives from the USGS and the Department of Oil, Gas and Mining on July 5 and 6. This technique affords an in place determination of total dissolved solids. A tabulation of these results can be found in Table 22. Again a high concentration of total dissolved solids was found to occur only in the most eastward end of 4th East. An explanation for this occurrence has not yet been formulated, but the close proximity of the outcrop to this area may be significant.

Table: 21 Wilberg Mine In-Mine Water Quality

Location	Date	Temp. (°C)	pH	Alkalinity	TSS	TDS	SO_4	Fluoride	Iron	O & G	Turbidity
1st North											
5, 1L-2L	3-21-79	13.0	7.41	542.5	1.3	743.0	184.4	0.20	0.25	0.1	3.0
6-7, 1L	3-21-79	12.5	7.44	533.3	1.3	739.0	184.8	0.21	0.25	0.2	2.3
10-11, 2L	5-24-79	----	6.67	418.0	1.0	700.0	174.0	0.10	0.005	<1.0	1.8
	8-21-79	10.5	7.60	433.7	0.1	716.0	202.0	0.22	0.18	0.9	0.61
	10-8-79	----	7.30	435.0	0.1	655	199.9	0.23	0.08	0.08	0.68
11,3R	5-24-79	----	6.55	390.0	15.0	700.0	185.0	0.09	0.119	2.8	1.50
	6-13-79	----	7.30	427.4	0.8	733.0	172.4	0.25	0.36	0	3.8
	7-6-79	----	7.35	433.6	1.2	729.0	255.5	0.21	0.30	0.1	3.5
	8-21-79	11.0	7.50	424.4	0.4	702.0	202.0	0.21	0.42	0.5	4.4
	10-8-79	----	7.20	437.3	4.8	702.0	207.4	0.24	1.20	0.3	13.0
12, 2R	6-13-79	----	7.39	425.4	0.8	699.0	174.9	0.24	0.30	2.0	3.0
8-9, 2R	8-21-79	11.0	7.30	391.6	0.2	687.0	227.1	0.21	0.07	0.9	0.5
17, 1L	10-8-79	----	7.50	408.0	0.8	670.0	180.2	0.23	0.34	0.5	4.9
4th East											
42, 1R	6-19-79	----	7.00	543.3	1.2	1610.0	655.9	0.18	0.06	2.6	0.22
	7-6-79	11.5	7.10	536.1	1.8	1549.0	661.7	0.24	0.06	0.1	0.19
	8-22-79	----	7.20	534.1	0.1	1385.0	619.7	0.24	0.15	1.0	0.42
43, 1L	6-19-79	----	7.20	495.1	3.0	1459.0	532.9	0.21	0.06	28.6	0.92
	8-22-79	----	7.40	500.9	0.2	1238.0	537.8	0.24	0.09	0.3	0.34
44-45, 1R	6-19-79	----	7.10	497.1	1.0	1556.0	643.2	0.21	0.04	0.4	0.27
	7-6-79	11.0	7.10	493.0	1.0	1516.0	669.5	0.2	0.12	0.1	0.21
44-45, B	8-22-79	----	7.40	493.7	0.4	1244.0	508.6	0.24	0.07	0.1	0.47
Main West											
127, 3L	3-21-79	14.5	7.40	480.5	1.7	631.0	151.4	0.25	0.18	0.2	1.0
139, 2L	8-9-79	12.0	7.70	357.7	0.2	590.0	142.4	0.24	0.48	0.8	2.7
145, 1R	10-11-79	----	7.50	343.0	0.1	419.0	78.2	0.26	0.19	0.1	1.1
1st East											
27, B	3-21-79	12.0	7.32	469.9	2.0	503.0	98.8	0.20	0.16	0.2	1.8

Table: 22 Electrical Conductivity Survey

Location	Temperature (°C)	Electrical Conductivity (μmhos)
1st North		
8-9, 2R	12.8	1025
9, 2R	13.0	1000
9, 3R	12.5	1100
10, 2L	12.5	1090
11, 3R	14.2	1025
15, 1L	13.0	1000
Main West		
30,1R	13.3	975
82, 2R	14.2	800
104, 1L-2L	13.5	1080
124, 3L	14.2	1000
125, 3L	14.5	990
128, 2L	14.1	950
134, B	14.1	800
3rd South		
10, 2L	14.2	1050
3rd West		
5, 1R	14.0	800
1st East		
37, B	11.5	800
27, 1L	11.5	810
5, 1L	10.0	1240
4th East		
42, 1R	11.5	1900
42, B	11.2	1850
42, 1L	11.5	1725
43, 1L	11.0	1700
44-45, 1R	11.0	1850

Discharge: Water produced within the Wilberg Mine is pumped to a primary sump located within the Old Wilberg workings by a complex pumping and piping system. The sump which functions as a settling basin, effectively removes settleable solids from the water. A portion of this water is redistributed to various areas of the mine to be utilized in the mining operations. This sump also supplies water to the Wilberg Mine water treatment facility which furnishes potable water at a rate of 20 gpm. Excess water is discharged into the Left Fork of Grimes Wash after passing through an oil skimmer in accordance with the stipulations of the Wilberg Mine discharge permit UT-0022896.

It has been established that a sufficient quantity of water is discharged thru the Wilberg Mine to meet the culinary, domestic and in-mine needs of the Church Mines. These mines which are relatively dry are currently supplied with water by truck haulage. A pipeline adjoining the two mines has been proposed to furnish water at a reduced cost and may be constructed in the near future.

The rate and frequency of discharge is dependent upon the water level in the sump. As the sump approaches its capacity, discharge is initiated until the water is drawn down to a reasonable level. Table 23 presents a history of discharge for 1979. On October 2, 1979, a single permit violation for the oil and grease content of discharged waters was recorded. The violation was caused by an inadvertant drop of the water level of the sump to such a low level that the oily surface water was discharged at a rate exceeding the capacity of the oil skimmer. Discharge was promptly ceased when the monthly analyses revealed the problem and the appropriate authorities were notified.

TABLE 23: Wilberg Mine Discharge

Quarter	Total Discharge (Gal.)	# Days in Quarter	Ave. Flow During Discharge (gpd.)
January - March	0		
April - June	20,186,100	91	221,825
July - September	22,029,500	92	239,451
October - December	28,545,100	92	310,273
Totals	70,760,700	275	257,312

The average discharge rate results from a calculation that divides the number of days in the quarter into the total gallons discharged even though discharge is not continual.

A comparison of mine discharges for 1978 and 1979 is shown in Table 24.

TABLE 24: Wilberg Mine Discharges, 1978-1979

Quarters	1978	1979
January - March	0	0
April - June	523,080	20,186,100
July - September	0	22,029,500
October - December	4,817,600	28,545,100
Totals	5,340,680	70,760,700

Water discharges during 1979 were substantially higher than 1978 due to:

1. Significant expansion of the Wilberg Mine during 1979 has resulted in a larger area that is dewatered.
2. During 1978, water produced in the mine workings was pumped into the old workings rather than being discharged. All excess water produced in the mine workings during 1979 was discharged into Grimes Wash.

Monthly water quality samples were collected to insure that water was discharged in accordance with the Wilberg Coal Mine discharge permit which is administered by the U.S. Environmental Protection Agency under the authority of the NPDES permit program. Table 25 depicts the range of water quality for discharge waters in 1979. Individual analyses can be found in APPENDIX I.

TABLE 25: Wilberg Mine Discharge Water Quality

Parameter	No. of Samples	Quality Data (Mg/1)		
		Min.	Ave.	Max.
Flow GPD		0	265,215	749,900
pH	10	7.30	7.49	8.07
BOD_5	6	1.0	2.08	4.0
Coliforms: Total	4	13	17	46
Coliforms: Fecal	4	2	2	2
Acidity	9	14.0	26.0	62.0
Alkalinity	10	244.0	280.6	322
Oil & Grease	14	0.1	3.14	23.8
TSS	10	1.0	4.3	9.0
TDS	10	500	576	650
Iron: Total	10	0.04	0.16	0.468

A comparison of water quality for mine discharge during 1978 and 1979 is shown in Table 26.

TABLE 26: Wilberg Mine Discharge Water Quality, 1978-1979

Parameter	1978 No. of Samples	1979 No. of Samples	1978 Ave. of Quality Data (Mg/1)	1979 Ave. of Quality Data (Mg/1)
pH	4	10	7.64	7.49
BOD_5	5	6	2.12	2.08
Coliforms: Total	2	4	0.75	17
Coliforms: Fecal	2	4	0.2	2
Acidity	3	9	14.67	26.0

TABLE 26: Wilberg Mine Discharge Water Quality, 1978-1979 - contd.

Parameter	1978 No. of Samples	1979 No. of Samples	1978 Ave. of Quality Data (Mg/l)	1979 Ave. of Quality Data (Mg/l)
Alkalinity	4	10	251	281
Oil & Grease	6	14	5.25	3.14
TSS	6	10	4.8	4.3
TDS	6	10	495.8	576.0
Iron: Total	3	10	0.085	0.16

An examination of the table shows that during 1979, the sampling program was greatly expanded. The 1979 values show a higher concentration for coliform bacteria, acidity, alkalinity, TDS and iron while lower concentrations were obtained from pH, BOD, oil and grease and TSS analyses.

Deer Creek Mine

The establishment of a comprehensive water monitoring program for the Deer Creek Mine is an awesome if not impossible task. The expansiveness of the mine (Figure 4) coupled with the inaccessibility of major water producing areas greatly hampers the ability to conduct an in-mine monitoring program.

In-mine Monitoring: As is the case in the Wilberg Mine, the majority of water produced within the Deer Creek Mine originates from the roof, in particular those areas composed of a sandstone top. Again, floor discharge is primarily from the Pleasant Valley Fault with the majority of the water ponding in Second South making a direct measurement of flow impossible.

Reference was made to EM-3 in the 1978 report. This is a surface drill hole which was intersected in September 1978 in the Third South section of the Deer Creek Mine. Weekly monitoring of the hole during 1978 established a continuous flow of 15 gpm. This hole continues to flow at the current rate of 10 gpm.

The best estimate of in-mine water production was arrived at by combining the values of discharge and domestic usage. These two readings

DEER CREEK COAL MINE

EMERY COUNTY, UTAH

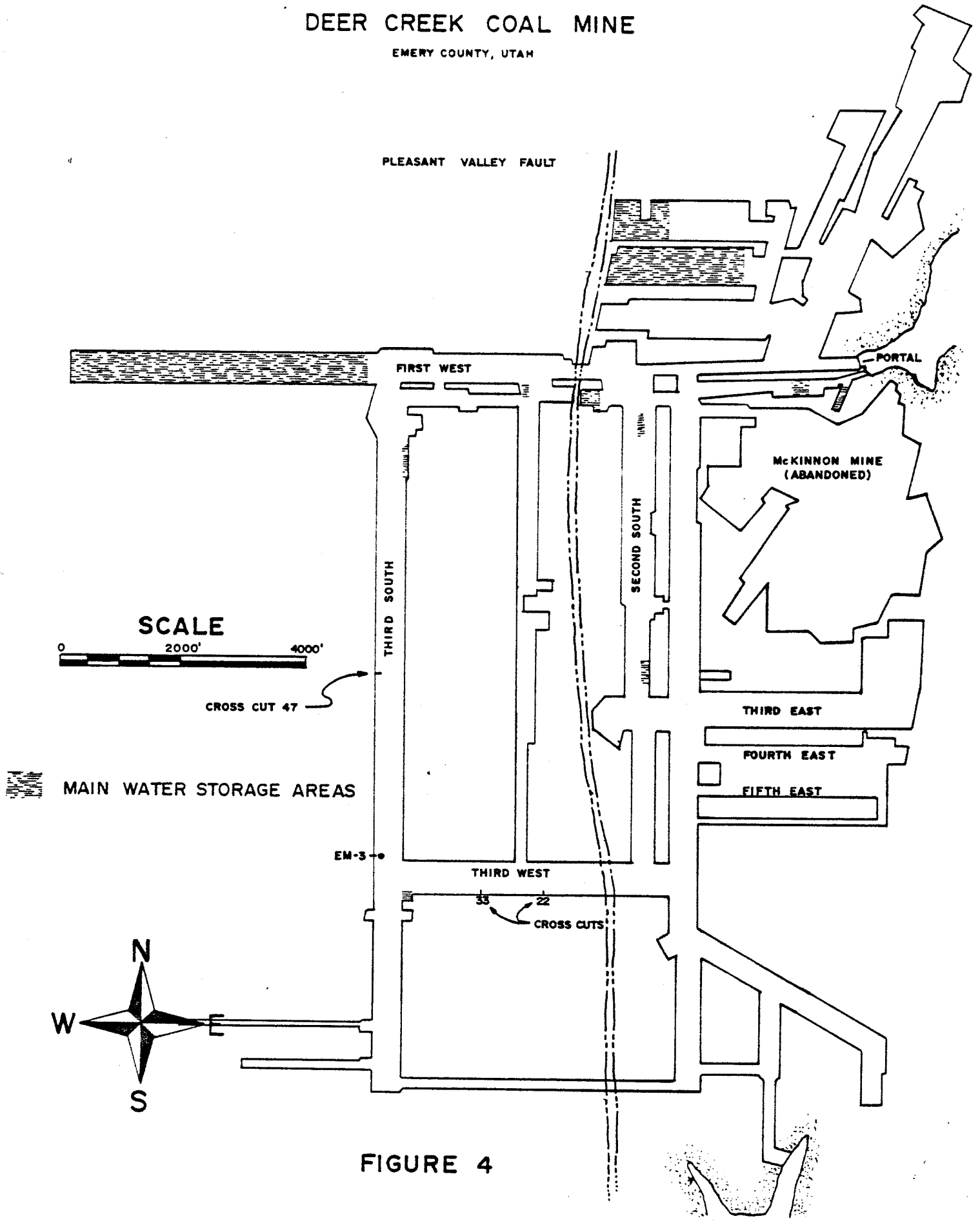


FIGURE 4

account for all water leaving the Deer Creek Mine. A totalizing flow meter recorded the quantity of water supplied to the Deer Creek water treatment facility. A staff located on the discharge weir was read monthly to give an estimate of the discharge rate. In December, 1979, a continuous recording device was installed on the weir. This addition to the Deer Creek Mine monitoring program has greatly increased the accuracy of discharge records and mine production estimates.

In-mine Quality: A review of the following table indicates a fairly uniform quality of water for the Deer Creek Mine and a close similarity to that of the Wilberg Mine. Again, the analyses indicate the suitability of this water for culinary use.

TABLE 27: Deer Creek Mine, In-mine Water Quality

Parameter	5th East	6th East 16, 1R	3rd Left	3rd South B 8,5 L	EM-3
# of Samples	2	1	1	1	4
pH	7.86	7.38	7.5	7.45	7.5
Alkalinity	-	214.7	400.0	534.6	504.6
TSS	0.38	0.8	4.7	2.0	1.88
TDS	527.0	655.0	745.3	641.0	604.1
Sulfate	208.2	152.3	280.6	160.1	151.9
Flouride	0.22	0.21	0.22	0.1	0.15
Iron	0.07	0.14	0.14	0.15	0.29
Oil & Grease	0.8	0.7	0.7	0.1	1.10
Turbidity	0.95	1.2	1.4	1.2	3.67

Averages are displayed for those locations where multiple sampling took place. Individual analyses can be found in APPENDIX J. Those samples taken at the end of 1978 which were not included in that year's report have been included in the 1979 report.

An electrical conductivity survey was conducted in cooperation with the USGS on July 30 and 31. This survey demonstrated the uniform quality of water within the Deer Creek Mine.

Discharge: Excess water not utilized in the mining operation or for domestic use was either pumped to storage areas or discharged. The locations of the main sump areas within the Deer Creek Mine are shown in Figure 3. The largest volume of water is stored in the western part of First West, an area that has not been actively mined for several years, and in the old McKinnon Mine workings. That water which is discharged passes first through an oil skimmer, secondly through the recording weir arrangement, then down to Utah Power & Light's Huntington Power Plant raw water settling pond via a six inch pipeline. It should be noted that none of the water leaving the Deer Creek Mine is discharged into the Huntington Creek but is totally consumed in the power plant cooling process.

Average recorded discharge from the Deer Creek Mine for December, 1979 was approximately 223,000 gallons per day. Equating this discharge to a yearly amount would result in a discharge of about 80 million gallons per year, compared to the estimated discharge of 35 million gallons in 1978. Continued discharge monitoring will probably confirm an increase in discharge as compared to the estimated 1978 values.

Water quality samples were collected at the discharge weir on a monthly basis. Analytical results are shown in the following table with individual analyses presented in APPENDIX K.

TABLE 28: Deer Creek Mine Discharge Water Quality

Parameter	No. of Samples	Quality Data (Mg/1)		
		Ave.	Max.	Min.
pH	13	7.44	7.80	7.16
BOD_5	2	1.1	2.1	0.1
Coliforms: Total	25	14.3	230	0
Coliforms: Feacal	9	2.0	2.0	2.0
Acidity	13	22.9	52.0	0.7
Alkalinity	13	289	330	254
Oil & Grease	13	1.6	3.8	1.0
TSS	13	35.8	272.0	2.0
TDS	13	780	3300	480
Iron: Total	13	0.43	1.12	0.12
Sulfate	13	178	274	144

A comparison of water quality values for the mine discharge for 1978 and 1979 is shown in Table 29.

TABLE 29: Deer Creek Mine Discharge Water Quality, 1978-1979

Parameter	1978	1979	1978	1979
	No. of Samples		Ave. of Quality Data (Mg/1)	
pH	-	13	7.17	7.44
BOD_5	-	2	-	1.1
Coliform: Total	-	25	-	14.3
Coliform: Fecal	-	9	-	2.0
Acidity	-	13	-	22.9
Alkalinity	3	13	273	289
Oil & Grease	-	13	-	1.6
TSS	3	13	25.0	35.8
TDS	3	13	587	780
Iron: Total	-	13	-	0.43
Sulfate	3	13	129	178

An examination of the table shows that during 1979, the sampling program was greatly expanded. The 1979 values show a higher concentration for all parameters analyzed.

DRILL HOLE MONITORING

In 1978, two surface exploration drill holes (EM-47 in Rilda Canyon and EM-31 in Cottonwood Canyon) were developed into permanent water monitoring stations (Figure 5 and Map). In 1979, the USGS installed a continous recording

water level instrument at drill hole EM-31. An additional station (A-126) was developed in the Fourth East section of the Wilberg Mine during 1979 (see Figure 5). This station was drilled 179 feet into the Starpoint Sandstone from within the Wilberg Mine. A 3/4 inch perforated pvc pipe was cemented in place to complete the permanent monitoring station.

The average static water level in EM-31 was measured down 41.6 feet from ground elevation placing the water table at an elevation of 7,376.2 feet, which is 57.8 feet above the top of the Starpoint Sandstone. This level has remained relatively constant throughout 1979. The static water level in EM-47 was down 188.64 feet from the surface. This level varied by 2.0 feet during 1979, placing the average water table elevation at 7,856.36 feet or 1.36 feet above the top of the Starpoint Sandstone. The water level in A-126 averaged 21.75 feet below the top of the Starpoint Sandstone or an elevation of 7,608.5 feet and varying 0.5 feet since monitoring began in June of 1979.

SUMMARY AND CONCLUSIONS:

Utah Power & Light Company has been conducting a water monitoring program in the area of their underground coal mines in Emery County, Utah in accordance with regulations set forth in Section 30 CFR 211 of the Coal Mine Operating Regulations of 1977. This program has been in existence since 1977 and this is the third annual report submitted concerning hydrology. The information compiled and interpreted in this report was obtained from numerous governmental agencies and was supplemented by data collected by Utah Power & Light Company.

In 1979, OSM and the Utah Division of Oil, Gas and Mining indicated approval of the Utah Power & Light hydrologic monitoring plan which was submitted in December, 1977.

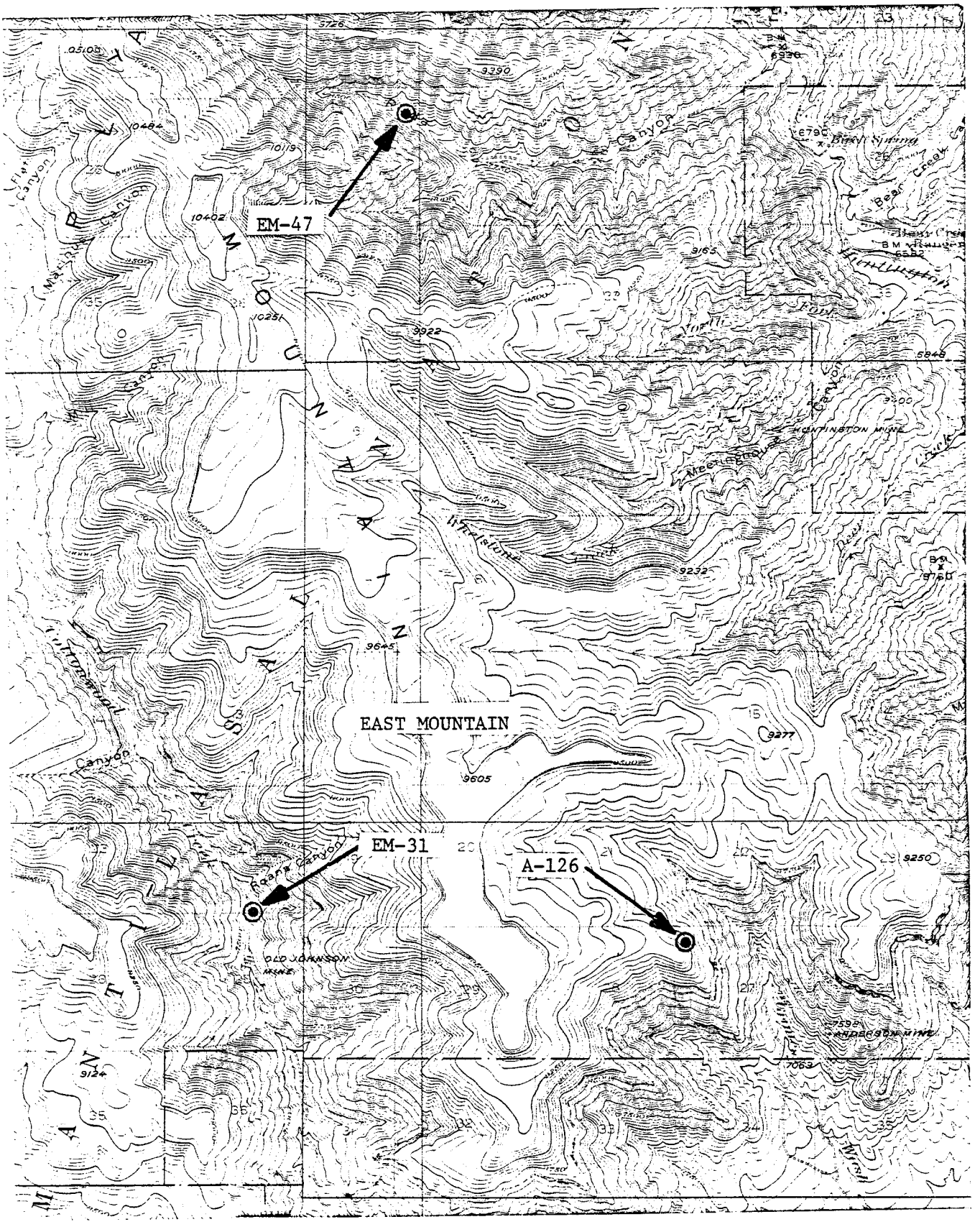


Figure 5

Drill Hole Water Monitoring Stations

Scale 1" = 1 Mile

Since runoff and associated water supplies are a function of climatic conditions, temperature and precipitation data were incorporated into the 1979 report. Precipitation amounts were above normal while temperatures were well below normal during the 1979 winter and above normal during the summer and fall.

