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**OCCIDENTAL VERTICAL MODIFIED IN SITU PROCESS FOR
THE RECOVERY OF OIL FROM OIL SHALE. PHASE II**

Quarterly Progress Report, September 1—November 30, 1979

December 1979
Date Published

Work Performed Under Contract No. FC20-78LC10036

Occidental Oil Shale, Inc.
Grand Junction, Colorado

950 6916



U. S. DEPARTMENT OF ENERGY

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OCCIDENTAL VERTICAL MODIFIED IN SITU PROCESS
FOR THE RECOVERY OF OIL FROM OIL SHALE
PHASE II

Quarterly Progress Report for the Period
September 1, 1979 through November 30, 1979

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Date Published - December 1979

PREPARED FOR THE UNITED STATES
DEPARTMENT OF ENERGY

Under Contract No. DE-FC20-78LC10036
Modification A004

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I. INTRODUCTION

The progress presented in this report covers the period September 1 through November 30, 1979 under the work scope for Phase II of the DOE/Occidental Oil Shale, Inc. (OOSI) Cooperative Agreement.

The major activities at OOSI's Logan Wash site during the quarter were: driving the access drifts towards the underground locations for Retorts 7 and 8; manway raise boring; constructing the change house; rubbing the first lift of Mini-Retort (MR)1; preparing the Mini-Retorts for tracer testing; coring of Retort 3E; and beginning the DOE instrumentation program.

II. RETORTS 7 and 8

1. MINING

Mining activities to access Retorts 7 and 8 continued during the quarter with progress in several areas for a quarterly total of 720'. See Figures 1-3.

The progress consisted of mining 389' of the L-910-E drift and incline to Retort 7, 82' of the L-1230-E drift in front of the retorts, 20' of L-380-N between the retorts, 116' of the ore pass run around off the L-1230-E drift, the manway drift from the L-380-N to the manway raise location, an 18' x 30' truck turnaround for muck loading operations, and 30' of an 8' x 8' heading off the U-905-E drift off the U-1 incline towards the upper level of Retorts 7 and 8.

In the pillar test area, the A-725-E drift was advanced 213' in the upper level and the U-180-N was advanced 176' in the lower level.

In October, a trench was mined across the L1 incline from the L-970 cross-cut to L-970-N. An air culvert was placed in the trench and then covered with shale. Bulkheads were built on the L1 ends of the 970 drifts. This arrangement was installed to improve air ventilation and provide fresh air to the mine workings near Retorts 7 and 8. Other instrumentation, ventilation and utility support work continued.

The drilling contractor moved on site early in November and started raise boring operations. The manway raise pilot hole was drilled by mid-November. At the end of November, 177' of the 8' diameter manway raise had been pulled.

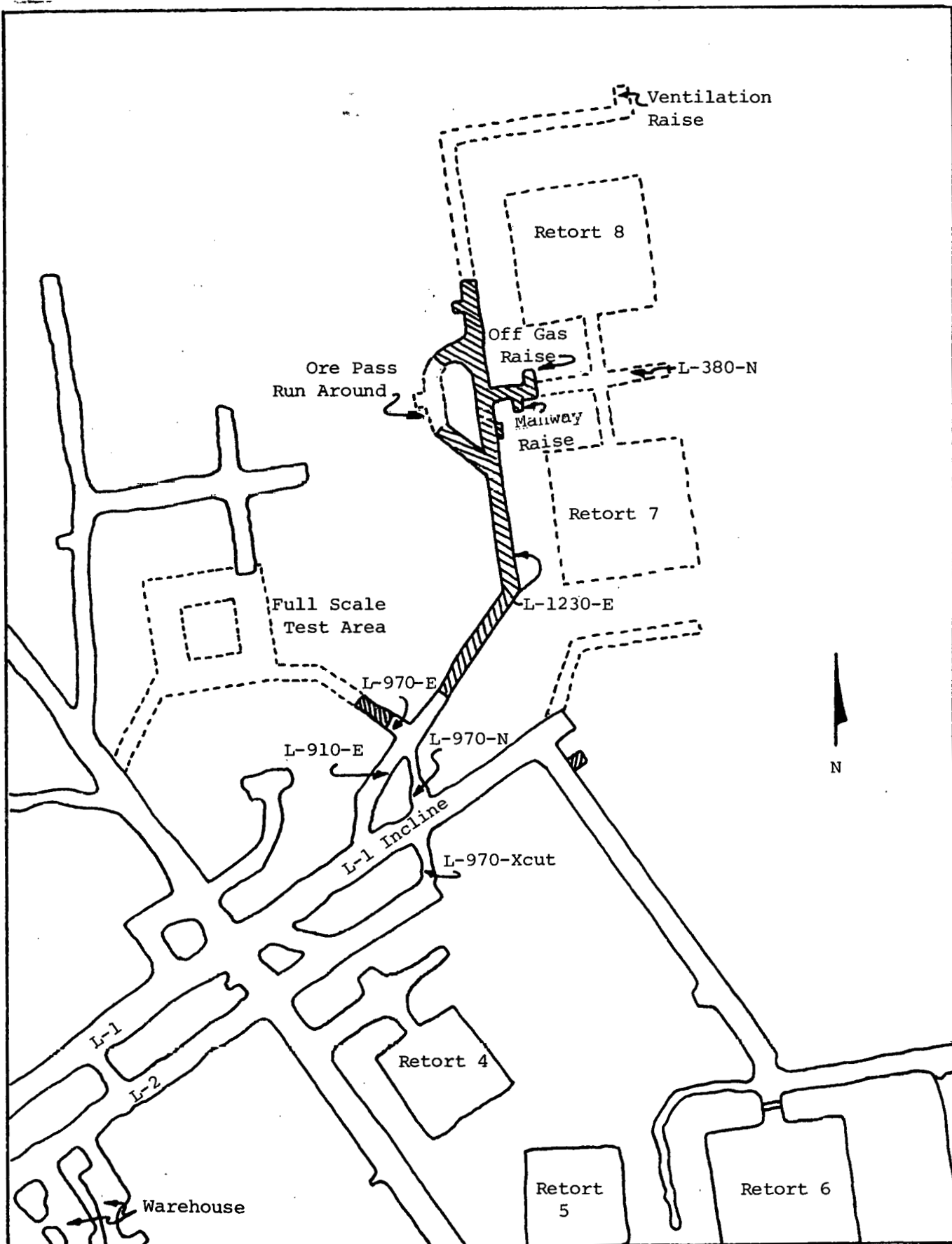


Figure 1. Mining progress during the quarter (September - November, 1979) at the Lower Level shown in crosshatched areas.

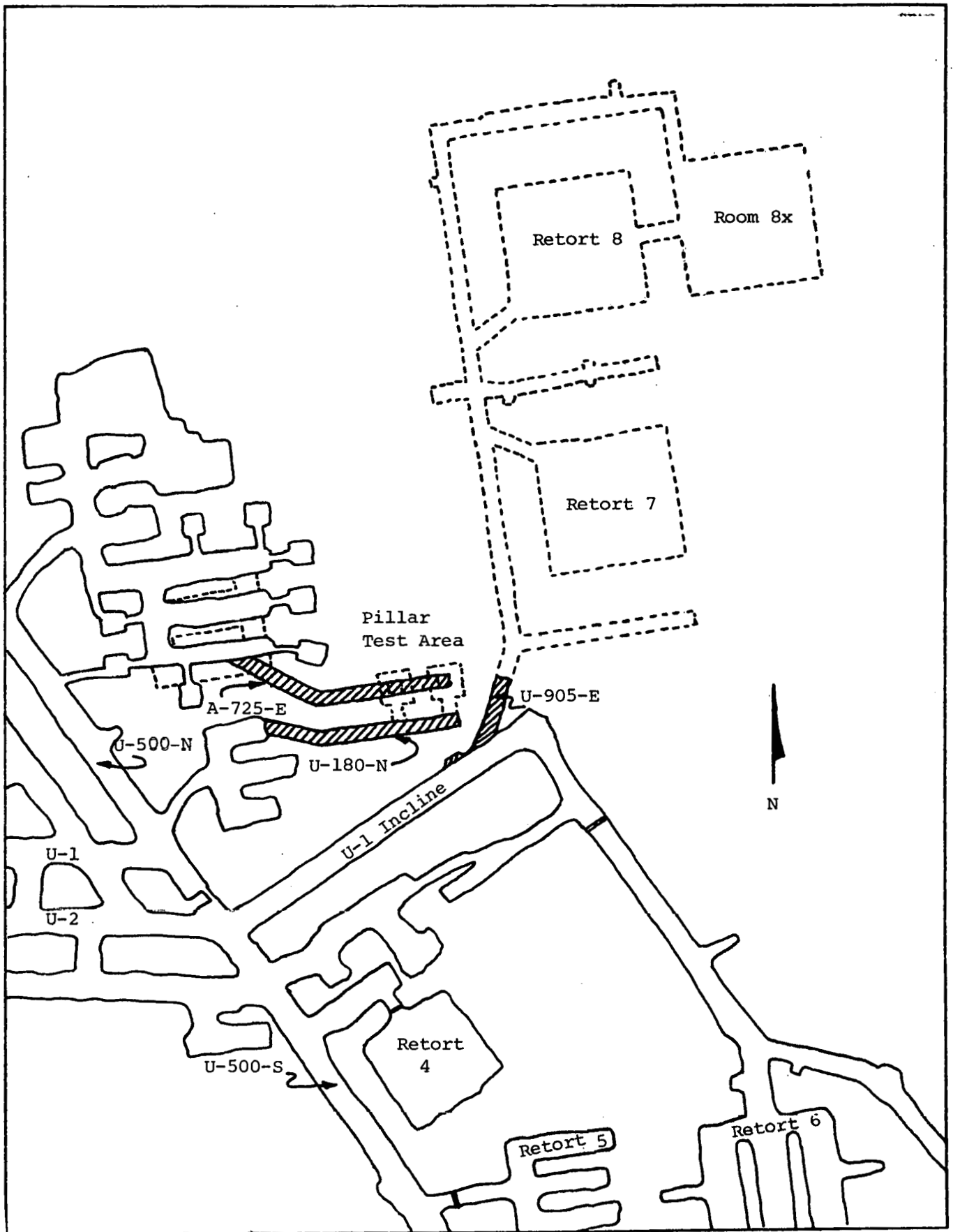


Figure 2. Mining progress during the quarter (September - November, 1979) at the Upper Level shown in crosshatched areas.

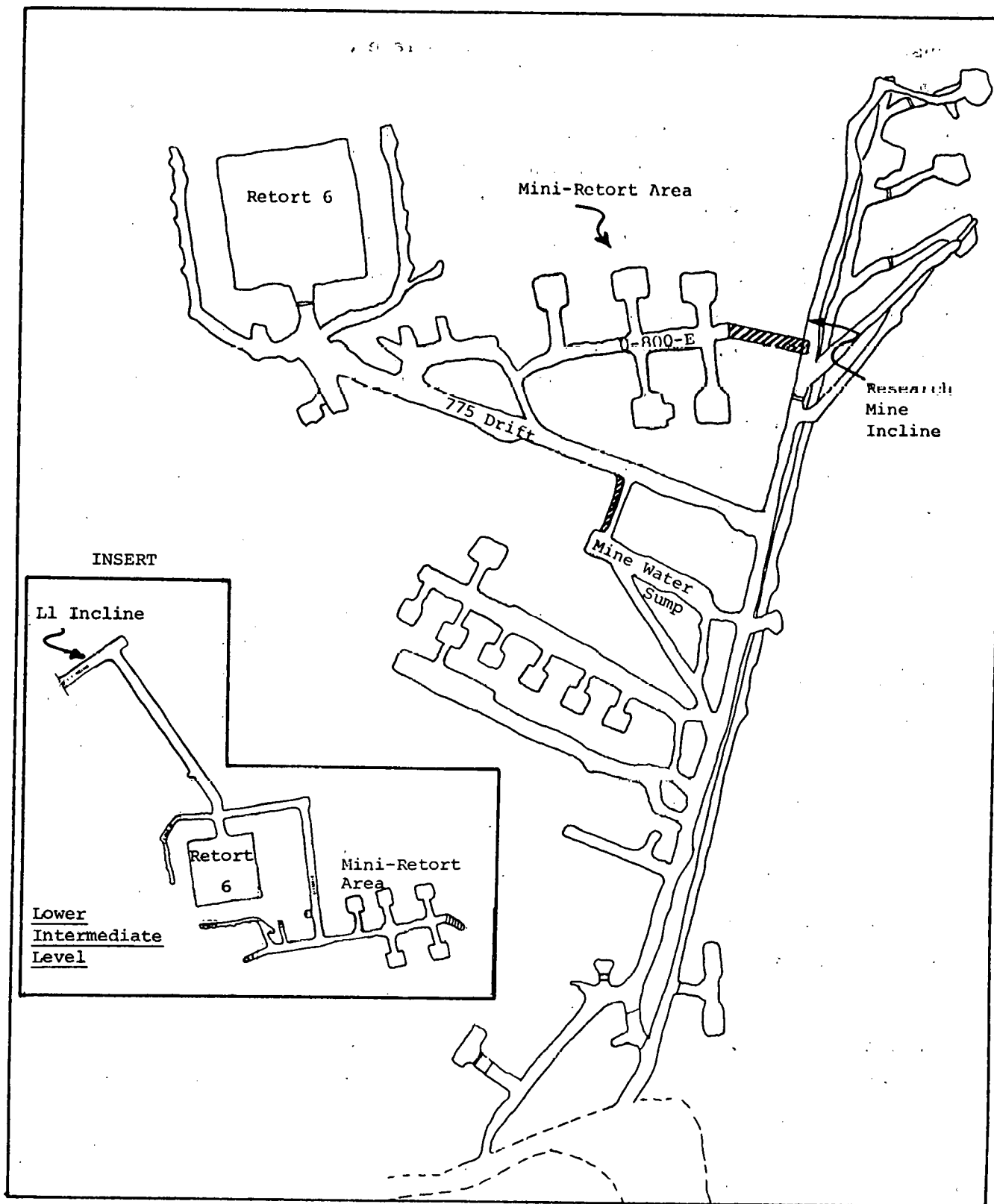


Figure 3. Mining progress during the quarter (September -- November, 1979) in the Research Mine and Lower Intermediate Level shown in cross hatched areas.

2. CONSTRUCTION

Construction activities progressed on the surface and at the lower mine level.

On the surface, the electrical substation for Logan Wash was relocated and the location for the surface facilities was graded. Electrical conduit to the manway raise location was installed in October to provide power for the drill rig. Also the pole line from the emergency generator to the ventilation fan above the U-500 drift was relocated. The drill pad and collar for the manway raise was excavated and poured and excavation for the off-gas raise drill pad and collar was begun in October. By the end of November the drill pads and collars for the off-gas raise and the ventilation raise had been completed.

At the lower mine level, the major activities centered around the Mini-Retorts (MR) and change house construction. In the Mini-Retort area, installation of electrical power and off-gas piping began in October. The pre-blast piping in the bottom of MR1 was completed and the blower to be used for tracer tests and burner tests was installed. The cribbing at the bottom of MR1 was constructed. The installation of off-gas piping in the bottom of MR2 began. After the blast of the first lift of MR1, building the bulkhead at its lower level was started.

A warehouse and construction staging area, near the Research Mine, were completed in October for the construction subcontractors use.

The subcontractor for the change house was mobilized in late September. The foundation was poured and the water and sewer services were tied in by mid-November. The fire water line was also installed. The building frame was erected.

Other progress was: construction of an air curtain on the L1 incline was started in late November; electrical expansion for Retorts 7 and 8 was started; the pad for a 1000 KVA transformer was poured; and the first Sandia Labs computer trailer was set up outside the Research Mine portal.

V. ENVIRONMENTAL SUPPORT

This section contains data for the environmental monitoring period of August through November 1979, and includes data not reported in previous Quarterly Reports.

Environmental monitoring has continued on the Logan Wash mine site and nearby area. The area is characterized as rugged and mountainous with steep bluffs and high elevation, and is located in western Colorado about 10 miles northeast of the town of DeBeque. Figure 4 is a map of the area showing elevation contours and the location of the environmental monitoring stations. The elevation of the area ranges from 7000 to 9000 feet above sea level as shown in Figure 5 which presents an elevation profile through the principle areas of activity.

The environmental monitoring network consists of several stations for collection of meteorological, hydrological, water quality, biological, and photographic data. These stations and the data collected at each are shown in Table I. Table II presents the water quality sampling stations. Data collected at these stations for the months of August through October 1979 are included in Appendix A of this report. Hydrologic data forwarded to Geothermal Surveys, Inc., has not been reported for May through October 1979. This data will be reduced by Occidental personnel for the next quarterly report and will include the following;

- Hydrothermograph at 3 stations (gate, mine, tower)
- Evaporation measurements at 2 stations (gate, tower)
- Wind gauge data at 2 stations (gate, tower)
- Rain gauge data at 5 stations (gate, mine, tower, Smith Gulch, Logan Wash)
- Stilling well data at 2 stations (Smith Gulch, Logan Wash)
- Surface water runoff at 3 stations (Smith Gulch, Logan Wash, Dry Gulch)

An Ecological baseline study of flora, vegetation, and soils is included in Appendix B of this report. The vegetation data and analysis for September 1979 are included in this baseline study. At the site, three plots have been prepared for mulching as part of the reclamation program.

III. OXY FUNDED ROCK FRAGMENTATION PROGRAM

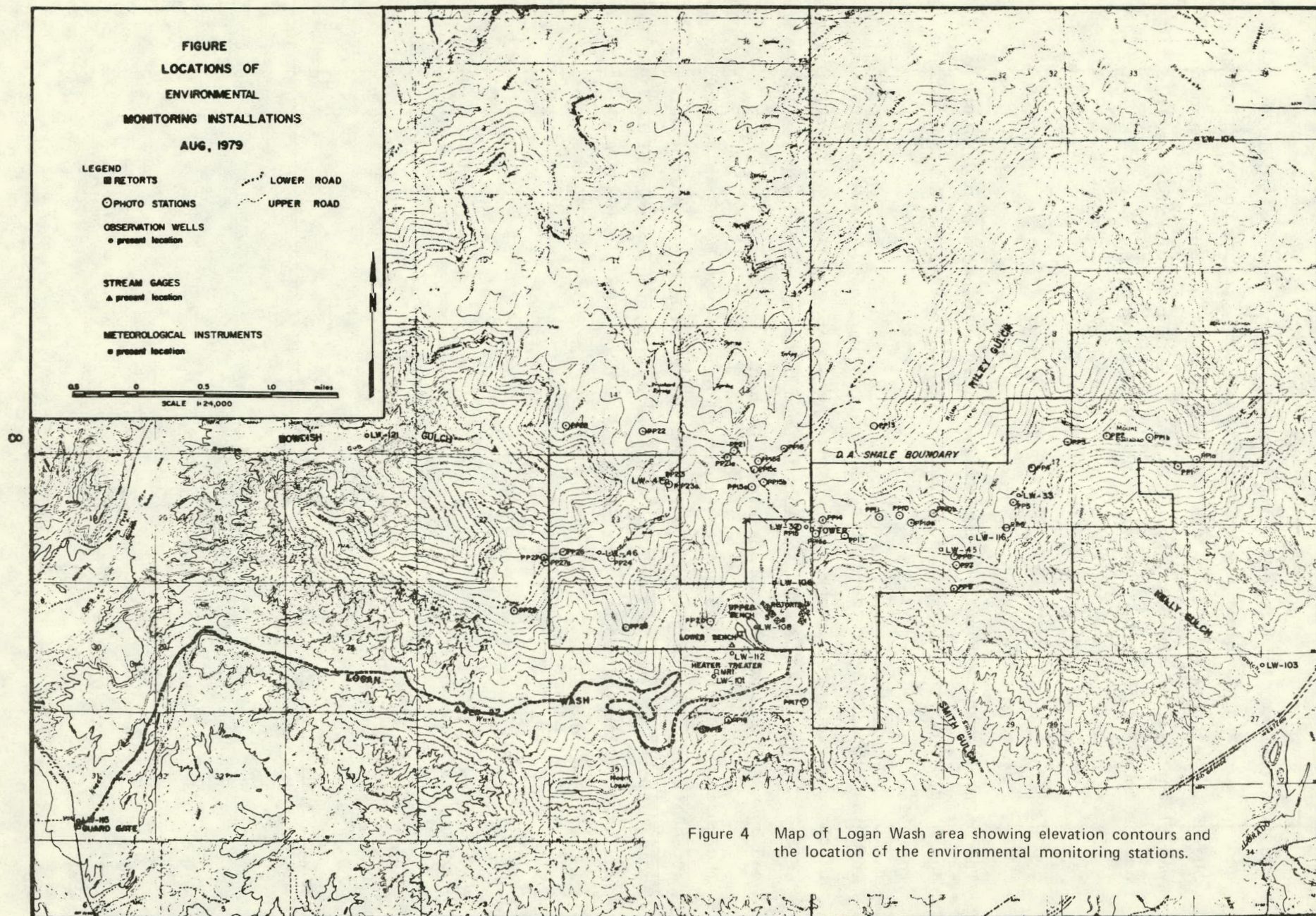
The first lift of Mini-Retort 1 was shot on Monday November 19, 1979, and seismic and air blast measurements and motion picture photography of the blast were taken. During the week following the blast, the stemming was cleaned out of the blast holes in the MR1 sill pillar in order to gain access to the rubble for surveying and photography.

IV. DOE FUNDED TASKS

The secrecy agreement between OOSI and Sandia was signed in mid-November and Sandia submitted a revised instrumentation proposal for DOE and OOSI to review and approve.

The mine stability portion of the DOE instrumentation program was started in the last week of November with Sandia personnel and equipment arriving at the Logan Wash site. By the end of November, the instrument trailer had been set up outside the Research Mine haulage portal.

The coring operation phase of the leaching program was begun in September at Retort 3E. Two spent shale cores were taken from the retort. In a joint effort with the DOE and its representatives, the cores will be analyzed to determine whether or not a field leach test, using Retort 3E, will be desirable.



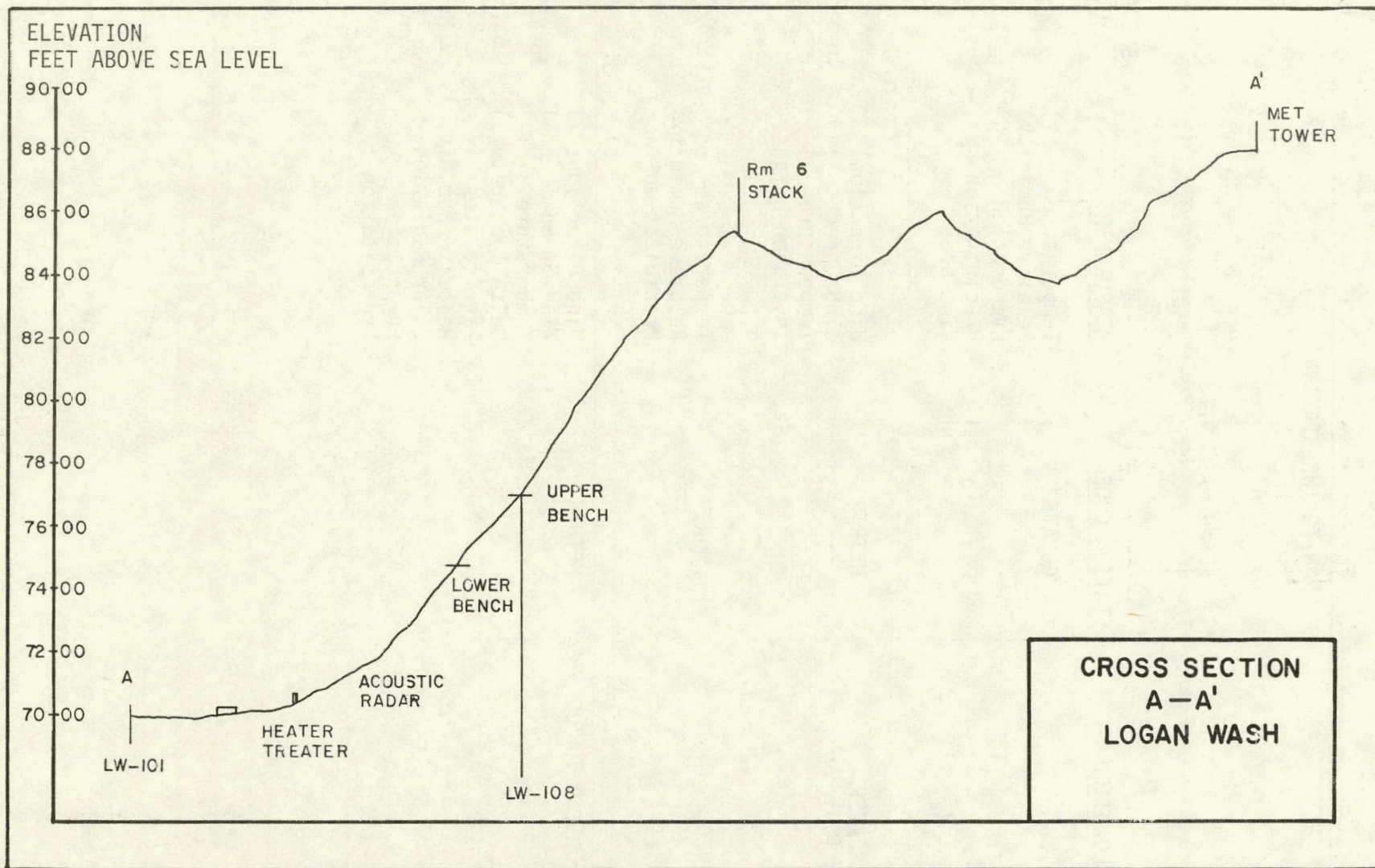


Figure 5. Elevation profile for Logan Wash Mine area.