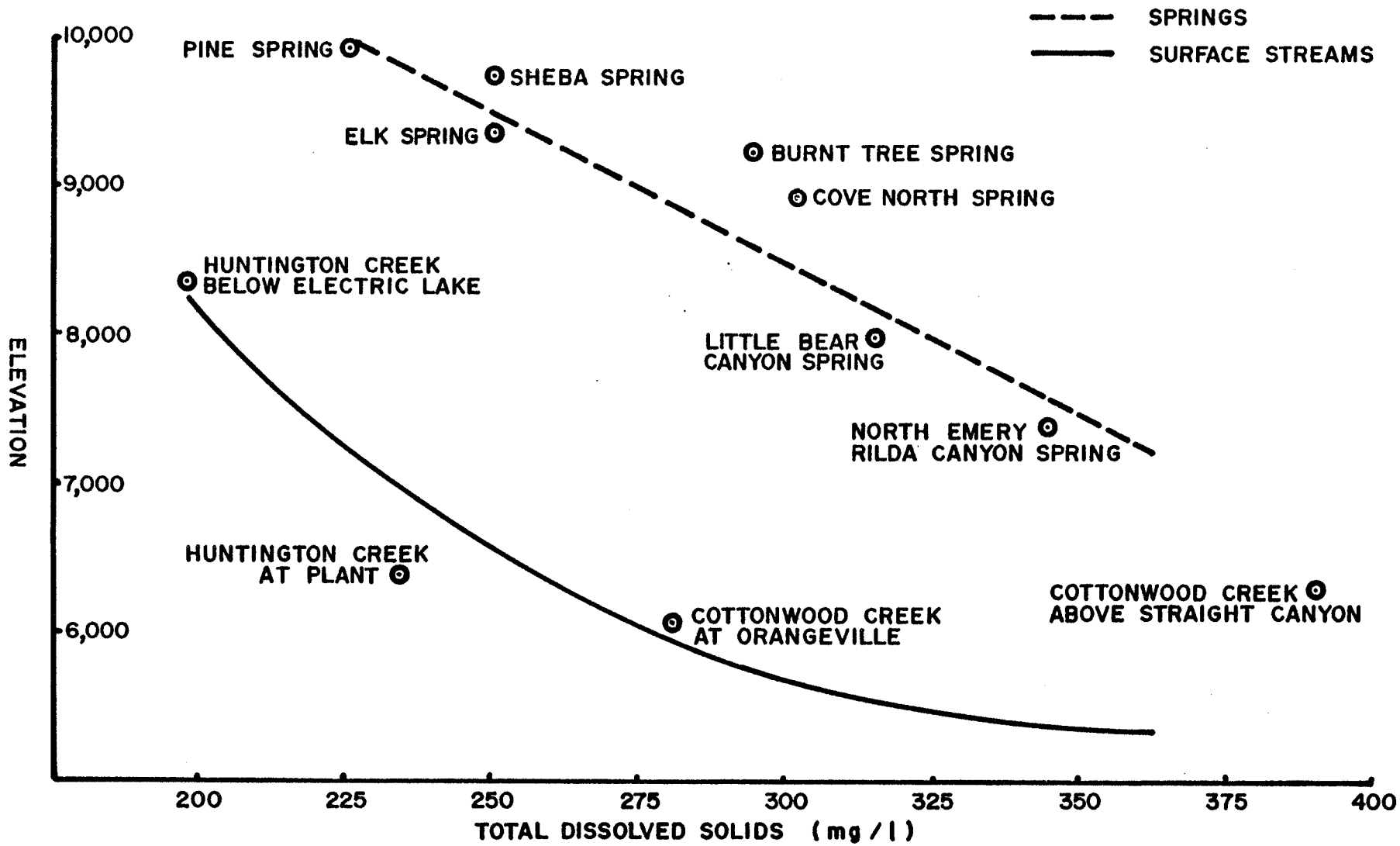
Water flow and quality information were collected from both surface and underground sources in the areas adjacent to Utah Power & Light mining activities. Samples were obtained from surface streams, tributaries, springs, mine discharges, underground workings and drill holes.

Information obtained during 1979 indicates that water flows in the Huntington and Cottonwood Creek drainage systems were less than 1978 values while flows from East Mountain springs were significantly higher during 1979.

Water quality data obtained during 1979 indicates a pronounced progressive decrease in the quality of water in the stream channels proceeding from high mountain stations to stations at the canyon mouths. The mountain springs are characterized by low and extremely variable discharges (which is a function of rainfall and climate) and quality which is suitable for culinary use. The springs exhibit a moderate hardness level as reflected by the high calcium content of the earth materials from which they flow.

An examination of Figure 6 indicates that a relationship exists between elevation and the total dissolved solids concentration of the springs and of the surface streams. A distinct relationship exists with respect to surface water and water eminating from the springs. The data indicates that concentrations of dissolved materials increase with a diminishing of elevation for both surface streams and springs. This may be a function of the differences in the chemical character of geologic formations which outcrop at different elevations.

FIGURE 6
ELEVATION VS. TOTAL DISSOLVED SOLIDS
OF SPRINGS AND SURFACE STREAMS



A dramatic increase in Wilberg Mine water flow is evident from the curve presented in Figure 1. An interpretation of this change shall be withheld until such time that a complete year of data has been collected to include seasonal influence as a possible variable causing fluctuation. Care must be taken in making steadfast interpretations of total mine water production since a dynamic environment is in question.

Discharge information from the mines indicates that TDS values are much higher than streams or springs, averaging 576 Mg/l at the Wilberg mine and 780 Mg/l at the Deer Creek Mine. No water was discharged from the Church Mines during 1979 even though water was encountered for a short period of time.

The total recorded discharge from the Deer Creek Mine during December, 1979 was calculated to be 6.9 million gallons, or about 80 million gallons per year. This amount is about 2.3 times the 1978 estimated discharge. Total discharge from the Wilberg Mine amounted to about 71 million gallons during 1979.

The installation of flow metering devices at the mine sites during 1979 has greatly increased the reliability of mine water production information. The 1980 water monitoring program will rely more heavily on the use of these meters rather than measuring individual point sources within the mine. Routine underground measurements of flows during the past two years has established that the majority of mine water is produced in the vicinity of the working face as advancement proceeds into virgin territory, particularly those areas overlain by sandstone. Routine sampling of in-mine water for quality measurements will be continued throughout 1980.

A continuing effort will be made to closely monitor the two surface exploration drill holes and one underground drill hole to better define a regional water table, interpret its fluctuations as well as to determine relationships with surface sources.

Data gathered as a part of the Utah Power & Light hydrologic monitoring plan do not indicate the deterioration of water quantity and quality as a result of mining activities. Information will continue to be collected in future years to assist in the determination of the impact, if any, of mining on the hydrology of the mine areas.

APPENDIX A

OSM AND OIL, GAS AND MINING CORRESPONDENCE

United States Department of the Interior

OFFICE OF SURFACE MINING
Reclamation and Enforcement
POST OFFICE BLDG. RM. 270
1823 STOUT STREET
DENVER, COLORADO 80202

OFFICE OF THE REGIONAL DIRECTOR

31 AUG 1979

Mr. Ron Daniels
Staff Assistant
Division of Oil, Gas and
Mining
Department of Natural Resources
1588 West North Temple
Salt Lake City, Utah 84116

Reference: Utah Power and Light Company Subsidence and Hydrology Monitoring Plans, Deer Creek and Wilberg Mines

Dear Mr. Daniels:

We are hereby providing approval of the hydrology monitoring plan submitted by Utah Power and Light (UP&L) for the Deer Creek and Wilberg Mines. The proposal was originally submitted to the U.S. Geological Survey in correspondence dated December 20, 1977, in combination with a subsidence monitoring plan. This letter does not constitute an approval for the subsidence or the sedimentation pond design for the Wilberg and/or Deer Creek Mines.

The above mentioned correspondence states that an engineering assessment of potential subsidence associated with the room and pillar method for the area being mined is included. However, no copy of this assessment was found. Please have UP&L forward a copy of the report to this Office.

Due to the questions of subsidence interfering with springs in the East Mountain area, OSM suggested that quarterly flow data be taken for these springs. It is also suggested that quarterly samples be taken for "Other Ground Water Sources."

The concept of using a photogrammetrical survey to monitor subsidence is acceptable to OSM. However, the methods used to maintain the 1.0 feet relative elevation accuracy must be demonstrated. In order to maintain such vertical accuracies, large scale photography, at least 1:6000, is needed as well as experienced operators conducting the study.

UP&L proposes using a third order-first class (1:10,000) grid system (page 3). There is some confusion as to what is meant by a third order-first class grid. The U.S. Geological Survey in Denver is unsure as to what is meant by third order-first class system, since third order signifies a 1:5000 scale. OSM requests that UP&L clarify what type of system is meant by third order-first class. If the scale is 1:10,000, UP&L must show that the operator will have the ability to maintain the vertical accuracy of 1.0 feet.

UP&L must show that the operator can maintain this accuracy in the given topography and vegetation cover with the given scale. Who will be doing the photogrammetrical survey (in-house verses contractual or federal agency)? What are the qualifications of this (these) persons? The questions pertaining to the ability of the operator is because of the high accuracy predicted by UP&L.

Copies of this letter are enclosed for transmittal to the company by your Office.

Sincerely,

DONALD A. CRANE

cc: Howard, BLM (1)
Feldmiller, USGS (1)
Daniels, UT-NS (2)
BLM District, Moab (1)
Moffit, USGS (1)

SCOTT M. MATHESON
Governor

GORDON E. HARMSTON
Executive Director,
NATURAL RESOURCES

CLEON B. FEIGHT
Director

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS, AND MINING
1588 West North Temple
Salt Lake City, Utah 84116
(801) 533-5771

OIL, GAS, AND MINING BOARD

CHARLES R. HENDERSON
Chairman

JOHN L. BELL
C. RAY JUVELIN
THADIS W. BOX
CONSTANCE K. LUNDBERG
EDWARD T. BECK
E. STEELE McINTYRE

October 10, 1979

RECEIVED
OCT 16 1979
MINING AND
EXPLORATION

Mr. Jerry Vaninetti
Director of Exploration
Mining and Exploration
Utah Power and Light Company
1407 West North Temple
P.O. Box 899
Salt Lake City, Utah 84110

Re: Hydrologic Monitoring Plans
Utah Power and Light Company
Deer Creek & Wilberg Mines
ACT/015/018a & ACT/015/018b
Emery County, Utah

Dear Jerry:

The Division has reviewed the Hydrologic Monitoring plans and modifications for Utah Power and Light Company's Deer Creek and Wilberg Mines. Approval of the Hydrologic Monitoring plan is hereby issued.

A copy of the Office of Surface Mining's approval is also enclosed for your information.

Sincerely,

Thomas J. Suchoski

THOMAS J. SUCHOSKI
RECLAMATION HYDROLOGIST

TJS/sp
enc: O.S.M. Approval
cc: M. Heward, Utah Power and Light
R. Jerman, Utah Power and Light
C. Shingleton, Utah Power and Light
K. Gurr, Utah Power and Light
J. Hardaway, O.S.M., Denver

APPENDIX B

HUNTINGTON CREEK STREAM FLOWS

UTAH POWER & LIGHT COMPANY
STREAM DISCHARGE RECORDS

STATION HUNTINGTON CREEK BELOW ELECTRIC LAKE
DATE OCT78SEP79

DAILY DISCHARGE (CFS)
MONTHS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14.00	12.00	12.00	14.00	14.00	14.00	15.00	14.00	14.00	14.00	12.00	16.00
2	14.00	12.00	14.00	14.00	14.00	14.00	15.00	14.00	14.00	14.00	12.00	16.00
3	14.00	12.00	14.00	14.00	14.00	14.00	15.00	14.00	14.00	14.00	12.00	16.00
4	14.00	12.00	14.00	14.00	14.00	14.00	15.00	14.00	14.00	14.00	13.00	16.00
5	15.00	12.00	14.00	14.00	14.00	14.00	15.00	14.00	14.00	14.00	12.00	16.00
6	15.00	12.00	14.00	14.00	14.00	14.00	15.00	14.00	15.00	12.00	12.00	14.00
7	15.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	15.00	13.00	79.00	17.00
8	15.00	12.00	14.00	14.00	15.00	14.00	15.00	13.00	13.00	13.00	152.00	16.00
9	15.00	12.00	14.00	14.00	15.00	14.00	15.00	13.00	14.00	13.00	151.00	14.00
10	15.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	14.00	66.00	13.00
11	15.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	12.00	15.00	13.00	13.00
12	15.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	13.00	14.00	14.00
13	14.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	12.00	14.00	14.00
14	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	14.00	14.00	14.00
15	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	14.00	15.00	14.00
16	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	14.00	15.00	14.00
17	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	14.00	14.00	14.00
18	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	13.00	14.00	15.00	14.00
19	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	37.00	14.00	15.00	14.00
20	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	33.00	13.00	15.00	14.00
21	12.00	12.00	14.00	14.00	15.00	14.00	15.00	14.00	14.00	14.00	16.00	14.00
22	12.00	12.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	16.00	14.00
23	12.00	12.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	16.00	14.00
24	12.00	12.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	15.00	14.00
25	12.00	12.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	15.00	14.00
26	12.00	12.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	15.00	14.00
27	12.00	12.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	12.00	15.00	14.00
28	12.00	12.00	14.00	14.00	14.00	14.00	14.00	13.00	14.00	14.00	15.00	14.00
29	12.00	12.00	14.00	14.00	0.0	14.00	14.00	13.00	13.00	14.00	15.00	14.00
30	12.00	12.00	14.00	14.00	0.0	15.00	14.00	13.00	13.00	14.00	15.00	14.00
31	12.00	0.0	14.00	14.00	0.0	15.00	0.0	14.00	0.0	14.00	16.00	0.0
MONTHLY												
TOT	406.00	360.00	432.00	434.00	407.00	436.00	441.00	429.00	451.00	424.00	834.00	433.00
MEA	13.10	12.00	13.90	14.00	14.50	14.10	14.70	13.80	15.00	13.70	26.90	14.40
MAX	15.00	12.00	14.00	14.00	15.00	15.00	15.00	14.00	37.00	15.00	152.00	17.00
MIN	12.00	12.00	12.00	14.00	14.00	14.00	14.00	13.00	12.00	12.00	12.00	13.00
ACR FT	805.00	714.00	857.00	861.00	807.00	865.00	875.00	851.00	895.00	841.00	1650.00	859.00

OCT78SEP79 TOTAL 5487.00 MEAN 15.00 MAX 152.00 MIN 12.00 TOT ACR FT 10880.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 172.00 CFS (2.59 FT) DATE AUG 8 MIN UNIT DISCHARGE 0.0 CFS DATE AUG 17

REMARKS:

UTAH POWER & LIGHT COMPANY
RESERVOIR RECORDS

STATION ELECTRIC LAKE
DATE OCT78TOSEP79

DAILY CONTENTS (ACRE FEET)
MONTHS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22043.	21310.	20823.	20227.	19647.	19137.	18583.	18648.	25626.	28221.	27523.	25893.
2	22025.	21328.	20803.	20207.	19627.	19118.	18565.	18770.	25837.	28213.	27497.	25877.
3	21997.	21317.	20782.	20188.	19611.	19099.	18550.	18826.	26029.	28204.	27468.	25849.
4	21965.	21300.	20762.	20171.	19592.	19084.	18531.	18910.	26231.	28200.	27434.	25821.
5	21937.	21279.	20742.	20152.	19573.	19065.	18513.	19018.	26417.	28187.	27405.	25797.
6	21902.	21259.	20725.	20132.	19554.	19046.	18495.	19153.	26613.	28174.	27375.	25765.
7	21870.	21242.	20705.	20112.	19538.	19028.	18480.	19253.	26827.	28165.	27225.	25733.
8	21842.	21221.	20685.	20096.	19519.	19012.	18461.	19300.	27009.	28153.	26930.	25709.
9	21807.	21200.	20665.	20076.	19500.	18993.	18443.	19335.	27175.	28135.	26634.	25693.
10	21779.	21190.	20648.	20057.	19481.	18975.	18425.	19350.	27300.	28118.	26491.	25673.
11	21751.	21190.	20628.	20037.	19465.	18956.	18410.	19373.	27405.	28097.	26466.	25658.
12	21713.	21183.	20608.	20018.	19446.	18937.	18392.	19395.	27514.	28071.	26450.	25622.
13	21685.	21170.	20588.	20002.	19427.	18922.	18374.	19424.	27624.	28054.	26429.	25595.
14	21667.	21135.	20571.	19982.	19408.	18903.	18355.	19493.	27734.	28032.	26425.	25551.
15	21643.	21128.	20551.	19963.	19392.	18885.	18340.	19634.	27844.	28007.	26413.	25519.
16	21622.	21115.	20531.	19943.	19373.	18866.	18322.	19865.	27943.	27977.	26389.	25487.
17	21615.	21094.	20511.	19927.	19354.	18851.	18304.	19986.	28037.	27951.	26360.	25456.
18	21580.	21074.	20495.	19907.	19335.	18832.	18313.	20106.	28092.	27921.	26332.	25424.
19	21559.	21057.	20475.	19888.	19316.	18814.	18334.	20432.	28148.	27891.	26316.	25393.
20	21545.	21036.	20455.	19869.	19300.	18795.	18352.	20799.	28144.	27866.	26287.	25351.
21	21535.	21016.	20435.	19852.	19281.	18780.	18358.	21190.	28127.	27857.	26263.	25330.
22	21518.	20996.	20418.	19833.	19262.	18761.	18361.	21611.	28157.	27844.	26231.	25302.
23	21497.	20979.	20399.	19814.	19244.	18743.	18364.	22014.	28170.	27827.	26198.	25267.
24	21476.	20958.	20379.	19794.	19228.	18724.	18380.	22430.	28187.	27806.	26166.	25235.
25	21452.	20938.	20359.	19778.	19209.	18709.	18395.	22852.	28200.	27781.	26142.	25204.
26	21431.	20917.	20339.	19759.	19190.	18691.	18413.	23224.	28213.	27755.	26114.	25177.
27	21414.	20901.	20323.	19740.	19171.	18672.	18428.	23613.	28221.	27730.	26081.	25145.
28	21390.	20880.	20303.	19720.	19156.	18654.	18465.	24062.	28221.	27704.	26053.	25114.
29	21369.	20860.	20283.	19704.	0.	18635.	18510.	24592.	28221.	27675.	26021.	25079.
30	21348.	20840.	20263.	19685.	0.	18620.	18577.	25032.	28221.	27645.	25989.	25048.
31	21328.	0.	20247.	19666.	0.	18602.	0.	25357.	0.	27603.	25961.	0.
MONTHLY CHANGE	-761.	-488.	-593.	-581.	-510.	-554.	-25.	6780.	2864.	-618.	-1642.	-913.

OCT78TOSEP79 TOTAL CHANGE 2959. MAX CONTENTS 28221. AC FT JUN 27 MIN CONTENTS 18304. AC FT APR 17

TOTAL CHANGE MAX CONTENTS MIN CONTENTS

REMARKS:

UTAH POWER & LIGHT COMPANY
STREAM DISCHARGE RECORDS

STATION HUNTINGTON CREEK AT PLANT
DATE OCT78TOSEP79

DAILY DISCHARGE (CFS)
MONTHS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30.00	34.00	34.00	34.00	32.00	34.00	33.00	71.00	190.00	145.00	145.00	65.00
2	30.00	40.00	27.00	34.00	32.00	33.00	33.00	66.00	176.00	143.00	144.00	59.00
3	30.00	39.00	25.00	34.00	31.00	27.00	31.00	67.00	175.00	133.00	147.00	79.00
4	31.00	33.00	34.00	34.00	31.00	27.00	32.00	75.00	180.00	122.00	143.00	112.00
5	31.00	39.00	33.00	34.00	28.00	30.00	34.00	99.00	190.00	110.00	141.00	103.00
6	32.00	39.00	22.00	34.00	32.00	29.00	35.00	100.00	218.00	112.00	143.00	111.00
7	32.00	39.00	15.00	31.00	32.00	27.00	37.00	87.00	226.00	110.00	200.00	109.00
8	33.00	40.00	23.00	29.00	32.00	27.00	37.00	73.00	187.00	109.00	210.00	103.00
9	33.00	40.00	23.00	34.00	30.00	24.00	39.00	61.00	155.00	108.00	210.00	111.00
10	34.00	41.00	23.00	34.00	30.00	39.00	39.00	58.00	145.00	101.00	154.00	111.00
11	34.00	41.00	24.00	33.00	31.00	24.00	32.00	54.00	162.00	101.00	126.00	124.00
12	35.00	35.00	24.00	33.00	32.00	27.00	35.00	52.00	169.00	100.00	134.00	124.00
13	35.00	25.00	24.00	31.00	29.00	20.00	31.00	59.00	212.00	101.00	143.00	125.00
14	27.00	24.00	25.00	31.00	25.00	24.00	35.00	77.00	240.00	106.00	129.00	125.00
15	20.00	19.00	25.00	34.00	23.00	26.00	36.00	95.00	241.00	108.00	131.00	125.00
16	23.00	18.00	25.00	34.00	22.00	25.00	42.00	134.00	212.00	90.00	122.00	123.00
17	29.00	19.00	26.00	34.00	26.00	25.00	45.00	186.00	186.00	104.00	127.00	113.00
18	32.00	18.00	26.00	32.00	18.00	24.00	52.00	272.00	159.00	121.00	122.00	74.00
19	29.00	24.00	27.00	27.00	27.00	24.00	42.00	289.00	150.00	125.00	123.00	74.00
20	32.00	25.00	27.00	31.00	30.00	25.00	40.00	290.00	165.00	128.00	119.00	83.00
21	33.00	23.00	28.00	29.00	33.00	25.00	40.00	302.00	126.00	128.00	83.00	72.00
22	29.00	23.00	28.00	32.00	26.00	25.00	42.00	292.00	135.00	130.00	79.00	70.00
23	31.00	22.00	29.00	29.00	30.00	25.00	42.00	305.00	148.00	124.00	75.00	70.00
24	34.00	21.00	29.00	31.00	31.00	26.00	50.00	304.00	153.00	122.00	71.00	69.00
25	35.00	25.00	30.00	32.00	30.00	26.00	56.00	280.00	146.00	120.00	70.00	68.00
26	36.00	25.00	30.00	33.00	34.00	27.00	56.00	285.00	170.00	118.00	75.00	67.00
27	36.00	13.00	31.00	21.00	33.00	30.00	59.00	331.00	162.00	127.00	71.00	69.00
28	37.00	15.00	31.00	25.00	30.00	33.00	63.00	360.00	148.00	134.00	71.00	76.00
29	37.00	32.00	32.00	20.00	0.0	35.00	68.00	316.00	144.00	132.00	72.00	76.00
30	38.00	36.00	33.00	26.00	0.0	34.00	65.00	259.00	147.00	131.00	72.00	75.00
31	39.00	0.0	33.00	25.00	0.0	33.00	0.0	209.00	0.0	142.00	72.00	0.0
MONTHLY												
TOT	997.00	872.00	846.00	955.00	820.00	860.00	1281.00	5509.00	5217.00	3693.00	3724.00	2775.00
MEA	32.20	29.10	27.30	30.80	29.30	27.70	42.70	178.00	174.00	119.00	120.00	92.50
MAX	39.00	41.00	34.00	34.00	34.00	39.00	68.00	360.00	241.00	145.00	210.00	125.00
MIN	20.00	13.00	15.00	20.00	18.00	20.00	31.00	52.00	126.00	90.00	70.00	59.00
ACR FT	1980.00	1730.00	1680.00	1890.00	1630.00	1710.00	2540.00	10930.00	10350.00	7320.00	7390.00	5500.00

OCT78TOSEP79 TOTAL 27549.00 MEAN 75.50 MAX 360.00 MIN 13.00 TOT ACR FT 54640.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 605.00 CFS (3.72 FT) DATE MAY 28 MIN UNIT DISCHARGE 0.0 CFS DATE FEB 18

REMARKS:

UTAH POWER & LIGHT COMPANY
INFLOW AND UTILIZATION RECORDS

TITLE HUNTINGTON CREEK NATURAL FLOW AT PLANT IN C.F.S.
DATE OCT78TOSEP79

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17.	38.	38.	30.	50.	34.	33.	126.	356.	169.	136.	49.
2	20.	54.	31.	30.	50.	33.	34.	135.	313.	164.	139.	46.
3	26.	47.	28.	30.	49.	26.	33.	133.	293.	152.	155.	76.
4	23.	38.	37.	31.	50.	27.	32.	129.	301.	143.	149.	119.
5	23.	36.	36.	31.	46.	37.	37.	167.	307.	138.	148.	122.
6	23.	36.	26.	30.	50.	40.	38.	180.	330.	129.	151.	123.
7	22.	37.	19.	26.	51.	42.	40.	157.	349.	128.	177.	119.
8	25.	37.	26.	25.	51.	43.	41.	114.	306.	128.	121.	121.
9	24.	37.	26.	31.	48.	39.	42.	92.	262.	124.	82.	127.
10	25.	40.	27.	30.	48.	54.	39.	83.	238.	116.	64.	129.
11	27.	46.	28.	27.	50.	39.	44.	74.	232.	116.	104.	142.
12	25.	40.	27.	26.	30.	40.	47.	71.	239.	110.	144.	133.
13	25.	27.	28.	25.	26.	32.	43.	82.	283.	112.	159.	128.
14	22.	19.	29.	26.	23.	36.	46.	115.	315.	118.	147.	129.
15	15.	16.	29.	27.	35.	37.	48.	168.	315.	118.	151.	130.
16	17.	20.	24.	27.	34.	36.	55.	246.	284.	93.	138.	128.
17	29.	17.	25.	28.	37.	37.	57.	284.	255.	107.	138.	118.
18	28.	14.	26.	26.	29.	36.	71.	345.	217.	123.	132.	79.
19	21.	21.	27.	21.	39.	35.	70.	418.	200.	127.	136.	80.
20	29.	22.	26.	25.	42.	36.	70.	476.	202.	131.	132.	93.
21	33.	20.	27.	23.	34.	37.	67.	515.	144.	136.	94.	82.
22	28.	19.	28.	27.	27.	37.	65.	519.	162.	141.	89.	82.
23	28.	19.	29.	23.	31.	36.	68.	535.	183.	133.	82.	80.
24	38.	18.	28.	24.	33.	38.	70.	531.	185.	129.	79.	78.
25	38.	22.	25.	27.	31.	39.	76.	512.	165.	137.	81.	78.
26	38.	21.	26.	28.	39.	39.	77.	507.	188.	134.	86.	79.
27	40.	10.	27.	33.	37.	31.	80.	544.	180.	144.	72.	81.
28	40.	19.	28.	35.	31.	34.	88.	592.	174.	151.	65.	86.
29	40.	35.	27.	31.	0.	34.	101.	573.	168.	142.	69.	86.
30	41.	39.	28.	38.	0.	35.	114.	517.	171.	140.	69.	86.
31	42.	0.	30.	37.	0.	34.	0.	416.	0.	148.	66.	0.
MONTHLY												
TOT	872.	868.	867.	877.	1098.	1130.	1724.	9356.	7317.	4080.	3555.	3008.
MEA	28.	29.	28.	28.	39.	36.	57.	302.	244.	132.	115.	100.
MAX	42.	54.	38.	38.	51.	54.	114.	592.	356.	169.	177.	142.
MIN	15.	10.	19.	21.	23.	26.	32.	71.	144.	93.	64.	46.