TABLE I

MONITORING STATIONS

AT

LOGAN WASH SITE

<u>STATION LOCATION</u>	<u>STATION CODE</u>	<u>MEASUREMENT</u>	<u>ELEVATION LEVEL ABOVE GROUND</u>
GUARD GATE	GDGATE	Temperature) Relative Humidity) Evaporation Precipitation Wind Speed	2 METER
HEATER-TREATER (MRI STATION)	HETRTR	Wind Direction) Wind Speed) Temperature) Inversion Height	10 METER
LOWER BENCH	LWBNCH	Temperature Relative Humidity Precipitation	2 METER
METEOROLOGICAL TOWER	METOWR	Wind Direction) Wind Speed) Temperature) Delta Temperature) Particulates) Relative Humidity) Solar Radiation) Evaporation Precipitation	30 METER 2 METER

TABLE II

WATER MONITORING STATIONS AT LOGAN WASH SITE

<u>WATER TYPE</u>	<u>STATION</u>	<u>STATION CODE</u>
Alluvial Wells	LW101	LWA101
	LW101A	LWA100
	LW102	LWA102
	LW103	LWA103
	LW104	LWA104
	LW112	LWA112
	LW115	LWA115
	LW121	LWA121
	LW22	LWA022
Deep Wells	LW32	LWD032
	LW33	LWD033
	LW46	LWD046
	LW47	LWD047
	LW108	LWD108
	LW106	LWD106
	LW45	LWD045
	LW116	LWD116
	LMB1	LMD601
	PLRL1	LWD602
	LILSW1	LWD603
	LILSE2	LWD604
	LILN3	LWD605
	L2PS1	LWD606
	L2PS2	LWD607
	UIL600	LWD608
	AL-N1	LWD609
Streams	Bowdish Gulch	LWS001
	Logan Wash	LWS002
	Upper Roan Creek	LWS003
	Lower Roan Creek	LWS013
	Smith Gulch	LWS004
	Kelly Gulch	LWS005
	Riley Gulch	LWS006
	Upper Parachute Creek	LWS007
	Lower Parachute Creek	LWS017
	Dry Gulch	LWS008
Retorts	Top Retort 1	LWR000
	Bottom Retort 1	LWR001
	Bottom Retort 2	LWR002
	Bottom Retort 3	LWR003
	Bottom Retort 4	LWR004
	Bottom Retort 5	LWR005
	Bottom Retort 6	LWR006

LOGAN WASH WATER QUALITY SAMPLING FREQUENCY BY SITE

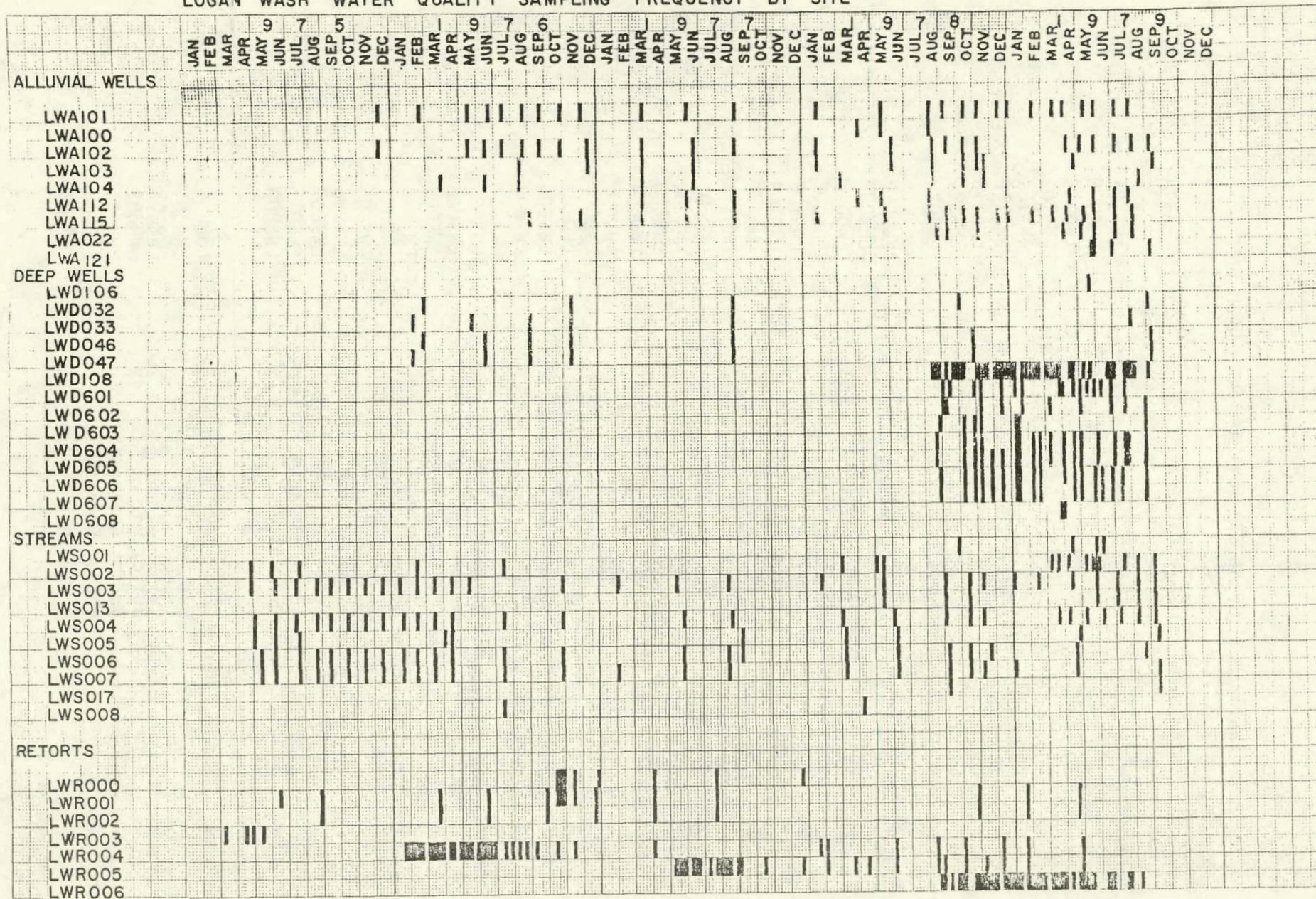


Figure 6. Water quality sampling frequency.

Color slides (135 mm) have been taken at twenty-eight photomap stations. Photographs were taken during August and September 1979 and the slides filed as a pictorial record.

Power to the Acoustic Radar was temporarily shutdown during high scaling operations at the upper mine bench from August 1 through October 24, 1979. The ambient temperature probe at the meteorological station malfunctioned and is being repaired.

Figure 6 shows water quality laboratory analyses included through September 1979. Deep wells, UILSW1 and UILSE2 were dry during this report period. Appendix C contains water quality analyses performed by Coors Laboratories for June through September.

The Prevention of Significant Deterioration (PSD) permit application was approved and went to Public Hearing on October 6, 1979. The permit was issued on November 1, 1979.

VI. SCHEDULE

The major activities in mining and construction are on schedule.

VI. PLANS FOR THE COMING QUARTER

The major activities planned are:

- Load with explosive and blast MR2, MR3 and the second lift of MR1.
- Perform necessary construction to tracer test MR2 and MR3.
- Tracer test MR2 and the first lift of MR1.
- Bore the manway, ventilation and off-gas raises.
- Complete mining the pillar and operational test areas.
- Continue access drifting towards Retorts 7 and 8 on three levels.
- Complete first phase of surface site preparation.
- Continue change house construction.

APPENDIX A
ENVIRONMENTAL DATA

This appendix contains environmental data collected during the months of August, September, and October, 1979

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DESCRIPTION OF DATA SYMBOLS:

Symbols used on meteorological and air quality data sheets are:

CA	Calibration
MT	Maintenance (changing paper, tape filters)
FO	Flame out (on the gas chromatographs)
IM	Instrument malfunction
PF	Power failure (generator failure, power outages)
RF	Recording system failure (chart jams, runs out, tape cassette fails, on-site computer goes down)
LI	Local interference (car nearby, contamination by generator)
OS	Off scale (at top of chart data value greater than range of instrument)
SE	Special experiment (instrument off-line for bag sample analysis or removed for special measurements in area).
VA	Variable wind direction
IN	Interference (CO ₂ interference on sulfur data, SO ₂ interference in oxidant readings)
NV	Not visible (data not visible, within range of instrument/recorder; data presumed monitored)
OE	Operator error (field tech., leaves switch in wrong position)
OR	Out for repair (instrument removed from site with no replacement)
CM	Calm (no wind direction when wind speed = 0)
UN	Unlimited Ceiling (reported by NWS Stations)
WR	Weather related malfunctions (frozen instruments, temperature reading below instrumental detection)

MECHANICAL WEATHER STATION DATA

10 METER LEVEL

HEATER-TREATER SITE

MRI diurnal tables for July through October 1979, will not be in this Appendix because of a power shutdown due to Operations conflict at the upper mine bench, and lag in data reduction. Therefore, frequency tables for July through October also will not be reported.

METEOROLOGICAL TOWER DATA

30 METER LEVEL

METEOROLOGICAL TOWER
WIND FREQUENCY TABLE
30 METER LEVEL

FREQUENCY TABLE OF WIND SPEED BY DIRECTION

30 METER

LOGAN WASH OIL SHALE PROJECT

STATION LW02 PERIOD(8/01/79 TO 8/31/79)

WIND SPEED MAX METERS/SEC	WIND DIRECTION																	TOTAL
	N	NNE	NE	FNE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
	7	14	15	10	8	8	8	12	9	9	9	8	8	8	6	5	0	
GT 11. :	0	2	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0 :	6
8. - 11. :	0	2	10	8	2	2	1	2	7	5	4	3	1	1	0	0	0 :	48
5. - 8. :	1	5	7	13	16	2	6	2	24	20	9	6	10	3	2	4	0 :	130
3. - 5. :	6	8	7	20	33	11	7	9	16	5	5	7	7	1	1	2	0 :	145
1. - 3. :	0	0	3	5	6	1	2	0	1	0	0	0	0	0	0	0	0 :	18
LT 1. :	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0 :	2
21 TOTAL :	7	17	30	47	57	16	16	14	49	30	18	16	18	5	3	6	0	349
.....																		
PERCENT	2.	5.	9.	13.	16.	5.	5.	4.	14.	9.	5.	5.	5.	1.	1.	2.	0.	100.

0 = NO OBSERVATIONS

FREQUENCY TABLE OF WIND SPEED BY DIRECTION

30 METER

LOGAN WASH OIL SHALE PROJECT

STATION LW02 PERIOD(9/01/79 TO 9/30/79)

WIND SPEED MAX METERS/SEC	WIND DIRECTION																	TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
	6	5	8	6	6	6	5	2	8	8	0	3	6	7	0	0	0	
GT 11. :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. - 11. :	0	0	1	0	0	0	0	0	2	2	0	1	0	0	0	0	0	0
5. - 8. :	1	2	1	3	1	2	1	0	6	3	0	3	8	2	0	0	0	0
3. - 5. :	1	1	6	4	0	2	1	0	9	3	0	3	4	0	0	0	0	0
1. - 3. :	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0
LT 1. :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL :	2	3	5	7	1	4	2	1	19	9	0	7	12	2	0	0	0	0
PERCENT	3.	4.	10.	9.	1.	5.	3.	1.	25.	12.	0.	9.	16.	3.	0.	0.	0.	100.

0 = NO OBSERVATIONS

FREQUENCY TABLE OF WIND SPEED BY DIRECTION

30 METER

LOGAN WASH OIL SHALE PROJECT

STATION LW02 PERIOD(10/01/79 TO 10/31/79)

WIND DIRECTION

WIND SPEED MAX METERS/SEC	WIND DIRECTION																	TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
	14	15	9	9	9	7	6	7	10	13	12	12	9	11	0	10	0	
GT 11. :	1	5	0	0	0	0	0	0	0	5	1	1	0	1	0	0	0 :	14
8. - 11. :	18	38	9	6	4	0	0	0	12	21	4	4	5	0	0	3	0 :	124
5. - 8. :	19	11	11	15	2	3	1	2	40	49	32	32	17	4	0	3	0 :	241
3. - 5. :	6	7	4	13	12	11	2	9	34	26	9	13	26	3	0	0	0 :	175
1. - 3. :	0	0	0	1	0	1	0	1	1	1	0	2	1	0	0	0	0 :	8
LT 1. :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 :	0
TOTAL :	44	61	24	35	18	15	3	12	87	102	46	52	49	8	0	6	0	562
PERCENT	8.	11.	4.	6.	3.	3.	1.	2.	15.	18.	8.	9.	9.	1.	0.	1.	0.	100.

0 = NO OBSERVATIONS.

ACOUSTIC RADAR
INVERSION HEIGHTS

Inversion Height and Stability Classes 50 meter and 200 meter diurnal tables for August through October 1979, will not be included in this Appendix because of a power shutdown due to Operations conflict at the upper mine bench.

SURFACE WATER QUALITY PARAMETERS
STREAMS

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	B (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWS001	79	4	17	90.0	-.040	-.100	-.020	-.020	.200	-.020	.800	-.500	2.0	.18
		5	31	178.0	.500	-.100	-.020	.080	.200	-.020	-.100	-.500	5.5	-.04
		6	7	110.0	.300	-.100	-.020	-.020	.100	-.020	-.100	-.500	2.9	-.04
LWS002	79	3	8	89.0	-.040	-.100	-.020	.400	.100	.030	3.000	-.500	1.0	.44
			21	510.0	-.040	.100	.040	-.020	.060	.100	15.000	4.000	6.0	.12
		4	13	160.0	.200	-.100	-.020	.030	.200	-.020	.400	-.500	3.0	.28
		5	10	146.0	.800	-.100	-.020	.030	.070	-.020	-.100	-.500	4.9	.24
			18	183.0	.070	-.100	-.020	.060	.070	-.020	-.100	-.500	6.9	.05
			30	156.0	.400	-.100	-.020	.100	.100	-.020	-.100	-.500	6.8	-.04
		6	6	150.0	.300	-.100	-.020	-.020	.100	-.020	-.100	.500	5.6	.07
		7	17	230.0	.400	-.100	-.020	-.020	.100	-.020	.100	-.500	6.6	.10
		8	8	200.0	.500	-.100	-.020	.200	.100	-.020	-.100	1.000	6.7	-.04
		9	12	220.0	.400	-.100	-.020	-.020	.100	.100	-.100	.500	6.9	-.04
LWS003	79	1	3	110.0	.400	-.100	-.020	.040	.070	-.020	-.100	.500	4.0	.17
		2	15	100.0	.300	-.100	-.020	.030	.070	.050	.500	-.500	3.0	.74
		4	17	63.0	.200	-.100	-.020	.200	.050	-.020	.500	-.500	2.0	.24
		5	31	71.0	.200	-.100	-.020	-.020	.040	-.020	-.100	-.500	1.2	-.04
		7	6	79.0	.100	-.100	-.020	-.020	.040	-.020	.800	-.500	1.9	-.04
		8	9	93.0	.300	-.100	-.020	-.020	.060	-.020	.200	-.500	2.6	-.04
LWS004	79	9	12	91.0	.300	-.100	-.020	-.020	.100	.050	-.100	-.500	2.9	.20
		3	21	160.0	.200	-.100	-.020	.400	.200	.100	2.000	-.500	3.0	.65
		4	13	160.0	.800	-.100	-.020	1.000	.200	.040	.400	-.500	3.0	.08
		5	11	135.0	.100	-.100	-.020	.100	.200	-.020	-.100	-.500	4.0	.24
		6	7	110.0	.600	-.100	-.020	-.020	.200	-.020	-.100	-.500	3.5	-.04
		7	12	110.0	.300	-.100	-.020	.600	.100	-.020	-.100	-.500	3.2	.03
LWS005	79	8	9	200.0	.600	-.100	-.020	.400	.200	-.020	.400	-.500	4.6	-.04
		9	11	60.0	.500	-.100	-.020	.040	.200	-.020	-.100	-.500	2.7	-.04
LWS006	79	4	25	118.0	-.040	.200	-.020	.100	.100	-.020	.600	-.500	3.4	.13
		9	16	120.0	.300	-.100	-.020	.400	.100	-.020	.100	-.500	2.8	.10
LWS007	79	4	25	86.0	-.040	.200	-.020	.100	.100	-.010	.800	-.500	3.0	.10
		9	23	60.0	.100	-.100	-.020	.200	.050	-.020	-.100	-.500	2.3	.10
LWS013	79	1	4	80.0	.200	-.100	-.020	.020	.040	-.020	.300	-.500	3.0	30.00
		4	25	66.0	-.040	-.100	.020	.020	.020	-.020	1.000	-.500	1.5	.06
		9	16	90.0	.200	-.100	-.020	.200	.030	-.020	.100	-.500	2.3	-.04

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	P (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWS013	79	7	6	77.0	.100	-.100	-.020	-.020	.040	-.020	.700	-.500	1.9	.30
		8	9	95.0	.300	-.100	-.020	.200	.100	-.020	.100	.500	2.6	.05
		9	12	91.0	.200	-.100	-.020	-.020	.100	-.020	-.100	-.500	2.9	-.04
LWS017	79	9	16	85.0	.100	-.100	-.020	.200	.030	-.020	.100	-.500	2.2	.20

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

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LOC	YR	MO	DAY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (PCI/1)	BETA (PCI/1)	RADIUM 226 (PCI/1)	AG (MG/L)
LWS001	79	4	17	-1.0	-1.00	16.0	-1.000	-.500	26.0	29.0	1.90	.00	.00	-.010
		5	31	-1.0	-1.00	3.0	-1.000	.040	178.0	44.0				-.010
		6	7	-1.0	-1.00	1.0	-1.000	.100	92.0	72.0				-.010
LWS002	79	3	8				-1.000	6.000	44.0					
			21				-1.000	16.000	100.0					
		4	13	-1.0	-1.00	4.0	-1.000	-.500	27.0	34.0	3.20	34.00	1.50	-.010
		5	10	-1.0	-1.00	3.0	-1.000	.100	100.0	53.0	2.50	27.00	.00	-.010
			18	-1.0	-1.00	18.0	-1.000	.200	127.0	63.0	1.50	19.00	.00	.010
			30	-1.0	-1.00	9.0	-1.000	.200	143.0	39.0				-.010
		6	6	-1.0	-1.00	3.0	-1.000	-.500	170.0	36.0				-.010
		7	17					-.500	190.0					.000
		8	8				-1.000	-.500	190.0					
		9	12				-1.000	.100	230.0					
LWS003	79	1	3				-1.000	-.500	100.0					
		2	15				-1.000	.700	90.0					
		4	17	-1.0	-1.00	28.0	-1.000	.700	26.0	9.0	1.30	41.00	1.70	-.010
		5	31	-1.0	-1.00	3.0	-1.000	.100	42.0	64.0				-.010
		7	6				-1.000	3.400	59.0					
		8	9				-1.000	.200	75.0					
LWS004	79	9	12				-1.000	.100	97.0					
		3	21				-1.000	1.000	120.0					
		4	13	-1.0	-1.00	29.0	-1.000	.600	27.0	60.0	.40	10.00	.00	-.010
		5	11	-1.0	-1.00	2.0	-1.000	.100	89.0	43.0	10.00	.00	.00	-.010
		6	7	-1.0	-1.00	2.0	-1.000	-.500	100.0	38.0				-.010
		7	12				-1.000	-.500	86.0					
LWS005	79	8	9				-1.000	.200	96.0					
		9	11				-1.000	.100	66.0					
		4	25	-1.0	-1.00	3.0	-1.000	.600	95.0	9.0	14.00	24.00	1.40	-.010
LWS006	79	9	16				-1.000	.200	75.0					
		4	25	-1.0	-1.00	3.0	-1.000	.900	74.0	63.0	1.80	5.00	.00	-.010
LWS007	79	3	23				-1.000	.040	67.0					
		1	4				-1.000	-.500	60.0					

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (PCI/1)	BETA (PCI/1)	RADIUM 226 (PCI/1)	AG (MG/L)
LWS007	79	4	25	-1.0	-1.00	3.0	-1.000	1.300	32.0	10.0	3.40	6.00	.00	-.010
		9	16				-1.000	.100	53.0					
LWS013	79	5	31	-1.0	-1.00	10.0	-1.000	.200	43.0	45.0				-.010
		7	6				-1.000	3.200	60.0					
		8	9				-1.000	-.500	75.0					
		9	12				-1.000	.100	96.0					
LWS017	79	9	16				-1.000	.100	52.0					

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	S2O3 (MG/L)	HG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWS001	79	4	17	-1.00	-.020	-.020	590.00	25.00	.77	40.00	16.0	200.0	5.00	-.020
		5	31	-1.00	-.020	.050	2550.00	12.00	.90	11.00	16.0	347.0	8.00	-.020
		6	7	-1.00	-.020	.080	530.00	8.50	1.20	17.00	15.0	160.0	4.90	-.020
LWS002	79	3	8				290.00	30.00	.50	28.00	21.0	60.0	9.00	-.020
			21				190.00	20.00	.48	100.00	7.0	83.0	11.00	-.020
		4	13	1.00	-.020	-.020	1100.00	27.00	.68	40.00	13.0	160.0	13.00	-.020
		5	10	12.00	-.020	-.020	757.00	10.00	.50	93.00	16.0	155.0	9.00	-.020
			18	14.00	-.020	-.020	896.00	32.00	.50	188.00	18.0	196.0	8.00	-.020
			30	1.00	-.020	.040	1008.00	39.00	.50	81.00	20.0	212.0	6.00	-.020
		6	6	-1.00	-.020	.050	1100.00	32.00	.50	62.00	20.0	200.0	8.20	-.020
		7	17				1400.00	33.00	.60	27.00	17.0	300.0	8.80	-.020
		8	8				1400.00	34.00	.60	23.00	16.0	270.0	8.10	-.020
		9	12				1500.00	35.00	.50	33.00	14.0	220.0	9.20	-.020
LWS003	79	1	3				550.00	17.00	.60	7.00	19.0	220.0	4.00	-.020
		2	15				440.00	17.00	.70	5.00	16.0	170.0	4.00	-.020
		4	17	-1.00	-.020	-.020	230.00	10.00	.61	18.00	17.0	82.0	4.00	-.020
		5	31	6.00	-.020	-.020	162.00	3.00	.50	37.00	17.0	65.0	2.00	-.020
		7	6				300.00	15.00	.70	-.10	17.0	110.0	4.50	-.020
		8	9				510.00	13.00	.60	15.00	16.0	150.0	5.90	-.020
		9	12				550.00	14.00	.70	-.10	16.0	160.0	5.00	-.020
LWS004	79	3	21				980.00	54.00	1.20	24.00	13.0	200.0	15.00	-.020
		4	13	4.00	-.020	.040	1100.00	.98	1.10	40.00	13.0	200.0	16.00	-.020
		5	11	2.00	-.020	-.020	923.00	9.00	1.00	6.00	11.0	223.0	11.00	-.020
		6	7	-1.00	-.020	.030	920.00	17.00	1.30	12.00	12.0	210.0	17.00	-.020
		7	12				580.00	33.00	1.30	7.00	14.0	160.0	15.00	-.020
		8	9				1300.00	21.00	1.50	10.00	19.0	280.0	27.00	-.020
		9	11				490.00	16.00	1.40	12.00	13.0	140.0	28.00	-.020
LWS005	79	4	25	-1.00	-.020	-.020	800.00	6.00	.90	38.00	12.0	208.0	5.00	-.020
		9	16				750.00	9.00	.90	110.00	15.0	150.0	6.70	-.020
LWS006	79	4	25	6.00	-.020	-.020	460.00	4.00	.50	18.00	18.0	141.0	5.00	-.020
		8	23				410.00	7.60	.40	-.10	18.0	110.0	3.90	-.020
LWS007	79	1	4				260.00	20.00	.80	5.00	18.0	110.0	3.00	-.020
		4	25	5.00	-.020	-.020	106.00	3.00	.40	31.00	16.0	53.0	3.00	-.020
		9	16				280.00	19.00	.90	-.10	20.0	100.0	4.90	-.020

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	S203 (MG/L)	MG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWS013	79	5	31	4.00	-.020	-.020	170.00	7.00	.50	37.00	18.0	64.0	2.00	-.020
		7	6				310.00	20.00	.70	-.10	18.0	110.0	4.60	-.020
		8	9				520.00	9.00	.70	23.00	17.0	160.0	6.10	-.020
		9	12				550.00	17.00	.70	-.10	17.0	170.0	5.00	-.020
LWS017	79	9	16				260.00	18.00	.80	-.10	20.0	95.0	4.60	-.020

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CACO3)	HCO3 (MG/L CACO3)	CO3 (MG/L CACO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM O2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWS001	79	4	17	280.0	240.0	40.0	1900.0	700.0	380.0	30.00	.007	3.00	10.00	8.00
		5	31	350.0	500.0	50.0	2660.0	60.0	10.0	38.00	-.001	6.00	22.00	24.00
		6	7	350.0	500.0	50.0	2700.0	35.0	10.0	44.00	.003	2.30	19.00	60.00
LWS002	79	3	8	150.0	130.0	20.0	1000.0	3,000.0	90.0	50.00	-.001	4.00	20.00	
			21	130.0	110.0	20.0	1600.0	3,500.0	20.0	60.00	.010	70.00	10.00	
		4	13	220.0	190.0	30.0	1900.0	200.0	180.0	30.00	.009	6.00	20.00	19.00
		5	10	330.0	290.0	40.0	1800.0	4,900.0	200.0	46.00	.003	5.00	17.00	25.00
			18	490.0	430.0	60.0	2000.0	2,000.0	220.0	20.00	-.001	19.00	8.00	31.00
			30	440.0	370.0	70.0	2100.0	890.0	300.0	25.00	.002	7.00	10.00	22.00
		6	6	430.0	370.0	60.0	2300.0	2,200.0	150.0	21.00	-.001	5.00	24.00	24.00
		7	17	380.0	310.0	70.0	2600.0	-1.0	10.0	33.00	.005	1.30	3.60	
		8	8	370.0	300.0	70.0	2700.0	-1.0	10.0	26.00	.020	3.10	25.00	
		9	12	420.0	360.0	60.0	2900.0	97.0	10.0	39.00	.003	17.00	3.00	
LWS003	79	1	3	540.0	540.0	-1.0	1400.0	10.0	4.0	2.00	.006	10.00	5.00	
		2	15	450.0	390.0	60.0	1400.0	200.0	60.0	6.00	.003	2.00	40.00	
		4	17	300.0	260.0	40.0	1200.0	2,000.0	200.0	30.00	.009	3.00	30.00	4.00
		5	31	290.0	240.0	50.0	600.0	30.0	320.0	10.00	-.001	3.00	4.00	14.00
		7	6	390.0	330.0	60.0	780.0	230.0	140.0	17.00	-.001	4.00	16.00	
		8	9	370.0	330.0	40.0	1300.0	850.0	450.0	2.20	.020	2.40	3.00	
		9	12	460.0	400.0	60.0	1300.0	92.0	20.0	30.00	.010	19.00	8.00	
LWS004	79	3	21	270.0	190.0	80.0	1900.0	300.0	210.0	30.00	-.001	20.00	20.00	
		4	13	290.0	240.0	50.0	2100.0	1,200.0	340.0	200.00	.007	2.00	40.00	31.00
		5	11	250.0	210.0	40.0	1800.0	280.0	200.0	20.00	.005	6.00	11.00	30.00
		6	7	280.0	230.0	50.0	1600.0	130.0	10.0	18.00	.004	13.00	22.00	33.00
		7	12	250.0	210.0	40.0	1700.0	-1.0	10.0	4.10	.030	5.60	18.00	
		8	9	210.0	170.0	40.0	2200.0	23.0	70.0	44.00	.020	5.80	16.00	
		9	11	220.0	180.0	50.0	1000.0	-1.0	10.0	27.00	.010	19.00	4.00	
LWS005	79	4	25	260.0	220.0	50.0	1600.0	140.0	130.0	20.00	-.001	4.00	40.00	4.00
		9	16	200.0	170.0	30.0	1600.0	8,300.0	10.0	12.00	.020	8.80	12.00	
LWS006	79	4	25	320.0	260.0	60.0	1200.0	970.0	400.0	12.00	.070	5.00	5.00	12.00
		8	23	290.0	220.0	70.0	830.0	-1.0	20.0	21.00	-.001	7.90	-1.00	
LWS007	79	1	4	410.0	410.0	-1.0	800.0	160.0	70.0	50.00	.004	9.00	10.00	

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
STREAMS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CaCO3)	HCO3 (MG/L CaCO3)	CO3 (MG/L CaCO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM C2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWS007	79	4	25	250.0	210.0	40.0	600.0	310.0	270.0	6.00	-.001	1.00	18.00	2.00
		9	16	360.0	330.0	50.0	870.0	15.0	70.0	2.00	.020	4.00	8.00	
LWS013	79	5	31	300.0	240.0	60.0	800.0	2,730.0	300.0	20.00	-.001	4.00	12.00	19.00
		7	6	380.0	330.0	50.0	820.0	240.0	130.0	13.00	-.001	3.10	6.60	
		8	9	390.0	350.0	40.0	1300.0	1,300.0	430.0	18.00	.010	2.50	10.00	
		9	12	430.0	360.0	70.0	1400.0	130.0	20.0	24.00	.003	21.00	4.00	
LWS017	79	9	16	400.0	350.0	50.0	860.0	17.0	60.0	1.00	.030	7.60	15.00	