OCT78TOSEP79 TOTAL 34753. MEAN 95. MAX 592. MIN 10.
TOTAL MEAN MAX MIN

REMARKS:

APPENDIX C

HUNTINGTON CREEK WATER QUALITY

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station UPL-9
Location Huntington Creek above Fish Creek - Below Plant

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
11-9-78	13:15	41	14	6.5	7.5							9.8				0.10				0.024	0.020	80.0			58.0		335			510	48.0		263.52	216	280			
12-14-78	12:10	42.5	3	1.4	8.13							10.7				0.20				0.025	0.020	66.0			25.0		333			510			283.04	232	282			
1-10-79	13:55	34	-3	2	7.8							9.2				0.90				0.045	0.020	60.0			67.0		282			430			244	200	248			
2-14-79	15:25	30	0	3	8.5							10.0				0.15				0.080	0.050	108			114		345			480			246.44	202	298			
3-15-79	15:25	40	6	6	8.5							9.9				0.02				0.025	0.020	66.0			18.0		302			460			241.56	198	264			
4-17-79	10:25	53	18	9	7.73							8.8				0.02				0.10	0.06	98.0			142		399			610			273.28	224	248			
5-8-79	13:10	55	7	6	8.4							10.1				0.48				0.200	0.15	44.0			114		280			455			248.88	204	236			
6-14-79	12:28	109	29	11	8.7							8.6				0.27				0.010	0.010	22.0			54.0		209			326			204.96	168	184			
7-12-79	14:43	84	35	12	7.8							8.2				0.28				0.160	0.025	21.0			166		216			395			219.60	180	192			
8-9-79	11:45	191	30	14	7.5							8.9				0.36				0.185	0.180	22.0			108		179			280			173.24	142	158			
9-20-79	15:15	51	20	13.5	8.3							8.1				<0.01				0.090	0.030	32.0			6.0		210			350			200.08	164	178			
TOTAL		730.5	159	94.4	92.81							102.3				2.79				.944	.585	569			872		3090			4806	48.0		2588.60	2130	2588			
AVE.		66.4	14.5	7.7	8.1							9.3				0.3				.09	.05	51.7			79.3		281			437	48.0		236	194	233			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L				COMMENTS
11-9-78	0.150		<0.001	0.015		0.190		66.4	14.0			0.002		0.09			0.258	0.220	27.36	0.028	<0.0002		0.040	1.581	<0.001			15.50	0.003						
12-14-78	0.03	<0.001	<0.001		<0.001	0.090	<0.001	71.2	12.0	<0.001		0.002					0.049	<0.001	24.96	0.010	<0.0002		<0.001	1.512	<0.001		<0.001	15.13	0.007						
1-10-79			<0.001		<0.001	<0.001	<0.001	31.2	10.0			0.001					0.534	<0.001	40.8	0.027	<0.0002		0.102	1.368	<0.001			13.0	0.007						
2-14-79			<0.001		<0.001	0.160	<0.001	72.8	4.0			0.001					1.872	<0.001	27.84	0.047	<0.0002	<0.01	0.015	1.675	<0.001			9.56	0.004						
3-15-79			<0.001		0.001	0.04	<0.001	61.6	14.0			0.006					0.509	<0.001	26.4	0.015	<0.0002		<0.001	1.571	<0.001			10.96	0.007						
4-17-79			<0.001		<0.001	0.090	<0.001	63.20	10.0			0.004		0.13			2.482	0.004	21.6	0.061	<0.0002	<0.01	<0.001	1.460	<0.001		<0.001	14.77	0.005						
5-8-79			<0.001		0.002	0.020	<0.001	59.2	8.0			0.002		0.05			1.947	0.001	21.4	0.060	<0.0002		<0.001	1.297	<0.001			16.98	0.005						
6-14-79	0.300	<0.001	<0.001	0.04	0.001	0.050	<0.001	52.8	<0.1	<0.001		<0.001					1.210	0.003	12.48	0.038	<0.0002		<0.001	0.743	<0.001			3.08	0.003						
7-12-79			0.001		<0.001	0.085	<0.001	52.0	4.0	0.001		0.007					6.840	0.002	14.88	0.108	<0.0002		<0.001	0.990	<0.001			4.51	0.013						
8-9-79			<0.001		<0.001	0.085	<0.001	54.40	4.0			0.001					1.850	<0.001	5.28	0.088	<0.0002	<0.001	<0.001	0.934	<0.001			3.39	0.008						
9-20-79			<0.001		0.001	<0.001	<0.001	63.20	2.0			0.001					0.200	<0.001	4.80	0.013	<0.0002	<0.001	<0.001	1.052	0.001			8.80	0.005						
TOTAL	.450	<.002	<.011	.105	<.011	.712	<.010	648	82.1	<.002		.028		.27			17.751	.236	227.8	.495	<.0022	<.022	.165	14.213	<.011		<.002	105.62	.067						
AVE.	.16	<.001	<.001	.01	<.001	.06	<.001	58.9	7.5	<.001		.003		.09			1.6	.02	20.7	.045	<.0002	<.006	.015	1.29	<.001		<.001	9.6	.006						

R 1-78

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station H-1
Location Huntington Creek above Huntington plant diversion

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L
11-9-78	13:35	41	11	4	7.55							9.1		
12-14-78	12:40	Ice	5	2.5								12.3	<1.0	
1-10-79	14:50	51	-2	1	8.2							9.8		
2-14-79	14:00	127.5	4	1	8.45							11.2		
3-15-79	14:16	80	8.5	4.5	8.5							9.7	<1.0	
4-17-79	09:30	107	15	5	7.88							9.3		
5-8-79	13:50	138	5	5	8.4							9.8		
6-14-79	13:33	394	30	12	8.6							8.1	<1.0	
7-12-79	15:29	133	34	15	8.05							8.2		
8-9-79	13:00	163	30	14	7.4							8.6		
9-20-79	14:45	97	16	13	8.45							8.5	3.0	
TOTAL		1331.5	156.5	77	81.48							104.6	6.	
AVERAGE		121.	13.9	7.	7.41							9.5	1.5	

DATE	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	DETERGENT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC COND. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
11-9-78		0.14				0.033	0.022	34.0			154		252			390	96.0		246.44	202	206			
12-14-78		0.12				0.042	0.020	33.0			14.0		250			380			261.08	214	240			
1-10-79		0.76				0.025	0.020	46.0			10.0		282			430			216.40	220	214			
2-14-79		0.16				0.022	0.020	52.0			43.0		265			395			224.48	184	250			
3-15-79		0.09				0.028	0.023	15.0			32.0		229			350			234.24	192	220			
4-17-79		0.06				0.10	0.05	26.0			92.0		310			470			265.96	218	230			
5-8-79		0.41				0.050	0.02	16.0			22.7		250			410			244	200	212			
6-14-79		0.24				0.018	0.010	18.0			42.0		190			300			192.76	158	172			
7-12-79		0.16				0.130	0.018	15.0			209		191			340			204.76	168	184			
8-9-79		0.34				0.100	0.020	8.2			63.0		148			230			163.48	134	136			
9-20-79		<0.01				0.360	0.020	15.0			8.0		179			310			187.88	154	152			
TOTAL		1.99				.908	.243	278.2			894		2546			4005			2493.28	1697.	2216.			
AVERAGE		.18				.08	.02	25.3			81.3		231.5			364.1			226.7	154.3	201.5			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L
11-9-78	0.030		<0.001	0.060		0.095		44.0	8.0			<0.001		0.08
12-14-78	0.10	<0.001	<0.001	0.060	<0.001	0.090	<0.001	60.8	2.0	<0.001		0.001		
1-10-79			<0.001		<0.001	0.210	<0.001	55.2	2.0			<0.001		
2-14-79			<0.001		<0.001	0.050	<0.001	63.2	14.0			<0.001		
3-15-79			<0.001		0.001	0.08	<0.001	57.0	16.0			0.003		
4-17-79			<0.001		0.002	0.07	<0.001	58.4	6.0	<0.001		0.001		
5-8-79			0.001		0.001	0.120	<0.001	54.4	6.0			0.003		0.12
6-14-79	0.230	<0.001	<0.001	0.03	<0.001	0.045	<0.001	48.0	<0.1			0.004		
7-12-79			<0.001		<0.001	0.070	<0.001	45.60	4.0	<0.001		0.005		
8-9-79			<0.001		<0.001	0.060	<0.001	47.20	<0.1			0.005		
9-20-79			<0.001		0.001	<0.001	<0.001	53.60	2.0			0.003		
TOTAL	.36	.002	.011	.15	.011	.891	.010	582.4	60.2	.003		.028		.20
AVERAGE	.13	.001	.001	.05	.001	.08	.001	52.9	5.47	.001		.002		.10

DATE	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	COMMENTS
11-9-78			0.521	<0.001	73.04	0.047	<0.0002			1.284	<0.001			18.60	<0.001		
12-14-78			0.089	0.001	21.12	0.011	<0.0002		0.011	1.347	<0.001		<0.001	4.59	0.004		
1-10-79			0.212	<0.001	18.24	0.013	<0.0002		0.040	1.203	<0.001			25.5	<0.001		
2-14-79			0.414	<0.001	22.08	0.030	<0.0002	<0.01	0.357	1.281	<0.001			4.40	<0.001		
3-15-79			0.568	<0.001	21.60	0.016	<0.0002		<0.001	1.346	<0.001			4.69	0.002		
4-17-79			1.873	<0.001	20.16	0.054	<0.0002		<0.001	1.317	<0.001			5.63	0.004		
5-8-79			4.031	<0.001	18.24	0.095	<0.0002	<0.01	<0.001	1.173	<0.001			4.20	0.009		
6-14-79			1.000	<0.001	12.48	0.035	<0.0002		<0.001	0.697	<0.001		<0.001	2.22	0.001		
7-12-79			5.470	0.002	14.88	0.100	<0.0002		<0.001	0.856	<0.001			2.51	0.009		
8-9-79			1.910	0.004	4.32	0.090	<0.0002	<0.001	<0.001	0.876	<0.001			2.13	0.006		
9-20-79			0.280	<0.001	4.32	0.021	<0.0002		<0.001	0.880	<0.001			8.00	0.005		
TOTAL			16.37	.015	180.48	.51	.002	.021	.42	12.26	.011		.002	82.47	.043		
AVERAGE			1.49	.001	16.41	.05	.001	.007	.04	1.12	.001		.001	7.50	.006		

R 1-70

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station UPL-2
Location Right Fork Huntington Creek above Left Fork

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L
11-9-78	13:55	28.5	9	5	7.6							8.7		
12-14-78	13:25		-2	0.5		33	<2					11.8		
1-10-79	15:15	51	0	1	8.0	49	<2			4.5		9.2		<0.001
2-14-79	13:30	28	0	1	8.1	33	<2							
3-15-79	14:45	37.6	2	4	8.55	34	<2	<2				9.4		
4-17-79	09:04	33	10	2.5	7.74	33.0	<2.0	<2.0				9.0		
5-8-79	14:10	53	5	7	8.45	10.0	<2.0	<2.2				9.3		
6-14-79	13:58	72	25	13	8.7	75.0	5.0	13.0				7.9		
7-12-79	15:55	38	31	17	7.9	1100	13.0	8.0				8.2		
8-9-79	13:25	10	25	14	7.1	230	49.0	490				8.2		
9-20-79	14:25	18	12	11	8.3	94.0	17.0	15.0				8.9		
Ave		33		6.9	8.0	169	9.6	76		4.5		9.1		<.001

DATE	NITROGEN AMMONIA as NH_3-N MG/L	NITRATE as NO_3-N MG/L	NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDAHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L
11-9-78		0.11					0.020	19.0					212		
12-14-78						0.024	0.070	10.0			12.0		223		
1-10-79		0.22					0.035	10.0			23.0		190		
2-14-79		0.16	<0.01			0.060	0.020				4.0		211		
3-15-79		0.08	<0.01			0.022	<0.001				5.0		206		
4-17-79		0.02	<0.01			0.04	0.02				7.0		250		
5-8-79		0.28	<0.01			0.150	0.10				9.0		210		
6-14-79		0.78	<0.01			0.020	0.010				10.0		210		
7-12-79		0.26	<0.01			0.010	<0.010				10.0		190		
8-9-79		0.39	<0.01			0.120	<0.010				114		140		
9-20-79		0.14	<0.01			0.070	0.030				8.0		190		
Ave		.24	<.01			.06	.03	13			20		203		

DATE	SPECIFIC COND µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK. as HCO_3 MG/L	TOTAL ALK. as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
11-9-78	325	0.85		231.8	190	202			
12-14-78	340	0.60		216.92	218	222			
1-10-79	290	1.10		217.16	178	186			
2-14-79	330	1.80							
3-15-79	310	3.50							
4-17-79	380	3.40							
5-8-79	280	0.35							
6-14-79	320	7.5							
7-12-79	330	6.0				174			
8-9-79	240	30.0							
9-20-79	340								
Ave	317	5.5		238	195	196			

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L
11-9-78	0.020			0.060		0.100		53.6	2.0		<0.001			0.08
12-14-78								55.2	2.0					
1-10-79		<0.001		0.080			<0.001	49.6	4.0	<0.001		<0.001	<0.001	0.09
2-14-79														
3-15-79														
4-17-79														
5-8-79														
6-14-79														
7-12-79														
8-9-79														
9-20-79														
Ave	.02	<.001		.07		.1	<.001	528	2.7	<.001	<.001	<.001	<.001	.09

DATE	FERMANAN TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L	COMMENTS
11-9-78			0.161		16.32	0.017	<0.0002			1.227				4.71	0.001		
12-14-78					20.16					1.162				3.50			
1-10-79			0.082	<0.001	14.88	0.013	<0.0002			0.992	<0.001		<0.001	2.50	0.014		
2-14-79																	Snowing
3-15-79																	
4-17-79																	
5-8-79																	
6-14-79																	
7-12-79																	
8-9-79																	
9-20-79																	Light Rain
Ave			.12	<.001	17	.015	<.0002			1.06	<.001		<.001	3.57	.008		

R 1-79

VAUGHN HANSEN ASSOCIATES
Consultants / Engineers

WATER QUALITY DATA

Station HFL-3
Location Huntington Creek below Electric Lake

DATE	TIME	FLOW CFS	TEMPERATURE AIR °C	TEMPERATURE WATER °C	pH	COLIFORM TOTAL MPN	COLIFORM FECAL MPN	FECAL STREP. MPN	C.O.D. MG/L	B.O.D. MG/L	T.O.C. MG/L	DISSOLVED OXYGEN MG/L	OIL & GREASE MG/L	PHENOL MG/L	NITROGEN AMMONIA as NH_3-N MG/L	NITROGEN NITRATE as NO_3-N MG/L	NITROGEN NITRITE as NO_2-N MG/L	NITROGEN TOTAL KJELDHL MG/L	NITROGEN ORGANIC MG/L	PHOSPHATE TOTAL as PO_4-P MG/L	PHOSPHATE ORTHO as PO_4-P MG/L	SULFATE as SO_4 MG/L	HYDROXIDE as OH MG/L	SURFACTANT as MBAS MG/L	SOLIDS TSS MG/L	SOLIDS TOTAL SETTLEABLE SOLIDS ML/L	SOLIDS T.D.S. MG/L	SOLIDS TOTAL SOLIDS MG/L	SOLIDS TOTAL VOLATILE SOLIDS MG/L	SPECIFIC CONO. µMHOS/CM	TURBIDITY FTU	CARBONATE ALK. as CO_3 MG/L	BI-CARBONATE ALK as HCO_3 MG/L	TOTAL ALK as $CaCO_3$ MG/L	TOTAL HARDNESS as $CaCO_3$ MG/L	ACIDITY as $CaCO_3$ MG/L	ALPHA RADIO-ACTIVITY pCi/L	BETA RADIO-ACTIVITY pCi/L
11-9-78	14:25	48	14	6.5	7.65							8.2				0.21				0.025	0.022	17.0					165			250	0.46		173.24	142	152			
12-14-78	13:45	41	1	4		8	<2					10.4								0.055		38.0			8.0		185			285	1.50		165.92	136	170			
1-10-79	15:55	25.5	2	4.5	7.9	8	<2			3.5		8.8		<0.001		0.28				0.040		19.0			1.0		164			250	1.00		168.36	138	138			
2-14-79	12:25	18.5	0	4	7.7	2	<2					9.4				0.17	<0.01			0.055	0.015				6.0		196			290	1.50							
3-15-79	15:35	22	0	5	8.45	23	<2	2				10.0				0.18	<0.01			0.020	<0.001				1.0		190			290	1.50							
4-17-79	08:25	34	9	3	7.51	33.0	<2.0	<2.0				8.1				0.06	<0.01			0.04	0.02				1.0		280			430	3.60							
5-8-79	14:45	53.5	1	5.5	8.1	5.0	<2.0	<2.2				10.4				0.10	<0.01			0.050	0.03				1.0		180			270	0.45							
6-14-79	14:35	88	25	7	7.8	17.0	2.0	14.0				8.0				0.78	<0.01			0.060	0.010				4.0		170			260	6.50							
7-12-79	16:28	48	30	10	7.35	940	<2.0	2.0				8.4				0.45	<0.01			0.020	<0.010				3.0		160			270	6.00							
7-19-79	17:25	28	19	9	7.1						7.00	8.4	<1.0	0.194	<0.01	0.56				<0.001		14.0			6.0		150			260	5.00		151.28	124		12.0		
8-9-79	13:55	154	25	12	7.0	11.0	<2.0	2.0				7.8				0.33	<0.01			0.040	0.020				8.0		120			220	10.0							
8-29-79	08:30	23		7	7.36	79.0	2.0				14.0	7.6	1.2	<0.001	<0.01	0.49				0.010		194.7			1.0		400			270	4.50		156.16	128		12.0	3.5	12.8
9-20-79	13:30	30	15	7.7	7.16	<2.0	<2.0	<2.0			10.00	8.16	1.6	0.110	<0.01	0.23				0.200	0.150	35.9			3.0		197			280	5.00		173.24	142				
Ave		47?		6.5	7.6	102	< 2	3.7		3.5	10	8.8	1.3	.08	<.01	.32	<.01			.05	.03	53			3.3		197			279	3.6		165	135	153	12	3.5	12.8

DATE	ALUMINUM TOTAL MG/L	ANTIMONY TOTAL MG/L	ARSENIC TOTAL MG/L	BARIUM TOTAL MG/L	BERYLLIUM TOTAL MG/L	BORON TOTAL MG/L	CADMIUM TOTAL MG/L	CALCIUM TOTAL MG/L	CHLORIDE DISS. MG/L	CHROMIUM HEX as CR MG/L	COBALT TOTAL MG/L	COPPER TOTAL MG/L	CYANIDE as CN MG/L	FLUORIDE DISS. MG/L	GERMANIUM TOTAL MG/L	IRON DISS. MG/L	IRON TOTAL MG/L	LEAD TOTAL MG/L	MAGNESIUM TOTAL MG/L	MANGANESE TOTAL MG/L	MERCURY TOTAL MG/L	MOLYBDENUM TOTAL MG/L	NICKEL TOTAL MG/L	POTASSIUM TOTAL MG/L	SELENIUM TOTAL MG/L	SILICA as SiO_2 MG/L	SILVER TOTAL MG/L	SODIUM TOTAL MG/L	ZINC TOTAL MG/L	VANADIUM TOTAL MG/L				COMMENTS
11-9-78	0.020		<0.001	0.040		0.090		47.2	2.0			<0.001		0.07			0.096		8.16	0.018	<0.0002			0.958				4.00	0.004					
12-14-78								56.0	<0.01										7.20					0.978				1.79						
1-10-79			<0.001	0.030			<0.001	46.4	2.0	<0.001		<0.001	0.005	0.08			0.164	<0.001	10.56	0.035	<0.0002			0.861	<0.001		<0.001	1.59	0.027					
2-14-79																																			
3-15-79																																			
4-17-79																																			
5-8-79																																			
6-14-79																																			
7-12-79																																			
7-19-79			<0.001	0.045		0.095	<0.001	40.80	<0.1	0.002		0.009	<0.001	0.10		0.040	0.130	0.017	7.68	0.012	<0.0002			1.072	<0.001		<0.001	2.34	0.014					
8-9-79																																			
8-29-79			<0.001	0.045		0.005	0.003	124	<0.1	0.003		0.016	<0.001	0.10		0.050	0.340	<0.001	4.80	0.021	<0.0002			0.886	0.002		<0.001	1.93	0.032					
9-20-79			<0.001	0.080		<0.001	<0.001	48.00	2.0	0.006		0.008	<0.001	0.14		0.030	0.090	0.001	8.90	0.016	<0.0002			1.100	<0.001		<0.001	12.0	0.006					
Ave		.02	<.001	.05		.05	.001	60	1.0	.003		.007	.002	.10		.04	.16	.005	7.9	.02	<.002			.98	.001		<.001	3.9	.02					

R 1-78

APPENDIX D

DEER CREEK SURFACE WATER QUALITY

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/31/79
DATE SAMPLED: 7/30/79

LAB NUMBER: 1079
DATE RECEIVED: 7/31/79

SAMPLE ID: Deer Creek
Below Mine
7/30/79

WATER ANALISIS REPORT

ND means not determined

pH units	8.4
Total Alkalinity mg/l $CaCO_3$	287.0
Total Suspended Solids mg/l	40.6
Total Dissolved solids mg/l	440
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	141.6
Total Flouride mg/l	0.31
Total Dissolved Iron mg/l	0.65
Oil and Grease mg/l	0.9
Turbidity NTU's	21.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/30/79

LAB NUMBER: 1078
DATE RECEIVED: 7/31/79

SAMPLE ID: Deer Creek
Above Mine
7/30/79

WATER ANALISIS REPORT

ND means not determined

pH units	8.5
Total Alkalinity mg/l $CaCO_3$	244.0
Total Suspended Solids mg/l	4.6
Total Dissolved solids mg/l	260
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	16.5
Total Flouride mg/l	0.25
Total Dissolved Iron mg/l	0.32
Oil and Grease mg/l	0.9
Turbidity NTU's	2.4

MANAGER

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

John M.

June 13, 1978

Utah Power & Light Company
41 North Redwood Road
ATTN: Mr. Jerry Vaninetti
Mining & Exploration Division
Salt Lake City, UT 84116

CERTIFICATE OF ANALYSIS

78-1248

Dear Mr. Vaninetti:

The following analysis is on samples of water received on May 22, 1978:

Sample: Deer Creek Mine dated May 16, 1978:

	Deer Creek Above Mine 5/16/78	Deer Creek Below Mine 5/16/78
pH Units	6.97	6.92
Conductivity umhos/cm	360.0	420.0
Total Dissolved Solids Mg/l	235.0	273.0
Suspended Solids Mg/l	521.0	1,124.0
Iron as Fe (Total) Mg/l	0.289	0.390
Manganese as Mn (Total) Mg/l	0.187	0.208

Sincerely,
FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

LSF/jms

reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pend- our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/18/79
CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-003173

SAMPLE: ~~WASTEWATER~~ DEER CREEK RUN OFF SAMPLES FROM DEER CREEK MINE RECEIVED MAY 17, 1979.

	ABOVE MINE	BELOW MINE
Acidity as CaCO3 mg/l	12.0	14.0
Alkalinity as CaCO3 mg/l	252.00	278.00
Chloride as Cl mg/l	12.0	22.0
Conductivity umhos/cm	470	730
Dissolved Oxygen mg/l	10.00	8.84
Iron as Fe (Total) mg/l	40.100	170.000
Oil and Grease mg/l	<1.0	<1.0
Sulfate as SO4 mg/l	10.0	113
Suspended Solids mg/l	1,400	20,540
Total Dissolved Solids mg/l	310	477
pH Units	7.68	7.40

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

APPENDIX E

COTTONWOOD CREEK (STRAIGHT CANYON) WATER QUALITY

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

Unpublished Records
Subject to Revision

10-12-79

WATER QUALITY ANALYSIS
LAB ID # 234070 RECORD # 13164

AMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
TATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--790815 END-- TIME--1215
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
ATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
JC MCNEELY-STREAM IS LOW & CLEAR. WEATHER IS CLOUDY. COND=BECKMAN CHECKED @ 1968. PH=NORTHROP SET TO 7.0
#1023

IR TEMP (DEG C)		19.5	POTASSIUM DISS	MG/L	1.5
LK,TOT(CACO3)	MG/L	180	POTASSIUM 40,D.PCI/L		1.1
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	228
ORON DISSOLVED	UG/L	20	RESIDUE DIS TON/AFT		0.31
ALCIUM DISS	MG/L	45	RESIDUE DIS TON/DAY		75.1
HLORIDE DISS	MG/L	4.4	SAR		0.3
LUORIDE DISS	MG/L	0.1	SILICA DISSOLVED	MG/L	3.9
ARDNESS NONCARB	MG/L	23	SODIUM + POTASSIUM	MG/L	11
ARDNESS TOTAL	MG/L	200	SODIUM DISS	MG/L	9.2
AGNESIUM DISS	MG/L	22	SODIUM PERCENT		9
NO3 AS N DISS	MG/L	0.16	SP. CONDUCTANCE FLD		400
IELD		8.2	SP. CONDUCTANCE LAB		397
H LAB		8.3	STREAMFLOW(CFS)-INST		122
HOS ORTHO DIS AS P	DETR.	DELETED	SULFATE DISS	MG/L	33
			WATER TEMP (DEG C)		11.0

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L)
LCIUM DISS	45	2.246	CHLORIDE DISS	4.4	0.125
GNESIUM DISS	22	1.810	FLUORIDE DISS	0.1	0.006
OTASSIUM DISS	1.5	0.039	SULFATE DISS	33	0.688
ODIUM DISS	9.2	0.401	ALK,TOT(CACO3)	180	3.597
			NO2+NO3 AS N D	0.16	0.012
TOTAL		4.494	TOTAL		4.424

PERCENT DIFFERENCE = 0.78

Unpublished Records
Subject to Revision

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

WATER QUALITY ANALYSIS
11-14-79 LAB ID # 263137 RECORD # 26000

AMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
TATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
~~ATE OF COLLECTION: BEGIN--790912 END-- TIME--1130~~
TATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464600300
ATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
OMMENTS:
R.R.TIBBETTS. WEATHER CLEAR. CREEK LOW & CLEAR. PH=LEEDS&NORTHRUP.
COND=YSI 33 #1023

IP TEMP (DEG C)		17.0	POTASSIUM 40,D.PCI/L		0.5
~~LK,TOT(CACO3)~~	~~MG/L~~	~~190~~	~~RESIDUE DIS CALC SUM MG/L~~		~~222~~
NALYZING AGENCY		80020	RESIDUE DIS TON/AFT		0.30
ORON DISSOLVED	UG/L	0	RESIDUE DIS TON/DAY		88.7
~~ALCIUM DISS~~	~~MG/L~~	~~43~~	~~SAR~~		~~0.3~~
HLORIDE DISS	MG/L	3.8	SILICA DISSOLVED	MG/L	4.0
LUORIDE DISS	MG/L	0.3	SODIUM + POTASSIUM	MG/L	9.7
~~ARDNESS NONCARB~~	~~MG/L~~	~~0~~	~~SODIUM DISS~~	~~MG/L~~	~~0.0~~
ARDNESS TOTAL	MG/L	190	SODIUM PERCENT		9
AGNESIUM DISS	MG/L	20	SP. CONDUCTANCE FLD		380
~~O2+NO3 AS N DISS~~	~~MG/L~~	~~0.20~~	~~SP. CONDUCTANCE LAB~~		~~397~~
H FIELD		8.4	STREAMFLOW(CFS)-INST		148
H LAB		8.3	SULFATE DISS	MG/L	26
~~OTASSIUM DISS~~	~~MG/L~~	~~0.7~~	~~WATER TEMP (DEG C)~~		~~8.5~~

~~CATIONS~~			~~ANIONS~~		
	(MG/L)	(MEQ/L)		(MG/L)	(MEQ/L)
~~ALCIUM DISS~~	~~43~~	~~2.146~~	~~CHLORIDE DISS~~	~~3.8~~	~~0.107~~
AGNESIUM DISS	20	1.645	FLUORIDE DISS	0.3	0.016
OTASSIUM DISS	0.7	0.018	SULFATE DISS	26	0.541
~~ODIUM DISS~~	~~9.0~~	~~0.392~~	~~ALK.TOT(CACO3)~~	~~190~~	~~3.746~~
			NO2+NO3 AS N D	0.20	0.014
~~TOTAL~~		~~4.200~~	~~TOTAL~~		~~4.475~~

~~PERCENT DIFFERENCE = -3.16~~

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

Unpublished Records
Subject to Revision

12-22-79

WATER QUALITY ANALYSIS
LAB ID # 319071 RECORD # 40365

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--791018 END-- TIME--1200
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
JRTIBBETTS. CLOUDY. STREAM LOW & CLEAR. PH=LEEDS NORTHRUP. COND=YSI33

AIR TEMP (DEG C)		13.5	POTASSIUM DISS	MG/L	0.9
ALK,TOT(CACO3)	MG/L	180	POTASSIUM 40,D.PCI/L		0.7
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	215
BORON DISSOLVED	UG/L	40	RESIDUE DIS TON/AFT		0.29
CALCIUM DISS	MG/L	43	RESIDUE DIS TON/DAY		63.9
CHLORIDE DISS	MG/L	4.1	SAR		0.3
FLUORIDE DISS	MG/L	0.1	SILICA DISSOLVED	MG/L	4.3
HARDNESS NONCARB	MG/L	10	SODIUM + POTASSIUM	MG/L	9.1
HARDNESS TOTAL	MG/L	190	SODIUM DISS	MG/L	8.2
MAGNESIUM DISS	MG/L	20	SODIUM PERCENT		9
?+NO3 AS N DISS	MG/L	0.22	SP. CONDUCTANCE FLD		390
PH FIELD		8.3	SP. CONDUCTANCE LAB		385
PH LAB		DETR. DELETED	STREAMFLOW(CFS)-INST		110
PHOSPHORUS DIS AS P	MG/L	0.01	SULFATE DISS	MG/L	25
			WATER TEMP (DEG C)		10.0

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L)
CALCIUM DISS	43	2.146	CHLORIDE DISS	4.1	0.11
MAGNESIUM DISS	20	1.645	FLUORIDE DISS	0.1	0.005
POTASSIUM DISS	0.9	0.023	SULFATE DISS	25	0.52
SODIUM DISS	8.2	0.357	ALK,TOT(CACO3)	180	3.59
			NO2+NO3 AS N D	0.22	0.01
TOTAL		4.171	TOTAL		4.25

PERCENT DIFFERENCE = -0.98

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

Unpublished Records
Subject to Revision

WATER QUALITY ANALYSIS
LAB ID # 334001 RECORD # 10624

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--781115 END-- TIME--1110
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J R TIBBETTS. WEATHER-CLEAR. CREEK LOW & CLEAR. DOUBLE CKD PH. PH= SARGENT-WELCH. COND=YSI MODLE 33

AIR TEMP (DEG C)		-1.0	PH LAB		8.0
ALK,TOT(CACO3)	MG/L	210	PHOS ORTHO DIS AS P	MG/L	0.00
ANALYZING AGENCY		80020	POTASSIUM DISS	MG/L	1.2
BORON DISSOLVED	UG/L	70	SAR		0.5
CALCIUM DISS	MG/L	49	SILICA DISSOLVED	MG/L	3.5
CHLORIDE DISS	MG/L	7.5	SODIUM DISS	MG/L	16
FLUORIDE DISS	MG/L	0.1	SODIUM PERCENT		13
HARDNESS TOTAL	MG/L	240	SP. CONDUCTANCE FLD		380
MAGNESIUM DISS	MG/L	28	SP. CONDUCTANCE LAB		500
NO2+NO3 AS N DISS	MG/L	0.09	STREAMFLOW(CFS)-INST		8
PH FIELD		8.8	SULFATE DISS	MG/L	52
			WATER TEMP (DEG C)		0.5

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/
CALCIUM DISS	49	2.446	CHLORIDE DISS	7.5	0.2
MAGNESIUM DISS	28	2.304	FLUORIDE DISS	0.1	0.00
POTASSIUM DISS	1.2	0.031	SULFATE DISS	52	1.0
SODIUM DISS	16	0.696	ALK,TOT(CACO3)	210	4.1
			NO2+NO3 AS N D	0.09	0.00
TOTAL		5.475	TOTAL		5.5

PERCENT DIFFERENCE = -0.24

Unpublished Record
Subject to Revision

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

WATER QUALITY ANALYSIS
LAB ID # 362048 RECORD # 17297

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--781214 END-- TIME--1100
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J R TIBBETTS. WEATHER-CLEAR. CREEK IS 100% ICE COVER. PH-SARGENT-WELCH. COND-YSI-MODEL 33.

AIR TEMP (DEG C)		-6.0
ALK,TOT(CACO3)	MG/L	210
ANALYZING AGENCY		80020
BORON DISSOLVED	UG/L	60
CALCIUM DISS	MG/L	51
CHLORIDE DISS	MG/L	7.8
FLUORIDE DISS	MG/L	0.2
HARDNESS NONCARB	MG/L	45
HARDNESS TOTAL	MG/L	260
MAGNESIUM DISS	MG/L	31
NO2+NO3 AS N DISS	MG/L	0.21
PH FIELD		7.5
PH LAB		8.2

PHOS ORTHO DIS AS P		DETR. DELETE
POTASSIUM DISS	MG/L	1.3
RESIDUE DIS CALC SUM	MG/L	304
RESIDUE DIS TON/AFT		0.4
RESIDUE DIS TON/DAY		4.3
SAR		0.5
SILICA DISSOLVED	MG/L	4.2
SODIUM DISS	MG/L	18
SODIUM PERCENT		13
SP. CONDUCTANCE FLD		500
SP. CONDUCTANCE LAB		548
STREAMFLOW(CFS)-INST		5.3
SULFATE DISS	MG/L	63
WATER TEMP (DEG C)		0.0

CATIONS	(MG/L)	(MEQ/L)
CALCIUM DISS	51	2.545
MAGNESIUM DISS	31	2.551
POTASSIUM DISS	1.3	0.034
SODIUM DISS	18	0.783
TOTAL		5.911

ANIONS	(MG/L)	(MEQ/
CHLORIDE DISS	7.8	0.2
FLUORIDE DISS	0.2	0.0
SULFATE DISS	63	1.3
ALK,TOT(CACO3)	210	4.1
NO2+NO3 AS N D	0.21	0.0
TOTAL		5.7

PERCENT DIFFERENCE = 1.36

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

Unpublished Records
Subject to Revision

WATER QUALITY ANALYSIS
LAB ID # 29031 RECORD # 22191

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--790124 END-- TIME--1100
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J R TIBBETTS. WEATHER IS CLOUDY. 1.5 SNOW @ GAGE. 100% ICE COVER @ GAGE. COND=YSI 33 PH=SARGENT-WELCH

AIR TEMP (DEG C)		-12.0	PHOS ORTHO DIS AS P		DETR. DELETED
ALK,TOT(CACO3)	MG/L	240	POTASSIUM DISS	MG/L	1.6
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	352
BORON DISSOLVED	UG/L	90	RESIDUE DIS TON/AFT		0.48
CALCIUM DISS	MG/L	59	RESIDUE DIS TON/DAY		4.07
CHLORIDE DISS	MG/L	9.3	SAR		0.6
FLUORIDE DISS	MG/L	0.2	SILICA DISSOLVED	MG/L	5.0
HARDNESS NONCARB	MG/L	43	SODIUM DISS	MG/L	23
HARDNESS TOTAL	MG/L	280	SODIUM PERCENT		15
MAGNESIUM DISS	MG/L	33	SP. CONDUCTANCE FLD		580
NO2+NO3 AS N DISS	MG/L	0.21	SP. CONDUCTANCE LAB		611
PH FIELD		7.8	STREAMFLOW(CFS)-INST		4.
PH LAB		8.0	SULFATE DISS	MG/L	76
			WATER TEMP (DEG C)		0.0

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L
CALCIUM DISS	59	2.945	CHLORIDE DISS	9.3	0.26
MAGNESIUM DISS	33	2.715	FLUORIDE DISS	0.2	0.01
POTASSIUM DISS	1.6	0.041	SULFATE DISS	76	1.58
SODIUM DISS	23	1.001	ALK,TOT(CACO3)	240	4.79
			NO2+NO3 AS N D	0.21	0.01
TOTAL		6.700	TOTAL		6.60

PERCENT DIFFERENCE = 0.26

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

Unpublished Records
Subject to Revision

WATER QUALITY ANALYSIS
LAB ID # 52107 RECORD # 26856

5-26-79

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--790213 END-- TIME--1130
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J.R.TIBBETTS. WEATHER-CLOUDY. STREAM IS 80% ICE COVER. PH=SARGENT WELCH. COND=YSI 33.
RERUNS: CA=66, MG=32, NA=26, CL=9.8, SO4=100
#1023 #0

AIR TEMP (DEG C)		1.0	PHOS ORTHO DIS AS P		DETR. DELETED
ALK,TOT(CACO3)	MG/L	170	POTASSIUM DISS	MG/L	1.7
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	353
BORON DISSOLVED	UG/L	60	RESIDUE DIS TON/AFT		0.48
CALCIUM DISS	MG/L	66	RESIDUE DIS TON/DAY		3.31
CHLORIDE DISS	MG/L	10	SAR		0.7
FLUORIDE DISS	MG/L	0.3	SILICA DISSOLVED	MG/L	5.4
HARDNESS NONCARB	MG/L	120	SODIUM DISS	MG/L	26
HARDNESS TOTAL	MG/L	290	SODIUM PERCENT		16
MAGNESIUM DISS	MG/L	30	SP. CONDUCTANCE FLD		580
NO2+NO3 AS N DISS	MG/L	0.27	SP. CONDUCTANCE LAB		570
PH FIELD		7.5	STREAMFLOW(CFS)-INST		3.5
PH LAB		8.1	SULFATE DISS	MG/L	110
			WATER TEMP (DEG C)		0.0

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L)
CALCIUM DISS	66	3.294	CHLORIDE DISS	10	0.2
MAGNESIUM DISS	30	2.468	FLUORIDE DISS	0.3	0.0
POTASSIUM DISS	1.7	0.044	SULFATE DISS	110	2.2
SODIUM DISS	26	1.131	ALK,TOT(CACO3)	170	3.3
			NO2+NO3 AS N D	0.27	0.0
	TOTAL	6.936		TOTAL	6.0

PERCENT DIFFERENCE = 7.20

Unpublished Records
Subject to Revision

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

WATER QUALITY ANALYSIS
LAB ID # 86123 RECORD # 34624

5-12-79

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--790320 END-- TIME--1130
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J.R.TIBBETTS. SNOWING HARD. STREAM IS LOW. PH=LEEDS & NORTHRUP.
COND=YSI 33.

#1023

AIR TEMP (DEG C)		6.0	PHOS ORTHO DIS AS P		DETR. DELETED
ALK,TOT(CACO3)	MG/L	210	POTASSIUM DISS	MG/L	1.5
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	326
BORON DISSOLVED	UG/L	50	RESIDUE DIS TON/AFT		0.44
CALCIUM DISS	MG/L	54	RESIDUE DIS TON/DAY		6.74
CHLORIDE DISS	MG/L	9.9	SAR		0.6
FLUORIDE DISS	MG/L	0.2	SILICA DISSOLVED	MG/L	4.7
HARDNESS NONCARB	MG/L	53	SODIUM DISS	MG/L	23
HARDNESS TOTAL	MG/L	260	SODIUM PERCENT		16
MAGNESIUM DISS	MG/L	31	SP. CONDUCTANCE FLD		530
NO2+NO3 AS N DISS	MG/L	0.12	SP. CONDUCTANCE LAB		565
PH FIELD		8.5	STREAMFLOW(CFS)-INST		7.7
PH LAB		8.3	SULFATE DISS	MG/L	75
			WATER TEMP (DEG C)		0.5

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L
CALCIUM DISS	54	2.695	CHLORIDE DISS	9.9	0.2
MAGNESIUM DISS	31	2.551	FLUORIDE DISS	0.2	0.0
POTASSIUM DISS	1.5	0.039	SULFATE DISS	75	1.56
SODIUM DISS	23	1.001	ALK,TOT(CACO3)	210	4.1
			NO2+NO3 AS N D	0.12	0.0
TOTAL		6.284	TOTAL		6.05

PERCENT DIFFERENCE = 1.85

Unpublished Records
Subject to Revision

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

WATER QUALITY ANALYSIS
7-26-79 LAB ID # 120142 RECORD # 42584

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE,UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: * NONE GIVEN *
DATE OF COLLECTION: BEGIN--790417 END-- TIME--1100
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J.R.TIBBETS. CLEAR & WARM.CREEK IS LOW & MUDDY. PH=LEEDS & NORTHRUP.
COND=YSI 33; FC RECEIVED UNCHILLED

AIR TEMP (DEG C)		18.5	PHOSPHATE DIS ORTHO	MG/L	0.00
ALK,TOT(CACO3)	MG/L	170	POTASSIUM DISS	MG/L	1.3
ANALYZING AGENCY		80020	POTASSIUM 40,D.PCI/L		1.0
BORON DISSOLVED	UG/L	120	RESIDUE DIS CALC SUM	MG/L	353
CALCIUM DISS	MG/L	46	RESIDUE DIS TON/AFT		0.48
CHLORIDE DISS	MG/L	11	RESIDUE DIS TON/DAY		11.5
FLUORIDE DISS	MG/L	0.2	SAR		1.4
ARDNESS NONCARB	MG/L	60	SILICA DISSOLVED	MG/L	5.1
HARDNESS TOTAL	MG/L	230	SODIUM DISS	MG/L	48
MAGNESIUM DISS	MG/L	28	SODIUM PERCENT		31
NO2+NO3 AS N DISS	MG/L	0.21	SP. CONDUCTANCE FLD		610
PH FIELD		8.4	SP. CONDUCTANCE LAB		587
PH LAB		8.1	STREAMFLOW(CFS)-INST		12
PHOS ORTHO DIS AS P	MG/L	0.00	SULFATE DISS	MG/L	110
			WATER TEMP (DEG C)		5.5

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L)
CALCIUM DISS	46	2.296	CHLORIDE DISS	11	0.311
MAGNESIUM DISS	28	2.304	FLUORIDE DISS	0.2	0.011
POTASSIUM DISS	1.3	0.034	SULFATE DISS	110	2.291
SODIUM DISS	48	2.088	ALK,TOT(CACO3)	170	3.397
			NO2+NO3 AS N D	0.21	0.015
TOTAL		6.720	TOTAL		6.023

PERCENT DIFFERENCE = 5.47

Unpublished Records
Subject to Revision

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

9-4-79

WATER QUALITY ANALYSIS
LAB ID # 157090 RECORD # 54722

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--790517 END-- TIME--1030
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
J.R.TIBBETTS & G.A.BIRDWELL. CLEAR PART OF CHANNEL HAS .2 OF NEW SILT. PH-LEED&NORTHRUP, COND-YSI 33, SEND COPY TO MOAB

#1023

AIR TEMP (DEG C)		17.5	POTASSIUM DISS	MG/L	1.0
ALK,TOT(CACO3)	MG/L	200	POTASSIUM 40,D.PCI/L		0.7
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	246
BORON DISSOLVED	UG/L	70	RESIDUE DIS TON/AFT		0.33
CALCIUM DISS	MG/L	48	RESIDUE DIS TON/DAY		51.6
CHLORIDE DISS	MG/L	5.7	SAR		0.4
FLUORIDE DISS	MG/L	0.2	SILICA DISSOLVED	MG/L	3.
HARDNESS NONCARB	MG/L	19	SODIUM + POTASSIUM	MG/L	15
HARDNESS TOTAL	MG/L	220	SODIUM DISS	MG/L	14
MAGNESIUM DISS	MG/L	24	SODIUM PERCENT		12
NO2+NO3 AS N DISS	MG/L	0.11	SP. CONDUCTANCE FLD		420
PH FIELD		8.4	SP. CONDUCTANCE LAB		439
PH LAB		8.2	STREAMFLOW(CFS)-INST		78
PHOS ORTHO DIS AS P	DETR.	DELETED	SULFATE DISS	MG/L	29
			WATER TEMP (DEG C)		6.5

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L
CALCIUM DISS	48	2.396	CHLORIDE DISS	5.7	0.1
MAGNESIUM DISS	24	1.975	FLUORIDE DISS	0.2	0.01
POTASSIUM DISS	1.0	0.026	SULFATE DISS	29	0.60
SODIUM DISS	14	0.609	ALK,TOT(CACO3)	200	3.9
			NO2+NO3 AS N D	0.11	0.00
TOTAL		5.004	TOTAL		4.7

PERCENT DIFFERENCE = 2.30

Unpublished Records
Subject to Revision

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CENTRAL LABORATORY, DENVER, COLORADO

WATER QUALITY ANALYSIS
LAB ID # 172136 RECORD # 61206

8-17-79

SAMPLE LOCATION: COTTONWOOD CREEK NEAR ORANGEVILLE, UTAH
STATION ID: 09324500 LAT.LONG.SEQ.: 391600 1110745 01
DATE OF COLLECTION: BEGIN--790613 END-- TIME--1630
STATE CODE: 49 COUNTY CODE: 015 PROJECT IDENTIFICATION: 464900300
DATA TYPE: 2 SOURCE: SURFACE WATER GEOLOGIC UNIT:
COMMENTS:
RIVER IS HIGH & CLEAR; COND BECKMAN- PH=NORTHRUP; NO FC RECEIVED.
#1023

AIR TEMP (DEG C)		29.5	POTASSIUM DISS	MG/L	0.6
ALK,TOT(CACO3)	MG/L	180	POTASSIUM 40,D.PCI/L		0.4
ANALYZING AGENCY		80020	RESIDUE DIS CALC SUM	MG/L	227
BORON DISSOLVED	UG/L	50	RESIDUE DIS TON/AFT		0.31
CALCIUM DISS	MG/L	46	RESIDUE DIS TON/DAY		305
CARBON DIOXIDE	MG/L	1.4	SAR		0.3
CHLORIDE DISS	MG/L	15	SILICA DISSOLVED	MG/L	3.3
FLUORIDE DISS	MG/L	0.4	SODIUM + POTASSIUM	MG/L	9.5
HARDNESS NONCARB	MG/L	17	SODIUM DISS	MG/L	8.9
ARDNESS TOTAL	MG/L	200	SODIUM PERCENT		9
MAGNESIUM DISS	MG/L	20	SP. CONDUCTANCE FLD		380
NO2+NO3 AS N DISS	MG/L	0.17	SP. CONDUCTANCE LAB		403
PH FIELD		8.4	STREAMFLOW(CFS)-INST		498
PH LAB		7.9	SULFATE DISS	MG/L	24
			WATER TEMP (DEG C)		17.5

CATIONS	(MG/L)	(MEQ/L)	ANIONS	(MG/L)	(MEQ/L)
CALCIUM DISS	46	2.296	CHLORIDE DISS	15	0.42
MAGNESIUM DISS	20	1.646	FLUORIDE DISS	0.4	0.02
POTASSIUM DISS	0.6	0.016	SULFATE DISS	24	0.50
SODIUM DISS	8.9	0.388	ALK,TOT(CACO3)	180	3.59
			NO2+NO3 AS N D	0.17	0.01
TOTAL		4.343	TOTAL		4.552

PERCENT DIFFERENCE = -2.35

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 09/07/79

CERTIFICATE OF ANALYSIS

JTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-005870

SAMPLE: WATER DATED 8/2/79 RECEIVED 8/3/79.