NOTE: - INDICATES LESS THEN

GROUNDWATER QUALITY PARAMETERS
ALLUVIAL WELLS

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	B (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWA022	79	1	3	150.0	.600	-.100	-.020	.100	.100	.020	1.000	-.500	8.0	.70
		2	14	190.0	.200	-.100	-.020	.090	.100	.030	.400	-.500	7.0	.38
		4	11	350.0	.200	-.100	-.020	.700	.200	-.020	1.000	-.500	8.0	.28
		5	10	229.0	.900	-.100	-.020	.060	.100	-.020	-.100	-.500	7.4	.45
		6	16	160.0	.500	-.100	-.020	-.020	.100	-.020	-.100	-.500	4.9	-.04
		7	12	190.0	.300	-.100	-.020	.400	.100	-.020	-.100	-.500	6.1	.20
		8	8	230.0	.300	-.100	-.020	.400	.100	.100	.200	.500	8.1	-.04
LWA101	79	1	3	200.0	2.000	-.100	-.020	.600	.100	-.020	-.100	-.500	9.0	.30
		2	14	240.0	1.700	-.100	-.020	.400	.200	.070	.200	-.500	10.0	.24
		3	21	220.0	1.600	-.100	-.020	.800	.200	.100	.300	-.500	8.0	.78
		4	11	190.0	.860	-.100	-.020	1.000	.200	-.020	-.100	-.500	8.0	1.70
		5	16	159.0	.500	-.100	.020	.400	.100	-.020	-.100	-.500	8.4	.31
		6	6	130.0	1.000	-.100	-.020	.700	.100	-.020	-.100	-.500	5.4	.40
		7	13	130.0	1.100	-.100	-.020	.900	.100	.020	.100	.500	6.1	10.00
		8	8	160.0	1.200	-.100	.100	.900	.100	.160	.800	-.500	7.2	.10
LWA102	79	4	13	150.0	.600	.200	-.020	.200	.200	-.020	-.100	-.500	7.0	.30
		5	11	159.0	.700	-.100	-.020	.100	.200	-.020	-.100	-.500	4.0	.51
		6	7	140.0	.500	-.100	-.020	-.020	.200	-.020	-.100	-.500	3.5	-.04
		7	12	160.0	.300	-.100	-.020	.400	.200	-.020	.100	-.500	3.9	.10
		8	10	170.0	.400	-.100	-.020	.400	.200	-.020	.100	-.500	4.1	.30
		9	11	160.0	.400	-.100	-.020	.020	.200	.100	-.100	-.500	4.1	.04
LWA103	79	4	25	237.0	-.040	-.100	-.020	.100	.100	-.020	-.100	-.500	5.4	.43
		9	16	260.0	.200	-.100	-.020	.400	.100	-.020	-.100	1.000	5.4	-.04
LWA104	79	8	23	360.0	1.000	-.100	-.020	.200	.300	.020	-.100	1.000	9.2	.20
LWA112	79	4	20	150.0	1.200	-.100	-.020	.500	.200	-.020	-.100	-.500	6.4	-.04
		6	1	90.0	1.100	-.100	.020	.400	.200	-.020	-.100	.500	5.2	2.90
		7	12	73.0	1.500	-.100	-.020	1.200	.100	.020	-.100	-.500	3.8	2.50
		3	8	570.0	1.000	.100	-.020	.400	.200	2.600	13.000	2.000	8.6	34.00
LWA115	79	1	4	120.0	.800	-.100	-.020	.100	.100	-.020	-.100	-.500	5.0	.38
		2	14	75.0	.300	-.100	-.020	.040	.080	.050	1.000	-.500	3.0	.49
		3	21	85.0	.900	-.100	-.020	.700	.100	-.020	1.000	-.500	2.0	.16
		4	13	72.0	.300	-.100	-.020	.030	.100	-.020	.700	-.500	2.0	.56
		5	18	87.0	.500	-.100	-.020	.070	.070	-.020	-.100	-.500	3.7	.82
		6	6	290.0	.200	-.100	-.020	-.020	.200	-.020	.100	.500	8.8	.07
		7	12	150.0	.900	-.100	-.020	.400	.100	-.020	.200	-.500	5.3	.20
		8	9	140.0	.400	-.100	-.020	.200	.100	-.020	.100	-.500	5.2	.02

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

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WELL	YR	MO	DY	CA (MG/L)	B (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWA121	79	5	31	102.0	.200	-.100	-.020	.050	.100	-.020	-.100	-.500	2.8	-.04
		6	6	130.0	.400	-.100	-.020	-.020	.100	.100	1.500	-.500	3.3	.90
		7		160.0	.500	-.100	-.020	-.020	.100	-.020	-.100	-.500	4.7	.03
		9	12	120.0	.400	-.100	-.020	.030	.100	.040	-.100	-.500	3.8	2.20

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (FCI/1)	BETA (FCI/1)	RADIUM 226 (FCI/1)	AG (MG/L)
LWA022	79	1	3				-1.000	4.000	140.0					
		2	14				-1.000	3.000	170.0					
		4	11	-1.0	-1.00	5.0	-1.000	2.000	87.0	85.0	1.90	.00	.00	-.010
		5	10	-1.0	-1.00	4.0	-1.000	.200	156.0	26.0	3.90	64.00	.90	-.010
		6	6	-1.0	-1.00	2.0	-1.000	-.500	140.0	58.0				-.010
		7	12				-1.000	.600	170.0					
		8	8				-1.000	23.000	200.0					
LWA101	79	1	3				-1.000	2.000	210.0					
		2	14				-1.000	2.000	260.0					
		3	21				2.000	7.000	280.0					
		4	11	-1.0	-1.00	35.0	.000	10.000	65.0	88.0				-.010
		5	16	-1.0	-1.00	3.0	-1.000	.200	169.0	25.0	3.00	111.00	.20	-.010
		6	6	-1.0	-1.00	2.0	-1.000	3.400	150.0	71.0				-.010
		7	13				.000	.300	140.0					
		8	8				-1.000	26.000	160.0					
LWA102	79	4	13	-1.0	-1.00	5.0	-1.000	.600	23.0	47.0	1.60	36.00	.50	-.010
		5	11	-1.0	-1.00	1.0	-1.000	.100	93.0	11.0	6.80	65.00	.80	-.010
		6	7	-1.0	-1.00	1.0	-1.000	-.500	92.0	33.0				-.010
		7	12				.000	.500	95.0					
		8	10				-1.000	.700	92.0					
		9	11				-1.000	.100	97.0					
LWA103	79	4	25	-1.0	-1.00	2.0	-1.000	.200	116.0	6.0	4.50	14.00	.00	-.010
		9	16				-1.000	.100	130.0					
LWA104	79	8	23				-1.000	.200	550.0					
LWA112	79	4	20	-1.0	-1.00	4.0	-1.000	.400	166.0	18.0	.60	33.00	1.40	-.010
		6	1	-1.0	-1.00	2.0	-1.000	-.500	140.0	43.0				-.010
		7	12				.000	.600	130.0					
		8	8				-1.000	140.000	260.0					
LWA115	79	1	4				-1.000	.400	110.0					
		2	14				-1.000	1.000	64.0					
		3	21				31.000	1.000	87.0					
		4	13	-1.0	-1.00	31.0	50.000	.500	30.0	62.0	.70	36.00	1.10	-.010

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

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LOC	YR	MO	DY	FECAL COLIF. /100 ML	TOTAL COLIF. /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (FCI/1)	BETA (FCI/1)	RADIUM 226 (FCI/1)	AG (MG/L)
LWA115	79	5	18	-1.0	-1.00		5.000	.200	64.0	29.0	6.20	12.00	.00	-.010
		6	6	-1.0	-1.00	3.0	-1.000	-.500	290.0	45.0				-.010
		7	12					-.500	130.0					
		8	9				-1.000	.100	130.0					
LWA121	79	5	31	-1.0	-1.00	2.0	-1.000	.100	88.0	31.0				-.010
		6	6				-1.000	6.800	97.0					
		7		-1.0	-1.00	3.0	-1.000	-.500	170.0	53.0				-.010
		9	12				-1.000	.300	110.0					

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	S2O3 (MG/L)	HG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	MG3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWA022	79	1	3				1000.00	30.00	.70	60.00	16.0	280.0	6.00	-.020
		2	14				960.00	30.00	.70	59.00	16.0	240.0	5.00	-.020
		4	11	-1.00	-.020	-.020	2200.00	120.00	.55	400.00	8.0	420.0	52.00	-.020
		5	10	2.00	-.020	.040	1260.00	25.00	.80	133.00	16.0	273.0	17.00	-.020
		6	6	-1.00	-.020	.030	910.00	26.00	.70	88.00	17.0	210.0	5.30	-.020
		7	12				1300.00	46.00	.70	130.00	15.0	200.0	5.30	-.020
		8	8				1500.00	65.00	.70	55.00	14.0	240.0	6.10	-.020
LWA101	79	1	3				1300.00	63.00	.70	100.00	18.0	320.0	10.00	-.020
		2	14				1400.00	73.00	.59	140.00	20.0	350.0	10.00	-.020
		3	21				1400.00	98.00	.58	130.00	8.0	300.0	12.00	-.020
		4	11	2.00	-.020	.050	1500.00	90.00	.52	250.00	5.0	240.0	12.00	-.020
		5	16	1.00	-.020	-.020	1213.00	55.00	.60	181.00	17.0	334.0	7.00	-.020
		6	6	2.00	-.020	.050	1000.00	27.00	.60	370.00	15.0	280.0	6.10	-.020
		7	13				940.00	28.00	.70	170.00	17.0	270.0	8.20	-.020
		8	8				260.00	52.00	.70	180.00	19.0	270.0	8.20	-.020
LWA102	79	4	13	2.00	-.020	.030	930.00	48.00	1.20	34.00	14.0	180.0	19.00	-.020
		5	11	-1.00	-.020	-.020	881.00	7.00	1.20	22.00	14.0	219.0	15.00	-.020
		6	7	-1.00	-.020	.030	740.00	18.00	.90	32.00	13.0	230.0	18.00	-.020
		7	12				920.00	29.00	1.20	17.00	4.8	250.0	18.00	-.020
		8	10				920.00	18.00	1.20	35.00	15.0	220.0	17.00	-.020
		9	11				920.00	21.00	1.20	177.00	14.0	200.0	18.00	-.020
LWA103	79	4	25	-1.00	-.020	.050	1100.00	8.00	.90	57.00	17.0	233.0	4.00	-.020
		9	16				1300.00	19.00	.90	113.00	17.0	220.0	4.50	-.020
LWA104	79	8	23				9500.00	83.00	.50	830.00	3.5	2600.0	9.60	-.020
LWA112	79	4	20	-1.00	-.020	-.020	1100.00	122.00	.80	153.00	13.0	295.0	10.90	-.020
		6	1	-1.00	-.020	.060	980.00	57.00	.80	260.00	7.9	240.0	12.00	-.020
		7	12				900.00	75.00	.70	39.00	16.0	280.0	13.00	-.020
		8	8				930.00	54.00	.70	53.00	65.0	300.0	14.00	-.020
LWA115	79	1	4				780.00	44.00	.92	8.00	15.0	330.0	4.00	-.020
		2	14				420.00	17.00	.90	18.00	9.0	200.0	3.00	-.020
		3	21				380.00	100.00	.74	33.00	13.0	250.0	5.00	-.020
		4	13	2.00	-.020	-.020	610.00	28.00	.89	110.00	15.0	420.0	5.00	-.020
		5	18	2.00	-.020	-.020	771.00	20.00	.90	9.00	12.0	445.0	5.00	-.020
		6	6	-1.00	-.020	.080	2300.00	22.00	.60	22.00	18.0	360.0	6.20	-.020

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

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LOC	YR	MO	DAY	S2O3 (MG/L)	HG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWA115	79	7	12				1000.00	37.00	.90	8.00	19.0	320.0	6.30	-.020
		8	9				990.00	14.00	.80	7.00	19.0	280.0	4.60	-.020
LWA121	79	5	31	2.00	-.020	-.020	519.00	17.00	.80	39.00	18.0	157.0	4.00	-.020
		6	6				550.00	25.00	.60	19.00	22.0	160.0	5.00	-.020
			7	4.00	-.020	.020	1300.00	18.00	.90	50.00	17.0	310.0	8.80	-.020
		9	12				720.00	8.00	1.10	81.00	13.0	190.0	8.10	-.020

NOTE: - INDICATES LESS THEN

LOSAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CACO3)	HCO3 (MG/L CACO3)	CO3 (MG/L CACO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHLORIDE (MG/L)	PHEN (MG/L)	BOSS (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWA022	79	1	3	450.0	450.0	-1.0	2000.0	550.0	230.0	10.00	.002	20.00	20.00	
		2	14	500.0	500.0	-1.0	1800.0	440.0	200.0	8.00	.006	20.00	20.00	
		4	11	230.0	230.0	-1.0	4300.0	30.0	100.0	150.00	.015	50.00	20.00	71.00
		5	10	410.0	410.0	-1.0	2600.0	20.0	40.0	50.00	.002	5.00	26.00	12.00
		6	6	440.0	440.0	-1.0	1900.0	26.0	50.0	17.00	-.001	3.00	26.00	21.00
		7	12	390.0	390.0	-1.0	2500.0	220.0	90.0	21.00	.050	6.00	11.00	
		8	5	410.0	410.0	-1.0	2800.0	34.0	80.0	31.00	.020	2.10	28.00	
LWA101	79	1	3	460.0	460.0	-1.0	2800.0	110.0	20.0	40.00	.002	2.00	7.00	
		2	14	450.0	450.0	-1.0	2900.0	200.0	50.0	60.00	.003	10.00	20.00	
		3	21	470.0	470.0	-1.0	3100.0	210.0	120.0	90.00	-.001	20.00	50.00	
		4	11	420.0	420.0	-1.0	3100.0	100.0	200.0	80.00	.023	30.00	6.00	78.00
		5	16	420.0	420.0	-1.0	2600.0	50.0	40.0	52.00	.005	.80	6.00	22.00
		6	6	380.0	380.0	-1.0	2200.0	30.0	100.0	50.00	-.001	4.00	20.00	61.00
		7	13	370.0	370.0	-1.0	2100.0	530.0	50.0	61.00	.020	3.80	8.80	
		8	8	370.0	350.0	20.0	2300.0	26.0	40.0	70.00	.030	6.50	12.00	
LWA102	79	4	13	360.0	360.0	-1.0	1700.0	110.0	40.0	30.00	.013	8.00	30.00	40.00
		5	11	360.0	360.0	-1.0	1800.0	30.0	60.0	12.00	.004	2.00	5.00	9.00
		6	7	380.0	380.0	-1.0	1800.0	43.0	40.0	2.00	.006	1.40	11.00	28.00
		7	12	350.0	350.0	-1.0	1700.0	230.0	80.0	12.00	.007	8.00	5.60	
		8	10	350.0	310.0	40.0	1800.0	27.0	60.0	24.00	.010	4.10	9.20	
		9	11	340.0	340.0	-1.0	1800.0	19.0	20.0	27.00	.005	18.00	8.00	
LWA103	79	4	25	410.0	410.0	-1.0	2100.0	20.0	30.0	2.00	-.001	2.00	12.00	6.00
		9	16	370.0	370.0	-1.0	2500.0	36.0	50.0	8.00	.030	8.00	1.00	
LWA104	79	8	23	500.0	500.0	-1.0	15000.0	1,000.0	150.0	78.00	.005	1.30	2.00	
LWA112	79	4	20	400.0	400.0	-1.0	2400.0	100.0	80.0	88.00	-.001	11.00	44.00	16.00
		6	1	500.0	470.0	30.0	2000.0	110.0	40.0	60.00	-.001	9.20	10.00	33.00
		7	12	350.0	320.0	25.0	1800.0	150.0	140.0	82.00	.010	16.00	14.00	
		8	8	180.0	180.0	-1.0	3000.0	2,600.0	100.0	220.00	.010	49.00	7.70	
LWA115	79	1	4	550.0	550.0	-1.0	1700.0	18.0	20.0	170.00	.021	10.00	20.00	
		2	14	340.0	340.0	-1.0	1100.0	60.0	70.0	60.00	.008	30.00	4.00	
		3	21	510.0	510.0	1.0	1200.0	1,000.0	120.0	200.00	.009	100.00	10.00	
		4	13	750.0	750.0	-1.0	1500.0	100.0	140.0	60.00	.008	40.00	30.00	39.00

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
ALLUVIAL WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DY	TGT ALK (MG/L CaCO3)	HCO3 (MG/L CaCO3)	CO3 (MG/L CaCO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM O2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWA115	79	5	18	650.0	650.0	-1.0	2000.0	340.0	200.0	92.00	.006	20.00	4.00	5.00
		6	6	500.0	500.0	-1.0	4200.0	110.0	100.0	13.00	.010	5.00	12.00	21.00
		7	12	500.0	500.0	-1.0	2200.0	390.0	210.0	120.00	.010	13.00	11.00	
		8	9	510.0	510.0	-1.0	2000.0	240.0	200.0	.90	.020	1.30	5.40	
LWA121	79	5	31	510.0	510.0	-1.0	1330.0	580.0	200.0	10.00	-.001	5.00	54.00	31.00
		6	6	460.0	460.0	-1.0	1300.0	290.0	150.0	22.00	-.001	1.90	23.00	
			7	490.0	490.0	-1.0	1400.0	490.0	240.0	25.00	.006	2.80	19.00	44.00
		9	12	460.0	460.0	-1.0	1700.0	180.0	50.0	110.00	.060	45.00	2.00	

NOTE: - INDICATES LESS THEN

GROUNDWATER QUALITY PARAMETERS

DEEP WELLS

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LOGAN WASH
WATER QUALITY PARAMETERS
DEEP WELLS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	Fe (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWD032	79	9	5	44.0	.400	-.100	-.020	-.020	.040	.050	-.100	-.500	5.9	.90
LWD033	79	8	6	87.0	.300	-.100	-.020	-.020	.100	.100	-.100	-.500	12.0	.80
LWD040	79	9	13	17.0	.200	-.100	-.020	-.020	.100	.020	-.100	-.500	6.1	.40
LWD047	79	9	13	54.0	.100	-.100	-.020	-.020	.050	-.020	-.100	-.500	7.9	.70
LWD106	79	5	23	54.0	.200	-.100	-.020	.020	.080	-.020	-.100	-.500	10.5	.30
LWD108	79	1	5	54.0	31.000	-.100	-.020	3.000	1.000	.040	-.100	-.500	8.0	6.00
			12	53.0	28.000	.100	-.020	1.000	.700	.100	-.100	-.500	8.0	2.60
			19	53.0	27.000	-.100	-.020	.500	.700	.040	-.100	-.500	8.0	2.80
		2	25	61.0	28.000	-.100	-.020	.800	.800	.040	.100	-.500	8.0	2.40
			1	60.0	28.000	-.100	-.020	.800	.800	.200	.100	-.500	8.0	.68
			9	61.0	27.000	-.100	-.020	.700	.800	.100	.200	-.500	8.0	2.00
			15	69.0	26.000	-.100	-.020	.600	.800	.090	.400	-.500	8.0	.26
			23	50.0	23.000	-.100	-.020	.700	.700	.040	-.100	-.500	7.0	1.80
		3	1	60.0	23.000	.100	-.020	2.000	.800	.040	-.100	-.500	5.0	1.70
			9	55.0	23.000	-.100	-.020	2.000	.800	.020	.100	-.500	4.0	1.90
			16	52.0	19.000	-.100	-.020	3.000	.800	-.020	-.100	-.500	4.0	2.00
			22	60.0	22.000	-.100	-.020	2.000	.700	.020	.100	-.500	4.0	2.20
			30	45.0	17.000	-.100	-.020	2.000	.700	-.020	.500	-.500	4.0	1.60
		4	13	49.0	16.000	-.100	-.020	1.000	.600	.500	-.100	-.500	5.0	1.30
			19	41.0	17.000	-.100	-.020	1.000	.500	.040	.200	-.500	7.0	1.70
			26	57.0	7.500	-.100	-.020	.600	.700	.030	.100	-.500	6.5	1.92
		5	11	52.0	6.000	-.100	-.020	.500	.700	-.020	-.100	-.500	6.1	1.94
			18	57.0	6.200	-.100	-.020	.400	.700	-.020	-.100	-.500	7.0	1.23
			22	59.0	12.000	-.100	-.020	.600	.700	.300	-.100	-.500	6.2	1.90
		7	23	61.0	11.000	-.100	-.020	.300	.600	.020	-.100	-.500	6.7	1.40
			3	69.0	11.000	-.100	-.030	.600	.600	.600	.600	-.500	6.4	5.90
			19	64.0	8.200	-.100	-.020	.400	.800	.190	-.100	-.500	7.6	2.00
		8	27	66.0	7.800	-.100	-.020	.700	.700	.080	-.100	-.500	7.6	2.50
			3	65.0	5.600	-.100	-.020	.700	.800	.200	.200	-.500	7.7	4.10
			9	66.0	10.000	-.100	-.020	.700	.800	.020	-.100	-.500	7.4	6.60
		9	5	62.0	12.000	-.100	-.020	.030	.700	.050	-.100	-.500	6.9	3.50
LWD116	79	9	6	63.0	.400	-.100	-.020	-.020	.030	-.020	-.100	.500	2.6	1.60

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
DEEP WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	FECAL COLIF. /100 ML	TOTAL COLIF. /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (FCI/1)	BETA (FCI/1)	RADIUM 226 (FCI/1)	AG (MG/L)
LWD032	79	9	5				-1.000	.200	19.0					
LWD033	79	8	6				-1.000	.200	71.0					
LWD046	79	9	13				-1.000	.100	20.0					
LWD047	79	9	13				-1.000	.200	30.0		20.00	82.00	.80	-.010
LWD106	79	5	23	-1.0	-1.00	3.0	2.000	.080	33.0	18.0				-.010
LWD108	79	1	5				5.000	-.500	62.0					
			12			-1.000	-.500	56.0						
			19			-1.000	-.500	50.0						
		2	25			-1.000	-.500	67.0						
			1	-1.0	-1.00	10.0	-1.000	-.500	70.0	390.0	9.00	9.00	.00	-.010
			9			-1.000	-.500	69.0						
		3	15			-1.000	.700	62.0						
			23			3.000	-.500	50.0						
			1	-1.0	-1.00	17.0	3.000	-.500	57.0	810.0	36.00	152.00	.80	-.010
		4	9			-1.000	-.500	55.0						
			16			.000	-.500	52.0						
			22			-1.000	-.500	71.0						
		5	30			-1.000	-.500	53.0						
			13	-1.0	-1.00	5.0	-1.000	-.500	21.0	21.0	3.80	.00	.00	-.010
			19			-1.000	.500	21.0						
		6	26			-1.000	.400	49.0						
			11	-1.0	-1.00	4.0	-1.000	.700	45.0	21.0	.40	18.00	.00	-.010
			18	-1.0	-1.00	4.0	-1.000	.070	52.0	27.0	20.00	82.00	.80	-.010
		7	22			-1.000	-.500	59.0						
			25			-1.000	-.500	61.0						
			3			-1.000	5.800	60.0						
		8	19			-1.000	-.500	61.0						
			27			-1.000	-.500	61.0						
			3			-1.000	.500	64.0						
		9	9			-1.000	-.500	67.0						
			5			-1.000	.100	64.0						
LWD116	79		9	0			-1.000	.100	28.0					

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
DEEP WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	S2O3 (MG/L)	MG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWD032	79	9	5				120.00	5.90	2.90	-0.10	22.0	72.0	0.70	-0.020
LWD033	79	8	6				240.00	7.50	0.60	17.00	26.0	110.0	0.80	0.020
LWD046	79	9	13				170.00	12.00	0.40	-0.10	9.3	140.0	0.50	-0.020
LWD047	79	9	13		-0.020	-0.020	200.00	5.00	0.10	8.00	26.0	98.0	1.00	0.030
LWD106	79	5	23	-1.00	-0.020	-0.020	291.00	6.00	0.40	-0.10	17.0	141.0	0.70	-0.020
47	79	1	5				2100.00	240.00	15.00	22.00	21.0	2000.0	30.00	0.180
			12				940.00	200.00	13.00	5.40	12.0	920.0	5.00	0.040
			19				870.00	160.00	13.00	7.00	22.0	9.0	6.00	0.050
			25				890.00	160.00	12.00	6.00	22.0	960.0	5.00	0.060
		2	1	-1.00	-0.020	0.030	970.00	180.00	12.00	9.00	25.0	1000.0	6.00	0.040
			9				910.00	156.00	12.00	6.00	23.0	920.0	5.00	0.050
			15				880.00	140.00	11.00	10.00	23.0	890.0	6.00	0.040
			23				1000.00	180.00	11.00	9.00	20.0	910.0	8.00	0.080
		3	1	2.00	-0.020	-0.020	930.00	150.00	11.00	7.00	22.0	720.0	8.00	0.050
			9				850.00	140.00	9.60	6.00	22.0	700.0	7.00	0.040
			16				820.00	120.00	9.30	42.00	19.0	650.0	6.00	0.060
			22				1100.00	140.00	1.10	8.00	21.0	800.0	9.00	0.050
			30				890.00	110.00	8.50	15.00	17.0	650.0	7.00	0.050
		4	13	-1.00	-0.020	-0.020	730.00	75.00	7.20	26.00	17.0	550.0	6.00	0.030
			19				670.00	71.00	6.90	14.00	16.0	500.0	6.00	0.030
			26				730.00	61.00	6.60	10.00	18.0	572.0	5.00	-0.020
			5	-1.00	-0.020	-0.020	711.00	3.00	5.50	5.00	18.0	517.0	3.00	-0.020
		6	18	-1.00	-0.020	-0.020	727.00	57.00	5.40	4.00	19.0	517.0	3.00	-0.020
			22				810.00	49.00	6.00	-0.10	22.0	540.0	3.40	-0.020
			28				340.00	66.00	3.60	-0.10	22.0	530.0	3.10	-0.020
			7				580.00	54.00	4.20	79.00	18.0	530.0	4.80	0.080
		8	3				420.00	70.00	5.60	16.00	21.0	630.0	3.20	-0.020
			27				830.00	52.00	5.60	-0.10	22.0	600.0	3.50	-0.020
			9				850.00	64.00	6.10	-0.10	22.0	640.0	4.70	0.020
			9				1200.00	84.00	6.90	7.00	21.0	810.0	7.40	0.040
		9	5				770.00	65.00	5.70	2.00	19.0	470.0	4.10	0.020
LWD116	79	9	6				80.00	18.00	0.10	13.00	18.0	48.0	1.60	-0.020