Flow @ 11:00 AM 352.2 cfm
Flow @ 5:00 PM 276.5 cfm

	COTTONWD CR ABV T. MTN. MINE 10:30 AG. 7.8°C	COTTONWD CR BEL T. MTN MINE 11 AM AG. 11.7°C	COTTONWD CR USGS FLUME 11:15 AM AGOSTON 12.4°C	COTTONWD CR ABV ST CANYON FK 11:30 AGOSTON 14°C
Acidity as CaCO3 mg/l	10.0	10.0	10.0	4.0
Alkalinity as CaCO3 mg/l	272.00	288.00	248.00	280.00
Arsenic as As (Tot) mg/l	<.001	<.001	<.001	<.001
BOD 5 Day mg/l	<1.0	<1.0	<1.0	1.5
Bicarbonate as HCO3 mg/l	331.84	351.36	302.56	341.60
Cadmium as Cd (Tot) mg/l	<.001	<.001	<.001	<.001
Calcium as Ca mg/l	101.60	108.00	96.00	108.00
Chloride as Cl mg/l	12.0	10.0	12.0	14.0
Fluoride as F mg/l	.15	.13	.12	.14
Iron as Fe (Total) mg/l	.140	.130	.170	.270
Lead as Pb (Total) mg/l	<.001	<.001	.001	<.001
MPN Fecal Coliform MPN/100 ml	170	23.0	110	79.0
MPN Total Coliform MPN/100 ml	1,100	170	790	1,300

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005870

	COTTONWD CR ABV T. MTN. MINE 10:30 AG.	COTTONWD CR BEL T. MTN MINE 11 AM AG.	COTTONWD CR USGS FLUME 11:15 AM AGOSTON	COTTONWD CR ABV ST CANYON FK 11:30 AGOSTON
agnesium as Mg mg/l	9.60	10.08	6.72	10.00
anganese as Mn (Tot) mg/l	.013	.015	.041	.007
itrite as NO2-N mg/l	<.01	<.01	<.01	<.01
and Grease mg/l	<1.0	<1.0	<1.0	1.4
hosphate PO4-P (Ortho) mg/l	.120	.060	<.001	.060
otassium as K mg/l	1.791	1.789	1.823	2.061
elenium as Se (Tot) mg/l	<.001	<.001	<.001	<.001
lica as SiO2 mg/l	6.70	6.50	6.50	6.50
odium as Na mg/l	19.18	19.29	19.10	22.87
ulfate as SO4 mg/l	52.0	49.0	49.0	60.0
uspended Solids mg/l	4.0	4.0	5.0	16.0
otal Dissolved Solids mg/l	368	361	341	389
otal Kjeldahl Nitrogen mg/l	.25	.31	.20	.10
inc as Zn (Total) mg/l	.017	.020	.035	.013
H Units	7.60	7.98	7.38	8.04

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 09/25/79

CERTIFICATE OF ANALYSIS

TAH POWER & LIGHT
INING & EXPLORATION
OX 1005
UNTINGTON, UT 84528

79-006458

AMPLE: WASTEWATER DATED 8/21/79 RECEIVED 8/22/79.

Flow 338.8 GPM

	COTTONWD CR STRAIGHT CAN F 1:45, 18.7 C AGOSTON	COTTONWD CR TRAIL MTN MINE 2:25, 14 C AGOSTON	COTTONWD CR BELOW T MTN MIN 2:15, 14C AGOSTON	COTTONWD CK USGS FLUME 2:00 PM 16°C AGOSTON	WILBERG MINE DIS. 1:00 P.M. AGOSTON
lkalinity as CaCO3 mg/l	284.00	248.00	256.00	252.00	286.00
luminum as Al (Total) mg/l	.280	.320	.370	.460	.11[illegible]
rsenic as As (Tot) mg/l	<.001	<.001	<.001	<.001	<.001
OD 5 Day mg/l	1.6	<1.0	<1.0	<1.0	<1.0
icarbonate as HCO3 mg/l	346.48	302.56	312.32	307.44	348.92
admium as Cd (Tot) mg/l	<.001	<.001	<.001	<.001	<.001
alcium as Ca mg/l	120.80	101.60	102.40	97.60	155.20
hloride as Cl mg/l	12.0	6.0	6.0	6.0	10.0
luoride as F mg/l	.19	.16	.16	.15	.20
ron as Fe (Total) mg/l	.450	.260	.520	.690	.290
ead as Pb (Total) mg/l	<.001	<.001	<.001	<.001	<.001
PN Fecal Coliform MPN/100 ml	21.0	130	33.0	31.0	<2.0
PN Total Coliform MPN/100 ml	220	490	330	2,300	17.0

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-008438

	COTTONWD CR STRAI GHT CAN F 1:45,18.7 C AGOSTON	COTTONWD CR TRAIL MTN MINE 2:25,14 C AGOSTON	COTTONWD CR BELOW T MTN MIN 2:15, AGOSTON	COTTONWD CK USGS FLUINE 2:00 PM AGOSTON	WILBERG MINE DIS. 1:00 P.M. AGOSTON
agnesium as Mg mg/l	8.16	4.80	5.76	4.80	14.88
ngganese as Mn (Tot) mg/l	.019	.017	.015	.021	.017
trite as NO2-N mg/l	<.01	<.01	<.01	<.01	<.01
il and Grease mg/l	<1.0	<1.0	2.2	<1.0	<1.0
hate PO4-P Ortho mg/l	.030	.050	.030	.090	.120
otassium as K mg/l	2.804	1.984	1.941	1.897	3.587
lenium as Se (Tot) mg/l	<.001	<.001	<.001	.002	.001
lica as SiO2 mg/l	7.90	6.70	6.70	6.70	8.00
dium as Na mg/l	32.81	18.89	19.53	19.36	23.29
lfate as SO4 mg/l	100	56.8	55.0	45.0	193
uspended Solids mg/l	13.0	21.0	24.0	52.0	4.0
tal Dissolved Solids mg/l	462	355	362	336	579
tal Kjeldahl Nitrogen mg/l	.04	.07	.05	.05	.02
nc as Zn (Total) mg/l	.038	.034	.035	.039	.038
Units	7.40	7.20	7.60	7.80	7.30

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 10/17/79
CERTIFICATE OF ANALYSIS

JTAH POWER & LIGHT
1INING & EXPLORATION
3OX 1005
HUNTINGTON, UT 84528

79-007279

SAMPLE: WATER SAMPLES DATED 9-17-79 RECEIVED 9-21-79 FROM COTTONWOOD CREEK COLLECTED BY ED AGOSTON.

	ABOVE TRAIL MOUNTAIN MINE 1200	BELOW TRAIL MOUNTAIN MINE 11:45	AT USGS FLUME 11:30	ABOVE STRAIGHT CANYON FORK 11:15
Acidity as CaCO3 mg/l	22.0	22.0	16.0	18.0
Alkalinity as CaCO3 mg/l	262.00	252.00	238.00	244.00
Arsenic as As (Tot) mg/l	<.001	<.001	<.001	<.001
BOD 5 Day mg/l	1.3	<1.0	<1.0	<1.0
Bicarbonate as HCO3 mg/l	319.64	307.44	290.36	297.68
Cadmium as Cd (Tot) mg/l	<.001	<.001	<.001	<.001
Calcium as Ca mg/l	93.60	100.00	90.40	101.60
Chloride as Cl mg/l	6.0	8.0	8.0	24.0
Fluoride as F mg/l	.17	.16	.16	.17
Iron as Fe (Total) mg/l	.100	.110	.110	.100
Lead as Pb (Total) mg/l	.002	<.001	<.001	<.001
MPN Fecal Coliform MPN/100 ml	46.0	13.0	33.0	23.0
MPN Total Coliform MPN/100 ml	1,300	140	280	370

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-007279

	ABOVE TRAIL MOUNTAIN MINE 1200	BELOW TRAIL MOUNTAIN MINE 11:45	AT USGS FLUME 11:30	ABOVE STRAIGHT CANYON FORK 11:15
agnesium as Mg mg/l	8.16	6.24	9.60	8.64
anganese as Mn (Tot) mg/l	.007	.009	.007	.007
itrite as NO2-N mg/l	<.01	<.01	.01	.01
and Grease mg/l	<1.0	<1.0	<1.0	<1.0
hosphate PO4-P Ortho mg/l	.090	.040	.150	.040
otassium as K mg/l	1.799	1.830	1.846	2.206
elenium as Se (Tot) mg/l	.002	.002	.001	.001
ilica as SiO2 mg/l	8.00	8.50	8.00	8.00
ulfate as SO4 mg/l	50.0	48.0	52.0	74.0
uspended Solids mg/l	6.0	7.0	9.0	10.0
otal Dissolved Solids mg/l	460	360	330	370
otal Kjeldahl Nitrogen mg/l	<.01	<.01	<.01	<.01
inc as Zn (Total) mg/l	.022	.018	.020	.021
H Units	7.30	7.40	7.40	7.50

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved ending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 11/15/79

CERTIFICATE OF ANALYSIS

ITAH POWER & LIGHT
IINING & EXPLORATION
OX 1005
UNTINGTON, UT 84528

79-007656

AMPLE: WATER FROM HUNTINGTON DATED 10/17/79 RECEIVED 10/18/79.

	COTTONWD CREEK ABV TRAIL MTN MINE	COTTONWD CREEK BE TRAIL MTN MINE	USGS FLUME	COTTONWD CREEK AB STRAIGHT CANYON FORK
cidity as CaCO3 mg/l	18.0	4.0	18.0	<1.0
lkalinity as CaCO3 mg/l	266.00	282.00	252.00	294.00
rsenic as As mg/l	<.001	<.001	<.001	<.001
OD 5 Day mg/l	<1.0	<1.0	1.7	2.4
icarbonate as HCO3 mg/l	324.52	344.04	307.44	305.00
admium as Cd mg/l	<.001	<.001	<.001	<.001
alcium as Ca mg/l	106.40	123.20	96.80	116.80
hloride as Cl mg/l	12.0	12.0	12.0	12.0
uoride as F mg/l	.23	.15	.12	.15
on as Fe (Total) mg/l	.065	.114	.080	.040
ad as Pb mg/l	<.001	<.001	<.001	<.001
N Fecal Coliform MPN/100 ml	13.0	13.0	70.0	94.0
N Total Coliform MPN/100 ml	46.0	460	2,300	1,800

ll reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved ending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-007656

	COTTONWD CREEK ABV TRAIL MTN MINE	COTTONWD CREEK BE TRAIL MTN MINE	USGS FLUME	COTTONWD CREEK AB STRAIGHT CANYON FORK
ignesium as Mg mg/l	2.40	2.40	2.00	2.40
anganese as Mn mg/l	.010	.018	.005	.005
trite as NO2-N mg/l	<.01	<.01	<.01	<.01
il and Grease mg/l	4.2	9.0	1.2	<1.0
osphate PO4-P Ortho mg/l	<.001	.120	.070	.100
tassium as K mg/l	1.500	3.650	1.850	2.450
elenium as Se mg/l	<.010	<.010	<.010	<.010
lica as SiO2 mg/l	6.95	7.10	7.05	6.90
odium as Na mg/l	25.00	11.85	29.00	14.00
lfate as SO4 mg/l	52.0	49.0	47.0	68.0
spended Solids mg/l	2.0	1.0	1.0	1.0
otal Dissolved Solids mg/l	360	378	344	366
tal Kjeldahl Nitrogen mg/l	<.01	<.01	<.01	<.01
inc as Zn mg/l	.012	.030	.010	.005
Units	7.70	8.10	7.90	8.40

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 12/27/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-008106

SAMPLE: WATER SAMPLES DATED 11/26/79 RECEIVED 11/28/79

	COT.WOOD CR. BELOW TRAIL MTN MINE	COT.WOOD CR.USGS FLUME	COT.WOOD CR.ABOVE STRAIGHT CANYON FORK
Acidity as CaCO3 mg/l	14.0	16.0	18.0
Alkalinity as CaCO3 mg/l	252.00	230.00	258.00
Arsenic as As mg/l	<.001	<.001	<.001
BOD 5 Day mg/l	1.6	<1.0	<1.0
Bicarbonate as HCO3 mg/l	307.44	280.60	317.76
Cadmium as Cd mg/l	<.001	<.001	<.001
Calcium as Ca mg/l	58.40	47.20	56.00
Chloride as Cl mg/l	8.0	8.0	12.0
Fluoride as F mg/l	.12	.12	.12
Iron as Fe (Total) mg/l	.119	.095	.050
Lead as Pb mg/l	<.001	.001	.001
MPN Fecal Coliform MPN/100 ml	<2.0	11.0	11.0
MPN Total Coliform MPN/100 ml	23.0	330	170

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-008106

	COT.WOOD CR. BELOW TRAIL MTN MINE	COT.WOOD CR.USGS FLUME	COT.WOOD CR.ABOVE STRAIGHT CANYON FORK
====	====	====	====
nesium as Mg mg/l	33.60	36.48	42.24
nganese as Mn mg/l	.006	.020	.013
rite as NO2-N mg/l	<.01	<.01	<.01
nd Grease mg/l	1.2	.8	1.8
osphate PO4-P Ortho mg/l	.140	.160	2.000
assium as K mg/l	1.759	1.853	2.238
lenium as Se mg/l	<.001	<.001	<.001
ica as SiO2 mg/l	10.00	10.00	10.00
lium as Na mg/l	14.95	14.75	19.71
lfate as SO4 mg/l	49.0	56.0	76.0
pended Solids mg/l	<1.0	13.0	<1.0
tal Dissolved Solids mg/l	320	310	370
al Kjeldahl Nitrogen mg/l	<.01	<.01	<.01
c as Zn mg/l	.001	.005	.007
Units	7.60	7.70	7.80

FORD CHEMICAL LABORATORY, INC.

reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved ing our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 12/04/79

CERTIFICATE OF ANALYSIS

ITAH POWER & LIGHT
INING & EXPLORATION
OX 1005
UNTINGTON, UT 84528

79-008107

AMPLE: WATER SAMPLE FROM ABOVE TRAIL MINE RECEIVED 11/28/79

RESULTS

FN Fecal Coliform MPN/100 ml	2.0
FN Total Coliform MPN/100 ml	33.0
il and Grease mg/l	<.1

FORD CHEMICAL LABORATORY, INC.

ll reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved ending our written approval as a mutual protection to clients, the public and ourselves.

APPENDIX F

GRIMES WASH WATER QUALITY

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/04/79

CERTIFICATE OF ANALYSIS

TAH POWER & LIGHT
STANDARD COAL LABS
OX 1140
JNTINGTON, UT 84528

79-002799

AMPLE: WATERS FROM GRIMS WASH RECEIVED ON MAY 2, 1979:

	RIGHT FORK ABOVE WILBERG MINE	BELOW WILBERG MINE
cidity as CaCO3 mg/l	<.1	<.1
linity as CaCO3 mg/l	288.00	202.00
Chloride as Cl mg/l	16.0	14.0
on as Fe (Total) mg/l	1.051	.883
il and Grease mg/l	5.2	1.8
lfate as SO4 mg/l	99.0	248
uspended Solids mg/l	35.0	31.0
otal Dissolved Solids mg/l	700	370
H Units	7.91	7.95

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/18/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-003174

SAMPLE: WASTEWATER SAMPLES FROM WILBERG MINE RECEIVED MAY 17, 1979.

	DISCHARGE	RIGHT FK OF GRIMES WASH ABOVE MINE	GRIMES WASH BELOW MINE
Acidity as CaCO3 mg/l	10.0	14.0	16.0
Alkalinity as CaCO3 mg/l	290.00	236.00	256.00
Chloride as Cl mg/l	18.0	8.0	12.0
Iron as Fe (Total) mg/l	1.648	3.985	18.900
Oil and Grease mg/l	<1.0	<1.0	<1.0
Sulfate as SO4 mg/l	193	33.0	66.0
Suspended Solids mg/l	15.0	1,860	1,180
Total Dissolved Solids mg/l	705	322	382
pH Units	7.63	7.78	7.55

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 9/5/79
DATE SAMPLED: 9/4/79

LAB NUMBER: 1096
DATE RECEIVED: 9/5/79

SAMPLE ID: Left Fork Grimes Wash
Above Wilberg
68°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.7
Total Alkalinity mg/l $CaCO_3$	262.9
Total Suspended Solids mg/l	28.2
Total Dissolved solids mg/l	327
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	30.4
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.81
Oil and Grease mg/l	0.1
Turbidity NTU's	24

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/21/79
DATE SAMPLED: 5/4/79

LAB NUMBER: 1027
DATE RECEIVED: 6/21/79

SAMPLE ID: Wilberg Mine
Grimes Wash Runoff
Rt. Fork Above mine

WATER ANALISIS REPORT

ND means not determined

pH units	8.0
Total Alkalinity mg/l $CaCO_3$	456.1
Total Suspended Solids mg/l	792.0
Total Dissolved solids mg/l	594.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	161.7
Total Flouride mg/l	0.25
Total Dissolved Iron mg/l	7.20
Oil and Grease mg/l	1.2
Turbidity NTU's	680.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/19/79
DATE SAMPLED: 6/18/79

LAB NUMBER: 1024
DATE RECEIVED: 6/18/79

SAMPLE ID: Right Fork Grimes Wash
Above Wilberg Mine
Temp 6^0 C

WATER ANALISIS REPORT

ND means not determined

pH units	8.45
Total Alkalinity mg/l $CaCO_3$	287.0
Total Suspended Solids mg/l	22.2
Total Dissolved solids mg/l	474.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	67.1
Total Flouride mg/l	0.27
Total Dissolved Iron mg/l	1.43
Oil and Grease mg/l	1.0
Turbidity NTU's	34.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/19/79
DATE SAMPLED: 6/18/79

LAB NUMBER: 1026
DATE RECEIVED: 6/18/79

SAMPLE ID: Grimes Wash
Below Wilberg Mine
Temp 5^0 C

WATER ANALISIS REPORT

ND means not determined

pH units	8.50
Total Alkalinity mg/l $CaCO_3$	297.2
Total Suspended Solids mg/l	10.0
Total Dissolved solids mg/l	172.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	71.2
Total Flouride mg/l	0.26
Total Dissolved Iron mg/l	0.74
Oil and Grease mg/l	2.4
Turbidity NTU's	25.0

MANAGER

APPENDIX G

EAST MOUNTAIN SPRINGS WATER QUALITY

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1041
DATE RECEIVED: 7/10/79

SAMPLE ID: SHEBA SPRINGS
(Upper Roans Canyon Spring)
12 GPM
45° F

WATER ANALISIS REPORT

ND means not determined

pH units		8.3
Total Alkalinity mg/l $CaCO_3$		211.2
Total Suspended Solids mg/l		0.4
Total Dissolved solids mg/l		216
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		8.6
Total Flouride mg/l		0.18
Total Dissolved Iron mg/l		0.02
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		0.22

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1105
DATE RECEIVED: 10/23/79

SAMPLE ID: Sheba Spring
Flow 0,95gpm
38°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.8
Total Alkalinity mg/l $CaCO_3$	235.9
Total Suspended Solids mg/l	less than0.1
Total Dissolved solids mg/l	284
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	5.3
Total Flouride mg/l	0.17
Total Dissolved Iron mg/l	0.80
Oil and Grease mg/l	1.0
Turbidity NTU's	0.58

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1045
DATE RECEIVED: 7/10/79

SAMPLE ID: Pine Spring
4.1 GPM
64° F

WATER ANALISIS REPORT

ND means not determined

pH units		8.4
Total Alkalinity mg/l $CaCO_3$		391.6
Total Suspended Solids mg/l		32.4
Total Dissolved solids mg/l		227
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		8.2
Total Flouride mg/l		0.26
Total Dissolved Iron mg/l		1.84
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		6.3

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1044
DATE RECEIVED: 7/10/79

SAMPLE ID: Upper Elk Spring
Flow >1000 GPM
Temp 39°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.4
Total Alkalinity mg/l $CaCO_3$	244.0
Total Suspended Solids mg/l	0.2
Total Dissolved solids mg/l	242
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	6.6
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.04
Oil and Grease mg/l less than	0.1
Turbidity NTU's	0.38

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1104
DATE RECEIVED: 10/23/79

SAMPLE ID: Upper Elk Spring
Flow 75 gpm
38°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.0
Total Alkalinity mg/l $CaCO_3$	237.2
Total Suspended Solids mg/l	3.6
Total Dissolved solids mg/l	257
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	23.5
Total Flouride mg/l	0.20
Total Dissolved Iron mg/l	0.27
Oil and Grease mg/l	1.1
Turbidity NTU's	0.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1043
DATE RECEIVED: 7/10/79

SAMPLE ID: Ted's Bathtub
Flow 65 GPM
Temp 40°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.1
Total Alkalinity mg/l $CaCO_3$	254.2
Total Suspended Solids mg/l	1.4
Total Dissolved solids mg/l	268
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	16.9
Total Flouride mg/l	0.2
Total Dissolved Iron mg/l	0.06
Oil and Grease mg/l	2.9
Turbidity NTU's	0.95

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1108
DATE RECEIVED: 10/23/79

SAMPLE ID: Ted's Tub
flow 12gpm
41°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	290.7
Total Suspended Solids mg/l	3.2
Total Dissolved solids mg/l	322
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	23.9
Total Flouride mg/l	0.22
Total Dissolved Iron mg/l	0.19
Oil and Grease mg/l	1.5
Turbidity NTU's	2.1

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1038
DATE RECEIVED: 7/10/79

SAMPLE ID: Cove Springs N
Flow 0.67 gpm
42° F

WATER ANALISIS REPORT

ND means not determined

pH units	8.3
Total Alkalinity mg/l $CaCO_3$	256.3
Total Suspended Solids mg/l	less than 0.1
Total Dissolved solids mg/l	304
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	10.7
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.03
Oil and Grease mg/l less than	0.1
Turbidity NTU's	5.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1036
DATE RECEIVED: 7/10/79

SAMPLE ID: Burnt Tree Spring
Flow 12 gpm
44°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.8
Total Alkalinity mg/l $CaCO_3$	274.7
Total Suspended Solids mg/l less than	0.1
Total Dissolved solids mg/l	283
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	8.2
Total Flouride mg/l	0.31
Total Dissolved Iron mg/l	0.04
Oil and Grease mg/l less than	0.1
Turbidity NTU's	1.7

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1106
DATE RECEIVED: 10/23/79

SAMPLE ID: Burnt Tree
Flow 1.9gpm
44°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.8
Total Alkalinity mg/l $CaCO_3$	281.8
Total Suspended Solids mg/l	less than 0.1
Total Dissolved solids mg/l	299
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	7.4
Total Flouride mg/l	0.26
Total Dissolved Iron mg/l	0.10
Oil and Grease mg/l	1.3
Turbidity NTU's	0.60