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
DEEP WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CACO3)	HCO3 (MG/L CACO3)	CO3 (MG/L CACO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM O2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWD032	79	9	5	260.0	260.0	-1.0	500.0	12.0	30.0	6.00	.020	7.00	12.00	
LWD033	79	8	6	560.0	560.0	-1.0	990.0	11.0	10.0	15.00	.002	7.40	8.00	
LWD046	79	9	13	250.0	220.0	30.0	620.0	160.0	30.0	6.00	-.001	6.80	3.00	
LWD047	79	9	13	300.0	300.0	-1.0	730.0	180.0	40.0	21.00	.010	6.20	3.00	
LWD106	79	5	23	320.0	305.0	15.0	730.0	400.0	150.0	6.00	-.001	14.00	12.00	10.00
LWD108	79	1	5	1640.0	1420.0	220.0	5600.0	20.0	10.0	500.00	.230	200.00	5.00	
			12	390.0	390.0	-1.0	3100.0	20.0	20.0	80.00	.027	30.00	6.00	
			19	1150.0	1130.0	20.0	2900.0	30.0	40.0	150.00	.009	80.00	40.00	
			25	1220.0	1180.0	40.0	3000.0	20.0	20.0	190.00	.079	50.00	9.00	
	2	1	1200.0	1200.0	-1.0	3200.0	10.0	30.0	220.00	.063	20.00	20.00	390.00	
		9	1160.0	1120.0	40.0	3000.0	50.0	30.0	150.00	.055	20.00	20.00		
		15	1130.0	1090.0	40.0	2800.0	140.0	30.0	160.00	.120	30.00	20.00		
		23	1100.0	1100.0	-1.0	3000.0	20.0	30.0	260.00	.150	100.00	30.00		
	3	1	1200.0	1200.0	-1.0	2900.0	40.0	30.0	200.00	.130	80.00	7.00	430.00	
		9	1030.0	990.0	40.0	2600.0	170.0	10.0	160.00	.050	30.00	20.00		
		16	930.0	930.0	-1.0	2500.0	2,100.0	30.0	540.00	.100	100.00	80.00		
		22	9300.0	9300.0	-1.0	3600.0	300.0	40.0	400.00	.030	130.00	120.00		
	4	30	940.0	940.0	-1.0	2600.0	250.0	100.0	150.00	.026	170.00	10.00		
		13	760.0	760.0	-1.0	1900.0	50.0	60.0	90.00	.033	40.00	10.00	16.00	
		19	680.0	650.0	30.0	1900.0	40.0	30.0	90.00	-.001	8.00	10.00		
		26	720.0	720.0	-1.0	2000.0	20.0	20.0	60.00	.002	23.00	12.00		
	5	11	700.0	700.0	-1.0	2000.0	10.0	20.0	72.00	.011	11.00	36.00	18.00	
		18	710.0	710.0	-1.0	2000.0	20.0	20.0	56.00	.005	12.00	6.00	19.00	
	6	22	830.0	830.0	-1.0	2200.0	54.0	20.0	78.00	12.000	11.00	9.00		
		28	890.0	890.0	-1.0	2200.0	10.0	10.0	41.00	.010	17.00	13.00		
	7	3	860.0	860.0	-1.0				52.00	.005	5.70	6.00		
		19	760.0	760.0	-1.0	2200.0	16.0	20.0	46.00	.005	11.00	3.40		
		27	780.0	780.0	-1.0	2200.0	15.0	10.0	110.00	.020	12.00	29.00		
	8	3	880.0	810.0	70.0	2300.0	14.0	10.0	160.00	.010	11.00	7.80		
		9	960.0	960.0	-1.0	3100.0	19.0	20.0	400.00	.300	49.00	16.00		
		9	830.0	760.0	70.0	2200.0	25.0	20.0	48.00	.040	6.90	4.00		
LWD116	79	9	6	340.0	310.0	30.0	530.0	13.0	20.0	12.00	-.001	5.00	5.00	

NOTE: - INDICATES LESS THEN

GROUNDWATER QUALITY PARAMETERS

RETORTS 1 through 6

LOGAN WASH
WATER QUALITY PARAMETERS
RETORTS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	B (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWR001	79	1	24	470.0	6.600	-.100	-.020	.020	2.000	.020	-.100	.500	9.0	40.00
		4	24	260.0	3.500	-.100	-.020	.200	2.000	-.020	-.100	1.000	4.0	5.50
LWR002	79	1	24	4.0	4.000	-.100	-.020	.700	1.000	-.020	.300	.500	.7	15.00
		4	24	5.0	2.900	.100	-.020	.400	1.000	-.020	.100	2.000	.2	14.00
LWR004	79	1	24	5.0	13.000	-.100	-.020	-.020	1.000	-.020	.700	.600	.7	560.00
		4	26	37.0	9.000	.100	-.020	-.020	1.000	-.020	-.100	.900	.6	290.00
LWR005	79	1	24	6.0	19.000	-.100	-.020	.030	2.000	.040	-.100	-.500	.5	240.00
		4	26	7.0	6.600	-.100	-.020	.100	.600	.200	-.100	.900	.6	2000.00
LWR006	79	1	4	5.0	15.000	-.100	-.020	.020	2.000	-.020	.200	2.000	2.0	1700.00
			11	3.0	14.000	-.100	-.020	.100	2.000	.020	-.100	2.000	2.0	1600.00
			19	4.0	14.000	.300	-.020	.300	2.000	.040	.400	2.400	2.0	1400.00
			25	6.0	12.000	-.100	-.020	.100	2.000	.050	.300	2.000	2.0	1200.00
		2	1	6.0	12.000	-.100	-.020	.100	2.000	.030	.200	2.000	2.0	1400.00
			9	7.0	12.000	-.100	-.020	.030	2.000	.060	.200	2.000	2.0	750.00
			15	5.0	5.000	-.100	-.020	.060	2.000	.020	-.100	2.000	2.0	1000.00
			22	16.0	2.000	-.100	-.020	.000	.040	.020	-.100	.500	2.0	1800.00
		3	1	7.0	-.040	-.100	-.020	.100	1.000	-.020	.300	2.000	.8	970.00
			7	6.0	-.040	.100	-.020	.100	1.000	-.020	.300	1.000	.8	1100.00
			16	7.0	5.100	-.100	-.020	.400	.900	-.020	.300	4.000	.8	1600.00
			22	7.0	5.900	.100	-.020	.200	1.000	-.020	.320	3.000	.7	1300.00
			29	6.0	6.000	-.100	-.020	.300	1.000	-.020	.400	3.000	.8	1300.00
		4	11	12.0	7.000	-.100	-.020	.200	1.000	-.020	.200	2.000	1.0	1100.00
			20	6.0	9.200	.100	-.020	.400	.900	-.020	-.100	.700	.9	890.00
			26	9.0	9.200	-.100	-.020	.100	.900	-.020	.200	-.500	.9	780.00
		5	3	47.0	6.000	-.100	-.020	.100	.900	-.020	.100	-.500	.8	860.00
			10	9.2	6.100	.200	-.020	.500	.900	.030	-.100	1.000	1.4	770.00
			18	11.0	2.900	.100	-.020	-.020	.500	.100	.300	-.500	1.2	1000.00
		6	8	4.7	6.900	-.100	-.020	.500	.100	-.020	-.100	-.500	.5	3900.00
			15	7.6	6.500	-.100	-.020	.600	.400	.200	-.100	-.500	.8	2500.00
			21	6.3	5.400	-.100	-.020	.050	.400	.100	-.100	-.500	.5	2800.00
		7	18	6.7	10.000	-.100	-.020	.400	1.000	-.020	-.100	-.500	1.0	410.00
			25	6.5	4.700	-.100	-.020	.050	.500	.020	-.100	-.500	.9	1400.00
		8	9	6.6	3.600	-.100	-.020	.040	.300	.020	-.100	-.500	.8	1200.00

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORTS
FOR SAMPLE DATA SHOWN

LUC	YR	MO	DY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (FCI/1)	BETA (PCI/1)	RADIUM 226 (FCI/1)	AG (MG/L)
LWR001	79	1	24				140.000	1.000	370.0					
		4	24	-1.0	-1.00	31.0	2.000	6.000	230.0	11.0	.50	13.00	.00	-.010
LWR002	79	1	24				40.000	-.500	.4					
		4	24	-1.0	-1.00	39.0	100.000	-.500	20.0	13.0	1.60	62.00	.80	-.010
LWR004	79	1	24				180.000	-.500	1.0					
		4	26	-1.0	-1.00	225.0	260.000	-.500	2.0	150.0	7.20	6.00	.00	-.010
LWR005	79	1	24				250.000	-.500	3.0					
		4	26	-1.0	-1.00	65.0	80.000	-.500	11.0	350.0	5.50	44.00	1.30	-.010
LWR006	79	1	4	-1.0	-1.00	822.0	170.000	-.500	3.0	3780.0	48.00	29.00	.80	-.010
			11				330.000	-.500	2.0					
			19				380.000	-.500	2.0					
			25				240.000	-.500	2.0					
		2	1	-1.0	-1.00	923.0	300.000	-.500	5.0	3510.0	23.00	45.00	.50	-.010
			9				170.000	-.500	3.0					
			15				180.000	-.500	3.0					
			22				50.000	-.500	8.0					
		3	1	-1.0	-1.00	1050.0	60.000	.600	2.0	3580.0	26.00	134.00	1.00	-.010
			7				90.000	-.500	3.0					
			16				50.000	-.500	2.0					
			22				100.000	-.500	2.0					
			29				60.000	.500	2.0					
		4	11	-1.0	-1.00	216.0	160.000	4.000	5.0	509.0	4.40	28.00	1.30	-.010
			20				120.000	-.500	3.0					
			26				140.000	-.500	2.0					
		5	3	-1.0	-1.00	94.0	140.000	-.500	2.0	513.0	1.10	23.00	.00	-.010
			10	-1.0	-1.00	49.0	100.000	-.500	2.2	403.0	2.10	27.00	.00	-.010
			18	-1.0	-1.00	1250.0	150.000	-.500	6.2	490.0	3.90	13.00	.00	-.010
		6	8	-1.0	-1.00	2190.0	170.000	-.500	3.0	110.0	.00	.00	.00	-.010
			15				2500.0	300.000	-.500	2.6				
			21				2700.0	330.000	-.500	2.1				
		7	16				740.0	220.000	-.500	2.9				
			25				1500.0	260.000	-.500	4.3				
		8	4				1400.0	190.000	-.500	1.9				

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORTS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	S203 (MG/L)	HG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWR001	79	1	24				3900.00	16.00	7.80	280.00	14.0	940.0	420.00	-.020
		4	24	-1.00	-.020	-.020	3400.00	48.00	6.80	28.00	10.0	590.0	320.00	.060
LWR002	79	1	24				1500.00	26.00	12.00	130.00	28.0	620.0	600.00	.160
		4	24	50.00	-.020	.030	1500.00	27.00	10.00	170.00	34.0	750.0	460.00	.040
LWR004	79	1	24				180.00	28.00	23.00	680.00	39.0	1100.0	3.00	.230
		4	26	246.00	-.020	-.020	440.00	24.00	22.00	830.00	30.0	1200.0	20.00	.110
LWR005	79	1	24				72.00	40.00	47.00	1400.00	80.0	1600.0	410.00	.100
		4	26	66.00	-.020	-.020	630.00	100.00	18.00	170.00	22.0	2800.0	350.00	.090
LWR006	79	1	4	269.00	-.020	-.020	720.00	110.00	36.00	600.00	36.0	4300.0	86.00	1.900
			11				670.00	68.00	36.00	930.00	33.0	4000.0	78.00	.810
			19				730.00	69.00	35.00	1200.00	38.0	3400.0	73.00	1.600
			25				740.00	67.00	35.00	680.00	38.0	3600.0	68.00	3.200
		2	1	150.00	-.020	-.020	770.00	170.00	36.00	520.00	38.0	3500.0	67.00	.800
			9				820.00	220.00	32.00	320.00	39.0	3100.0	57.00	.840
			15				970.00	110.00	33.00	460.00	39.0	3400.0	59.00	.440
			22				110.00	20.00	26.00	220.00	10.0	82.0	3.00	.070
		3	1	43.00	-.020	-.020	1000.00	140.00	57.00	320.00	38.0	3100.0	48.00	.520
			7				1000.00	640.00	33.00	240.00	36.0	3000.0	47.00	.420
			16				890.00	810.00	26.00	230.00	29.0	3900.0	4.00	.360
			22				1100.00	420.00	33.00	180.00	32.0	2800.0	53.00	.270
			29				1100.00	130.00	32.00	280.00	31.0	2900.0	47.00	.200
		4	11	70.00	-.020	.030	1800.00	130.00	36.00	410.00	38.0	3400.0	66.00	.160
			20				1600.00	62.00	40.00	530.00	39.0	3100.0	60.00	.100
			26				1600.00	120.00	42.00	290.00	37.0	3000.0	54.00	.060
		5	3	57.00	-.020	-.020	1600.00	31.00	46.00	580.00	35.0	3200.0	56.00	.070
			10	50.00	-.020	-.020	1600.00	30.00	44.00	440.00	36.0	2300.0	48.00	.100
			18	97.00	-.020	-.020	940.00	85.00	32.00	550.00	20.0	1200.0	32.00	.200
		6	8	183.00	-.020	.040	200.00	130.00	5.60	710.00	6.3	2300.0	8.20	.100
			15				880.00	230.00	12.00	580.00	17.0	910.0	31.00	.100
			21				810.00	110.00	11.00	630.00	16.0	770.0	26.00	.100
		7	18				910.00	220.00	51.00	300.00	42.0	1700.0	290.00	.300
			25				780.00	130.00	47.00	330.00	20.0	780.0	50.00	2.200
		8	9				610.00	78.00	16.00	220.00	14.0	580.0	21.00	.600

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORTS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CACO3)	HCO3 (MG/L CACO3)	CO3 (MG/L CACO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	PB (MG/L)	NI (MG/L)	PHEN (MG/L)	CD (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWR001	79	1	24	240.0	240.0	-1.0	6400.0	170.0	-.020	-.020	.210	-.020	50.00	
		4	24	210.0	210.0	-1.0	5500.0	20.0	-.020	-.020	170.000	-.020	20.00	5.00
LWR002	79	1	24	360.0	140.0	220.0	3000.0	260.0	-.020	-.020	.310	-.020	30.00	
		4	24	570.0	250.0	320.0	3300.0	40.0	-.020	-.020	160.000	-.020	30.00	11.00
LWR004	79	1	24	3400.0	2900.0	500.0	3200.0	1,300.0	-.020	-.020	14.000	-.020	24.00	
		4	26	3000.0	2470.0	530.0	3400.0	870.0	-.020	-.020	25.000	-.020	290.00	113.00
LWR005	79	1	24	3200.0	2500.0	700.0	4800.0	250.0	-.020	-.020	9.100	-.020	50.00	
		4	26	9700.0	7100.0	2600.0	5100.0	60.0	-.020	-.020	28.000	-.020	30.00	260.00
LWR006	79	1	4	14700.0	13000.0	2400.0	14000.0	210.0	-.020	-.020	19.000	-.020	400.00	3490.00
			11	13000.0	10800.0	2200.0	12000.0	250.0	-.020	-.020	33.000	-.020	20.00	
			19	10700.0	8600.0	2100.0	11400.0	600.0	-.020	-.020	19.000	-.020	100.00	
			25	10600.0	8000.0	2600.0	11600.0	100.0	-.020	-.020	24.000	-.020	50.00	
		2	1	9600.0	8000.0	1600.0	11400.0	340.0	-.020	-.020	20.000	-.020	20.00	2910.00
			9	8700.0	7100.0	1600.0	11000.0	120.0	-.020	-.020	31.000	-.020	300.00	
			15	8000.0	6500.0	1500.0	11200.0	170.0	-.020	-.020	43.000	-.020	230.00	
			22	5800.0	4960.0	840.0	11000.0	200.0	-.020	-.020	21.000	-.020	80.00	
		3	1	9000.0	7300.0	1700.0	11000.0	270.0	-.020	-.020	38.000	-.020	190.00	3010.00
			7	8900.0	6600.0	2300.0	12000.0	120.0	-.020	-.020	36.000	-.020	100.00	
			16	9500.0	7000.0	2800.0	10000.0	140.0	-.020	-.020	53.000	-.020	100.00	
			22	7900.0	5200.0	2700.0	9400.0	310.0	-.020	-.020	70.000	-.020	70.00	
			29	7700.0	5600.0	2100.0	9800.0	330.0	-.020	-.020	31.000	-.020	30.00	
		4	11	8300.0	6100.0	2200.0	11000.0	120.0	-.020	-.020	30.000	-.020	60.00	368.00
			20	6700.0	5000.0	1700.0	10000.0	80.0	-.020	-.020	29.000	-.020	40.00	
			26	6700.0	5100.0	1600.0	9600.0	180.0	-.020	-.020	31.000	-.020	40.00	
		5	3	7000.0	5000.0	2000.0	9600.0	200.0	-.020	-.020	18.500	-.020	33.00	491.00
			10	6000.0	4600.0	1400.0	9400.0	370.0	.040	.030	29.000	-.020	60.00	312.00
			18	5300.0	4100.0	1200.0	8300.0	210.0	.040	.030	18.000	-.020	110.00	437.00
		6	8	15000.0	11000.0	4400.0	1200.0	63.0	-.020	-.020	42.000	-.020	8.00	50.00
			15	8500.0	6000.0	2500.0	6600.0	33.0	.050	.030	25.000	-.020	400.00	
			21	8300.0	6400.0	2000.0	6600.0	150.0	.100	.030	53.000	-.020	37.00	
		7	18	4400.0	3000.0	1400.0	1400.0	20.0	.030	.030	6.000	-.020	180.00	
			25	4400.0	3200.0	1200.0	5000.0	20.0	.040	.020	35.000	-.020	330.00	
		8	9	4800.0	3600.0	1200.0	3800.0	100.0	.040	.100	14.000	-.020	230.00	

NOTE: - INDICATES LESS THEN

GROUNDWATER QUALITY

RETORT 6 WELLS

LOGAN WASH
WATER QUALITY PARAMETERS
RTORT 6 WELLS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	B (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWD601	79	1	12	13.0	7.600	-.100	-.020	1.000	.500	.040	.200	-.500	1.0	-.04
			19	12.0	8.000	-.100	-.020	.900	.500	.040	.400	-.500	1.0	.16
		3	29	80.0	7.700	-.100	-.020	2.000	.500	-.020	1.000	-.500	3.0	.85
		4	5	64.0	12.000	-.100	-.020	2.000	.700	-.020	.100	-.500	3.0	.83
			19	58.0	13.000	-.100	-.020	2.000	.600	-.020	1.000	-.500	2.0	1.10
		5	3	39.0	7.500	-.100	-.020	.800	.800	.020	-.100	-.500	3.3	1.35
			16	74.0	7.800	-.100	-.020	1.400	.700	.020	-.100	-.500	5.1	1.11
			30	29.0	6.900	-.100	-.020	1.000	.700	-.020	.100	-.500	2.6	1.23
		6	13	28.0	7.500	-.100	-.020	1.300	.600	-.020	-.100	-.500	2.2	.70
			27	33.0	9.800	-.100	-.020	1.400	.600	-.020	-.100	-.500	2.3	-.04
		7	19	36.0	8.000	-.100	-.020	1.300	.700	.200	-.100	-.500	2.4	.03
LWD602	79	1	19	20.0	1.200	-.100	.040	.100	.200	.300	2.000	-.500	.5	1.20
		3	9	5.0	1.300	-.100	-.020	.700	.300	-.020	-.100	-.500	.2	.80
		5	3	4.0	.400	-.100	-.020	.100	.300	-.020	-.100	-.500	.2	.84
		6	28	3.0	.500	-.100	-.020	.020	.200	-.020	-.100	-.500	.3	.60
		7	19	3.5	.300	-.100	-.020	.200	.300	-.020	-.100	-.500	.2	.80
			28	4.8	.500	-.100	-.020	.200	.300	.020	.100	-.500	.3	1.10
LWD603	79	8	30	14.0	.400	-.100	-.020	-.020	.300	.040	-.100	-.500	.2	.40
		1	12	37.0	3.400	-.100	-.020	.200	1.000	.200	2.000	.800	2.0	21.00
			17	40.0	2.000	-.100	-.020	.200	1.000	.100	2.000	1.000	2.0	14.00
LWD604	79	8	30	40.0	14.000	-.100	-.020	.800	2.400	.020	-.100	-.500	3.6	8.40
		1	12	60.0	7.100	-.100	-.020	.100	.800	.030	.800	.500	14.0	5.00
			17	60.0	6.000	-.100	-.020	.200	.800	.030	-.100	-.500	16.0	4.00
		2	8	74.0	3.000	-.100	-.020	.030	.800	.030	.100	.500	14.0	.40
			21	74.0	3.400	-.100	-.020	-.020	.800	.020	-.100	-.500	12.0	1.80
		3	7	65.0	3.000	-.100	-.020	.700	.800	-.020	.200	-.500	8.0	1.40
		4	5	53.0	3.000	-.100	-.020	.900	1.000	-.020	.300	-.500	8.0	2.50
			20	77.0	6.600	-.100	.220	.300	1.000	-.020	.200	-.500	13.7	.78
		5	2	73.0	3.500	-.100	-.020	.100	1.000	-.020	-.100	-.500	13.4	1.64
		6	1	51.0	4.000	-.100	-.020	1.500	.800	-.020	-.100	-.500	10.0	2.80
		7	3	49.0	6.600	-.100	-.020	.500	.600	.020	-.100	-.500	10.0	2.20
			19	52.0	7.700	-.100	-.020	.900	.800	.020	.100	-.500	10.0	2.90
LWD605	79		26	46.0	8.100	-.100	-.020	.400	.800	-.020	-.100	-.500	10.0	2.70
		8	30	47.0	7.800	-.100	-.020	.800	.900	-.020	-.100	-.500	12.0	12.00
		1	12	14.0	2.700	-.100	-.020	.300	2.000	.030	-.100	.600	3.0	18.00
			17	14.0	2.100	-.100	-.020	.300	2.000	.300	-.100	-.500	3.0	21.00
		2	9	18.0	3.000	-.100	-.020	.300	3.000	-.020	.100	.600	4.0	11.00
			21	24.0	4.200	-.100	-.020	.200	3.000	.020	.100	.500	4.0	10.00

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT 6 WELLS
FOR SAMPLE DATA SHOWN

WELL	YR	MO	DAY	CA (MG/L)	R (MG/L)	V (MG/L)	CU (MG/L)	MOLY (MG/L)	LI (MG/L)	ZN (MG/L)	AL (MG/L)	BA (MG/L)	SR (MG/L)	NH3 (MG/L)
LWD605	79	3	8	27.0	5.000	-.100	-.020	2.000	3.000	-.020	.200	-.500	3.0	11.00
		4	5	28.0	6.000	-.100	-.020	2.000	3.000	-.020	-.100	-.500	4.0	10.00
			20	58.0	9.400	-.100	-.020	.500	2.900	-.020	-.100	-.500	8.4	6.50
		5	2	50.0	2.800	.200	.200	.200	1.900	-.020	-.100	-.500	6.6	4.01
		6	1	23.0	1.900	-.100	.020	.400	1.900	-.020	-.100	-.500	3.3	3.00
		7	3	17.0	3.600	-.100	-.020	.300	1.400	-.020	-.100	-.500	2.4	7.60
			19	15.0	2.300	-.100	-.020	.700	1.600	-.020	.100	-.500	2.2	.90
			26	15.0	3.100	-.100	-.020	.700	1.500	.020	.200	-.500	2.2	3.70
		8	30	24.0	13.000	-.100	-.020	.300	2.300	.040	-.100	-.500	4.3	19.00
LWD606	79	1	12	53.0	.500	-.100	-.020	.100	.200	.030	.200	-.500	.3	.93
			18	4.0	.300	-.100	-.020	.100	.200	.020	-.100	-.500	.2	.10
		2	8	4.0	.200	-.100	-.020	.100	.300	.040	.100	-.500	.2	.60
			22	5.0	.400	-.100	-.020	.200	.300	-.020	.300	-.500	.2	.41
		4	4	3.0	.800	-.100	-.020	2.000	.300	-.020	.300	-.500	.2	.62
			19	5.0	.800	-.100	-.020	.300	.300	-.020	.400	-.500	.2	.98
		5	2	4.0	.200	-.100	-.020	.200	.300	-.020	.100	-.500	.3	.90
			30	5.0	.200	-.100	-.020	.100	.300	-.020	.600	-.500	.2	1.09
		6	13	3.6	.500	-.100	-.020	.400	.200	-.020	-.100	-.500	.3	.60
			27	2.5	.300	-.100	-.020	.030	.200	-.020	-.100	-.500	.3	.30
LWD607	79	7	17	3.6	.300	-.100	-.020	.200	.300	-.020	.200	-.500	.2	.50
		8	30	2.9	.300	-.100	-.020	-.020	.300	-.020	-.100	-.500	.2	.60
		1	10	15.0	2.000	.100	-.020	.900	.400	.040	.300	-.500	1.0	4.40
			18	13.0	1.600	-.100	-.020	.700	.300	.030	-.100	-.500	1.0	4.00
		2	8	13.0	2.200	-.100	-.020	.600	.400	.030	.200	.500	1.0	4.20
			22	11.0	1.800	-.100	.200	.600	.400	.020	.200	.500	.9	3.30
		4	19	8.0	3.000	-.100	.030	2.000	.500	-.020	.300	-.500	.9	3.00
		5	2	8.0	1.800	-.100	-.020	1.000	.500	-.020	-.100	-.500	.7	14.60
			30	9.0	1.500	-.100	-.020	.800	.600	-.020	.200	-.500	.6	3.00
LWD608	79	6	13	9.0	.900	-.100	-.020	1.000	.300	-.020	-.100	-.500	.7	3.40
			27	8.0	1.600	-.100	-.020	.700	.300	-.020	-.100	-.500	.7	3.00
		7	17	12.0	1.300	-.100	-.020	.700	.300	-.020	-.100	-.500	.6	12.00
		8	30	4.7	1.200	-.100	-.020	.200	.300	-.020	-.100	-.500	.3	2.90
		4	4	49.0	7.100	-.100	-.020	2.000	.600	-.020	-.100	2.000	2.0	4.80

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT 6 WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (PCI/1)	BETA (FCI/1)	RADIUM 226 (FCI/1)	AG (MG/L)
LWD601	79	1	12				-1.000	.600	8.0					
			19				-1.000	-.500	8.0					
		3	29	-1.0	-1.00	5.0	-1.000	-.500	49.0	98.0	16.00	11.00	.00	-.010
		4	5	-1.0	-1.00	5.0	-1.000	-.500	21.0	15.0	2.30	6.00	.00	-.010
		5	19				-1.000	-.500	19.0					
			3	-1.0	-1.00	5.0	-1.000	.200	29.0	23.0	.60	13.00	.00	-.010
			16	-1.0	-1.00	3.0	-1.000	.200	48.0	24.0	1.50	13.00	.00	-.010
			30	-1.0	-1.00	12.0	-1.000	.100	25.0	50.0			.00	-.010
		6	13				-1.000	-.500	28.0					
			27				-1.000	-.500	28.0					
		7	19				-1.000	-.500	27.0					
LWD602	79	1	19				1.000	6.000	5.0					
		3	9				-1.000	-.500	2.0					
		5	3	-1.0	-1.00	3.0	-1.000	.100	1.0	14.0	.50	15.00	.00	-.010
		6	28				-1.000	-.500	1.0					
		7	19				-1.000	.300	1.0					
		8	28				-1.000	-.500	2.0					
			30				-1.000	.040	1.9					
LWD603	79	1	12				2.000	5.000	16.0					
			17				-1.000	3.000	13.0					
		8	30				-1.000	.200	34.0					
LWD604	79	1	12				60.000	2.000	60.0					
			17				100.000	-.500	80.0					
		2	8				40.000	-.500	99.0					
			21				40.000	-.500	85.0					
		3	7				-1.000	-.500	81.0					
		4	5	-1.0	-1.00	19.0	-1.000	-.500	76.0	22.0	.40	29.00	.00	-.010
			20				30.000	.500	86.0					
		5	2	-1.0	-1.00	4.0	10.000	.500	82.0	24.0	4.80	.00	.00	-.010
		6	1	-1.0	-1.00	3.0	-1.000	1.100	66.0	60.0				-.010
		7	3				.000	.500	61.0					
			19				50.000	.700	66.0					
			26				40.000	-.500	63.0					
		8	30				2.000	5.700	71.0					