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1039
DATE RECEIVED: 7/10/79

SAMPLE ID: Pine Trough
Flow ~~[illegible]~~ gpm 6.6 gpm.
Temp 43° F

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	222.4
Total Suspended Solids mg/l	0.4
Total Dissolved solids mg/l	214
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	10.7
Total Flouride mg/l	0.23
Total Dissolved Iron mg/l	0.04
Oil and Grease mg/l	less than 0.1
Turbidity NTU's	0.35

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1042
DATE RECEIVED: 7/10/79

SAMPLE ID: Unknown 79-1
Flow 40+gpm
Temp 47° F

WATER ANALISIS REPORT

ND means not determined

pH units		8.4
Total Alkalinity mg/l $CaCO_3$		188.7
Total Suspended Solids mg/l		5.4
Total Dissolved solids mg/l		210
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		11.9
Total Flouride mg/l		0.2
Total Dissolved Iron mg/l		0.17
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		3.1

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1103
DATE RECEIVED: 10/23/79

SAMPLE ID: 79-1
Flow 5 gpm
37°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.1
Total Alkalinity mg/l $CaCO_3$	195.1
Total Suspended Solids mg/l	5.0
Total Dissolved solids mg/l	208
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	6.2
Total Flouride mg/l	0.18
Total Dissolved Iron mg/l	1.16
Oil and Grease mg/l	1.9
Turbidity NTU's	16

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1040
DATE RECEIVED: 7/10/79

SAMPLE ID: Unknown 79-2
Flow 0.5 gpm
Temp 67°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.3
Total Alkalinity mg/l $CaCO_3$	381.3
Total Suspended Solids mg/l	14
Total Dissolved solids mg/l	401
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	13.2
Total Flouride mg/l	0.26
Total Dissolved Iron mg/l	0.14
Oil and Grease mg/l	1
Turbidity NTU's	2.4

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/11/79
DATE SAMPLED: 7/10/79

LAB NUMBER: 1037
DATE RECEIVED: 7/12/79

SAMPLE ID: Unknown 79-3
Flow 2.6 gpm
Temp 46° F

WATER ANALISIS REPORT

ND means not determined

pH units		7.8
Total Alkalinity mg/l $CaCO_3$		291.1
Total Suspended Solids mg/l		1.6
Total Dissolved solids mg/l		298
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		11.1
Total Flouride mg/l		0.24
Total Dissolved Iron mg/l		0.06
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		1.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/12/79
DATE SAMPLED: 7/11/79

LAB NUMBER: 1046
DATE RECEIVED: 7/12/79

SAMPLE ID: Spring 79-4
Flow 2.4 GPM
Temp 40° F

WATER ANALISIS REPORT

ND means not determined

pH units	7.7
Total Alkalinity mg/l $CaCO_3$	219.4
Total Suspended Solids mg/l	147.4
Total Dissolved solids mg/l	201
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	6.2
Total Flouride mg/l	0.18
Total Dissolved Iron mg/l	4.12
Oil and Grease mg/l	4.3
Turbidity NTU's	63.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/12/79
DATE SAMPLED: 7/11/79

LAB NUMBER: 1047
DATE RECEIVED: 7/12/79

SAMPLE ID: 79-5
Flow 3.1 GPM
Temp 62° F

WATER ANALISIS REPORT

ND means not determined

pH units	8.4
Total Alkalinity mg/l $CaCO_3$	223/5
Total Suspended Solids mg/l	11.6
Total Dissolved solids mg/l	208
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	20.6
Total Flouride mg/l	0.2
Total Dissolved Iron mg/l	0.23
Oil and Grease mg/l	34.1
Turbidity NTU's	2.5

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/12/79
DATE SAMPLED: 7/11/79

LAB NUMBER: 1048
DATE RECEIVED: 7/12/79

SAMPLE ID: 79-6 Spring
Flow 0.86 GPM
Temp 40°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.9
Total Alkalinity mg/l $CaCO_3$	262.4
Total Suspended Solids mg/l	139.8
Total Dissolved solids mg/l	243
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	23.5
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	2.12
Oil and Grease mg/l	0.7
Turbidity NTU's	72.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/12/79
DATE SAMPLED: 7/11/79

LAB NUMBER: 1049
DATE RECEIVED: 7/12/79

SAMPLE ID: 79-7
Flow 0.53 GPM
Temp 42° F

WATER ANALISIS REPORT

ND means not determined

pH units	8.1
Total Alkalinity mg/l $CaCO_3$	248.1
Total Suspended Solids mg/l	14.6
Total Dissolved solids mg/l	65
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	15.2
Total Flouride mg/l	0.14
Total Dissolved Iron mg/l	1.36
Oil and Grease mg/l	0.6
Turbidity NTU's	4.3

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/13/79
DATE SAMPLED: 7/12/79

LAB NUMBER: 1050
DATE RECEIVED: 7/13/79

SAMPLE ID: 79-8
Flow 2gpm
Temp 43°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.1
Total Alkalinity mg/l $CaCO_3$	234
Total Suspended Solids mg/l	3.8
Total Dissolved solids mg/l	230
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	13.2
Total Flouride mg/l	0.34
Total Dissolved Iron mg/l	0.10
Oil and Grease mg/l	620
Turbidity NTU's	1.4

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/13/79
DATE SAMPLED: 7/12/79

LAB NUMBER: 1051
DATE RECEIVED: 7/13/79

SAMPLE ID: 79-9 Water Trough
Flow 4.1gpm
Temp 43° F

WATER ANALISIS REPORT

ND means not determined

pH units		7.4
Total Alkalinity mg/l $CaCO_3$		244
Total Suspended Solids mg/l		2.6
Total Dissolved solids mg/l		224
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		12.3
Total Flouride mg/l		0.21
Total Dissolved Iron mg/l		0.07
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		0.65

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/13/79
DATE SAMPLED: 7/12/79

LAB NUMBER: 1052
DATE RECEIVED: 7/13/79

SAMPLE ID: 79-10
Flow 6gpm 40^0
Donners Spring

WATER ANALISIS REPORT

ND means not determined

pH units		7.8
Total Alkalinity mg/l $CaCO_3$		234
Total Suspended Solids mg/l		8
Total Dissolved solids mg/l		221
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		12.3
Total Flouride mg/l		0.16
Total Dissolved Iron mg/l		0.33
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		3.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/16/79
DATE SAMPLED: 7/12/79

LAB NUMBER: 1053
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-11
Flow 6gpm
Tem 40^{0}F

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	285
Total Suspended Solids mg/l	20.8
Total Dissolved solids mg/l	340
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	5.8
Total Flouride mg/l	0.32
Total Dissolved Iron mg/l	0.24
Oil and Grease mg/l	1.0
Turbidity NTU's	8.3

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/16/79
DATE SAMPLED: 7/12/79

LAB NUMBER: 1054
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-13
Flow 6gpm
Temp 44°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.0
Total Alkalinity mg/l $CaCO_3$	330.1
Total Suspended Solids mg/l	9.2
Total Dissolved solids mg/l	368
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	2230
Total Flouride mg/l	0.31
Total Dissolved Iron mg/l	0.48
Oil and Grease mg/l	0.4
Turbidity NTU's	3.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/16/79
DATE SAMPLED: 7/12/79

LAB NUMBER: 1055
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-14
Flow 1.5gpm
Temp 42°F

WATER ANALISIS REPORT

ND means not determined

pH units		8.2
Total Alkalinity mg/l $CaCO_3$		317.8
Total Suspended Solids mg/l		2.8
Total Dissolved solids mg/l		352
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		342
Total Flouride mg/l		0.32
Total Dissolved Iron mg/l		0.08
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		0.96

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/16/79
DATE SAMPLED: 7/13/79

LAB NUMBER: 1056
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-15
Flow 2gpm
3.8^{0}C

WATER ANALISIS REPORT

ND means not determined

pH units	7.8
Total Alkalinity mg/l $CaCO_3$	290.9
Total Suspended Solids mg/l	19.8
Total Dissolved solids mg/l	293
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	591
Total Flouride mg/l	0.34
Total Dissolved Iron mg/l	0.36
Oil and Grease mg/l	0.2
Turbidity NTU's	8.2

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/16/79
DATE SAMPLED: 7/13/79

LAB NUMBER: 1057
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-16
Flow 12gpm
Temp 1.5°C

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	289.1
Total Suspended Solids mg/l	3.8
Total Dissolved solids mg/l	302.
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	1897
Total Flouride mg/l	0.22
Total Dissolved Iron mg/l	0.02
Oil and Grease mg/l	0.3
Turbidity NTU's	0.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/16/79
DATE SAMPLED: 7/13/79

LAB NUMBER: 1058
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-17
Flow 0.5gpm
Temp 2.5°C

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	276.8
Total Suspended Solids mg/l	42.4
Total Dissolved solids mg/l	308
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	5.76
Total Flouride mg/l	0.28
Total Dissolved Iron mg/l	0.90
Oil and Grease mg/l	1.1
Turbidity NTU's	13.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/14/79

LAB NUMBER: 1059
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-18
Flow 4.0gpm
3.5^{0}C

WATER ANALISIS REPORT

ND means not determined

pH units	7.8
Total Alkalinity mg/l $CaCO_3$	246.0
Total Suspended Solids mg/l	5.6
Total Dissolved solids mg/l	249
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	2.5
Total Flouride mg/l	0.25
Total Dissolved Iron mg/l	0.03
Oil and Grease mg/l less than	0.1
Turbidity NTU's	1.9

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/14/79

LAB NUMBER: 1060
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-19
3gpm
45°C

WATER ANALISIS REPORT

ND means not determined

pH units		8.5
Total Alkalinity mg/l $CaCO_3$		217.3
Total Suspended Solids mg/l		14.2
Total Dissolved solids mg/l		201
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		4.1
Total Flouride mg/l		0.25
Total Dissolved Iron mg/l		0.24
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		3.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/14/79

LAB NUMBER: 1061
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-20
Flow 40gpm
3.0°C

WATER ANALISIS REPORT

ND means not determined

pH units		7.9
Total Alkalinity mg/l $CaCO_3$		248.1
Total Suspended Solids mg/l		21.4
Total Dissolved solids mg/l		233
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		2.1
Total Flouride mg/l		0.33
Total Dissolved Iron mg/l		0.41
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		7.4

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/14/79

LAB NUMBER: 1062
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-21
Flow 20gpm
3^0C

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	268.6
Total Suspended Solids mg/l	9.4
Total Dissolved solids mg/l	267
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	11.5
Total Flouride mg/l	0.39
Total Dissolved Iron mg/l	0.10
Oil and Grease mg/l	0.5
Turbidity NTU's	1.7

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/14/79

LAB NUMBER: 1063
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-22
Flow 14gpm
2.5°C

WATER ANALISIS REPORT

ND means not determined

pH units	8.0
Total Alkalinity mg/l $CaCO_3$	293.2
Total Suspended Solids mg/l	5.2
Total Dissolved solids mg/l	298
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	8.2
Total Flouride mg/l	0.34
Total Dissolved Iron mg/l	0.04
Oil and Grease mg/l	0.1
Turbidity NTU's	2.9

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/14/79

LAB NUMBER: 1064
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-23
Flow 8.5gpm
8^0C

WATER ANALISIS REPORT

ND means not determined

pH units	7.8
Total Alkalinity mg/l $CaCO_3$	280.9
Total Suspended Solids mg/l	7.6
Total Dissolved solids mg/l	292
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	10.3
Total Flouride mg/l	0.30
Total Dissolved Iron mg/l	0.04
Oil and Grease mg/l	0.3
Turbidity NTU's	4.4

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1109
DATE RECEIVED: 10/23/79

SAMPLE ID: 79-24
flow 2.4gpm
33°F

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	323.9
Total Suspended Solids mg/l	673.6
Total Dissolved solids mg/l	340
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	52.3
Total Flouride mg/l	0.23
Total Dissolved Iron mg/l	7.60
Oil and Grease mg/l	0.1
Turbidity NTU's	280

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/15/79

LAB NUMBER: 1065
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-25 Jerk Water Spring
Flow 10gpm
6.0°C

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	352.6
Total Suspended Solids mg/l	190
Total Dissolved solids mg/l	345
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	2.5
Total Flouride mg/l	0.38
Total Dissolved Iron mg/l	15.04
Oil and Grease mg/l	0.4
Turbidity NTU's	47.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/15/79

LAB NUMBER: 1066
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-26
8.0gpm
~~4.5°C~~ 6.0° C

WATER ANALISIS REPORT

ND means not determined

pH units	8.3
Total Alkalinity mg/l $CaCO_3$	301.4
Total Suspended Solids mg/l	39.4
Total Dissolved solids mg/l	331
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	49.0
Total Flouride mg/l	0.40
Total Dissolved Iron mg/l	0.08
Oil and Grease mg/l	0.1
Turbidity NTU's	14.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/17/79
DATE SAMPLED: 7/15/79

LAB NUMBER: 1067
DATE RECEIVED: 7/16/79

SAMPLE ID: 79-27
Flow 10gpm
4.5°C

WATER ANALISIS REPORT

ND means not determined

pH units		8.1
Total Alkalinity mg/l $CaCO_3$		282.9
Total Suspended Solids mg/l		19.4
Total Dissolved solids mg/l		285
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		7.0
Total Flouride mg/l		0.17
Total Dissolved Iron mg/l		0.25
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		5.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1102
DATE RECEIVED: 10/23/79

SAMPLE ID: Flag Lake - 79-28
Flow 3 gpm
41.5°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.2
Total Alkalinity mg/l $CaCO_3$	220.5
Total Suspended Solids mg/l	5
Total Dissolved solids mg/l	412.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	128.4
Total Flouride mg/l	0.42
Total Dissolved Iron mg/l	0.48
Oil and Grease mg/l	0.7
Turbidity NTU's	2.4

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/26/79

LAB NUMBER: 1068
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-29
4 gpm 2.5°C
7/26/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.7
Total Alkalinity mg/l $CaCO_3$	312.6
Total Suspended Solids mg/l	7.2
Total Dissolved solids mg/l	340
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	4.1
Total Flouride mg/l	0.37
Total Dissolved Iron mg/l	0.24
Oil and Grease mg/l	0.9
Turbidity NTU's	3.5

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/26/79

LAB NUMBER: 1069
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-30
1.5 gpm
6.0°C
7/26/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	402.8
Total Suspended Solids mg/l	27
Total Dissolved solids mg/l	472
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	57.6
Total Flouride mg/l	0.22
Total Dissolved Iron mg/l	0.54
Oil and Grease mg/l	0.5
Turbidity NTU's	11.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/26/79

LAB NUMBER: 1070
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-31
6.0 gpm
6.5°C
7/26/79

WATER ANALISIS REPORT

ND means not determined

pH units	8.0
Total Alkalinity mg/l $CaCO_3$	269.6
Total Suspended Solids mg/l	36.8
Total Dissolved solids mg/l	362
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	67.1
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.50
Oil and Grease mg/l	0.8
Turbidity NTU's	37.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/26/79

LAB NUMBER: 1071
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-32
1.4 gpm
6^0C
7/26/79

WATER ANALISIS REPORT

ND means not determined

pH units	8.1
Total Alkalinity mg/l $CaCO_3$	411.0
Total Suspended Solids mg/l	168.8
Total Dissolved solids mg/l	488
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	71.2
Total Flouride mg/l	0.34
Total Dissolved Iron mg/l	2.99
Oil and Grease mg/l	0.6
Turbidity NTU's	74.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/26/79

LAB NUMBER: 1072
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-33
1.4 gpm
4.5°C
7/26/79

WATER ANALISIS REPORT

ND means not determined

pH units	8.2
Total Alkalinity mg/l $CaCO_3$	365.3
Total Suspended Solids mg/l	186.4
Total Dissolved solids mg/l	424
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	61.7
Total Flouride mg/l	0.28
Total Dissolved Iron mg/l	2.02
Oil and Grease mg/l	1.5
Turbidity NTU's	50

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/23/79
DATE SAMPLED: 10/22/79

LAB NUMBER: 1107
DATE RECEIVED: 10/23/79

SAMPLE ID: 79-33
Flow 1.3gpm
44°F

WATER ANALISIS REPORT

ND means not determined

pH units	7.7
Total Alkalinity mg/l $CaCO_3$	359.55
Total Suspended Solids mg/l	4.2
Total Dissolved solids mg/l	465
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	67.5
Total Flouride mg/l	0.28
Total Dissolved Iron mg/l	0.73
Oil and Grease mg/l	1.4
Turbidity NTU's	1.5

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/26/79

LAB NUMBER: 1073
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-34
10 gpm
3.5°C
7/26/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	319.8
Total Suspended Solids mg/l	60
Total Dissolved solids mg/l	264
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	6.6
Total Flouride mg/l	0.27
Total Dissolved Iron mg/l	1.82
Oil and Grease mg/l	0.7
Turbidity NTU's	17.5

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7 7

LAB NUMBER: 1074
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-35
20 gpm
40C
7

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	278.8
Total Suspended Solids mg/l	less than 0.1
Total Dissolved solids mg/l	263
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	3.7
Total Flouride mg/l	0.22
Total Dissolved Iron mg/l	0.05
Oil and Grease mg/l	1.8
Turbidity NTU's	0.9

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/27/79

LAB NUMBER: 1075
DATE RECEIVED: 7;/30/79

SAMPLE ID: 79-36
1.3 gpm
5.5°C
7/27/79

7

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	311.6
Total Suspended Solids mg/l	20.4
Total Dissolved solids mg/l	293
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	4.5
Total Flouride mg/l	0.30
Total Dissolved Iron mg/l	0.52
Oil and Grease mg/l	1.0
Turbidity NTU's	7.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/27/79

LAB NUMBER: 1076
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-37
1.4 gpm
10^0C
7/27/79

WATER ANALISIS REPORT

ND means not determined

pH units	8.1
Total Alkalinity mg/l $CaCO_3$	335.2
Total Suspended Solids mg/l	141.2
Total Dissolved solids mg/l	316
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	10.3
Total Flouride mg/l	0.23
Total Dissolved Iron mg/l	2.52
Oil and Grease mg/l	1.0
Turbidity NTU's	53.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/30/79
DATE SAMPLED: 7/27/79

LAB NUMBER: 1077
DATE RECEIVED: 7/30/79

SAMPLE ID: 79-38
7 gpm
3.50c
7/27/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.6
Total Alkalinity mg/l $CaCO_3$	309.6
Total Suspended Solids mg/l	10.2
Total Dissolved solids mg/l	316
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	2.9
Total Flouride mg/l	0.31
Total Dissolved Iron mg/l	0.47
Oil and Grease mg/l	2.5
Turbidity NTU's	3.7

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/24/79
DATE SAMPLED: 8/23/79

LAB NUMBER: 1094
DATE RECEIVED: 8/24/79

SAMPLE ID: 79-39
14gpm 40°F

WATER ANALISIS REPORT

ND means not determined

pH units		8.0
Total Alkalinity mg/l $CaCO_3$		354.0
Total Suspended Solids mg/l		20.4
Total Dissolved solids mg/l		366.0
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		11.93
Total Flouride mg/l		0.26
Total Dissolved Iron mg/l		0.15
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		5.9

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/24/79
DATE SAMPLED: 8/23/79

LAB NUMBER: 1095
DATE RECEIVED: 8/24/79

SAMPLE ID: 79-40

WATER ANALISIS REPORT

ND means not determined

pH units		8.0
Total Alkalinity mg/l $CaCO_3$		345.7
Total Suspended Solids mg/l		407.6
Total Dissolved solids mg/l		385
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		30.45
Total Flouride mg/l		0.26
Total Dissolved Iron mg/l		4.20
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		140

MANAGER

APPENDIX H

WILBERG MINE IN-MINE WATER QUALITY

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 3/23/79
DATE SAMPLED: 3/21/79

LAB NUMBER: 1016
DATE RECEIVED: 3/21/79

SAMPLE ID:

Wilberg Mine
1st North X 5, 1L-2L
Temp. 13.0 Flow 1.5 gal/min
3/21/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.41
Total Alkalinity mg/l $CaCO_3$	542.5
Total Suspended Solids mg/l	1.3
Total Dissolved solids mg/l	743.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	184.4
Total Flouride mg/l	0.20
Total Dissolved Iron mg/l	0.25
Oil and Grease mg/l	0.1
Turbidity NTU's	3.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 3/23/79
DATE SAMPLED: 3/21/79

LAB NUMBER: 1014
DATE RECEIVED: 3/21/79

SAMPLE ID:

Wilberg Mine
1st North X6-7, 1L
Temp. 12.5 Flow 1.5 gal/min
3/21/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.44
Total Alkalinity mg/l $CaCO_3$	533.3
Total Suspended Solids mg/l	1.3
Total Dissolved solids mg/l	739.0
Settleable Solids, 1 hour, mg/l	0.2
Total Sulfate mg/l	184.8
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.25
Oil and Grease mg/l	0.2
Turbidity NTU's	2.3

MANAGER

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/27/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-003574

SAMPLE: IN MINE WATERS DATED 5/24/79 RECEIVED ON 5/29/79.