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETURN TO WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TDC (MG/L)	ALPHA (PCI/1)	BETA (PCI/1)	RADIUM 226 (PCI/1)	AG (MG/L)
LWD#05	79	1	12				-1.000	-.500	15.0					
			17				20.000	-.500	17.0					
		2	8				15.000	-.500	26.0					
			21				12.000	-.500	30.0					
		3	8				3.000	-.500	35.0					
			5	-1.0	-1.00	8.0	-1.000	-.500	44.0	15.0	1.50	35.00	1.50	-.010
		5	20				-1.000	.200	53.0					
			2	-1.0	-1.00	5.0	-1.000	.200	60.0	11.0	5.10	1.00	.00	-.010
		6	1	-1.0	-1.00	3.0	-1.000	-.500	33.0	36.0				-.010
			3				-1.000	-.500	21.0					
		7	19				-1.000	-.500	21.0					
			26				-1.000	-.500	20.0					
		8	30				-1.000	.100	37.0					
		1	12				-1.000	.500	2.0					
			18				-1.000	-.500	1.0					
WD#06	79	2	8				-1.000	.600	1.0					
			22				-1.000	-.500	2.0					
		4	4	-1.0	-1.00	3.0	-1.000	-.500	.7	13.0	1.90	22.00	.00	-.010
			19				-1.000	-.500	2.0					
		5	2	-1.0	-1.00	3.0	-1.000	.200	2.0	16.0	2.90	31.00	.50	-.010
			30	-1.0	-1.00	3.0	-1.000	.700	2.0	39.0				-.010
		6	13				-1.000	-.500	1.4					
			27				-1.000	-.500	.9					
		7	17					.200	1.4					
			30				-1.000	.100	1.0					
LWD#07	79	1	10				-1.000	.600	8.0					
			18				-1.000	.500	9.0					
		2	8				-1.000	-.500	9.0					
			22				-1.000	-.500	7.0					
		4	14	-1.0	-1.00	5.0	-1.000	.500	3.0	11.0	2.30	.00	.00	-.010
			2	-1.0	-1.00	5.0	-1.000	.400	4.0	14.0	8.30	31.00	.10	-.010
		5	30	-1.0	-1.00	10.0	-1.000	.200	5.0	37.0				-.010
			13	-1.0	-1.00	3.0	-1.000	-.500	6.6	55.0				-.010
		7	27				-1.000	-.500	5.8					
			17					.200	8.8					
8		8	30				-1.000	.100	2.2					

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT 6 WELLS
FOR SAMPLE DATA SHOWN

159

LOC	YR	MO	DAY	FECAL COLIF. COLONY /100 ML	TOTAL COLIF. COLONY /100 ML	N KJELD. (MG/L)	SO3 (MG/L)	FE (MG/L)	MG (MG/L)	TOC (MG/L)	ALPHA (PCI/1)	BETA (FCI/1)	RADIUM 226 (PCI/1)	AG (MG/L)
1WD608	79	4	4	-1.0	-1.00	21.0	-1.000	-0.500	98.0	150.0	9.00	1.00	0.00	-0.010

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RFTORT 6 WELLS
FOR SAMPLE DATA SHOWN

09

LOC	YR	MO	DAY	S203 (MG/L)	HG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWD601	79	1	12				1400.00	120.00	2.30	16.00	12.0	880.0	2.00	.040
			19				1400.00	130.00	2.40	14.00	18.0	920.0	2.00	.030
		3	29	-1.00	-.020	-.020	1300.00	150.00	2.20	42.00	17.0	620.0	7.00	.030
		4	5	-1.00	-.020	-.020	1600.00	210.00	1.90	32.00	20.0	780.0	6.00	.040
			19				1400.00	180.00	1.90	27.00	17.0	720.0	6.00	.040
		5	3	-1.00	-.020	-.020	414.00	182.00	1.60	5.00	24.0	1092.0	4.00	.100
			16	3.00	-.020	-.020	1653.00	184.00	2.00	29.00	20.0	955.0	5.00	.040
			30	-1.00	-.020	-.020	1735.00	170.00	1.60	-.10	25.0	1024.0	4.00	.060
		6	13				1700.00	160.00	1.80	-.10	25.0	890.0	3.60	.070
			27				1700.00	190.00	2.00	2.00	25.0	890.0	3.50	.060
		7	19				1700.00	150.00	2.10	6.00	23.0	1100.0	3.80	.040
LWD602	79	1	19				420.00	68.00	1.50	45.00	9.5	490.0	4.00	-.020
		3	9				410.00	86.00	1.30	2.00	10.0	480.0	2.00	-.020
		5	3	-1.00	-.020	-.020	2900.00	41.00	1.20	3.00	10.0	440.0	2.00	-.020
		6	25				430.00	58.00	1.30	-.10	9.3	410.0	1.90	-.020
		7	15				430.00	66.00	1.40	-.10	8.0	490.0	1.80	-.020
			25				410.00	41.00	1.20	-.10	9.0	470.0	1.90	-.020
		8	30				390.00	39.00	.90	-.10	10.0	340.0	1.50	-.020
LWD603	79	1	12				640.00	140.00	4.60	17.00	11.0	730.0	11.00	.030
			17				500.00	110.00	4.70	230.00	24.0	690.0	9.00	-.020
		8	30				1000.00	150.00	4.90	-.10	15.0	870.0	12.00	.020
LWD604	79	1	12				510.00	65.00	.63	74.00	20.0	500.0	3.00	-.020
			17				580.00	26.00	12.00	140.00	32.0	560.0	3.00	-.020
		2	8				680.00	68.00	1.60	71.00	29.0	2000.0	2.00	-.020
			21				980.00	15.00	1.40	16.00	30.0	430.0	2.00	-.020
		3	7				610.00	72.00	1.40	8.00	29.0	360.0	4.00	-.020
		4	5	2.00	-.020	-.020	690.00	83.00	1.40	4.00	28.0	380.0	3.00	-.020
			20				730.00	45.00	1.40	71.00	28.0	483.0	2.00	-.020
		5	2	-1.00	-.020	-.020	680.00	18.00	1.50	2.00	28.0	490.0	3.00	-.020
		6	1	7.00	-.020	-.020	690.00	37.00	2.40	55.00	19.0	450.0	4.30	-.020
		7	3				470.00	56.00	2.10	-.10	25.0	440.0	3.10	-.020
			15				430.00	45.00	2.40	170.00	24.0	610.0	3.90	-.020
			26				450.00	50.00	2.30	-.10	23.0	580.0	3.00	-.020
		8	30				570.00	57.00	2.80	190.00	19.0	630.0	7.60	-.020
LWD605	79	1	12				420.00	42.00	4.30	12.00	11.0	540.0	4.00	-.020
			17				520.00	36.00	4.10	12.00	17.0	580.0	4.00	-.020

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT 6 WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	S2O3 (MG/L)	HG (MG/L)	SE (MG/L)	SO4 (MG/L)	CL (MG/L)	F (MG/L)	NO3 (MG/L)	SI (MG/L)	NA (MG/L)	K (MG/L)	AS (MG/L)
LWD605	79	2	8				820.00	60.00	3.50	8.00	16.0	670.0	4.00	-.020
			21				1000.00	46.00	3.50	11.00	17.0	740.0	4.00	-.020
			3				1200.00	95.00	3.20	5.00	16.0	680.0	5.00	-.020
		4	5	-1.00	-.020	-.020	1400.00	110.00	3.30	5.00	18.0	710.0	6.00	-.020
			20				1400.00	75.00	2.80	16.00	16.0	815.0	5.00	-.020
		5	2	-1.00	-.020	-.020	1200.00	47.00	2.30	5.00	18.0	569.0	3.00	-.020
		6	1	-1.00	-.020	-.020	780.00	49.00	3.20	10.00	18.0	480.0	5.50	-.020
		7	3				730.00	80.00	4.50	4.00	17.0	500.0	4.50	-.020
			19				690.00	100.00	5.00	17.00	15.0	570.0	4.00	-.020
			26				640.00	99.00	5.60	7.70	17.0	550.0	3.60	-.020
		8	30				970.00	110.00	5.00	2.00	15.0	680.0	13.00	-.020
LWD606	79	1	12				460.00	20.00	1.60	20.00	6.0	380.0	2.00	.080
			18				420.00	17.00	.50	11.00	12.0	400.0	2.00	.020
		2	8				440.00	21.00	.43	9.00	11.0	410.0	2.00	.030
			22				480.00	24.00	.68	18.00	11.0	420.0	2.00	.110
		4	4	-1.00	-.020	-.020	500.00	44.00	.85	20.00	10.0	380.0	2.00	.250
			19				490.00	100.00	.76	20.00	8.0	380.0	4.00	.140
		5	2	-1.00	-.020	-.020	479.00	24.00	.70	10.00	8.0	402.0	2.00	.200
			30	-1.00	-.020	-.020	448.00	21.00	.70	9.00	10.0	417.0	2.00	.120
		6	13				460.00	10.00	.70	-.10	8.8	390.0	1.90	.050
			27				430.00	24.00	.50	2.00	11.0	350.0	1.90	-.020
		7	17				430.00	10.00	.40	-.10	8.8	390.0	1.70	-.020
		8	30				430.00	18.00	.40	2.00	9.3	330.0	1.40	.020
LWD607	79	1	10				890.00	190.00	1.40	31.00	12.0	700.0	9.00	.030
			18				800.00	160.00	1.30	14.00	12.0	620.0	9.00	.030
		2	8				840.00	180.00	1.40	21.00	13.0	660.0	8.00	.020
			22				860.00	180.00	1.50	17.00	11.0	690.0	7.00	.030
		4	19	-1.00	-.020	-.020	950.00	230.00	2.10	24.00	10.0	650.0	7.00	.030
		5	2	-1.00	-.020	-.020	930.00	220.00	2.00	10.00	9.0	700.0	54.00	.050
			30	-1.00	-.020	-.020	873.00	195.00	1.60	2.00	11.0	644.0	6.00	.030
		6	13	-1.00	.030	-.020	810.00	140.00	1.40	23.00	9.3	560.0	8.00	.040
			27				740.00	140.00	1.30	6.00	12.0	510.0	7.60	.020
		7	17				680.00	110.00	1.10	-.10	10.0	550.0	6.40	.030
		8	30				630.00	94.00	1.20	5.00	10.0	480.0	4.10	.030
LWD608	79	4	4	-1.00	-.020	-.020	1400.00	140.00	6.40	94.00	16.0	720.0	120.00	.050

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT & WELLS
FOR SAMPLE DATA SHOWN

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LOC	YR	MO	DAY	TOT ALK (MG/L CaCO3)	HCO3 (MG/L CaCO3)	CO3 (MG/L CaCO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM O2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWD601	79	1	12	180.0	160.0	20.0	2300.0	30.0	10.0	60.00	.011	6.00	20.00	
			19	450.0	400.0	50.0	2800.0	20.0	100.0	70.00	.010	10.00	20.00	
		3	29	430.0	430.0	-1.0	2600.0	70.0	60.0	70.00	.012	6.00	4.00	78.00
			5	520.0	490.0	30.0	3300.0	30.0	40.0	90.00	.019	10.00	8.00	9.00
		5	19	440.0	420.0	20.0	2800.0	30.0	60.0	150.00	.016	20.00	10.00	
			3	600.0	570.0	30.0	3600.0	20.0	20.0	115.00	.010	8.00	24.00	22.00
			16	490.0	490.0	-1.0	3500.0	50.0	50.0	112.00	.007	14.00	36.00	22.00
			30	530.0	470.0	60.0	3500.0	290.0	30.0	118.00	.008	7.00	5.00	35.00
			6	520.0	520.0	-1.0	3400.0	18.0	30.0	100.00	-.004	2.20	32.00	
			27	490.0	490.0	-1.0	3500.0	10.0	10.0	.01	-.001	5.80	22.00	
			7	480.0	430.0	40.0	3300.0	20.0	10.0	97.00	.020	2.90	46.00	
LWD602	79	1	19	480.0	400.0	80.0	1300.0	740.0	350.0	30.00	.002	20.00	30.00	
			3	490.0	400.0	90.0	1200.0	190.0	20.0	20.00	-.001	6.00	4.00	
		5	3	460.0	380.0	80.0	1800.0	50.0	20.0	13.00	.002	6.00	4.00	12.00
			6	490.0	430.0	70.0	1200.0	-1.0	10.0	45.00	.002	9.20	5.00	
		7	19	510.0	420.0	90.0	1300.0	26.0	10.0	18.00	.010	11.00	12.00	
			28	480.0	410.0	70.0	1200.0	-1.0	20.0	36.00	-.001	2.90	25.00	
			8	410.0	350.0	60.0	1200.0	22.0	10.0	30.00	.020	6.40	2.40	
LWD603	79	1	12	350.0	310.0	40.0	2000.0	470.0	230.0	100.00	.078	20.00	20.00	
			17	780.0	700.0	80.0	2200.0	800.0	530.0	90.00	.008	6.00	30.00	
		8	30	1300.0	970.0	60.0	2300.0	-1.0	10.0	180.00	.010	12.00	4.00	
LWD604	79	1	12	410.0	390.0	20.0	2100.0	60.0	100.0	80.00	.006	20.00	70.00	
			17	820.0	760.0	60.0	1900.0	70.0	180.0	180.00	.013	9.00	5.00	
		2	8	760.0	760.0	-1.0	1900.0	140.0	20.0	70.00	.047	20.00	30.00	
			21	660.0	650.0	10.0	1600.0	200.0	30.0	40.00	.024	20.00	20.00	
		3	7	610.0	560.0	50.0	1600.0	330.0	100.0	60.00	.020	4.00	40.00	
			5	600.0	540.0	60.0	1600.0	100.0	60.0	50.00	-.001	3.00	8.00	14.00
		5	20	700.0	700.0	-1.0	1800.0	10.0	30.0	97.00	-.001	15.00	14.00	
			2	800.0	760.0	40.0	1900.0	110.0	80.0	110.00	.009	16.00	9.00	20.00
		6	1	630.0	790.0	40.0	2100.0	70.0	100.0	140.00	-.001	3.60	18.00	56.00
			3	1000.0	960.0	50.0	1900.0	50.0	20.0	130.00	-.001	59.00	12.00	
		7	19	100.0	70.0	30.0	2100.0	50.0	160.0	420.00	.010	120.00	11.00	
			26	1100.0	1000.0	30.0	2000.0	41.0	150.0	360.00	.020	110.00	5.40	
		8	30	110.0	60.0	50.0	1000.0	-1.0	40.0	210.00	.003	60.00	5.80	

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT 6 WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CACO3)	HCO3 (MG/L CACO3)	CO3 (MG/L CACO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM O2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOC (MG/L)
LWD605	79	1	12	500.0	410.0	90.0	1300.0	70.0	10.0	130.00	.290	40.00	20.00	
			17	750.0	670.0	80.0	1600.0	40.0	10.0	100.00	.210	20.00	10.00	
		2	9	680.0	630.0	50.0	2100.0	20.0	10.0	70.00	-.001	6.00	30.00	
			21	610.0	560.0	50.0	2300.0	120.0	30.0	60.00	-.001	9.00	4.00	
		3	9	670.0	520.0	150.0	2600.0	20.0	20.0	70.00	.017	10.00	30.00	
			4	590.0	520.0	65.0	2600.0	20.0	20.0	50.00	.009	6.00	20.00	14.00
		5	20	520.0	460.0	60.0	2600.0	10.0	10.0	70.00	.010	2.00	34.00	
			2	470.0	420.0	50.0	2100.0	85.0	20.0	24.00	.008	7.00	11.00	5.00
		6	1	490.0	430.0	60.0	1800.0	30.0	40.0	38.00	-.001	6.30	10.00	22.00
			3	530.0	430.0	90.0	1700.0	12.0	10.0	73.00	.001	3.00	16.00	
		7	19	470.0	400.0	70.0	1700.0	25.0	20.0	105.00	.010	12.00	7.60	
			26	470.0	410.0	60.0	1600.0	-1.0	20.0	64.00	.010	14.00	10.00	
		8	30	760.0	660.0	100.0	2500.0	33.0	10.0	140.00	.200	24.00	5.60	
LWD606	79	1	12	190.0	170.0	20.0	1700.0	70.0	50.0	7.00	.008	6.00	20.00	
			18	390.0	310.0	80.0	1100.0	30.0	30.0	20.00	.006	20.00	10.00	
		2	8	390.0	310.0	80.0	1200.0	20.0	40.0	2.00	.010	4.90	23.00	
			22	420.0	330.0	90.0	1200.0	190.0	130.0	2.00	-.001	2.80	60.00	
		4	4	440.0	320.0	120.0	1200.0	180.0	50.0	8.00	-.001	6.00	50.00	11.00
			19	380.0	280.0	100.0	1200.0	20.0	50.0	30.00	-.001	7.00	7.00	
		5	2	410.0	290.0	120.0	1150.0	120.0	30.0	8.00	.007	6.00	24.00	11.00
			30	390.0	280.0	110.0	1200.0	340.0	100.0	29.00	-.001	4.00	39.00	24.00
		6	13	400.0	310.0	90.0	1200.0	30.0	80.0	70.00	.003	2.50	11.00	
			27	370.0	270.0	100.0	1100.0	42.0	10.0	21.00	.001	11.00	15.00	
		7	17	380.0	280.0	100.0	1100.0	35.0	20.0	6.60	.040	3.30	6.40	
			30	380.0	290.0	90.0	1400.0	37.0	10.0	72.00	.010	5.70	6.60	
		8												
LWD607	79	1	10	370.0	320.0	50.0	2100.0	90.0	60.0	50.00	.011	3.00	30.00	
			18	340.0	280.0	60.0	1900.0	20.0	20.0	30.00	.002	60.00	20.00	
		2	8	370.0	310.0	60.0	2000.0	9.0	20.0	10.00	.011	3.00	50.00	
			22	360.0	300.0	60.0	2000.0	80.0	40.0	30.00	.047	5.00	40.00	
		4	19	370.0	320.0	50.0	2200.0	40.0	20.0	70.00	.009	5.00	20.00	8.00
			5	2	370.0	310.0	60.0	2100.0	140.0	51.00	.013	4.00	13.00	11.00
		5	30	370.0	320.0	50.0	2040.0	210.0	30.0	32.00	.004	7.00	16.00	23.00
			6	13	370.0	300.0	70.0	1900.0	23.0	38.00	.003	4.00	20.00	47.00
		7	27	370.0	300.0	70.0	1700.0	-1.0	10.0	29.00	.010	11.00	16.00	
			17	350.0	290.0	60.0	1500.0	-1.0	20.0	33.00	.002	11.00	6.40	
		8	30	380.0	320.0	60.0	2900.0	-1.0	10.0	45.00	.020	7.30	5.40	
		9												

NOTE: - INDICATES LESS THEN

LOGAN WASH
WATER QUALITY PARAMETERS
RETORT 6 WELLS
FOR SAMPLE DATA SHOWN

LOC	YR	MO	DAY	TOT ALK (MG/L CaCO3)	HCO3 (MG/L CaCO3)	CO3 (MG/L CaCO3)	TDS (MG/L)	TOTAL SUSPEND SOLIDS (MG/L)	TURBIDITY NTU	CHEM O2 DEMAND (MG/L)	PHEN (MG/L)	BOD5 (MG/L)	OIL AND GREASE (MG/L)	DOL (MG/L)
LWD608	79	4	4	500.0	500.0	100.0	2800.0	160.0	-1.0	-1.00	.004	-1.00	40.00	147.00

NOTE: - INDICATES LESS THEN

SUSPENDED PARTICULATES

ANALYZED BY

COORS/SPECTRO-CHEMICAL LABORATORY

Coors / SPECTRO-CHEMICAL LABORATORY
DIVISION OF COORS PORCELAIN COMPANY
GOLDEN, COLORADO, U.S.A.
303-278-4000 Ext. 2302

Mailing Address:
P.O. Box 500
Golden, Colorado 80401

Analytical Report

TO: . Occidental Oil Shale, Inc.
P. O. Box 2687
. Grand Junction, CO 81501
. Attention: Paul Oliver

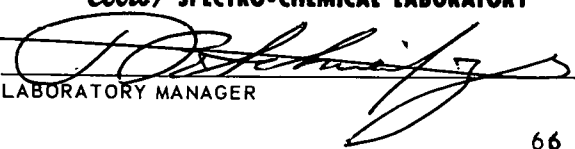
LABORATORY NUMBER	90207
DATE	8-13-79
CUSTOMER ORDER NO.	AFE 8779-01

Hi-Vol Filters

Filter No.	Date	Particulates ($\mu\text{g}/\text{m}^3$)
1006329	6-12-79	0.1
1006330	6-19-79	4.7
1006331	6-26-79	3.5
1006332	7-12-79	0
1006334	7-18-79	0
1006333	7-24-79	1.4
1006335	7-31-79	2.4

Note: A value of zero denotes that no result was obtainable.

Coors / SPECTRO-CHEMICAL LABORATORY

BY 
LABORATORY MANAGER

LW-HV³-PART-1

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY
GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

TO: . Occidental Oil Shale Inc.
2372 "G" Road
P. O. Box 2687
Grand Junction, CO 81501
Attention: Paul Oliver

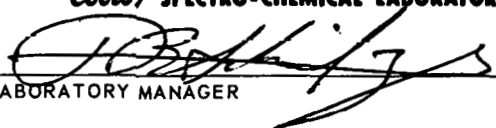
LABORATORY NUMBER	90494
DATE	10-5-79
CUSTOMER ORDER NO.	AFE 8779-01

Hi-Vol Filters

Filter No.	Date	Particulates ($\mu\text{g}/\text{m}^3$)
1006336	8-8-79	*
1005237		*
1005238	8-28-79	4.3
1005240	9-5-79	3.7
1005241	9-12-79	0.1
1005242	9-18-79	8.9

*Note: These filters were damaged, resulting in a loss of weight of the filter.

Coors / SPECTRO-CHEMICAL LABORATORY

BY 
LABORATORY MANAGER

WIND SPEED DATA

WIND SPEED
METERS / SEC

LOGAN WASH
TRATLER 02
AUG 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK
1	4	4	4	4	4	5	5	6	4	4	3	1	5	7	7	7	5	4	6	5	9	3	9	11	5	11
2	8	6	4	4	4	4	3	3	3	3	3	4	5	4	3	4	3	4	4	3	3	4	4	4	4	8
3	5	7	10	9	9	8	7	5	4	4	4	4	5	7	6	8	7	5	3	4	7	3	5	5	6	10
4	4	4	4	4	4	4	3	3	3	4	4	4	5	4	6	8	9	6	6	6	6	5	4	4	5	9
5	5	4	5	7	10	8	9	7	6	5	5	5	5	6	5	5	4	4	3	9	4	4	1	4	5	10
6	4	4	5	7	8	7	7	5	4	5	6	5	5	6	6	5	4	5	9	8	13	8	7	7	6	13
7	9	5	6	5	7	5	3	4	4	4	5	4	5	5	6	6	5	7	9	9	8	7	5	6	6	9
8	5	4	3	4	5	7	6	5	4	4	4	5	5	6	6	7	7	5	6	5	4	4	3	4	5	7
9	4	6	5	4	3	4	3	2	3	3	4	4	4	6	5	4	4	4	4	7	9	13	14	15	5	15
10	15	13	8	5	7	7	8	6	6	6	5	4	4	7	8	8	8	9	10	11	9	10	10	8	3	15
11	6	5	5	6	6	6	5	5	4	4	4	4	4	5	5	6	5	4	3	4	5	5	5	5	5	6
12	4	4	6	6	6	6	6	6	6	8	8	8	7	5	6	6	6	6	5	6	8	6	7	10	7	10
13	9	7	7	5	4	4	4	4	5	7	9	9	8	9	9	9	10	8	8	6	5	6	5	4	7	10
14	4	4	4	4	3	4	4	4	4	4	4	3	4	4	4	3	4	4	4	5	5	5	5	4	4	5
15	4	4	4	4	3	3	3	4	6	5	5	5	4	4	7	6	5	4	4	5	5	4	4	4	4	7
16	4	4	4	4	4	4	5	5	6	5	5	5	5	6	5	4	5	5	4	4	3	3	3	4	4	6
17	4	4	3	4	4	3	4	4	3	4	4	4	6	4	4	4	5	4	4	3	4	4	4	5	4	6
18	4	4	3	3	4	4	4	5	4	4	4	4	4	4	4	6	9	4	4	4	7	5	4	4	4	9
19	3	4	5	4	8	7	7	5	6	7	6	7	9	8	5	5	7	5	6	4	6	5	6	5	6	9
20	4	4	5	5	7	7	7	7	6	7	8	7	5	8	10	7	7	5	8	5	3	3	4	4	6	10
21	4	4	5	4	6	6	5	4	4	4	4	4	4	5	5	4	4	5	6	4	4	6	5	4	5	6
22	4	4	4	4	4	4	7	5	4	4	3	4	4	4	4	4	4	4	4	5	6	8	7	7	5	8
23	5	6	6	5	5	5	6	5	4	4	3	4	4	5	6	5	6	7	4	4	5	6	7	6	5	7
24	5	6	5	12	8	5	7	5	5	4	4	4	4	5	6	7	4	6	5	4	5	8	6	5	6	12
25	4	6	7	8	8	7	6	5	5	4	4	3	3	4	4	5	4	4	4	6	4	8	5	5	5	8
26	4	5	6	5	4	3	3	3	2	2	4	4	4	5	4	5	4	6	7	6	7	6	6	6	5	7
27	7	7	5	6	4	5	6	5	4	6	6	6	6	6	7	8	11	13	12	9	8	7	6	6	7	13
28	7	7	6	6	6	6	7	7	8	7	5	8	7	6	7	9	11	9	10	8	8	6	8	7	7	11
29	6	7	5	6	5	6	6	5	4	4	4	4	5	9	11	12	9	7	9	8	8	8	8	7	7	12
30	7	7	6	4	4	5	8	7	8	9	11	6	8	4	4	5	4	4	5	5	6	6	9	8	6	11
31	5	10	10	11	8	7	7	7	7	8	7	8	7	7	9	9	8	8	8	6	8	7	5	5	8	11
AV	6	5	5	6	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	5	
PK	15	13	10	12	10	8	9	7	8	9	11	9	9	9	11	12	11	13	12	11	13	13	14	15		15