	WILBERG MINE 5/24/79 1ST NORTH X11,3R	WILBERG MINE 5/24/79 1ST NORTH X10-11,2L
Flow	6.0 GPM	1.3 GPM
Acidity as CaCO3 mg/l	40.0	46.0
Alkalinity as CaCO3 mg/l	390.00	418.00
Chloride as Cl mg/l	10.0	8.0
Conductivity umhos/cm	880	990
Dissolved Oxygen mg/l	7.4	7.8
Fluoride as F mg/l	.09	.10
Hardness as CaCO3 mg/l	550	580
Iron as Fe mg/l	.119	.005
Oil and Grease mg/l	2.8	<1.0
Sulfate as SO4 mg/l	185	174
Suspended Solids mg/l	15.0	1.0
Total Dissolved Solids mg/l	700	700
Turbidity NTU	1.50	1.80

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-003574

	WILBERG MINE 5/24/79 1ST NORTH X113R	WILBERG MINE 5/24/79 1ST NORTH X10-112L
pH Units	6.55	6.67

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/15/79
DATE SAMPLED: 6/13/79

LAB NUMBER: 1022
DATE RECEIVED: 6/13/79

SAMPLE ID: Wilberg
1N x 12 2L
6/13/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.39
Total Alkalinity mg/l $CaCO_3$	425.4
Total Suspended Solids mg/l	0.8
Total Dissolved solids mg/l	699
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	174.9
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.30
Oil and Grease mg/l	2.0
Turbidity NTU's	3.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/15/79
DATE SAMPLED: 6/13/79

LAB NUMBER: 1023
DATE RECEIVED: 6/13/79

SAMPLE ID: Wilberg
1N x 11, 3R
Flow 4.6 g/m
6/13/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.30
Total Alkalinity mg/l $CaCO_3$	427.4
Total Suspended Solids mg/l	0.8
Total Dissolved solids mg/l	733.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	172.4
Total Flouride mg/l	0.25
Total Dissolved Iron mg/l	0.36
Oil and Grease mg/l	0.0
Turbidity NTU's	3.8

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/6/79
DATE SAMPLED: 7/6/79

LAB NUMBER: 1033
DATE RECEIVED: 7/6/79

SAMPLE ID: Wilberg Mine
1st North
Sample C
x/1 3R
Flow 4.0 GPM
Temp 14.2°C

WATER ANALISIS REPORT

ND means not determined

pH units	7.35
Total Alkalinity mg/l $CaCO_3$	433.6
Total Suspended Solids mg/l	1.2
Total Dissolved solids mg/l	729
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	255.5
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.30
Oil and Grease mg/l less than	0.1
Turbidity NTU's	3.5

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/22/79
DATE SAMPLED: 8/21/79

LAB NUMBER: 1089
DATE RECEIVED: 8/22/79

SAMPLE ID: Wilberg
1N x/o-11 2L
0.3gpm
10.5°C

WATER ANALISIS REPORT

ND means not determined

pH units		7.6
Total Alkalinity mg/l $CaCO_3$		433.7
Total Suspended Solids mg/l	less than	0.1
Total Dissolved solids mg/l		716
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		202.0
Total Flouride mg/l		0.22
Total Dissolved Iron mg/l		0.18
Oil and Grease mg/l		0.9
Turbidity NTU's		0.61

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/22/79
DATE SAMPLED: 8/21/79

LAB NUMBER: 1090
DATE RECEIVED: 8/22/79

SAMPLE ID: Wilberg
1N x 11 3R
20gpm
11°C

WATER ANALISIS REPORT

ND means not determined

pH units	7.5
Total Alkalinity mg/l $CaCO_3$	424.4
Total Suspended Solids mg/l	0.4
Total Dissolved solids mg/l	702
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	202.0
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.42
Oil and Grease mg/l	0.5
Turbidity NTU's	4.4

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/22/79
DATE SAMPLED: 8/21/79

LAB NUMBER: 1088
DATE RECEIVED: 8/22/79

SAMPLE ID: Wilberg 11°C
1N x 8-9 2R
0.34gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.3
Total Alkalinity mg/l $CaCO_3$	391.6
Total Suspended Solids mg/l	0.2
Total Dissolved solids mg/l	687.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	227.1
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.07
Oil and Grease mg/l	0.9
Turbidity NTU's	0.50

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/9/79
DATE SAMPLED: 10/8/79

LAB NUMBER: 1098
DATE RECEIVED: 10/9/79

SAMPLE ID: Wilberg
1N x 10-11 2L
Flow 0.1 gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.3
Total Alkalinity mg/l $CaCO_3$	435.0
Total Suspended Solids mg/l	less than 0.1
Total Dissolved solids mg/l	655
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	199.9
Total Flouride mg/l	0.23
Total Dissolved Iron mg/l	0.08
Oil and Grease mg/l	0.8
Turbidity NTU's	0.68

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/9/79
DATE SAMPLED: 10/8/79

LAB NUMBER: 1099
DATE RECEIVED: 10/9/99

SAMPLE ID: Wilberg
1N x 11 3R
Flow 1.2 gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.2
Total Alkalinity mg/l $CaCO_3$	437.3
Total Suspended Solids mg/l	4.8
Total Dissolved solids mg/l	702
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	207.4
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	1.20
Oil and Grease mg/l	0.3
Turbidity NTU's	13

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/9/79
DATE SAMPLED: 10/8/79

LAB NUMBER: 1097
DATE RECEIVED: 10/9/79

SAMPLE ID: Wilberg
1N x 17 1L
Flow 6.0 GPM

WATER ANALISIS REPORT

ND means not determined

pH units	7.5
Total Alkalinity mg/l $CaCO_3$	408.0
Total Suspended Solids mg/l	0.8
Total Dissolved solids mg/l	670
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	180.2
Total Flouride mg/l	0.23
Total Dissolved Iron mg/l	0.34
Oil and Grease mg/l	0.5
Turbidity NTU's	4.9

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/21/79
DATE SAMPLED: 6/19/79

LAB NUMBER: 1030
DATE RECEIVED: 6/19/79

SAMPLE ID: Wilberg Mine
4th E x42 IR
flow 20 gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.0
Total Alkalinity mg/l $CaCO_3$	543.3
Total Suspended Solids mg/l	1.2
Total Dissolved solids mg/l	1610.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	655.9
Total Flouride mg/l	0.18
Total Dissolved Iron mg/l	0.06
Oil and Grease mg/l	2.6
Turbidity NTU's	0.22

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/21/79
DATE SAMPLED: 6/19/79

LAB NUMBER: 1029
DATE RECEIVED: 6/21/79

SAMPLE ID: Wilberg Mine
4th E x43 IL
flow 1.5 gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.2
Total Alkalinity mg/l $CaCO_3$	495.1
Total Suspended Solids mg/l	3.0
Total Dissolved solids mg/l	1459.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	532.9
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.06
Oil and Grease mg/l	28.6
Turbidity NTU's	0.92

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 6/21/79
DATE SAMPLED: 6/19/79

LAB NUMBER: 1028
DATE RECEIVED: 6/21/79

SAMPLE ID: Wilberg
Mine
4th E x44-45 1R
flow 0.8 gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.1
Total Alkalinity mg/l $CaCO_3$	497.1
Total Suspended Solids mg/l	1.0
Total Dissolved solids mg/l	1556.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	643.2
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.04
Oil and Grease mg/l	0.4
Turbidity NTU's	0.27

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/9/79
DATE SAMPLED: 7/6/79

LAB NUMBER: 1034
DATE RECEIVED: 7/6/79

SAMPLE ID: Wilberg Mine
4th East
Sample A
x44-45 1R
Flow 0.25 GPM
Temp 11.0°C

WATER ANALISIS REPORT

ND means not determined

pH units	7.1
Total Alkalinity mg/l $CaCO_3$	493.0
Total Suspended Solids mg/l	1.0
Total Dissolved solids mg/l	1516
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	669.5
Total Flouride mg/l	0.2
Total Dissolved Iron mg/l	0.12
Oil and Grease mg/l less than	0.1
Turbidity NTU's	0.21

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 7/9/79
DATE SAMPLED: 7/6/79

LAB NUMBER: 1035
DATE RECEIVED: 7/6/79

SAMPLE ID: Wilberg Mine
4th East
Sample B
x42 1R
Flow 15.0 GPM
Temp 11.5°C

WATER ANALISIS REPORT

ND means not determined

pH units	7.1
Total Alkalinity mg/l $CaCO_3$	536.1
Total Suspended Solids mg/l	1.8
Total Dissolved solids mg/l	1549
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	661.7
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.06
Oil and Grease mg/l less than	0.1
Turbidity NTU's	0.19

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/23/79
DATE SAMPLED: 8/22/79

LAB NUMBER: 1091
DATE RECEIVED: 8/22/79

SAMPLE ID: Wilberg
4thE x 42 . 1R
7gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.2
Total Alkalinity mg/l $CaCO_3$	534.1
Total Suspended Solids mg/l less than	0.1
Total Dissolved solids mg/l	1385.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	619.7
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.15
Oil and Grease mg/l	1.0
Turbidity NTU's	0.42

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/23/79
DATE SAMPLED: 8/22/79

LAB NUMBER: 1092
DATE RECEIVED: 8/22/79

SAMPLE ID: Wilberg
4thE x 43 1L
0.9gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.4
Total Alkalinity mg/l $CaCO_3$	500.9
Total Suspended Solids mg/l	0.2
Total Dissolved solids mg/l	1288.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	537.8
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.09
Oil and Grease mg/l	0.3
Turbidity NTU's	0.34

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/23/79
DATE SAMPLED: 8/22/79

LAB NUMBER: 1093
DATE RECEIVED: 8/22/79

SAMPLE ID: Wilberg
4thE x 44-45 B
0.1gpm

WATER ANALISIS REPORT

ND means not determined

pH units	7.4
Total Alkalinity mg/l $CaCO_3$	493.7
Total Suspended Solids mg/l	0.4
Total Dissolved solids mg/l	1244.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	508.6
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.07
Oil and Grease mg/l	0.1
Turbidity NTU's	0.47

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 3/23/79
DATE SAMPLED: 3/21/79

LAB NUMBER: 1013
DATE RECEIVED: 3/21/79

SAMPLE ID:

Wilberg Mine
Main West X 127, 3L
Temp. 14.5 Flow 0.1 gal/min
3/21/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.40
Total Alkalinity mg/l $CaCO_3$	480.5
Total Suspended Solids mg/l	1.7
Total Dissolved solids mg/l	631.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	151.4
Total Flouride mg/l	0.25
Total Dissolved Iron mg/l	0.18
Oil and Grease mg/l	0.2
Turbidity NTU's	1.0

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 8/10/79
DATE SAMPLED: 8/9/79

LAB NUMBER: 1085
DATE RECEIVED: 8/10/79

SAMPLE ID: Wilberg Mine Main West
x 139 2L
0.2 gpm 12°C
8/9/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.7
Total Alkalinity mg/l $CaCO_3$	357.7
Total Suspended Solids mg/l	0.2
Total Dissolved solids mg/l	590
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	142.4
Total Flouride mg/l	0.24
Total Dissolved Iron mg/l	0.48
Oil and Grease mg/l	0.8
Turbidity NTU's	2.7

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/12/79
DATE SAMPLED: 10/11/79

LAB NUMBER: 1100
DATE RECEIVED: 10/12/79

SAMPLE ID: Wilberg Main West
W1240
Flow 15gpm

WATER ANALISIS REPORT

ND means not determined

pH units		7.5
Total Alkalinity mg/l $CaCO_3$		343.0
Total Suspended Solids mg/l	less than	0.1
Total Dissolved solids mg/l		419
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		78.2
Total Flouride mg/l		0.26
Total Dissolved Iron mg/l		0.19
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		1.1

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 3/23/79
DATE SAMPLED: 3/21/79

LAB NUMBER: 1015
DATE RECEIVED: 3/21/79

SAMPLE ID:

Wilberg Mine
1st East X 27 B
Temp. 12.0 Flow 1.0 gal/min
3/21/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.32
Total Alkalinity mg/l $CaCO_3$	469.9
Total Suspended Solids mg/l	2.0
Total Dissolved solids mg/l	503.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	98.8
Total Flouride mg/l	0.20
Total Dissolved Iron mg/l	0.16
Oil and Grease mg/l	0.2
Turbidity NTU's	1.8

MANAGER

APPENDIX I

WILBERG MINE DISCHARGE WATER QUALITY

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115

TELEPHONE:
(801) 485-5761

MONTHLY BACTERIOLOGICAL SUMMARY
Multiple-Tube Fermentation Method

Water System ID # _____

Water System Utah Power and Light Co.

Number of Samples Required _____

SAMPLING INFORMATION						LAB ANALYSIS INFORMATION					
Date	Time	Location	Sampled By	Type		Sample ID#	Date	Routine Samples			Check Samples
				Routine	Check			No. of Tubes	No. of Positive Tubes	No. of Samples with 3 or more Positive Tubes	No. of Positive Tubes
4/16/79	3:30	Wilberg	L. Varinette	✓		2492	4/19	5	0	0	

1	5	0	0
TOTAL Number of Routine Samples for the Month	TOTAL Number of Tubes Used In Monthly Tests	TOTAL Number of Positive Tubes	TOTAL Number of Samples With 3 or More Positive Tubes

MONTHLY CALCULATIONS*

I. CALCULATE THE MONTHLY PERCENTAGE -- 0

$$\% \text{ of Tubes Positive} = \frac{\text{TOTAL No. of Positive Tubes}}{\text{TOTAL No. of Tubes Used in Monthly Tests}}$$

II. DETERMINE THE NUMBER OF TIMES 3 OR MORE PORTIONS WERE POSITIVE -- 0

For Systems Taking Fewer Than 20 Samples Per Month:

Use the total box, "TOTAL Number of Samples with 3 or more positive Tubes", to determine compliance with the MCL.

For Systems Taking 20 or More Samples Per Month:

$$\% \text{ of Samples With 3 or More Positive Tubes} = \frac{\text{TOTAL No. of Samples With 3 or More Positive Tubes}}{\text{TOTAL No. of Routine Samples for the Month}}$$

FORD CHEMICAL LABORATORY, INC.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115

TELEPHONE:
(801) 485-5761

MONTHLY BACTERIOLOGICAL SUMMARY
Multiple-Tube Fermentation Method

Water System ID #

Water System Utah Power & Light Co.

Number of Samples Required

SAMPLING INFORMATION						LAB ANALYSIS INFORMATION					
Date	Time	Location	Sampled By	Type		Sample ID#	Date	Routine Samples			Check Samples
				Routine	Check			No. of Tubes	No. of Positive Tubes	No. of Samples with 3 or more Positive Tubes	No. of Positive Tubes
9/4/79	12:00	Deer Crk	Ogden	✓		3696	6/6	5	0	0	
9/4/79	10.00	Wilberg	Ogden	✓		3696	6/6	5	0	0	

2	10	0	0
TOTAL Number of Routine Samples for the Month	TOTAL Number of Tubes Used In Monthly Tests	TOTAL Number of Positive Tubes	TOTAL Number of Samples With 3 or More Positive Tubes

MONTHLY CALCULATIONS*

I. CALCULATE THE MONTHLY PERCENTAGE -- 0

$$\% \text{ of Tubes Positive} = \frac{\text{TOTAL No. of Positive Tubes}}{\text{TOTAL No. of Tubes Used in Monthly Tests}}$$

II. DETERMINE THE NUMBER OF TIMES 3 OR MORE PORTIONS WERE POSITIVE -- 0

For Systems Taking Fewer Than 20 Samples Per Month:

Use the total box, "TOTAL Number of Samples with 3 or more positive Tubes", to determine compliance with the MCL.

For Systems Taking 20 or More Samples Per Month:

$$\text{\% of Samples With 3 or More Positive Tubes} = \frac{\text{TOTAL No. of Samples With 3 or More Positive Tubes}}{\text{TOTAL No. of Routine Samples for the Month}}$$

Neal Ford

FORD CHEMICAL LABORATORY, INC.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 05/01/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
STANDARD COAL LABS
BOX 1140
HUNTINGTON, UT 00000

79-002356

SAMPLE: WASTEWATER FROM WILBERG MINE DISCHARGE RECEIVED 4-13-79.

	WILBERG MINE DISCHARGE	COLIFORM WILBERG MINE, 4-12, 11AM AGASTON
Acidity as CaCO3 mg/l	20.0	
Alkalinity as CaCO3 mg/l	256.00	
BOD 5 Day mg/l	3.5	
Chloride as Cl mg/l	16.0	
Iron as Fe (Total) mg/l	.040	
MPN Fecal Coliform MPN/100 ml		2.0
MPN Total Coliform MPN/100 ml		21.0
Oil and Grease mg/l	1.4	
Sulfate as SO4 mg/l	202	
Suspended Solids mg/l	9.0	
Total Dissolved Solids mg/l	612	
pH Units	7.60	

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/04/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
STANDARD COAL LABS
BOX 1140
HUNTINGTON, UT 84528

79-002493

SAMPLE: WATER FROM WILBERG MINE DISCHARGE DATED 4-16-79 RECEIVED 4-19-79.

	WILBERG MINE DISCHARGE	WILBERG MINE DIS. 4-16-79 3:30 P.M. AGASTON
Acidity as CaCO3 mg/l	14.0	
Alkalinity as CaCO3 mg/l	300.00	
BOD 5 Day mg/l	<1.0	
Chloride as Cl mg/l	38.0	
Iron as Fe (Total) mg/l	.468	
MPN Fecal Coliform MPN/100 ml		<2.0
MPN Total Coliform MPN/100 ml		17.0
Oil and Grease mg/l	<2.0	
Sulfate as SO4 mg/l	196	
Suspended Solids mg/l	<1.0	
Total Dissolved Solids mg/l	596	
pH Units	8.07	

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/22/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-003573

SAMPLE: WILBERG MINE DISCHARGE WATER DATED 5/24/79.
RECEIVED ON 5/29/79.

	RESULTS
Acidity as CaCO3 mg/l	16.0
Alkalinity as CaCO3 mg/l	244.00
Chloride as Cl mg/l	12.0
Iron as Fe mg/l	.064
Oil and Grease mg/l	1.4
Sulfate as SO4 mg/l	216
Suspended Solids mg/l	8.0
Total Dissolved Solids mg/l	600
pH Units	7.35

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 09/25/79

CERTIFICATE OF ANALYSIS

JTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-006458

SAMPLE: WASTEWATER DATED 8/21/79 RECEIVED 8/22/79.

	COTTONWD CR STRAIGHT CAN F 1:45,18.7 C AGOSTON	COTTONWD CR TRAIL MTN MINE 2:25,14 C AGOSTON	COTTONWD CR BELOW T MTN MIN 2:15, AGOSTON	COTTONWD CK USGS FLUINE 2:00 PM AGOSTON	WILBERG MINE DIS. 1:00 P.M. AGOSTON
Alkalinity as CaCO3 mg/l	284.00	248.00	256.00	252.00	286.00
Aluminum as Al (Total) mg/l	.280	.320	.370	.460	[illegible]
Arsenic as As (Tot) mg/l	<.001	<.001	<.001	<.001	<.001
BOD 5 Day mg/l	1.6	<1.0	<1.0	<1.0	<1.0
Bicarbonate as HCO3 mg/l	346.48	302.56	312.32	307.44	348.[illegible]
Cadmium as Cd (Tot) mg/l	<.001	<.001	<.001	<.001	<.001
Calcium as Ca mg/l	120.80	101.60	102.40	97.60	155.[illegible]
Chloride as Cl mg/l	12.0	6.0	6.0	6.0	10.0
Fluoride as F mg/l	.19	.16	.16	.15	.20
Iron as Fe (Total) mg/l	.450	.260	.520	.690	.2[illegible]
Lead as Pb (Total) mg/l	<.001	<.001	<.001	<.001	<.001
MPN Fecal Coliform MPN/100 ml	21.0	130	33.0	31.0	<2.[illegible]
MPN Total Coliform MPN/100 ml	220	490	330	2,300	17.0

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

USE in 3rd Quarter Rep

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 07/10/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-004269

SAMPLE: WATER FOR WILBERG DISCHARGE DATED 6/22/79 RECEIVED 6/28/79.

	RESULTS
Acidity as CaCO3 mg/l	18.0
Alkalinity as CaCO3 mg/l	268.00
Chloride as Cl mg/l	12.0
Iron as Fe (Total) mg/l	.046
Oil and Grease mg/l	2.2
Sulfate as SO4 mg/l	237
Suspended Solids mg/l	<1.0
Total Dissolved Solids mg/l	600
pH Units	7.48

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-006438

	COTTONWD CR STRAI GHT CAN F 1:45,18.7 C AGOSTON	COTTONWD CR TRAIL MTN MINE 2:25,14 C AGOSTON	COTTONWD CR BELOW T MTN MIN 2:15, AGOSTON	COTTONWD CK USGS FLUINE 2:00 PM AGOSTON	WILBERG MINE DIS. 1:00 P.M. AGOSTON
agnesium as Mg mg/l	8.16	4.80	5.76	4.80	14.88
anganese as Mn (Tot) mg/l	.019	.017	.015	.021	.01
itrite as NO2-N mg/l	<.01	<.01	<.01	<.01	<.01
il and Grease mg/l	<1.0	<1.0	2.2	<1.0	<1.
hosphate PO4-P Ortho mg/l	.030	.050	.030	.090	
otassium as K mg/l	2.804	1.984	1.941	1.897	3.587
elenium as Se (Tot) mg/l	<.001	<.001	<.001	.002	.00
ilica as SiO2 mg/l	7.90	6.70	6.70	6.70	8.00
odium as Na mg/l	32.31	18.89	19.53	19.36	23.2
ulfate as SO4 mg/l	100	56.8	55.0	45.0	19
uspended Solids mg/l	13.0	21.0	24.0	52.0	4.0
otal Dissolved Solids mg/l	462	355	362	336	57
otal Kjeldahl Nitrogen mg/l	.04	.07	.05	.05	.02
inc as Zn (Total) mg/l	.038	.034	.035	.039	.03
H Units	7.40	7.20	7.60	7.80	7.3

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 08/09/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-005112

SAMPLE: WATER DATED 7/2/79 RECEIVED 7/5/79.

	WILBING MINE DISCHARGE 7/2/79	DEER CREEK MIN DISCHARGE 7/2/79
Acidity as CaCO3 mg/l	44.0	20.0
Alkalinity as CaCO3 mg/l	270.00	280.00
Arsenic as As mg/l	<.001	<.001
Bicarbonate as HCO3 mg/l	329.40	341.60
Cadmium as Cd mg/l	<.001	<.001
Calcium as Ca mg/l	84.00	88.00
Chloride as Cl mg/l	14.0	20.0
Fluoride as F mg/l	.20	.23
Gross Alpha pci/l	2.1	2.5
Gross Beta pci/l	9.6	10.4
Iron as Fe (Total) mg/l	.210	.336
Lead as Pb mg/l	.001	.001
MPN Fecal Coliform MPN/100 ml	<2.0	<2.0

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005112

	WILBING MINE DISCHARGE 7/2/79	DEER CREEK MIN DISCHARGE 7/2/79
MPN Total Coliform MPN/100 ml	13.0	230
Magnesium as Mg mg/l	62.40	51.84
Manganese as Mn mg/l	.008	.015
Nitrite as NO2-N mg/l	<.01	.01
Oil and Grease mg/l	<1.0	<1.0
Phosphate as PO4-P (Ortho) mg	.030	.110
Potassium as K mg/l	3.939	5.160
Selenium as Se mg/l	<.001	<.001
Silica as SiO2 mg/l	10.00	7.80
Sodium as Na mg/l	26.00	30.00
Sulfate as SO4 mg/l	235	197
Suspended Solids mg/l	8.0	55.0
Total Dissolved Solids mg/l	592	568
Total Kjeldahl Nitrogen mg/l	.20	.15
Total Organic Carbon mg/l	5.00	1.00
Zinc as Zn mg/l	.008	.014
pH Units	6.98	7.16

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005112

	WILBING MINE DISCHARGE 7/2/79	DEER CREEK MIN DISCHARGE 7/2/79

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 10/05/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-006830

SAMPLE: MINE WATER COLLECTED 9/4/79 FROM WILBERG AND DEER CREEK MINES RECEIVED 9/6/79.

	WILBERG MINE	DEER CREEK MINE
Acidity as CaCO3 mg/l	18.0	20.0
Alkalinity as CaCO3 mg/l	322.00	322.00
Chloride as Cl mg/l	20.0	20.0
Iron as Fe (Total) mg/l	.230	.240
Oil and Grease mg/l	1.2	1.2
Sulfate as SO4 mg/l	190	232
Suspended Solids mg/l	2.0	20.0
Total Dissolved Solids mg/l	535	565
pH Units	7.40	7.60

Dale Ford
FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 10/18/79
DATE SAMPLED: 10/17/79

LAB NUMBER: 1101
DATE RECEIVED: 10/17/79

SAMPLE ID: Wilberg Mine
Water Treatment Plant

WATER ANALISIS REPORT

ND means not determined

pH units	
Total Alkalinity mg/l $CaCO_3$	
Total Suspended Solids mg/l	
Total Dissolved solids mg/l	
Settleable Solids, 1 hour, mg/l	
Total Sulfate mg/l	
Total Flouride mg/l	
Total Dissolved Iron mg/l	
Oil and Grease mg/l	0.8
Turbidity NTU's	

MANAGER

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 11/05/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-007491

SAMPLE: MINE WATERS FROM WILBERG AND DEER CREEK MINE DISCHARGES DATED 10/2/79 RECEIVED 10/5/79.

	WILBERG MINE DISCHARGE	DEER CREEK MINE DISCHARGE
Acidity as CaCO3 mg/l	26.0	28.0
Alkalinity as CaCO3 mg/l	300.00	284.00
BOD 5 Day mg/l	4.0	
Chloride as Cl mg/l	12.0	8.0
Conductivity umhos/cm		760
Dissolved Oxygen mg/l		7.5
Iron as Fe (Total) mg/l	.070	.300
Oil and Grease mg/l	23.8	3.8
Sulfate as SO4 mg/l	154	168
Suspended Solids mg/l	2.0	3.0
Total Dissolved Solids mg/l	500	490
pH Units	7.50	7.30

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 11/27/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-007905

SAMPLE: WATER DATED 11/5/79 RECEIVED 11/7/79 FROM WILBERG AND DEER CREEK MINES.

	WILBERG MINE DISCHARGE	DEER CREEK MINE DISCHARGE
Acidity as CaCO3 mg/l	62.0	52.0
Alkalinity as CaCO3 mg/l	292.00	260.00
BOD 5 Day mg/l	1.6	
Chloride as Cl mg/l	12.0	30.0
Conductivity umhos/cm		890
Dissolved Oxygen mg/l		7.9
Iron as Fe (Total) mg/l	.074	.265
Oil and Grease mg/l	1.2	3.0
Sulfate as SO4 mg/l	163	274
Suspended Solids mg/l	7.0	2.0
Total Dissolved Solids mg/l	650	770
pH Units	7.60	7.55

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 11/9/79
DATE SAMPLED: 11/8/79

LAB NUMBER: 1111
DATE RECEIVED: 11/8/79

SAMPLE ID: Wilberg Mine Discharge
1000AM

WATER ANALISIS REPORT

ND means not determined

pH units	
Total Alkalinity mg/l $CaCO_3$	
Total Suspended Solids mg/l	
Total Dissolved solids mg/l	
Settleable Solids, 1 hour, mg/l	
Total Sulfate mg/l	
Total Flouride mg/l	
Total Dissolved Iron mg/l	
Oil and Grease mg/l	1.9
Turbidity NTU's	

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 11/14/79
DATE SAMPLED: 11/13/79

LAB NUMBER: 1112
DATE RECEIVED: 11/13/79

SAMPLE ID: Wilberg Mine Discharge

WATER ANALISIS REPORT

ND means not determined

pH units	
Total Alkalinity mg/l $CaCO_3$	
Total Suspended Solids mg/l	
Total Dissolved solids mg/l	
Settleable Solids, 1 hour, mg/l	
Total Sulfate mg/l	
Total Flouride mg/l	
Total Dissolved Iron mg/l	
Oil and Grease mg/l	less than .1
Turbidity NTU's	

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 11/20/79
DATE SAMPLED: 11/20/79

LAB NUMBER: 1113
DATE RECEIVED: 11/20/79

SAMPLE ID: Wilberg Mine Discharge

WATER ANALISIS REPORT

ND means not determined

pH units	
Total Alkalinity mg/l $CaCO_3$	
Total Suspended Solids mg/l	
Total Dissolved solids mg/l	
Settleable Solids, 1 hour, mg/l	
Total Sulfate mg/l	
Total Flouride mg/l	
Total Dissolved Iron mg/l	
Oil and Grease mg/l	0.2
Turbidity NTU's	

MANAGER

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 12/17/79
CERTIFICATE OF ANALYSIS

ITAH POWER & LIGHT
INING & EXPLORATION
OX 1005
UNTINGTON, UT 84528

79-008175

AMPLE: WATERS DATED 12/03/79 RECEIVED 12/05/79

	WILBERG MINE DISCHARGE	DEER CRK MINE DISCHARGE
cidity as CaCO3 mg/l	16.0	30.0
kalinity as CaCO3 mg/l	268.00	266.00
OD 5 Day mg/l	1.4	<.1
hloride as Cl mg/l	8.0	1,350
onductivity umhos/cm		4,000
ron as Fe (Total) mg/l	.100	.430
il and Grease mg/l	5.8	1.8
ulfate as SO4 mg/l	171	199
uspended Solids mg/l	1.0	7.0
otal Dissolved Solids mg/l	500	3,300
H Units	7.60	7.20

Disolved Oxygen

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

APPENDIX J

DEER CREEK MINE IN-MINE WATER QUALITY

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 1/8/79
DATE SAMPLED: 12/27/78

LAB NUMBER: 1012
DATE RECEIVED: 12/27/78

SAMPLE ID:

Deer Creek
Point of Use
12/27/78

WATER ANALISIS REPORT

ND means not determined

pH units	8.40
Total Alkalinity mg/l $CaCO_3$	308.9
Total Suspended Solids mg/l	<0.1
Total Dissolved solids mg/l	662.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	404.9
Total Flouride mg/l	0.34
Total Dissolved Iron mg/l	0.16
Oil and Grease mg/l	0.4
Turbidity NTU's	3.01

Sharon Hale
MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 4/11/79
DATE SAMPLED: 4/9/79

LAB NUMBER: 1018
DATE RECEIVED: 4/9/79

SAMPLE ID:

Deer Creek Mine
3rd South EM-3
Temp: 12.5 C Flow: 15 gal/min

WATER ANALYSIS

pH	7.16	
Total Alkalinity	525.4	mg/1 $CaCO_3$
Total Sulfate	146.5	mg/1 SO_4
Settable Solids	ND	
Filterable Solids	3.7	mg/1
Dissolved Solids	613.3	mg/1
Oil & Grease	0.7	mg/1
Turbidity	4.4	NTU's
Flouride	$\underline{/}$ 0.1	mg/1
Iron (dissolved Fe)	0.36	mg/1

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 1/8/79
DATE SAMPLED: 12/27/78

LAB NUMBER: 1011
DATE RECEIVED: 12/27/78

SAMPLE ID:
Deer Creek
EM-3
12/27/78

WATER ANALISIS REPORT

ND means not determined

pH units	7.40
Total Alkalinity mg/l $CaCO_3$	543.8
Total Suspended Solids mg/l	< 0.1
Total Dissolved solids mg/l	514.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	151.4
Total Flouride mg/l	0.18
Total Dissolved Iron mg/l	0.08
Oil and Grease mg/l	0.5
Turbidity NTU's	3.50

Sharon Hale
MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE 12/19/78
DATE SAMPLED 12/15/78

LAB NUMBER 1009
DATE RECEIVED 12/15/78

SAMPLE ID:
DEER CREEK
EM-3
12/15/78

ND MEANS NOT DETERMINED

WATER ANALYSIS REPORT

PH UNITS	7.50
TOTAL ALKALINITY MG/L CACO3	547.10
TOTAL SUSPENDED SOLIDS MG/L	2.70
TOTAL DISSOLVED SOLIDS MG/L	589.00'
SETTLEABLE SOLIDS, 1HR, MG/L	0.00
TOTAL SULFATE MG/L	149.80
TOTAL FLOURIDE MG/L	0.18
TOTAL DISSOLVED IRON MG/L	0.42
OIL AND GREASE MG/L	0.00
TURBIDITY, NTU'S	3.10

Sharon Hale
MANAGER

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

January 3, 1979

Utah Power & Light Co.
Mining & Exploration
41 North Redwood Rd.
Salt Lake City, Utah

CERTIFICATE OF ANALYSIS

78-4191

Attn: Jerry Vaninetti

Gentlemen:

The following analysis is on sample of water received on December 19, 1978.

Sample: Water labeled Deer Creek Mine, EM-3 dated Dec. 15, 1978.

	Results
pH	7.93 Units
Conductivity	1,070 umhos/cm
Suspended Solids	1.0 mg/l
Total Dissolved Solids	700.0 mg/l ?
Iron as Fe	0.307 mg/l
Alkalinity as CaC03	402.0 mg/l ?
Acidity as CaC03	30.0 mg/l
Chloride as Cl	8.0 mg/l
Oil & Grease	3.2 mg/l ?
Dissolved Oxygen	7.60 mg/l
Sulfate as S04	160.0 mg/l

Sincerely,

FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

LSF/do

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 5/3/79
DATE SAMPLED: 4/30/79

LAB NUMBER: 1021
DATE RECEIVED: 4/30/79

SAMPLE ID:

Deer Creek Mine
6th East X 16 1R
Temp. = 10.0 C Flow= 2.5 gal/min
4/30/79

WATER ANALISIS REPORT

ND means not determined

pH units	7.38
Total Alkalinity mg/l $CaCO_3$	214.7
Total Suspended Solids mg/l	0.8
Total Dissolved solids mg/l	655.0
Settleable Solids, 1 hour, mg/l	ND
Total Sulfate mg/l	152.3
Total Flouride mg/l	0.21
Total Dissolved Iron mg/l	0.14
Oil and Grease mg/l	0.7
Turbidity NTU's	1.2

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 1/8/79
DATE SAMPLED: 12/27/78

LAB NUMBER: 1010
DATE RECEIVED: 12/27/78

SAMPLE ID:

Deer Creek
5th East Water Supply
12/27/78

WATER ANALISIS REPORT

ND means not determined

pH units	8.20
Total Alkalinity mg/l $CaCO_3$	<0.1
Total Suspended Solids mg/l	456.0
Total Dissolved solids mg/l	ND
Settleable Solids, 1 hour, mg/l	208.2
Total Sulfate mg/l	0.22
Total Flouride mg/l	0.07
Total Dissolved Iron mg/l	0.8
Oil and Grease mg/l	0.95
Turbidity NTU's	

Sharon Hale
MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE 12/15/78
DATE SAMPLED 12/13/78

LAB NUMBER 1008
DATE RECEIVED 12/13/78

SAMPLE ID:
DEER CREEK
5th EAST
12/13/78

ND MEANS NOT DETERMINED

WATER ANALYSIS REPORT

PH UNITS	7.86
TOTAL ALKALINITY MG/L CACO3	ND
TOTAL SUSPENDED SOLIDS MG/L	0.66
TOTAL DISSOLVED SOLIDS MG/L	598.00
SETTLEABLE SOLIDS, 1HR. MG/L	ND
TOTAL SULFATE MG/L	ND
TOTAL FLOURIDE MG/L	ND
TOTAL DISSOLVED IRON MG/L	ND
OIL AND GREASE MG/L	ND
TURBIDITY, NTU'S	ND

Sharon Hale

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 4/11/79
DATE SAMPLED: 4/9/79

LAB NUMBER: 1017
DATE RECEIVED: 4/9/79

SAMPLE ID:

Deer CReek Mine
3rd Left, water from gob.
Temp: 11.0 C Flow: 200 gal/min

WATER ANALYSIS

pH	7.50	
Total Alkalinity	400.0	mg/1 $CaCO_3$
Total Sulfate	280.6	mg/1 SO_4
Settable Solids	ND	
Filterable Solids	4.7	mg/1
Dissolved Solids	745.3	mg/1
Oil and Grease	0.7	mg/1
Turbidity	1.4	NTU's
Flouride	0.22	mg/1
Iron (dissolved FE)	0.14	mg/1

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 4/11/79
DATE SAMPLED: 4/9/79

LAB NUMBER: 1019
DATE RECEIVED: 4/9/79

SAMPLE ID:

Deer Creek Mine
3rd South B, X 8 5L
Temp: 11.5 C Flow: 5gal/min

WATER ANALYSIS

pH	7.45	
Total Alkalinity	534.6	mg/1 $CaCO_3$
Total Sulfate	160.1	mg/1 SO_4
Settable Solids	ND	
Filterable Solids	2.0	mg/1
Dissolved Solids	641.0	mg/1
Oil & Grease	0.1	mg/1
Turbidity	1.2	NTU's
Flouride	$\underline{/}$ 0.1	mg/1
Iron (dissolved Fe)	0.15	mg/1

MANAGER

STANDARD LABORATORIES, INC.
UTAH POWER & LIGHT

DATE: 12/20/79
DATE SAMPLED: 12/19/79

LAB NUMBER: 1116
DATE RECEIVED: 12/19/79

SAMPLE ID: Deer Creek Mine
EM-3

WATER ANALISIS REPORT

ND means not determined

pH units		7.3
Total Alkalinity mg/l $CaCO_3$		408.0
Total Suspended Solids mg/l		.06
Total Dissolved solids mg/l		.61
Settleable Solids, 1 hour, mg/l		ND
Total Sulfate mg/l		135.4
Total Flouride mg/l		0.24
Total Dissolved Iron mg/l		.44
Oil and Grease mg/l	less than	0.1
Turbidity NTU's		1.06

MANAGER

APPENDIX K

DEER CREEK MINE DISCHARGE WATER QUALITY

Tom L.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

December 22, 1978

Utah Power & Light Co.
Mining & Exploration
41 North Redwood Rd.
Salt Lake City, Utah

CERTIFICATE OF ANALYSIS
78-4074

Attn: Jerry Vaninetti

Gentlemen:

The following analysis is on sample of water received on December 6, 1978.

Sample: Deer Creek Discharge dated 12/5/78.

	Results
pH	7.75 units
Conductivity	920.0 umhos/cm
Suspended Solids	9.0 mg/l
Total Dissolved Solids	610.0 mg/l
Iron as Fe	0.016 mg/l
Alkalinity as CaC03	262.0 mg/l
Acidity as CaC03	10.0 mg/l
Sulfate as S04	198.0 mg/l
Chloride as Cl	8.0 mg/l
Oil & Grease	<1.0 mg/l
Dissolved Oxygen	6.90 mg/l

Sincerely,

FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

LSF/do

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

RECEIVED
JAN 18 1979
MINING AND
EXPLORATION

January 15, 1979

Utah Power & Light Co.
Mining & Exploration
41 North Redwood Rd.
Salt Lake City, Utah

CERTIFICATE OF ANALYSIS

79-31

Attn: Jerry Vaninetti

Gentlemen:

The following analysis is on sample of water received on January 4, 1979.

Sample: Deer Creek Discharge, 1/3/79.

	Results
Flow	0.15 mg/d
Temperature	7°C
pH	7.38 units
Conductivity	750.0 umhos/cm
Suspended Solids	12.0 mg/l
Total Dissolved Solids	480.0 mg/l
Iron as Fe	0.414 mg/l
Alkalinity as CaC03	296.0 mg/l
Acidity as CaC03	20.0 mg/l
Sulfate as S04	144 mg/l
Chloride as Cl	10.0 mg/l
Oil and grease	1.2 mg/l
Dissolved Oxygen	7.20 mg/l

Sincerely,

FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

February 22, 1979

Utah Power & Light Company
P.O. Box 899
Salt Lake City, Utah 84110

CERTIFICATE OF ANALYSIS

Attn: Carly Burton

79-790

Gentlemen:

The following analysis is on sample of water received on February 8, 1979.

Sample: Water, Deer Creek Mine Discharge 2/6/79.

	Results
Flow	0.15 Mgd
Temperature	6°C
pH	7.79 Units
Conductivity	800.0 umhos/cm
Suspended Solids	20.0 mg/l
Total Dissolved Solids	531.0 mg/l
Iron as Fe	0.121 mg/l
Alkalinity as CaC03	254.0 mg/l
Acidity as CaC03	14.0 mg/l
Sulfate as S04	176.0 mg/l
Chloride as Cl	18.0 mg/l
Oil & Grease	<1.0 mg/l
Dissolved Oxygen	8.97 mg/l

Sincerely,

FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

LSF/do
cc: Tom Lloyd, Huntington

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Jim Lloyd

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

RECEIVED
MAR 2 1 1979
MINING AND EXPLORATION

March 21, 1979

Utah Power & Light Co.
Mining & Exploration
41 North Redwood Rd.
Salt Lake City, Utah

CERTIFICATE OF ANALYSIS

79-1418

Attn: Jerry Vaninetti

Gentlemen:

The following analysis is on sample of water received on March 8, 1979.

Sample: Water, Deer Creek Mine, dated 3/7/79.
DISCHARGE

	Results
pH	7.41 Units
Conductivity	940.0 umhos/cm
Suspended Solids	272.0 mg/l
Total Dissolved Solids	616.0 mg/l
Iron as Fe	1.119 mg/l
Alkalinity as CaC03	292.0 mg/l
Acidity as CaC03	0.7 mg/l
Sulfate as S04	145.0 mg/l
Chloride as Cl	16.0 mg/l
Oil & Grease	<1.0 mg/l
Dissolved Oxygen	8.91 mg/l

Sincerely,

FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

LSF/do

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 04/20/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
STANDARD COAL LABS
BOX 1140
HUNTINGTON, UT 00000

79-002038

SAMPLE: WATER FROM DEER CRK.MINE DISCHARGE. DATED 4/3/79, TEMP. 12C @ 11:00 A.M.

	RESULTS
Acidity as CaCO3 mg/l	16.0
Alkalinity as CaCO3 mg/l	284.00
Chloride as Cl mg/l	18.0
Conductivity umhos/cm	900
Dissolved Oxygen mg/l	8.26
Iron as Fe mg/l	.212
Oil and Grease mg/l	2.2
Sulfate as SO4 mg/l	193
Suspended Solids mg/l	24.0
Total Dissolved Solids mg/l	598
pH Units	7.80

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/04/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
STANDARD COAL LABS
BOX 1140
HUNTINGTON, UT 84528

79-002800

SAMPLE: WATER FROM DEER CREEK MINE DISCHARGE RECEIVED ON MAY 2, 1979:

	DEER CR MINE DISCHARGE 5-1-79
Acidity as CaCO3 mg/l	20.0
Alkalinity as CaCO3 mg/l	302.00
Chloride as Cl mg/l	10.0
Conductivity umhos/cm	890
Dissolved Oxygen mg/l	9.85
Iron as Fe mg/l	.232
Oil and Grease mg/l	<1.0
Sulfate as SO4 mg/l	146
Suspended Solids mg/l	8.0
Total Dissolved Solids mg/l	500
pH Units	7.49

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 06/27/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-003697

SAMPLE: WATER FROM DEER CREEK MINE DISCHARGE DATED 6-4-79, 12 A.M.
FLOW 0.22, TEMP. 8 DEGREES C.

	RESULTS
Acidity as CaCO3 mg/l	22.0
Alkalinity as CaCO3 mg/l	270.00
Chloride as Cl mg/l	10.0
Conductivity umhos/cm	850
Dissolved Oxygen mg/l	6.7
Iron as Fe (Total) mg/l	.460
Oil and Grease mg/l	<1.0
Sulfate as SO4 mg/l	171
Suspended Solids mg/l	26.0
Total Dissolved Solids mg/l	550
pH Units	7.36

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 08/09/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-005112

SAMPLE: WATER DATED 7/2/79 RECEIVED 7/5/79.

	WILBING MINE DISCHARGE 7/2/79	DEER CREEK MIN DISCHARGE 7/2/79
Acidity as CaCO3 mg/l	44.0	20.0
Alkalinity as CaCO3 mg/l	270.00	280.00
Arsenic as As mg/l	<.001	<.001
Bicarbonate as HCO3 mg/l	329.40	341.60
Cadmium as Cd mg/l	<.001	<.001
Calcium as Ca mg/l	84.00	88.00
Chloride as Cl mg/l	14.0	20.0
Fluoride as F mg/l	.20	.23
Gross Alpha pci/l	2.1	2.5
Gross Beta pci/l	9.6	10.4
Iron as Fe (Total) mg/l	.210	.336
Lead as Pb mg/l	.001	.001
MPN Fecal Coliform MPN/100 ml	<2.0	<2.0

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005112

	WILBING MINE DISCHARGE 7/2/79	DEER CREEK MIN DISCHARGE 7/2/79
MPN Total Coliform MPN/100 ml	13.0	230
Magnesium as Mg mg/l	62.40	51.84
Manganese as Mn. mg/l	.008	.015
Nitrite as NO2-N mg/l	<.01	.01
and Grease mg/l	<1.0	<1.0
Phosphate as PO4-P (Ortho) mg	.030	.110
Potassium as K mg/l	3.939	5.160
Selenium as Se mg/l	<.001	<.001
Silica as SiO2 mg/l	10.00	7.80
Sodium as Na mg/l	26.00	30.00
Sulfate as SO4 mg/l	235	197
Suspended Solids mg/l	8.0	55.0
Total Dissolved Solids mg/l	592	568
Total Kjeldahl Nitrogen mg/l	.20	.15
Total Organic Carbon mg/l	5.00	1.00
Zinc as Zn mg/l	.008	.014
pH Units	6.98	7.16

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005112

	WILBING MINE DISCHARGE 7/2/79	DEER CREEK MIN DISCHARGE 7/2/79
==========	==========	==========

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 09/11/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-006181

SAMPLE: WATER DATED 8/13/79 RECEIVED 8/15/79 FROM DEER CREEK MINE DISCHARGE.

	DEER CREE MINE DIS. 9:30 AM 10.5 C
Acidity as CaCO3 mg/l	15.0
Alkalinity as CaCO3 mg/l	330.00
Chloride as Cl mg/l	12.0
Conductivity umhos/cm	900
Dissolved Oxygen mg/l	7.1
Iron as Fe (Total) mg/l	.860
Oil and Grease mg/l	<1.0
Sulfate as SO4 mg/l	154
Suspended Solids mg/l	11.0
Total Dissolved Solids mg/l	589
pH Units	7.39

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 10/05/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-006830

SAMPLE: MINE WATER COLLECTED 9/4/79 FROM WILBERG AND DEER CREEK MINES RECEIVED 9/6/79.

	WILBERG MINE	DEER CREEK MINE
Acidity as CaCO3 mg/l	18.0	20.0
Alkalinity as CaCO3 mg/l	322.00	322.00
Chloride as Cl mg/l	20.0	20.0
Iron as Fe (Total) mg/l	.230	.240
Oil and Grease mg/l	1.2	1.2
Sulfate as SO4 mg/l	190	232
Suspended Solids mg/l	2.0	20.0
Total Dissolved Solids mg/l	535	565
pH Units	7.40	7.60

Kyle Ford
FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 09/28/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-007280

SAMPLE: WATER SAMPLE FROM DEER CREEK MINE DISCHARGE DATED 9-17-79
RECEIVED 9-21-79.

	DEER CREEK MINE DISCHARGE
BOD 5 Day mg/l	2.1

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 11/05/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-007491

SAMPLE: MINE WATERS FROM WILBERG AND DEER CREEK MINE DISCHARGES
DATED 10/2/79 RECEIVED 10/5/79.

	WILBERG MINE DISCHARGE	DEER CREEK MINE DISCHARGE
Acidity as CaCO3 mg/l	26.0	28.0
Alkalinity as CaCO3 mg/l	300.00	284.00
BOD 5 Day mg/l	4.0	
Chloride as Cl mg/l	12.0	8.0
Conductivity umhos/cm		760
Dissolved Oxygen mg/l		7.5
Iron as Fe (Total) mg/l	.070	.300
Oil and Grease mg/l	23.8	3.8
Sulfate as SO4 mg/l	154	168
Suspended Solids mg/l	2.0	3.0
Total Dissolved Solids mg/l	500	490
pH Units	7.50	7.30

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 09/07/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-005830

SAMPLE: WASTEWATER DATED 7/30/79, 2:20 P.M. RECEIVED 8/1/79.

8/1/79

DEER CR.
MINE
DISCHARGE
FLOW 0.22
TEM:10.3C

cidity as CaCO3 ms/l	40.0
Alkalinity as CaCO3 ms/l	320.00
Arsenic as As ms/l	<.001
Bicarbonate as HCO3 ms/l	390.40
Cadmium as Cd ms/l	.001
Calcium as Ca ms/l	92.00
Chloride as Cl ms/l	14.0
Conductivity umhos/cm	890
Dissolved Oxygen ms/l	8.6
Fluoride as F ms/l	.30
Gross Alpha pci/l	2.5
Gross Beta pci/l	8.9
Iron as Fe ms/l	.620

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005830

	DEER CR. MINE DISCHARGE FLOW 0.22 TEM:10.3C
Lead as Pb mg/l	<.001
Magnesium as Mg mg/l	51.84
Manganese as Mn mg/l	.020
Nitrite as NO2-N mg/l	.05
Oil and Grease mg/l	<1.0
Phosphate PO4-P (Ortho) mg/l	.060
Potassium as K mg/l	7.200
Selenium as Se mg/l	.002
Silica as SiO2 mg/l	9.00
Sodium as Na mg/l	31.81
Sulfate as SO4 mg/l	182
Suspended Solids mg/l	6.0
Total Dissolved Solids mg/l	577
Total Kjeldahl Nitrogen mg/l	.30
Total Organic Carbon mg/l	8.00
Zinc as Zn mg/l	.036
pH Units	7.31

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

CERTIFICATE OF ANALYSIS

79-005830

DEER CR.
MINE
DISCHARGE
FLOW 0.22
TEM:10.3C

========== =========

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 11/27/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-007905

SAMPLE: WATER DATED 11/5/79 RECEIVED 11/7/79 FROM WILBERG AND DEER CREEK MINES.

	WILBERG MINE DISCHARGE	DEER CREEK MINE DISCHARGE
Acidity as CaCO3 mg/l	62.0	52.0
Alkalinity as CaCO3 mg/l	292.00	260.00
BOD 5 Day mg/l	1.6	
Chloride as Cl mg/l	12.0	30.0
Conductivity umhos/cm		890
Dissolved Oxygen mg/l		7.9
Iron as Fe (Total) mg/l	.074	.265
Oil and Grease mg/l	1.2	3.0
Sulfate as SO4 mg/l	163	274
Suspended Solids mg/l	7.0	2.0
Total Dissolved Solids mg/l	650	770
pH Units	7.60	7.55

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

DATE: 12/17/79

CERTIFICATE OF ANALYSIS

UTAH POWER & LIGHT
MINING & EXPLORATION
BOX 1005
HUNTINGTON, UT 84528

79-008175

SAMPLE: WATERS DATED 12/03/79 RECEIVED 12/05/79

	WILBERG MINE DISCHARGE	DEER CRK MINE DISCHARGE
Acidity as CaCO3 mg/l	16.0	30.0
Alkalinity as CaCO3 mg/l	268.00	266.00
BOD 5 Day mg/l	1.4	<.1
Chloride as Cl mg/l	8.0	1,350
Conductivity umhos/cm		4,000
Iron as Fe (Total) mg/l	.100	.480
Oil and Grease mg/l	5.8	1.8
Sulfate as SO4 mg/l	171	199
Suspended Solids mg/l	1.0	7.0
Total Dissolved Solids mg/l	500	3,300
pH Units	7.60	7.20

Disolved Oxygen

FORD CHEMICAL LABORATORY, INC.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or, extracts from or regarding them, is reserved pending our written approval as a mutual protection to clients, the public and ourselves.