WIND SPEED
METERS / SEC

LOGAN WASH
TRAILER 02
SEPT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK
1	4	4	5	5	4	5	4	4	4	4	4	5	6	5	6	6	6	5	6	6	8	9	8	7	6	9
2	7	5	6	6	4	4	5	5	4	4	4	4	5	7	8	8	8	7	6	5	6	6	4	4	6	8
3	4	4	4	4	4	4	4	4	4	4	4	5	6	8	8	10	10	5	7	6	7	7	6	7	6	10
4	7	6	7	7	6	5	5	4	4	4	4	5	7	8	9	8	9	8	8	7	7	5	6	6	7	9
5	4	4	4	4	4	3	3	3	4	4	4	4	4	4	5	6	5	6	6	4	6	4	4	4	4	6
6	4	4	4	4	4	3	4	3	3	4	4	4	4	4	7	6	7	6	6	5	4	6	8	7	5	8
7	6	4	4	3	3	4	4	4	4	4	4	4	4	6	8	7	7	5	6	5	5	4	4	4	5	8
8	5	5	4	4	6	6	6	4	4	4	4	4	4	4	6	8	8	5	7	7	6	4	4	4	4	8
9	4	4	4	4	4	4	3	3	4	5	6	5	4	6	7	7	7	6	6	5	5	6	9	7	5	9
10	8	7	7	9	13	11	6	4	8	5	4	4	5	5	6	6	5	8	6	4	5	4	4	6	6	13
11	9	10	7	4	3	4	4	4	3	4	5	4	5	8	8	12	12	11	11	8	9	13	14	12	8	14
12	10	12	12	10	11	11	9	8	7	6	6	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()	12
13	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
14	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
15	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
16	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
17	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
18	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
19	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
20	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
21	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
22	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
23	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
24	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
25	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
26	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
27	6	4	5	4	5	4	4	5	4	5	5	5	4	5	6	4	4	4	4	6	5	4	4	4	5	6
28	4	4	4	4	5	4	4	3	4	4	4	4	5	4	6	8	8	5	7	8	5	6	5	6	5	8
29	5	5	4	4	7	6	6	4	3	3	3	3	4	5	5	6	6	6	4	4	4	4	6	6	5	8
30	4	3	3	3	4	4	4	5	4	4	4	4	4	4	6	6	7	6	7	4	5	4	5	6	4	7
AV	6	5	5	5	5	5	5	4	4	4	4	4	5	6	7	7	7	7	7	6	6	6	6	6	5	
PK	10	12	12	10	13	11	9	5	8	6	6	7	3	9	9	12	12	11	11	8	9	13	14	12		14

WIND SPEED
METERS / SEC

LOGAN WASH.
TRAILER 02
OCT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK	
1	7	7	9	11	10	9	8	7	6	4	5	4	4	5	5	6	6	5	5	5	6	4	6	8	6	11	
2	7	6	6	6	6	5	6	7	5	4	5	5	7	5	6	13	11	6	5	5	4	9	11	8	7	13	
3	8	11	10	9	7	3	10	9	10	8	7	4	8	5	9	7	9	9	10	8	7	6	5	8	3	11	
4	6	5	5	4	4	4	4	4	4	4	4	4	5	5	6	4	5	6	5	4	4	5	5	6	5	6	
5	7	7	8	6	7	10	8	9	6	6	5	5	5	5	4	5	5	4	4	4	4	4	3	5	6	10	
6	7	7	8	9	10	8	8	8	5	5	5	4	5	6	4	5	5	5	6	5	3	4	4	5	6	10	
7	5	5	5	6	6	6	5	4	5	4	4	5	4	5	5	5	5	5	6	6	7	5	6	6	5	7	
8	6	6	6	5	6	6	7	7	6	5	4	4	4	5	6	7	6	7	7	5	9	8	6	7	6	9	
9	3	3	4	4	4	4	4	5	5	5	5	5	5	4	4	4	4	3	4	5	5	6	6	6	4	6	
10	6	6	6	4	5	6	5	5	6	3	4	4	5	5	5	5	6	6	5	5	5	4	4	5	5	6	
11	5	5	5	4	5	5	5	5	4	3	4	5	4	4	4	6	6	5	4	6	5	5	5	4	5	6	
12	4	4	4	4	6	5	4	4	3	4	4	5	4	4	4	4	4	4	6	7	6	5	6	6	5	7	
13	6	5	4	3	4	4	4	4	3	4	5	4	4	5	6	5	5	6	5	6	5	6	8	5	5	9	
14	9	8	8	7	8	7	7	6	6	5	6	5	6	7	13	5	4	6	5	5	6	13	9	5	7	13	
15	4	5	5	4	4	6	5	5	4	4	4	4	4	4	6	6	7	8	8	8	8	3	6	6	6	8	
16	5	6	12	10	12	9	11	10	7	8	9	7	5	5	5	4	4	4	6	4	3	3	3	4	6	12	
17	3	3	4	4	4	4	4	5	4	5	6	6	5	4	6	5	6	5	5	5	5	6	9	11	5	11	
18	7	13	10	9	9	8	7	7	6	5	6	5	5	5	11	7	10	9	7	8	9	13	15	17	9	17	
19	13	14	15	13	13	15	13	15	16	13	13	13	13	14	13	12	13	13	15	14	13	17	13	14	14	18	
20	11	13	13	16	14	14	18	16	16	17	18	22	18	18	20	18	16	9	8	11	8	9	7	(IM)	20	148	
21	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	8	9	10	10	11	10	9	10	9	8	9	7	9	8	7	4	6	4	8	11	
22	4	5	4	4	4	4	4	4	4	4	4	4	5	4	5	5	4	4	4	5	6	4	5	5	4	6	
23	5	4	4	4	4	6	5	4	4	4	4	4	4	4	4	4	4	5	6	6	6	6	7	7	5	7	
24	7	6	5	5	5	4	4	4	3	4	3	5	6	4	4	5	6	6	5	5	6	6	6	6	5	7	
25	7	7	8	8	7	8	7	8	7	7	8	6	5	7	6	7	9	9	9	8	9	12	11	13	9	13	
26	10	10	10	11	9	8	8	9	8	6	6	6	8	8	9	12	9	6	10	9	10	9	8	9	8	12	
27	8	10	9	9	9	7	8	6	6	6	6	5	4	4	4	4	4	4	4	4	4	4	4	4	6	10	
28	4	5	6	6	5	6	6	8	8	5	5	8	10	9	8	8	5	6	5	8	7	5	4	8	7	10	
29	9	8	9	8	8	8	9	6	9	10	8	4	9	10	14	15	14	13	12	11	9	10	8	8	10	15	
30	8	9	9	9	10	9	7	8	8	7	6	6	7	7	5	6	9	5	9	10	11	10	10	9	8	11	
31	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	()	()	()
AV	7	7	7	7	12	7	7	7	7	6	6	6	6	6	7	7	7	7	7	7	7	7	8	7			
FK	18	14	15	16	148	15	18	16	16	17	18	22	18	18	20	18	16	13	15	14	13	17	15	17		148	

WIND DIRECTION
DEGS

LOGAN WASH
TRAILER 02
AUG 1979
OCCIDENTAL OIL SHALE INC.

FOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	PREV
1	90	90	90	75	330	300	310	320	360	90	180	190	200	230	220	210	60	340	330	20	30	40	50	60	31
2	60	70	80	100	100	90	140	90	90	70	120	180	190	90	130	120	90	120	60	90	45	360	60	90	94
3	90	10	40	50	60	60	80	70	70	110	120	190	180	210	160	100	180	220	90	30	60	60	340	80	87
4	310	300	280	240	360	360	130	120	120	90	120	180	180	180	140	130	90	80	90	80	80	90	100	110	110
5	100	130	170	190	230	220	240	230	210	220	210	180	200	190	180	180	180	120	60	180	90	100	60	30	173
6	360	280	270	260	250	280	270	260	240	250	210	90	200	180	190	180	180	190	70	180	150	270	90	270	225
7	210	90	120	270	240	150	90	150	90	240	230	180	180	150	180	120	230	210	190	210	250	270	330	270	195
8	240	360	160	240	210	110	240	70	90	60	90	180	190	180	210	210	90	60	70	30	170	150	90	70	142
9	90	30	30	30	40	40	50	70	60	70	60	90	120	30	70	90	70	90	270	300	300	50	40	30	52
10	40	30	30	40	50	40	40	40	40	60	70	90	90	60	90	90	60	50	40	60	60	50	50	50	55
11	60	90	80	70	80	80	70	60	70	130	150	180	190	180	160	180	150	160	90	210	250	300	330	210	127
12	240	220	22	210	200	210	200	210	210	230	210	180	240	230	180	190	180	210	230	240	220	240	210	180	212
13	180	150	13	130	90	130	130	140	130	130	120	120	140	150	150	180	200	180	210	270	230	270	30	90	151
14	230	270	220	270	70	70	60	65	70	60	90	90	120	180	270	25	30	30	30	50	60	35	40	50	56
15	50	40	50	40	60	90	135	150	180	180	150	210	210	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	118
16	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
17	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
18	(PF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
19	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
20	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
21	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
22	(PF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
23	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
24	(PF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
25	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
26	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
27	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
28	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
29	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
30	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
31	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
PV	24	48	110	104	67	67	111	102	99	115	140	159	178	172	169	148	127	129	71	78	95	22	44	72	119

WIND DIRECTION
DEGS

LOGAN WASH
TRAILER 02
SEPT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	PREV
1	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
2	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
3	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
4	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
5	(PF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
6	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
7	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
8	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
9	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
10	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
11	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
12	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
13	80	70	40	40	240	240	30	30	40	70	80	90	90	90	120	120	110	90	70	70	90	80	90	90	120
14	80	70	70	70	70	80	70	70	80	90	90	80	90	80	80	50	90	70	60	50	60	50	50	60	71
15	90	90	90	100	90	90	80	80	80	80	80	130	120	100	150	180	210	270	270	300	50	40	50	60	91
16	60	260	260	270	280	240	240	230	220	210	190	190	180	110	120	100	110	60	40	40	40	50	60	60	146
17	60	70	60	60	60	60	50	40	60	70	90	90	90	90	110	90	70	60	40	40	50	60	100	120	70
18	110	90	100	100	90	90	90	90	90	100	180	190	190	180	200	190	210	240	250	270	280	260	260	210	167
19	200	240	230	250	240	220	230	210	230	230	230	230	190	130	220	210	210	210	80	90	80	360	50	60	211
20	30	30	40	50	50	50	70	80	240	240	240	310	180	180	90	60	360	300	10	270	300	170	190	190	32
21	60	210	210	230	210	220	210	160	240	210	220	210	180	180	80	270	240	210	240	250	240	250	240	240	219
22	240	240	230	230	240	240	240	230	240	230	240	240	230	210	150	170	170	180	230	260	270	260	240	220	228
23	210	210	220	230	230	240	220	230	220	230	240	240	220	210	210	230	230	240	240	270	280	260	180	190	228
24	200	210	210	220	210	230	210	200	200	190	240	220	210	200	210	210	240	240	270	280	280	240	280	180	225
25	180	170	180	350	120	280	270	210	190	180	180	180	210	220	210	210	220	240	230	210	190	190	200	200	204
26	210	220	220	210	190	200	280	180	220	100	110	120	120	120	120	120	240	180	180	210	180	70	60	90	166
27	70	70	60	120	180	120	130	140	170	250	240	240	190	200	190	210	180	270	180	270	30	50	40	40	159
28	50	60	60	40	20	30	0	200	210	180	240	260	240	210	240	200	200	270	300	300	280	270	280	260	267
29	230	270	260	270	350	40	40	50	150	160	190	210	190	150	180	180	190	150	150	150	(RF)	(RF)	(RF)	(RF)	203
30	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
FV	107	153	159	157	178	185	139	152	189	176	194	191	172	167	160	174	192	217	231	289	352	18	87	135	169

WIND DIRECTION
DEGS

LOGAN WASH
TRAILER 02
OCT 1979
OCCIDENTAL OIL SHALE INC.

74
HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	PREV
1	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	()
2	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	238
3	0	0	350	20	30	30	30	60	90	80	70	60	60	60	50	40	40	50	50	50	40	40	70	90	46
4	40	70	40	110	100	100	150	150	120	200	240	180	200	260	240	210	270	240	260	270	260	250	260	270	208
5	280	300	0	0	10	40	30	40	50	60	60	90	90	120	120	130	0	270	60	0	40	60	60	0	33
6	300	330	30	40	60	60	60	60	60	80	70	70	120	190	170	100	240	220	220	130	240	260	220	200	114
7	200	180	210	230	240	220	240	260	240	220	210	270	240	240	210	200	220	230	210	220	220	250	240	220	226
8	240	230	230	220	210	220	210	210	230	240	270	240	190	210	190	210	210	210	240	260	260	270	210	0	228
9	210	0	30	60	300	260	270	30	40	30	40	40	180	180	180	180	120	90	60	0	350	330	300	350	18
10	300	350	330	300	260	270	350	10	30	160	200	240	190	190	200	220	210	220	230	240	270	230	270	260	256
11	270	280	270	280	260	270	0	30	20	270	300	270	260	210	180	190	180	210	210	230	240	210	200	210	246
12	220	210	270	20	40	60	110	270	240	270	30	45	90	180	170	180	180	90	80	70	70	60	50	70	93
13	60	60	70	70	120	40	120	240	260	210	190	210	210	180	160	210	230	240	270	240	210	210	180	190	194
14	180	190	200	120	200	190	180	190	190	200	210	210	190	270	240	210	180	180	180	200	180	210	270	180	197
15	150	130	150	160	180	170	180	190	180	180	120	210	250	210	210	240	210	240	250	270	260	250	240	210	202
16	210	270	300	20	30	30	20	20	30	40	80	60	90	360	120	90	120	90	60	60	270	120	160	165	62
17	165	270	200	150	130	160	170	180	210	210	200	210	210	230	250	240	210	240	220	240	240	220	170	190	207
18	180	210	230	210	180	170	180	160	180	180	130	160	120	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	173
19	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
20	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
21	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
22	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
23	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()
24	200	210	190	210	210	200	210	180	30	60	180	180	220	180	230	240	250	240	250	240	200	210	210	220	210
25	220	210	210	210	220	220	220	220	200	200	190	220	210	210	210	220	220	210	210	210	220	210	200	210	212
26	190	210	200	150	150	210	200	190	210	210	190	190	210	200	210	210	240	240	270	0	30	30	30	30	208
27	20	25	20	20	20	20	20	30	30	40	40	70	180	150	160	170	180	240	260	210	200	190	180	190	93
28	180	190	190	180	160	190	180	170	180	180	190	200	210	240	200	210	240	260	240	210	270	0	30	30	203
29	30	30	20	20	10	25	25	25	25	20	20	20	20	10	10	15	15	15	15	15	10	10	20	20	19
30	20	20	20	20	20	20	5	0	5	5	10	10	10	10	10	5	0	0	0	5	5	5	10	5	9
31	5	5	5	5	5	5	5	10	5	5	10	10	10	30	120	80	70	50	50	60	50	60	50	60	30
FV	224	277	231	58	143	144	136	120	84	180	136	183	185	204	189	200	212	228	241	254	255	267	231	225	193

TEMPERATURE
DEG. C

LOGAN WASH
TRAILER 02
AUG 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	FEAK
1	17	16	15	14	15	14	14	15	17	19	19 (IM)	22	23	23	23	23	22	22	20	19	18	18	17	18	23	
2	17	15	16	16	17	16	16	18	19	21	22	23	23	24	24	22	22	21	20	19	19	19	19	17	19	24
3	17	17	16	16	15	14	14	17	18	19	20	21	23	25	26	24	24	23	23	21	19	20	19	19	19	26
4	19	19	19	19	19	19	19	18	21	23	24	25	26	27	27	26	26	24	23	22	21	22	21	21	22	27
5	19	19	19	17	18	18	18	19	21	23	24	26	26	28	27	28	26	23	23	21	21	21	20	19	22	28
6	20	19	19	19	19	17	17	17	18	20	21	21	23	26	27	26	27	23	22	16	14	14	16	17	20	27
7	17	16	15	14	14	14	15	17	17	18	19	21	23	24	24	24	23	22	22	19	17	16	16	16	18	24
8	14	14	14	14	13	13	13	14	17	17	17	20	22	23	23	23	21	12	12	11	9	14	12	11	16	23
9	12	11	14	11	12	12	13	16	16	17	18	19	20	18	20	23	22	21	21	19	17	16	13	12	16	23
10	11	10	10	10	10	10	11	12	12	14	17	18	19	18	20	20	19	19	18	17	10	15	14	14	14	20
11	14	13	13	13	12	12	12	12	14	17	17	17	19	21	22	23	23	21	21	20	19	18	17	17	17	23
12	17	17	16	16	14	14	14	14	17	17	17	17	19	19	20	22	23	21	20	19	18	16	15	13	17	23
13	12	12	12	11	11	11	11	12	11	10	10	11	12	14	16	17	16	16	14	14	14	13	13	13	13	17
14	13	13	13	13	13	11	12	12	13	11	12	11	12	12	10	10	12	11	10	10	9	9	9	9	11	13
15	9	9	8	9	9	9	9	9	10	11	12	12	13	13	11	10	12	12	10	9	9	9	8	8	10	13
16	8	8	8	8	8	7	7	7	8	8	8	8	8	10	11	12	11	10	10	9	8	8	8	8	8	12
17	8	8	7	7	7	7	7	9	9	10	11	11	12	12	11	12	12	12	11	9	9	8	8	8	9	12
18	8	8	9	9	8	8	8	8	8	8	10	11	11	12	11	6	8	9	8	7	6	6	6	6	8	12
19	6	6	6	6	6	6	6	6	8	8	11	10	10	7	11	13	10	6	6	7	6	6	6	6	7	13
20	6	6	6	6	6	6	6	6	6	10	12	13	10	9	10	12	11	9	9	8	6	6	7	6	8	13
21	7	7	7	7	7	7	7	10	11	14	15	16	18	17	17	18	17	17	16	13	12	11	11	10	12	18
22	10	10	9	9	9	8	8	11	14	17	17	18	18	19	19	17	15	14	18	14	13	13	12	12	14	19
23	12	11	11	10	10	10	9	12	14	16	19	20	22	23	23	23	21	20	18	16	14	14	14	14	16	23
24	13	13	11	10	9	9	9	11	13	16	19	19	22	24	23	22	21	18	17	16	14	14	13	13	16	24
25	12	12	12	12	10	10	10	10	13	17	17	20	21	21	22	20	19	17	15	13	12	12	12	12	14	22
26	12	12	12	11	10	10	10	12	16	19	21	21	22	21	18	17	17	19	16	13	12	12	12	12	15	22
27	12	11	11	10	9	10	10	14	16	17	18	19	20	22	21	19	19	19	17	17	16	15	14	14	16	22
28	14	13	13	13	13	13	13	13	13	17	19	19	21	21	20	19	19	19	17	17	16	16	15	15	16	21
29	14	14	14	13	13	13	13	14	16	17	18	19	21	21	21	21	20	19	19	17	17	16	14	14	17	21
30	14	14	13	13	13	13	13	13	12	12	10	8	7	7	8	9	10	12	12	11	11	10	11	11	11	14
31	11	11	12	11	10	10	10	11	12	13	14	17	17	17	18	18	18	17	17	17	15	14	14	13	14	18
AV	13	12	12	12	12	11	11	13	14	16	16	17	18	19	19	19	18	17	16	15	13	13	13	13	14	
FK	20	19	16	15	19	19	18	19	21	23	24	26	26	28	27	28	27	24	23	22	21	22	21	21		28

TEMPERATURE
DEG. C

LOGAN WASH
TRAILER 02
SEPT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	FEAK
1	13	13	11	11	11	11	10	12	13	17	17	18	19	20	21	21	20	19	18	17	16	16	14	14	16	21
2	14	14	14	14	13	13	13	16	17	17	18	19	19	21	21	20	19	19	18	17	16	16	15	14	17	21
3	14	14	14	14	14	14	14	16	17	19	20	21	23	23	22	23	21	20	19	18	17	17	16	15	18	23
4	14	14	14	14	14	13	13	13	16	18	19	19	21	22	22	21	20	19	19	17	16	16	15	15	17	22
5	15	15	15	15	14	15	14	14	17	19	19	20	21	22	24	23	22	21	20	19	17	17	17	17	18	24
6	17	17	17	17	16	14	14	14	16	19	21	21	21	23	24	23	22	21	20	19	18	17	17	16	18	24
7	16	17	17	17	17	16	16	17	18	19	21	21	22	24	24	23	22	21	20	19	13	18	18	17	19	24
8	17	17	17	17	17	17	17	16	18	18	19	16	21	23	24	24	23	21	20	19	18	18	18	17	19	24
9	17	17	17	17	17	17	14	17	19	19	21	21	21	23	24	24	22	21	20	19	18	17	13	13	19	24
10	12	12	12	12	12	9	9	8	10	11	16	17	18	19	20	21	20	19	18	17	16	16	16	14	14	21
11	13	12	12	12	12	12	13	13	14	18	19	19	21	21	20	20	19	19	18	17	16	14	14	13	16	21
12	12	10	9	8	7	7	6	7	8	10	12	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	12
13	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
14	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
15	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
16	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
17	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
18	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
19	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
20	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
21	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
22	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
23	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
24	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
25	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
26	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	14	14	14	14	13	12	17	16	16	16	()	17
27	9	9	9	10	11	11	11	11	11	12	13	14	14	16	16	17	16	16	16	14	13	13	13	13	13	17
28	13	12	12	12	12	12	12	12	13	14	15	16	17	17	18	17	17	16	15	14	14	14	14	13	14	18
29	13	13	13	13	12	12	13	13	14	15	17	17	17	18	19	18	18	17	16	15	14	14	14	14	15	19
30	14	14	14	14	13	13	13	13	14	16	16	17	18	18	19	19	18	17	16	16	15	20	20	20	16	20
AV	14	14	13	13	13	13	13	13	14	16	18	18	19	21	21	21	19	19	18	17	16	16	16	15	17	
FK	17	17	17	17	17	17	17	17	19	19	21	21	23	24	24	24	23	21	20	19	18	20	20	20		24

TEMPERATURE
DEG. C

LOGAN WASH
TRAILER 02
OCT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK
1	14	14	13	13	13	12	12	13	16	16	17	17	18	18	19	19	18	17	16	16	16	16	15	15	15	19
2	15	15	14	14	14	14	13	13	13	15	16	17	17	18	19	19	17	18	17	17	16	15	16	15	16	19
3	14	14	14	14	13	13	12	11	10	10	12	13	13	14	14	14	14	14	13	12	12	11	11	10	13	14
4	10	10	11	11	11	11	11	12	14	15	16	16	17	17	16	16	16	15	14	14	14	14	13	13	14	17
5	13	13	13	13	12	12	12	11	12	14	14	15	17	17	18	18	18	17	17	16	15	14	14	14	14	18
6	14	14	13	13	12	12	12	12	14	16	17	17	17	18	18	19	18	18	17	16	15	16	16	15	15	19
7	14	14	13	13	13	13	13	13	14	16	17	18	18	17	19	19	19	18	17	16	16	16	15	15	16	19
8	15	14	14	14	14	14	13	13	14	15	16	17	17	18	19	19	19	18	17	16	14	14	14	14	16	19
9	13	12	11	12	11	9	8	9	10	10	12	21	21	21	21	22	21	21	20	19	16	18	18	18	16	22
10	17	17	17	17	17	17	16	17	16	18	19	20	21	22	22	22	23	22	21	20	19	20	19	19	19	23
11	19	19	19	18	18	18	18	17	18	19	20	21	21	22	22	22	23	22	21	21	20	19	19	19	20	23
12	19	18	18	18	17	18	18	17	17	18	18	21	21	22	21	22	22	21	20	19	19	19	18	18	19	22
13	18	18	18	18	18	18	19	19	19	21	21	22	22	23	23	23	22	21	20	19	19	19	19	18	20	23
14	18	18	18	18	18	18	17	17	17	17	19	19	18	18	18	17	18	17	17	16	16	14	13	13	17	19
15	14	13	13	13	13	13	14	14	16	17	18	18	19	20	21	20	19	18	17	17	17	17	17	17	17	21
16	17	17	17	15	14	13	12	12	11	12	13	14	16	17	17	17	17	17	16	15	14	14	15	14	15	17
17	14	14	14	14	14	14	13	13	13	15	16	17	18	18	17	18	18	18	18	17	15	17	17	16	16	18
18	16	15	13	13	12	13	12	12	12	14	15	16	17	12	12	11	12	11	11	11	11	10	10	10	13	17
19	10	10	10	10	10	10	10	9	9	9	9	9	10	11	11	11	11	11	11	11	11	11	11	11	11	11
20	10	10	10	10	10	10	9	9	9	9	9	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11
21	11	11	11	10	10	10	9	9	9	8	8	8	9	9	10	9	6	4	3	3	3	3	3	2	7	11
22	2	2	2	2	2	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0	0	-1	-1	0	1	2
23	0	-1	0	0	0	-1	-1	-1	-1	1	3	3	4	4	5	5	6	5	4	4	3	4	4	4	2	6
24	4	4	4	4	4	4	4	5	5	5	4	6	9	9	9	9	10	10	10	9	9	8	8	8	7	10
25	8	8	8	8	7	7	7	6	6	8	10	11	12	12	12	13	12	12	11	10	10	10	9	9	9	13
26	9	9	9	9	9	9	9	9	11	12	13	13	13	13	14	13	13	13	12	12	12	12	11	11	11	14
27	11	11	11	11	11	10	10	10	11	12	13	13	13	13	13	12	11	10	9	8	8	8	7	6	11	13
28	6	6	6	4	4	3	3	3	3	4	7	8	8	9	10	11	10	9	9	8	8	7	7	7	7	11
29	7	7	6	6	6	6	5	6	6	7	9	9	10	10	10	11	11	9	8	7	8	9	7	6	8	11
30	4	3	3	3	2	2	2	1	1	1	1	1	1	1	1	1	0	0	0	0	-1	-1	-1	-1	1	4
31	-1	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	-1	-1	-1	-2	-2	-2	-2	-3	-1	0
AV	12	11	11	11	11	11	10	10	11	11	12	13	14	14	14	14	14	13	13	12	12	12	12	11	12	
PK	19	19	19	19	18	18	19	19	19	21	21	22	22	23	23	23	23	22	21	21	20	20	19	19		23

DELTA TEMP. 30-3 M
DEG. C*100

LOGAN WASH
TRAILER 02
AUG 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK
1	0	-28	-56	0	0	0	-56	-28	-28	-139	-139	(IM)	417	417	278	167	167	56	28	28	-28	-28	-56	-56	40	417
2	-111	-139	-111	0	-56	111	139	-167	-167	-195	-167	0	167	56	83	56	-56	-56	0	139	334	167	0	-111	-3	334
3	-139	-56	-111	-139	-139	-139	-139	-83	-28	-139	0	222	278	334	334	167	222	83	0	-83	-56	167	-28	28	23	334
4	111	56	56	56	139	111	-56	-222	-278	-195	-111	139	222	167	111	0	56	0	-83	-139	-167	-83	-28	-28	-7	222
5	-139	-56	-111	-167	-83	-56	-28	28	111	167	167	278	334	417	139	167	56	0	56	0	0	56	56	111	63	417
6	23	0	-28	-56	-83	-28	-139	0	0	-56	0	278	278	417	389	278	139	28	56	0	0	111	-111	-83	59	417
7	56	-56	-28	-56	-83	0	56	-56	-56	-56	28	167	334	278	334	139	139	111	111	56	0	0	-28	0	58	334
8	-28	0	83	0	-28	-56	-56	-28	0	28	56	167	278	417	389	334	167	0	0	56	0	-139	-139	-167	56	417
9	-139	-111	-83	-222	-83	-139	56	-278	-222	-278	-83	-56	-56	0	0	56	56	0	28	0	0	0	0	0	-65	56
10	28	-25	-83	-83	-111	-56	-28	0	111	167	111	0	56	83	167	167	139	56	28	-28	-28	-28	-56	-83	21	167
11	-111	-56	-83	-83	-111	-111	-111	-28	-83	-111	139	167	278	361	389	334	139	83	56	28	0	0	-28	0	44	389
12	0	-28	0	0	-28	0	-28	28	111	167	139	167	278	278	334	278	167	111	56	28	0	0	0	-83	32	334
13	-83	0	0	-28	-28	-28	-56	28	56	56	83	111	167	167	222	167	56	28	0	28	28	-28	56	28	43	222
14	0	0	-56	111	111	-83	-111	-111	-83	111	0	-111	0	111	56	-28	28	0	-28	-56	-83	-83	-56	-28	-15	111
15	-56	-56	-83	-83	56	56	0	0	28	28	28	0	-28	222	139	111	0	83	83	28	28	28	56	83	31	222
16	56	83	56	28	56	0	0	0	0	56	28	56	83	-83	111	167	-139	-56	0	-56	-83	-56	-56	0	11	167
17	0	83	-56	0	56	0	0	-28	0	111	139	83	167	250	167	167	139	56	-28	0	-56	-56	-56	-28	46	250
18	-56	-28	0	0	0	0	0	28	28	0	0	0	139	111	139	0	0	0	28	28	-28	-139	-83	-111	2	139
19	-139	-139	-139	-111	-83	-83	-28	56	139	167	334	250	278	28	417	445	278	0	-28	-56	-83	-56	-83	-83	53	445
20	-111	-56	-83	-56	-28	-56	-28	28	28	278	417	417	222	139	167	278	111	28	28	0	-222	-111	-139	-167	45	417
21	-111	-139	-83	-56	-83	-83	-83	0	139	278	417	445	612	417	250	334	250	167	139	0	-111	-111	-111	-139	97	612
22	-111	-111	-111	-111	-139	-167	-167	-167	0	222	417	278	334	278	167	222	28	56	111	-111	-111	-111	-111	-28	23	417
23	-139	-139	-167	-195	-145	-139	-167	-56	56	334	556	612	612	612	556	417	278	139	0	-28	-139	-56	-83	-83	108	612
24	-83	-111	-28	-83	-139	-139	-139	0	222	222	417	612	612	445	445	417	111	56	0	-56	-139	-139	-111	-111	95	612
25	-167	-167	-167	-139	-139	-167	-167	-111	139	278	167	278	278	417	612	278	167	139	56	-56	-111	-111	-111	-139	44	612
26	-139	-111	-111	-111	-139	-56	-111	-83	0	195	473	612	612	278	139	139	278	417	167	-28	-83	-56	-83	-56	89	612
27	-83	-111	-111	-278	-167	-222	-167	139	334	417	445	417	500	556	417	222	139	111	28	0	-28	-56	-56	-33	98	556
28	-56	-56	-83	-56	-28	-28	-28	28	195	250	445	0	334	278	195	139	56	28	28	28	28	0	28	28	73	445
29	0	0	-28	-56	-56	0	0	28	56	139	195	167	445	417	417	334	195	139	56	0	0	0	-56	-83	96	445
30	-83	-56	-28	-111	-83	-28	0	28	56	83	56	83	111	83	111	56	111	139	56	-83	-139	-111	-56	-83	4	139
31	-56	-56	-56	28	0	0	0	56	167	222	250	389	334	278	278	167	139	56	0	0	0	0	0	0	92	389
AV	-60	-54	-61	-66	-54	-51	-53	-31	33	91	161	207	280	265	256	199	117	66	33	-11	-41	-33	-49	-50	46	
PK	111	83	83	111	139	111	139	139	334	417	556	612	612	612	612	445	278	417	167	139	334	167	56	111	612	

DELTA TFMP. 30-3 M
DEG. C=190

LOGAN WASH
TRAILER 02
SEPT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK
1	0	0	-56	-56	-56	-56	-56	-28	-28	-111	139	167	278	334	334	278	167	111	0	0	0	0	-56	0	54	334
2	-56	0	0	-28	0	56	0	0	0	56	111	167	278	389	389	278	167	111	0	0	0	0	0	0	80	389
3	0	0	0	0	111	0	0	-28	83	139	278	389	500	445	389	334	167	111	23	28	56	0	0	-28	127	500
4	-83	0	0	0	0	0	83	56	111	167	167	278	445	417	334	278	139	83	28	28	28	-56	23	28	107	445
5	111	139	139	139	139	278	111	-56	0	0	139	0	111	278	389	334	139	56	28	28	0	139	56	111	117	389
6	139	167	195	139	139	167	0	-278	-139	-28	139	222	278	389	445	278	167	111	56	56	56	0	0	-28	111	445
7	-28	-139	278	389	139	111	83	-56	-83	-111	111	56	278	445	389	278	167	111	56	28	56	111	56	28	115	445
8	28	0	28	28	28	0	0	0	0	-28	-83	-56	167	334	389	389	167	56	28	0	111	0	0	0	66	389
9	83	111	56	111	167	139	56	0	56	139	167	139	278	417	389	334	139	56	0	28	56	56	-28	-28	122	417
10	-56	-28	-56	56	83	-28	-83	-111	83	111	0	139	417	278	417	278	167	83	56	56	28	111	0	0	83	417
11	-56	-56	-28	-56	28	-28	56	-56	-222	278	306	278	445	417	167	139	111	35	56	56	56	83	83	56	92	445
12	28	0	0	0	0	-28	-56	56	167	278	278	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	278
13	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
14	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
15	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
16	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
17	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
18	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
19	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
20	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
21	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
22	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
23	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
24	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
25	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
26	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
27	-56	0	0	0	-28	28	0	-28	0	56	111	111	278	389	556	28	83	56	0	0	0	28	28	56	71	556
28	28	-28	28	-28	56	167	334	0	0	56	111	167	222	389	389	278	278	139	28	56	28	0	28	56	116	389
29	83	28	56	-28	-28	-83	0	0	-167	0	278	111	417	556	417	417	278	139	111	167	-28	-28	0	139	118	556
30	389	278	278	83	83	83	56	0	-28	-28	56	167	334	445	556	445	278	111	83	111	111	56	28	0	166	556
AV	35	29	57	47	54	51	37	-33	-11	61	144	156	315	395	396	281	181	97	42	40	35	31	14	24	103	
PK	389	278	278	389	167	278	334	56	167	278	306	389	500	556	556	445	278	139	111	167	111	139	83	139		556

DELTA TEMP. 30-3 M
DEG. CM100

LOGAN WASH
TRAILER 02
OCT 1979
OCCIDENTAL OIL SHALE INC.

HOUR (LOCAL STANDARD TIME)

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVE	PEAK
1	0	0	-28	-56	-56	-56	-56	-83	-56	111	222	83	111	417	417	445	389	167	111	83	83	56	28	28	98	445
2	28	0	0	0	0	0	0	0	0	0	167	139	3	417	389	139	167	83	83	56	111	83	83	111	86	417
3	83	83	56	28	56	0	-111	-167	139	222	278	417	389	306	278	222	139	56	0	0	-28	-83	-56	-56	94	417
4	-83	0	56	56	139	139	56	0	-56	0	139	278	222	278	417	278	111	111	56	83	0	0	0	0	95	417
5	0	28	0	0	-28	-28	-56	0	167	278	334	334	250	278	167	56	56	56	28	83	83	111	83	28	96	334
6	0	-28	0	-56	-83	-56	-56	0	222	278	278	167	278	417	445	278	139	83	33	-28	139	334	83	56	124	445
7	56	-56	-56	-83	-83	0	0	0	28	56	28	222	334	278	417	278	167	111	56	0	-28	-28	-28	-28	68	417
8	56	0	28	56	28	28	28	56	83	139	28	111	278	417	417	278	195	111	56	28	56	56	-28	-28	103	417
9	167	-28	-56	111	28	-56	-56	-56	28	167	222	278	0	0	278	139	0	0	0	0	28	0	28	0	51	278
10	0	0	111	56	0	-56	-56	-56	-111	111	139	278	417	389	334	334	167	83	56	56	111	139	56	28	108	417
11	56	-111	0	0	0	-56	56	-56	-139	-111	56	0	167	334	389	389	139	56	0	0	0	0	0	0	49	389
12	139	167	0	-56	-56	56	111	111	-56	56	139	278	222	278	167	56	83	111	278	0	0	0	-56	-56	82	278
13	-83	-56	28	334	389	334	167	0	-139	83	222	278	334	334	389	334	167	83	28	28	-28	28	0	-56	133	389
14	0	0	-56	0	-28	0	28	28	111	167	222	167	111	111	139	222	167	111	0	28	56	56	0	28	69	222
15	28	28	56	83	83	56	56	56	0	-56	0	139	278	389	389	278	167	111	28	56	56	0	0	28	96	389
16	56	56	56	56	28	0	-56	0	139	278	334	334	222	139	83	0	-111	0	0	0	111	139	0	0	73	334
17	167	56	83	56	111	0	0	0	56	139	195	167	139	111	83	83	111	111	56	0	56	56	56	83	82	195
18	56	56	56	56	0	0	0	0	139	250	334	417	278	334	167	278	278	111	28	28	56	28	56	56	127	417
19	56	56	56	56	56	56	56	56	56	56	83	111	139	111	111	93	56	56	56	56	56	56	56	56	68	139
20	56	56	56	56	56	56	56	56	56	56	56	56	56	83	111	83	28	28	0	28	23	28	28	0	49	111
21	-28	0	0	0	-28	0	0	0	0	0	56	83	83	111	139	139	111	28	-28	-28	-83	-111	-111	-83	11	139
22 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
23 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
24 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
25 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
26 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
27 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
28 (RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	(RF)	()	()
29	0	0	0	-56	-56	-56	-139	-139	-56	-111	-111	-111	-83	-139	-83	-56	-111	-56	-167	-111	0	83	111	83	-57	111
30	0	0	28	28	-56	-83	-83	-28	-28	0	0	-56	-56	-56	-83	-111	-28	56	111	278	222	278	278	278	37	278
31 (IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	(IM)	()	()
AV	35	13	21	32	22	12	-2	-9	26	95	146	181	181	232	242	183	112	72	40	32	47	57	24	24	76	
FW	167	167	111	334	389	334	167	111	222	278	334	417	417	417	445	445	389	167	278	278	222	334	278	278	445	

APPENDIX B

to

AN ECOLOGICAL BASELINE STUDY OF FLORA,
VEGETATION, AND SOILS ON
THE OCCIDENTAL OIL SHALE, INC.
LOGAN WASH SITE NEAR DEBEQUE, COLORADO

VEGETATION DATA AND ANALYSIS
FOR SEPTEMBER, 1979

by

Neil E. West

and

James R. Irvine

for

OCCIDENTAL OIL SHALE, INC.
Grand Junction
Colorado

November, 1979

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ABSTRACT

Twenty-one macroplots that had been located during the 1974 and 1975 field season have been consistently resurveyed in July, 1977 and July, 1978, for cover density and frequency of various higher plant species. These plots were again resurveyed in late August-early September, 1979, with methods remaining consistent with previous data collections. Observation of general conditions of the vegetation in relation to natural and man-induced changes were also noted.

Tables summarizing data for each of nine community types are presented. General comparisons were made with the data collected in 1978. There were only slight changes in vegetal cover, density, and frequency. Fluctuations were mostly associated with understory species, especially some annuals that bloom later in the summer and others that have matured and decomposed by late summer. Variation in abundance occurs naturally throughout the flowering season. Other site conditions were similar to the 1978 data set.

INTRODUCTION

Monitoring of vegetation begun in 1974 on the Occidental Oil Shale, Inc. Logan Wash site nine miles north of DeBeque, Colorado was repeated in 1979 in order to determine natural fluctuations and man-induced changes. This process allows for expansion of the existing data bank and measures the condition of the vegetation during different periods of the flowering season. Such information is useful for future comparisons and monitoring change of vegetation due to climatic-seasonal variations and industrial perturbations.

METHODS

During the 1974-1975 field season, 54 macroplots were located throughout Occidental Oil Shale, Inc. property and adjacent Bureau of Land Management (BLM) lands (Fig. 1). These macroplots were combined into nine plant community types. Three macroplots were chosen from each community type for the 1977 resurvey. The selection of macroplots was based on comparative floristic diversity and the relative abundance of vegetal cover in the macroplot: one macroplot had the fewest species and lowest apparent vegetal cover, one had a nearly average number of species and near average vegetal cover, and the third macroplot had the greatest floristic diversity and vegetal cover available from the set of 1975 macroplots taken in a given vegetation type. In the cases where only two or three macroplots existed in a community type, all were surveyed. The same subset of macroplots were again resurveyed in late August-early September except two macroplots (#1 and #20), which could not be located due to the removal of the macroplot marker stake. This resulted in 21 macroplots being resurveyed (Table 1).

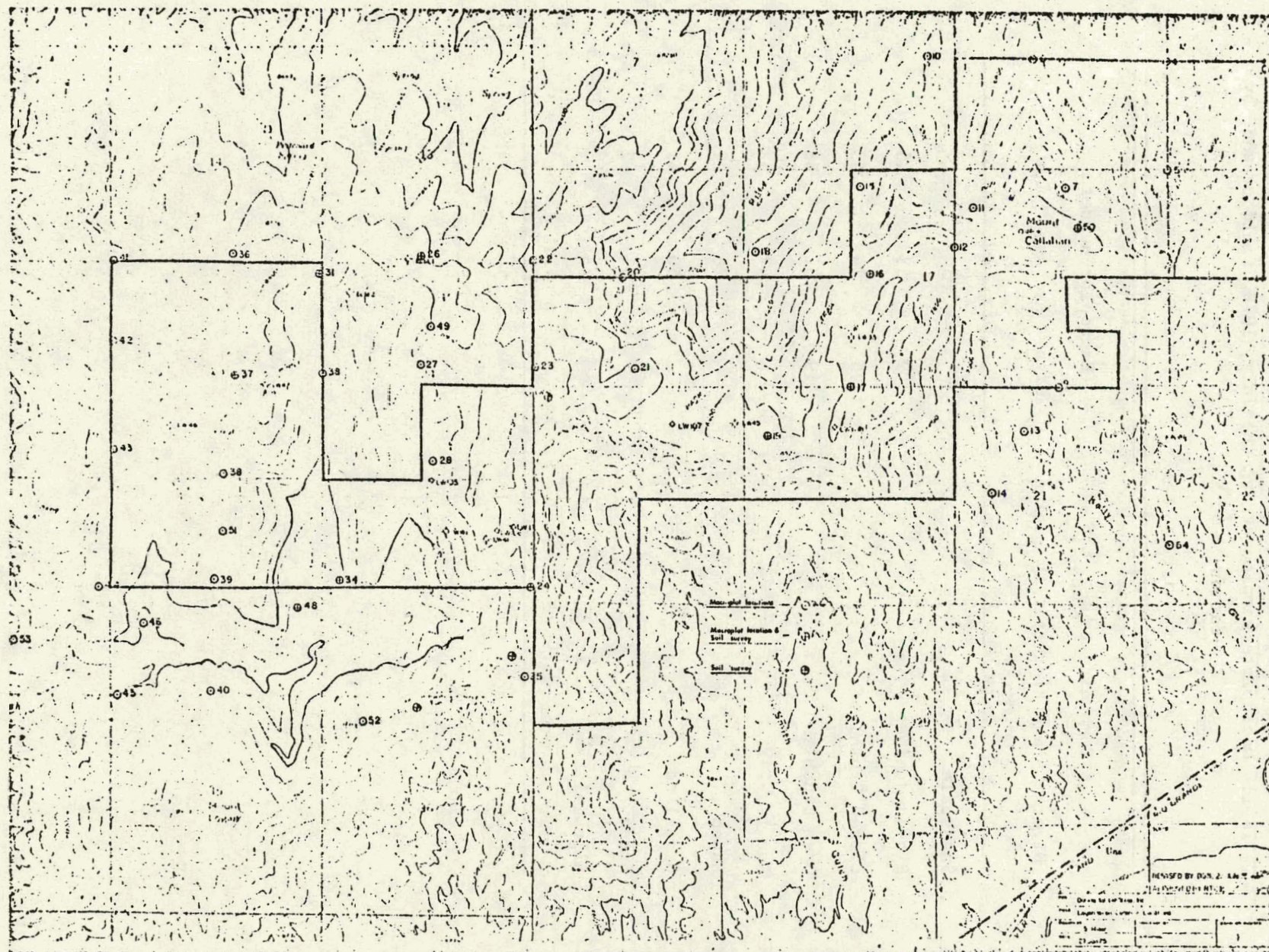


Figure. 1. Map of Occidental Oil Shale Corp. property with vegetation and soil sample locations

Table 1. Macroplots sampled during the July, 1978, field season, by community type.

Community type	Macroplot number		
	High	Average	Low
Diversity and Productivity Rating			
Shadscale		54	
Pinyon-Juniper	9	53	45
Closed Brushland	25	24	43
Open Brushland	19	32	38
Douglas-Fir		42	52
Aspen		26	22
Grassland		50	41
Scree		51	2
Alluvial		48	

RESULTS

Tables 2 through 10 summarize vegetation data recorded in each of nine community types located on Occidental Oil Shale, Inc. property.

Little change in total cover, density, and frequency occurred between 1978 and 1979. The most significant change was a general decrease in understory annuals in most plant communities.

Since soil moisture recharge in 1979 was similar to 1978, relatively little change in overstory vegetation occurred. However, due to the economic circumstances, resampling of the macroplots did not occur until late August-early September. By this time, a majority of the annual vegetation had flowered, seeds had shattered and standing dead material was in various states of decomposition. This led to a general decrease in annual vegetal cover. However, several species of annuals, especially Gayophytum ramosissimum and Viguiera multiflora were at peak bloom and showed an increase in relative cover.

In the Aspen woodland community numerous new stems (probably root suckers) of Populus tremuloides were found. Increase in aspen stems is probably a response to two good years of soil moisture recharge.

Of particular interest are macroplot numbers 2, 9, and 54 located in the Kelly Wash area. Scree macroplot 2 at the ridge top had 6 inch to 1 foot deep gullies spaced approximately 10 feet apart. These gullies appear due to heavy cornicing of snow along the ridgetop. Removal of vegetation occurred, but high moisture recharge over the last two years caused higher cover and density figures. Roots were generally exposed.

Macroplot 9 at about midslope in Pinyon-Juniper woodlands showed scouring by mud and debris. Ten to 30 feet deep gullies were created and vegetation removed and roots exposed. Macroplot 54 at the slope base was

Table 2. Summary of 1979 vegetation data for the shadscale community type by cover (C), Density (D, number of plants per 50 m²), and frequency (F).

Species ^{1/}	Macroplot numbers					
	54			Average		
	C ^{2/}	D	F ^{3/}	C	D	F
Trees and Shrubs						
<i>Artemisia tridentata</i>	4	7	30	4	7	30
dead <i>Artemisia tridentata</i>	T	1	10	T	1	10
<i>Sarcobatus vermiculatus</i>	3	5	50	3	5	50
<i>Atriplex confertifolia</i>	2	7	50	2	7	50
<i>Atriplex nuttallii</i>	2	2	20	2	2	20
<i>Juniperus osteosperma</i>	1	1	10	1	1	10
Grasses						
<i>Bromus tectorum</i>	2	20	40	2	20	40
<i>Orizopsis hymenoides</i>	T	4	30	T	4	30
<i>Agropyron spicatum</i>	T	0	0	T	0	0
<i>Elymus salina</i>	T	0	0	T	0	0
Forbs						
<i>Lepidium perfoliatum</i>	1	10	10	1	10	10
<i>Halogeton glomeratus</i>	1	7	20	1	7	20
<i>Humenoxys acaulis</i>	T	11	20	T	11	20
<i>Amsonia tomenatosa</i>	1	1	10	1	1	10
<i>Chenopodium album</i>	0	100	10	0	100	10

^{1/} For authorities, listing of associated common names, life forms, longevities, season of growth and origin see Table 3 of 1976 report.

^{2/} Cover is line intercept vertical projection of percentage of line which has vegetation canopy above it.

^{3/} Frequency is the percentage of the 10 1x5 meter macroplots which has at least one individual of a given species occurring in it.

T = Trace

Table 3. Summary of the 1979 vegetation data for the Pinyon-Juniper woodland community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot number											
	9			45			53			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Trees and shrubs												
<i>Juniperus osteosperma</i>	8	3	20	4	0	0	10	1	10	7	1	13
dead <i>Juniperus osteosperma</i>	2	0	0							1	0	0
<i>Cercocarpus montanus</i>	5	6	50	6	11	60	3	7	40	5	8	50
dead <i>Cercocarpus montanus</i>	T	1	10	1	0	0				T	1	3
<i>Artemisia tridentata</i>				10	18	60				3	6	20
dead <i>Artemisia tridentata</i>				1	1	10				T	1	3
<i>Amelanchier alnifolia</i>				3	15	60				1	5	20
dead <i>Amelanchier alnifolia</i>				1	0	0				T	0	0
<i>Ephedra viridis</i>	1	2	20	2	10	40	T	1	10	1	4	23
dead <i>Ephedra viridis</i>				1	0	0				T	0	0
<i>Pinus edulis</i>							3	0	0	1	0	0
<i>Symphoricarpos oreophilus</i>				1	15	70				T	5	23
dead <i>Symphoricarpos oreophilus</i>				0	2	20				0	1	7
<i>Gutierrezia sarothrae</i>	1	7	30							T	2	10
<i>Atriplex confertifolia</i>	T	0	0							T	0	0
<i>Chrysothamnus viscidiflorus</i>	0	1	10							0	1	3
Grasses and grass-like												
<i>Elymus salina</i>	4	29	80	14	133	100	0	7	20	9	56	67
<i>Oryzopsis hymenoides</i>	T	1	10	2	13	20	T	1	10	1	5	13
<i>Bromus tectorum</i>				T	12	10	T	0	0	T	4	3
<i>Agropyron spicatum</i>							T	1	10	T	1	3
<i>Sitanion hystrix</i>				T	0	0				T	0	0
<i>Hilaria jamesii</i>				T	0	0				T	0	0
Forbs												
<i>Hymenoxys acaulis</i>	T	15	10	1	25	50				T	13	20
<i>Cryptantha bakerii</i>	T	2	20	1	11	40	T	11	50	T	8	37
<i>Physaria australis</i>							T	8	50	T	3	17
<i>Euphorbia robusta</i>	T	1	10				T	4	10	T	2	7
<i>Lepidium perfoliatum</i>							T	6	20	T	2	7
<i>Leptodactylon walsonii</i>				T	5	20				T	2	7
<i>Stanleya pinnati</i>				1	1	10	0	1	10	T	1	7
<i>Arenaria fendlerii</i>				T	1	20				T	1	7
<i>Astragalus</i> spp.	T	1	10							T	1	3
<i>Erigeron eatonii</i>				T	2	10				T	1	3
<i>Allium cernuum</i>				T	0	0				T	0	0

Table 3 (continued).

Species	Macroplot numbers											
	9			45			53			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Forbs (cont.)												
<i>Penstemon strictus</i>				T	0	0				T	0	0
<i>Erysimum inconspicuum</i>				T	0	0				T	0	0
<i>Pennstemon ousterhoutii</i>				0	1	10				0	1	3
Succulents												
<i>Yucca harrimaniae</i>	T	0	0							T	0	0
<i>Opuntia rhodantha</i>				T	0	0				T	0	0

Table 4. Summary of the 1979 vegetation data for the closed brushland community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot number											
	24			25			43			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Trees and Shrubs												
<i>Amelanchier alnifolia</i>	29	36	80	7	16	60	16	39	80	17	50	70
dead <i>Amelanchier alnifolia</i>	2	2	20	1	3	20	1	1	10	1	2	20
<i>Quercus gambelii</i>	17	40	90	15	41	90	13	82	80	15	54	86
dead <i>Quercus gambelii</i>	2	2	20	2	0	0	2	7	40	2	3	20
<i>Symphoricarpos oreophilus</i>	13	22	90	T	1	10	T	7	40	4	10	47
dead <i>Symphoricarpos oreophilus</i>	T	0	0							T	0	0
<i>Purshia tridentata</i>				8	10	50				3	3	17
<i>Cercocarpus montanus</i>	1	2	20	1	0	0	8	2	10	3	1	10
dead <i>Cercocarpus montanus</i>							T	0	0	T	0	0
<i>Artemisia tridentata</i>	T	1	10	2	3	20	1	2	10	1	2	13
dead <i>Artemisia tridentata</i>				T	0	0				T	0	0
<i>Chrysothamnus viscidiflorus</i>				T	2	10	0	1	10	T	1	7
<i>Tetradymia canescens</i>							T	1	10	T	1	3
<i>Ceanothus martinii</i>	T	0	0	T	0	0				T	0	0
<i>Pseudotsuga menziesii</i>	T	0	0							T	0	0
<i>Ribes wolfii</i>				1	0	0				T	0	0
Grasses and grass-like												
<i>Oryzopsis hymenoides</i>	T	2	20	1	13	60	1	7	50	1	7	43
<i>Elymus salina</i>				T	2	20	2	19	30	1	7	17
<i>Carex rossii</i>	1	30	20	1	30	60				T	20	27
<i>Poa pratensis</i>				T	30	10				T	10	10
<i>Stipa lettermanii</i>				T	0	0				T	0	0
<i>Festuca daoyolada</i>	0	1	10	0	0	0				0	1	5
Forbs												
<i>Penstemon ousterhoutii</i>	T	12	20	2	46	70	1	15	60	1	24	50
<i>Galium coloradoense</i>	T	6	20	1	15	50	3	44	100	1	22	57
<i>Pachystima myrsinites</i>	1	16	70	T	0	0	T	5	30	T	7	23
<i>Eriogonum umbellata</i>	T	0	0	1	22	40				T	7	13
<i>Achillea lanulosa</i>	T	12	10							T	4	3
<i>Physaria australis</i>	T	1	10	T	2	10	1	6	50	T	3	23
<i>Castilleja linariifolia</i>							T	5	20	T	2	7
<i>Penstemon strictus</i>	T	2	20							T	1	7
<i>Stephanomeria tenuifolia</i>	T	1	10	T	0	0				T	1	3
<i>Chenopodium album</i>							T	0	0	T	0	0
<i>Eriogonum effusum</i>				0	1	10				0	1	3
<i>Leptodactylon watsonii</i>				0	1	10				0	1	3
<i>Tragopogon dubius</i>							0	1	10			

Table 5. Summary of the 1979 vegetation data for the open brush-grassland community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot numbers											
	19			32			38			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Trees and Shrubs												
<i>Amelanchier alnifolia</i>	4	11	20	16	35	70	17	21	50	12	22	47
dead <i>Amelanchier alnifolia</i>	T	1	10	1	6	60	2	1	10	1	3	27
<i>Symphoricarpos oreophilus</i>	4	28	10	20	62	100	8	12	50	11	33	73
dead <i>Symphoricarpos oreophilus</i>	T	1	10	0	2	20	0	1	10	T	1	13
<i>Quercus gambelii</i>	1	11	21	10	72	60	17	27	80	10	37	53
dead <i>Quercus gambelii</i>	T	0	0	1	7	30	2	0	0	1	2	10
<i>Artemisia tridentata</i>	11	31	90	3	9	30	9	23	70	8	21	60
dead <i>Artemisia tridentata</i>	3	8	70	T	1	10	7	3	30	1	4	37
<i>Prunus virginiana</i>				10	19	30				3	6	10
<i>Purshia tridentata</i>				T	0	0	3	1	10	1	1	3
<i>Tetradymia canescens</i>				0	1	10				0	1	3
Grasses and Grass-like												
<i>Carex rossi</i>	8	40	100	7	20	70				5	30	57
<i>Poa pratensis</i>	4	30	90	T	15	70				1	15	53
<i>Stipa lettermanii</i>	1	24	50	T	1	10				T	8	20
<i>Sitanion hystrix</i>	1	16	80							T	5	27
<i>Bromus polyanthus</i>	0	2	10	1	3	30				T	2	13
<i>Bromus inermis</i>	T	1	10				T	2	10	T	1	7
<i>Oryzopsis hymenoides</i>				0	3	10	T	0	0	T	1	3
<i>Stipa comata</i>	T	0	0	T	4	10				T	1	3
<i>Agropyron smithii</i>	T	2	10	T	0	0				T	1	3
<i>Agropyron spicatum</i>				T	1	10				T	1	3
<i>Elymus salina</i>							T	0	0	T	0	0
Forbs												
<i>Lupinus adoncus</i>	4	58	90	6	57	70	2	31	90	4	49	83
<i>Eriogonum umbellatum</i>	2	82	71	1	18	30	1	32	80	1	44	60
<i>Achillea lanulosa</i>	1	60	80	T	30	30	1	16	20	1	35	43
<i>Gayophytum ramosissimum</i>	1	40	20	1	16	30	T	0	0	1	84	17
<i>Lathyrus leucanthus</i>	2	32	60	2	32	70	T	2	20	1	22	50
<i>Lathyrus pauciflorus</i>	1	15	60	1	26	80				1	14	47
<i>Erigeron speciosus</i>	0	3	10	2	19	60				1	7	23
<i>Antennaria rosea</i>	1	41	60							T	14	20
<i>Agastache urticifolia</i>				2	36	30				T	12	10
<i>Salium boreale</i>				1	3	50				T	8	17
<i>Chenopodium album</i>				T	41	20				T	6	7
<i>Rosa nutkana</i>				1	0	60				T	4	20

(continued)

Table 5 (continued).

Species	Macroplot number											
	19			32			38			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Forbs (cont.)												
<i>Viguiera multiflora</i>	T	3	10	1	8	30	T	0	0	T	4	13
<i>Ligusticum porteri</i>				2	12	30				T	4	10
<i>Penstemon ousterhoutii</i>				T	1	10	1	9	50	T	3	20
<i>Aster canescens</i>	T	2	20	T	1	10	T	1	10	T	1	13
<i>Comandra umbellata</i>	T	1	10	T	1	10				T	1	7
<i>Phacelia hastata</i>	T	1	10				T	1	10	T	1	7
<i>Castilleja linariifolia</i>	T	0	0	T	1	10	0	2	10	T	1	7
<i>Lithosperma ruderae</i>	T	3	20				T	0	0	T	1	7
<i>Hymenoxys acaulis</i>	T	3	10							T	1	3
<i>Cirsium undulatum</i>	T	0	0	T	1	10				T	1	3
<i>Senecio serra</i>							T	1	10	T	1	3
<i>Galium coloradoense</i>							1	2	10	T	1	3
<i>Pachistima myrsinites</i>							T	1	10	T	1	3
<i>Penstemon strictus</i>				T	1	10				T	1	3
<i>Salsola kali</i>	T	0	0							T	0	0
<i>Erigeron eatonii</i>	T	0	0							T	0	0
<i>Chaenactis douglasii</i>	T	0	0							T	0	0
<i>Taraxacum laevigatum</i>	T	0	0	T	0	0				T	0	0
<i>Collomia linearis</i>	T	0	0							T	0	0
<i>Gilia aggregata</i>							T	0	0	T	0	0
<i>Tragopogon dubius</i>							T	0	0	T	0	0
<i>Chrysopsis villosa</i>							T	0	0	T	0	0
<i>Linum lewisii</i>				T	0	0				T	0	0
<i>Physaria australis</i>							0	1	10	0	1	3
Succulents												
<i>Opuntia rhodantha</i>				T	0	0	T	0	0	T	0	0

Table 6. Summary of the 1979 vegetation data for the Douglas-fir forest community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot numbers								
	42			52			Average		
	C	D	F	C	D	F	C	D	F
Trees and Shrubs									
<i>Pseudotsuga menziesii</i>	20	7	40	25	5	40	26	3	40
dead <i>Pseudotsuga menziesii</i>	T	1	10				T	1	5
<i>Amelanchier alnifolia</i>	20	11	60	7	10	50	14	11	55
dead <i>Amelanchier alnifolia</i>				2	0	0	1	0	0
<i>Quercus gambelii</i>	12	27	80	10	55	100	11	41	90
dead <i>Quercus gambelii</i>	1	3	20	1	2	20	1	3	20
<i>Symphoricarpos oreophilus</i>	8	20	80	1	7	30	5	14	55
<i>Betula occidentalis</i>	7	4	30				4	2	15
<i>Rosa nutkana</i>	5	28	90				3	14	45
<i>Acer glabrum</i>	3	4	30				2	2	15
<i>Ribes wolfii</i>	T	2	20	2	2	20	1	2	20
<i>Cercocarpus montanus</i>	1	2	20	T	1	10	T	2	15
<i>Ceanothus martinii</i>				T	1	10	T	1	5
<i>Chrysothamnus nauseosus</i>				T	1	10	T	1	5
Grasses and Grass-like									
<i>Carex rossii</i>	4	85	50	1	10	50	3	48	50
<i>Elymus salina</i>				1	32	30	T	16	15
<i>Sitanion hystrix</i>				T	1	10	T	1	5
Forbs									
<i>Berberis repens</i>	7	94	100	T	11	30	4	53	65
<i>Pachystima myrsinites</i>	3	14	80				2	7	40
<i>Pestomen ousterhoutii</i>				2	73	70	1	37	35
<i>Clematis linguistictifolia</i>	2	22	50				1	11	25
<i>Galium boreale</i>	2	18	50				1	9	25
<i>Lathyrus leucanthus</i>	2	0	0				1	0	0
<i>Smilacina stellata</i>	1	24	50				T	12	25
<i>Smilacina racemosa</i>	1	A	70				T	10	35
<i>Allium cernuum</i>	T	5	40				T	3	20
<i>Achillea lanulosa</i>				T	0	0	T	0	0
<i>Aster canescens</i>				T	0	0	T	0	0
<i>Galium coloradoense</i>				T	0	0	T	0	0

Table 7. Summary of the 1979 vegetation for the aspen woodland community type by cover (C), density (D, number of plants per 50 m²) and frequency (F).

Species	Macroplot numbers											
	21			22			26			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Trees and Shrubs												
<i>Populus tremuloides</i>	60	18	40	30	16	50	39	17	60	43	17	50
<i>Symphoricarpos oreophilus</i>	10	30	90	10	56	80	8	14	40	9	33	70
dead <i>Symphoricarpos oreophilus</i>	0	2	20							0	1	7
<i>Acer glabrum</i>	12	79	70	6	37	60				6	22	43
<i>Rosa nutkana</i>	9	7	40	1	11	50	1	2	20	4	7	37
<i>Amelanchier alnifolia</i>	1	0	0	0	1	10				T	1	3
<i>Chrysothamnus viscidiflorus</i>	T	2	10							T	1	3
<i>Artemisia tridentata</i>	0	1	10				0	2	20	0	1	10
Grass and Grass-like												
<i>Carex rossii</i>	9	20	50	12	40	90	9	40	50	10	33	63
<i>Poa pratensis</i>	7	30	20	5	30	10	10	50	20	7	37	17
<i>Stipa lettermanii</i>	T	5	10	T	5	30	T	2	20	T	4	20
<i>Stipa comata</i>	T	4	30				T	0	0	T	1	10
<i>Elymus salina</i>	T	0	0							T	0	0
Forbs												
<i>Senecio serra</i>	2	17	30	13	204	90	7	79	70	7	100	70
<i>Galium boreale</i>	12	378	100	6	181	100	1	15	50	6	191	83
<i>Osmorhiza occidentalis</i>	3	140	90	6	140	80	2	37	30	4	106	67
<i>Lathyrus leucanthus</i>	3	42	90	3	74	80	2	33	70	3	50	80
<i>Thalictrum fendleri</i>	1	22	70	1	152	90	3	30	50	2	68	70
<i>Lathyrus pauciflorus</i>	2	35	70	2	54	80	1	30	60	2	40	70
<i>Taraxacum officinale</i>	1	27	30	1	42	50	2	51	80	1	37	53
<i>Ligusticum porteri</i>	1	3	20	T	6	40	3	12	60	1	7	40
<i>Achillea lanulosa</i>	T	19	20	1	44	40	1	26	70	T	30	60
<i>Chenopodium album</i>				0	10	10	T	56	40	T	22	17
<i>Gayophytum ramosissimum</i>							1	65	30	T	22	10
<i>Agastache urticifolia</i>	T	4	30	1	17	50	T	0	0	T	7	27
<i>Chenopodium botrys</i>	T	14	30							T	5	10
<i>Aquilegia caerulea</i>				0	6	10	T	5	20	T	4	10
<i>Smilacina stellata</i>	T	0	0	1	12	10				T	4	3
<i>Fragaria ovalis</i>				T	6	10	T	4	20	T	3	10
<i>Aster canescens</i>							T	8	30	T	3	10
<i>Castilleja linariaefolia</i>							1	7	40	T	2	13
<i>Potentilla gracilis</i>							T	3	20	T	1	7
<i>Cirsium undulatum</i>							T	4	20	T	1	7
<i>Geranium fremontii</i>	T	0	0	T	3	20	T	0	0	T	1	7

(continued)

Table 7 (cont.)

Species	Macroplot numbers											
	21			22			26			Average		
	C	D	F	C	D	F	C	D	F	C	D	F
Forbs (cont.)												
<i>Valeriana occidentalis</i>	T	2	10	T	0	0				T	1	3
<i>Streptopus amplexifolius</i>	T	1	10							T	1	3
<i>Hackelia floribunda</i>							T	2	10	T	1	3
<i>Erigeron speciosus</i>	T	0	0							T	0	0
<i>Phacelia sericea</i>	T	0	0							T	0	0
<i>Lupinus aduncus</i>							T	0	0	T	0	0
<i>Penstemon striatus</i>	0	1	10							0	1	3
<i>Viola canadensis</i>							0	3	10	0	1	3

Table 8. Summary of the 1979 vegetation data for the Grassland community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot numbers								
	41			50			Average		
	C	D	F	C	D	F	C	D	F
Trees and Shrubs									
<i>Artemisia frigida</i>	4	28	90				2	14	45
<i>Amelanchier alnifolia</i>	3	2	10				2	1	5
<i>Chrysothamnus visidiflorus</i>				2	18	80	1	9	40
<i>Ephedra viridis</i>	2	3	30						
<i>Atriplex canescens</i>	1	11	50				T	6	25
<i>Symphoricarpus oreophilus</i>	1	4	20				T	2	10
<i>Tetradymia canescens</i>				T	3	10	T	2	5
<i>Gutierrezia sarothrae</i>	T	2	10				T	1	5
<i>Artemisia arbuscula</i>				T	0	0	T	0	0
<i>Chrysothamnus nauseosus</i>	1	0	0				T	0	0
Grasses									
<i>Elymus salina</i>	10	100	90	18	237	90	14	169	70
<i>Bromus tectorum</i>	11	180	90				6	90	45
<i>Oryzopsis hymenoides</i>	5	40	100	3	16	60	4	28	80
<i>Hilaria jamesii</i>				2	35	50	1	18	35
<i>Stipa comata</i>				T	0	0	T	0	0
<i>Sitanion hystrix</i>				T	0	0	T	0	0
Forbs									
<i>Erigeron eatonii</i>				5	115	90	3	50	45
<i>Astragalus amphioxys</i>				3	24	80	2	12	40
<i>Eriogonum effusum</i>	4	12	80	T	0	0	2	6	40
<i>Rorripa islandica</i>	2	4	40	T	4	30	1	4	35
<i>Castilleja rhexifolia</i>				1	52	80	T	26	40
<i>Hymenoxys acaulis</i>				1	28	70	T	14	35
<i>Astragalus spp.</i>				1	16	80	T	8	40
<i>Chenopodium album</i>	T	7	40				T	4	20
<i>Achillea lanulosa</i>				1	8	20	T	4	10
<i>Penstemon ousterhoutii</i>	T	5	30				T	3	15
<i>Linum lewisii</i>				T	5	20	T	3	10
<i>Artemisia biennis</i>	T	5	20				T	3	10
<i>Arenaria fendlerii</i>				T	3	20	T	2	10
<i>Galium coloradoense</i>	T	3	10				T	2	5
<i>Cryptantha bakerii</i>	T	1	10				T	1	5
<i>Speargalcea coccinea</i>	1	1	10				T	1	5
<i>Trifolium gymnocarpon</i>				T	2	10	T	1	5
<i>Leptodactylon watsonii</i>				T	0	0	T	0	0
<i>Eriogonum umbellatum</i>				0	1	10	0	1	15

Table 9. Summary of the 1979 vegetation data for the scree slope community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot numbers								
	2			51			Average		
	C	D	F	C	D	F	C	D	F
Trees and Shrubs									
<i>Holodiscus dumosus</i>	1	1	10	3	3	20	2	2	15
<i>Chrysothamnus viscidiflorus</i>	T	0	0	T	1	10	T	1	5
<i>Symphoricarpos oreophilus</i>				1	1	10	T	1	5
Grasses									
<i>Agropyron spicatum</i>	T	0	0	T	1	10	T	1	5
<i>Festuca dasyclada</i>				T	1	10	T	1	5
<i>Oryzopsis hymenoides</i>	T	1	10				T	1	5
Forbs									
<i>Pteryxia hendersonii</i>	2	20	80				1	10	40
<i>Leptodaactylon watsonii</i>	2	12	80				1	6	40
<i>Cirsium undulatum</i>	1	5	40	T	0	0	1	3	20
<i>Galum coloradoense</i>	1	40	70				T	20	35
<i>Penstemon cyanocaulis</i>	0	1	10	T	12	50	T	6	30
<i>Euphorbia robusta</i>	T	3	30				T	2	15
<i>Mentzelia albicaulis</i>	T	3	20				T	2	10
<i>Astragalus lutosus</i>	T	1	10	0	1	10	T	1	20
<i>Physaria australis</i>	T	1	10				T	1	5

Table 10. Summary of the 1979 vegetation data for the alluvial community type by cover (C), density (D, number of plants per 50 m²), and frequency (F).

Species	Macroplot numbers								
	46			48			Average		
	C	D	F	C	D	F	C	D	F
Trees and Shrubs									
<i>Artemisia tridentata</i>	20	33	90	19	25	90	20	29	90
dead <i>Artemisia tridentata</i>	7	9	60	4	9	60	6	9	60
<i>Symphoricarpos oreophilus</i>	T	3	20	20	36	100	10	20	60
dead <i>Symphoricarpos oreophilus</i>	T	0	0	0	8	35	T	4	15
<i>Quercus gambelii</i>	4	3	10	14	85	70	9	44	40
dead <i>Quercus gambelii</i>				T	0	0	T	0	0
<i>Chrysothamnus nauseosus</i>	7	8	50	5	4	30	6	6	40
<i>Amelanchier alnifolia</i>	5	0	0	T	0	0	3	0	0
<i>Rhus trilobata</i>	2	3	20				1	2	10
<i>Cercocarpus montanus</i>	1	0	0	T	1	10	T	1	5
<i>Juniperus osteosperma</i>	1	0	0				T	0	0
<i>Rosa nutkana</i>				T	0	0	T	0	0
Forbs									
<i>Penstemon ousterhoutii</i>	1	1	10	3	48	80	2	25	45
<i>Stanleya pinnata</i>	2	2	20	0	1	10	1	2	15
<i>Erigeron inconspicuus</i>	1	60	70				T	30	10
<i>Lepidium perfoliatum</i>	1	41	50	0	10	10	T	29	30
<i>Physaria australis</i>	1	45	90	T	1	10	T	23	50
<i>Cryptantha bakerii</i>	1	25	70				T	12	35
<i>Chenopodium album</i>	T	1	10				T	1	5
<i>Aster canescens</i>				T	2	10	T	1	5
<i>Galium coloradoense</i>				0	1	10	0	1	5
<i>Euphorbia robusta</i>	T	0	0				T	0	0
<i>Artemisia biennis</i>	T	0	0				T	0	0
<i>Cirsium undulatum</i>				T	0	0	T	0	0

partially destroyed as mud and debris overflowed 15 foot deep gullies and deposited 1 to 2 feet of mud over half the macroplot. This action removed and buried much vegetation. This phenomenon was also observed on south-facing side canyons coming into Logan Wash. Considerable scouring and gullying was noted at mid-slope, and mud and debris accumulated at slope bases.

Vegetation behind the old exhaust stack has recovered to normal conditions and the new exhaust stack, although very recent, has appeared to have little effect on surrounding vegetation.

By comparing the values presented in tables of preceding reports and noting climatic data for that same period, we can judge that almost all fluctuations detected by the four years of sampling thus far are largely due to climatic and seasonal variations. Mining activity up to the present seems to have had little effect on vegetation and its growth. The only detectable change from mining activity has been surface destruction from tailing deposits and road-building activity.

CONCLUSIONS

Twenty-one vegetation macroplots were resurveyed in late August-early September, 1979. Tabular summaries of the data were organized for each community type.

Little difference in overstory and shrub cover occurred between 1978 and 1979 due to similar soil moisture conditions. Seedling and root suckers have increased in response to this favorable moisture situation. Annual plant species varied due to their seasonal cycle and time of measurement. This change occurs naturally as these plants complete their annual life cycle.

The data collected during the previous four years should give a good baseline of average values found prior to major activity on the pro-

perty. These four years, because they represent near average (1975), drought (1977) and wet (1978 and 1979) conditions, give a good indication of the natural fluctuations in the vegetation due to the major climatic control, i.e. winter precipitation. They also include the effects of frost, insect outbreaks on major species, erosional influences, etc. This data bank provides evidence of the importance of these natural perturbations and allows, when coupled with climatic and other environmental data, the separation of natural from man-induced changes in vegetation.

RECOMMENDATIONS

Continual resampling of the vegetations should take place to monitor long-term changes in vegetation that might be related to man's activity on the property.

Recommendations made in 1978 should be observed. Plots closer to the mining activity should be established and compared to the baseline data that has accumulated. A summarization of the vegetation data and its relation to climatic, livestock and insect herbivory, frost, erosional influences, etc. might prove useful after next year's readings.

Revegetation studies should occur on raw shale mine tailings to determine plant species suitable for revegetation and methods that would expedite reestablishment of original plant communities. Such a program is desirable to prevent mudflows similar to the natural situation that occurred in the Kelly Wash area. This would also decrease the risk of carrying sediments into water drainages and reduce surface leaking of undesirable elements.

APPENDIX C
COORS LABS WATER QUALITY ANALYSIS

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI 1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

	6113 A-474	6113 A-475	6115 A-476	6122 A-477	6127 A-478	6121 A-479	6127 A-480
TOC (mg/l)	44	35	2496	144	63	4251	37
DCC (mg/l)	30	29	2375	130	35	3232	17
SiO ₂ (mg/l)	< 1	< 1	461	8	< 1	533	< 1
Nitrogen-Kjeldahl (mg/l)	4	4	3620	6	2	3370	2
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
SCN							
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity (mg/l)	To be reported.						
Total Hardness (mg/l)	To be reported.						
Sulfate (mg/l)	To be reported.						
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium (mg/l)	< 0.02	< 0.02	0.09	< 0.02	< 0.02	0.07	< 0.02
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron (mg/l)	0.5	3.6	0.2	5.5	1.6	0.2	0.3

< = less than

Coors / SPECTRO-CHEMICAL LABORATORY

LABORATORY REPORT

Cools / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COOLS PORCELAIN COMPANY
GOLDEN, COLORADO, U.S.A.

307-275 4000 E-1, 2, 1977

Mailing Address:
P.O. Box 500
Golden, Colorado 80401

Analytical Report

CL 1417-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

	Lab 1 6121	Lab 2 6122	Lab 3 6123	Lab 4 6124	Lab 5 6125	Lab 6 6126	Lab 7 6127
	A-481	A-482	A-483	A-484	A-485	A-486	A-487
TOC (mg/l)	48	16	3729	119	1650	92	175
BCC (mg/l)	45	12	3613	100	1543	90	164
SiO ₂ (mg/l)	1	< 1	453	2	481	< 1	6
Nitrogen-Kjeldahl (mg/l)	2	1	1890	3	1070	2	3
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
SCB							
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity (mg/l)	To be reported.						
Total Hardness (mg/l)	To be reported.						
Fluoride (mg/l)	To be reported.						
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium (mg/l)	< 0.02	< 0.02	0.02	< 0.02	< 0.02	0.03	< 0.02
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron (mg/l)	3.2	0.3	0.2	3.5	0.2	1.2	1.8

< = less than

Cools / SPECTRO-CHEMICAL LABORATORY

[Handwritten Signature]

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 200

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CL-1217-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2637
Grand Junction, CO 81501

Attention: Carol A. Hienwenhuis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

	Mine Water Sample 713	108 713	<i>Bondish</i> 716	Upper Room 716	Lower Room 716	Water Samples Logan 717	717
	A-488	A-489	A-490	A-491	A-492	A-493	A-494

TOC (mg/l)	66	95	74	49	49	61	72
------------	----	----	----	----	----	----	----

DCC (mg/l)	60	94	43	43	41	57	56
------------	----	----	----	----	----	----	----

SiO ₂ (mg/l)	1	38	4	3	< 1	< 1	< 1
-------------------------	---	----	---	---	-----	-----	-----

Nitrogen-Ejeldahl (mg/l)	2	24	1	< 1	< 1	< 1	< 1
--------------------------	---	----	---	-----	-----	-----	-----

Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
----------------------------------	-----	-----	-----	-----	-----	-----	-----

SCN

Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
----------------------------------	-----	-----	-----	-----	-----	-----	-----

Total Alkalinity (mg/l) To be reported.

Total Hardness (mg/l) To be reported.

Total Solids (mg/l) To be reported.

Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
---------------	--------	--------	--------	--------	--------	--------	--------

Cadmium (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.03	< 0.02
----------------	--------	--------	--------	--------	--------	------	--------

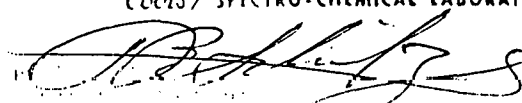
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
----------------	--------	--------	--------	--------	--------	--------	--------

Boron (mg/l)	0.2	4.3	0.4	0.2	0.4	0.5	1.2
--------------	-----	-----	-----	-----	-----	-----	-----

< = less than

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COOLS / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303.771-4000 Ext. 2007

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CL-1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Hienwehnis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

Water Samples

	6265 7117 A-495	61058-2 7119 A-496	22 7112 A-497	Smith 11/2 A-498	102 7112 A-499	112 7112 A-500	115 7112 A-501
TOC (mg/l)	71	207	43	47	132	73	61
DCC (mg/l)	57	193	34	28	119	52	50
SeO ₃ (mg/l)	2	31	12	< 1	8	8	2
Nitrogen-Kjeldahl (mg/l)	< 1	3	1	< 1	< 1	7	2
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
SCN							
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Arsenic (μg/l)	To be reported.						
Total Lead (μg/l)	To be reported.						
Total Cadmium (μg/l)	To be reported.						
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium (mg/l)	< 0.02	< 0.02	0.03	< 0.02	< 0.02	< 0.02	< 0.02
Mercury (μg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron (mg/l)	0.3	3.1	0.5	0.4	0.5	0.2	1.2

< = less than

[Signature]

COORS / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278 4000 Ext. 2102

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

	101 7/19 A-502	102 7/19 A-503	103 7/19 A-504	LAB-1 7/19 A-505	109 7/19 A-506	Water Samples 7/19 A-507	7/24 A-508
TOC (mg/l)	42	45	42	64	52	2815	133
DCC (mg/l)	37	38	36	61	48	2517	125
SiO ₂ (mg/l)	8	< 1	< 1	< 1	< 1	215	24
Nitrogen-Ejeldahl (mg/l)	1	< 1	1	1	2	2880	6
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
SCB							
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total A.P.L. (g/l)	To be reported.						
Total B.P.L. (g/l)	To be reported.						
Total C.P.L. (g/l)	To be reported.						
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.36	< 0.02
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron (mg/l)	1.5	1.4	0.5	3.4	3.8	0.2	2.7

< = less than

COORS / SPECTRO-CHEMICAL LABORATORY

Cools / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-778-4600 Ext. 2307

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

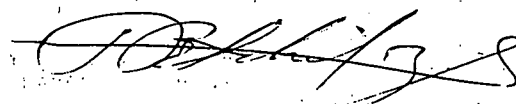
Attention: Carol A. Nicuvenhuis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

LILN3 108 PRL1 112 101 108 Samples 22-818
 7/22 7/21 118 8/8 3/8 8/3
 A-509 A-510 A-511 A-512 A-513 A-514 A-515

TOC (mg/l)	61	86	32	91	47	63	30
DOC (mg/l)	47	81	29	90	46	50	26
SiO ₂ (mg/l)	< 1	8	< 1	16	2	4	8
Nitrogen-Ekjeldahl (mg/l)	1	2	< 1	1	2	7	< 1
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
SCN							
Total Coliforms (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkalinity (mg/l)	To be reported.						
Total Hardness (mg/l)	To be reported.						
Radioactivity (mg/l)	To be reported.						
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium (mg/l)	< 0.02	0.03	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Barium (mg/l)	1.5	0.3	0.4	1.6	2.1	1.7	0.5

< = less than



COOLS / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

307-278 1900 E.O. 2402

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CL-1217-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90541
DATE	9-21-79
CUSTOMER ORDER NO.	OS-17615

	Lower 819	Lower 819	Upper 819	Upper 819	Water 108	Samples 819
	A-516	A-517	A-518	A-519	A-520	A-521
TOC (mg/l)	37	33	34	41	2035	167
BCC (mg/l)	32	32	35	37	1958	134
S ₂ O ₃ (mg/l)	1	8	8	2	595	32
Nitrogen-Ejeldahl (mg/l)	< 1	2	4	1	2820	18
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1
SON						
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1	< 1
Total Alkal (pH/1)	To be reported.					
Total Acid (pH/1)	To be reported.					
Total Hard (pH/1)	To be reported.					
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium (mg/l)	0.04	< 0.02	< 0.02	< 0.02	0.38	0.03
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron (mg/l)	0.6	0.3	0.4	0.6	0.2	9.0

< = less than

COOLS / SPECTRO-CHEMICAL LABORATORY

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[Signature]

Cools / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2637
Grand Junction, CO 81501

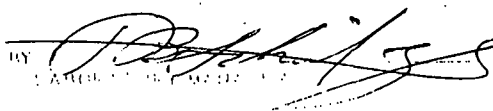
Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90704
DATE	9-25-79
CUSTOMER ORDER NO.	OS-17615

	Smith 8/9 A-522	102 8/10 A-523	Upper Para- chute 9/16 A-524	Lower Para- chute 9/16 A-525	Water Kelly 9/16 A-526
TOC (mg/l)	9	4	13	10	50
DOC (mg/l)	4	3	10	4	45
SiO ₂ (mg/l)	< 1	< 1	< 1	< 1	16
Nitrogen-Kjeldahl (mg/l)	3	2	2	2	30
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1
SCN					
Total Coliforms (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1
Total Alkalinity (mg/l)	To Be Reported				
Total Hardness (mg/l)	To Be Reported				
Total Solids (mg/l)	To Be Reported				
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Boron (mg/l)	0.7	0.5	0.2	0.2	0.4

Cools / SPECTRO-CHEMICAL LABORATORY

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BY 

Cools / SPECTRO-CHEMICAL LABORATORY
 DIVISION OF COORS PORCELAIN COMPANY
 GOLDEN, COLORADO, U.S.A.

Mailing Address:
 P.O. Box 500
 Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.
 P. O. Box 2687
 Grand Junction, CO 81501

Attention: Carol A. Hienwehner

LABORATORY NUMBER	90704
DATE	9-25-79
CUSTOMER ORDER NO.	OS-17615

	103 9/16 A-527	Riley 8/23 A-528	104 8/23 A-529	8/24/79 8/23 A-530	Water
TSS (mg/l)	12	6	54	1383	
BOD (mg/l)	8	< 1	44	1158	
Fe ₂ O ₃ (mg/l)	< 1	< 1	1	231	
Nitrogen-Ekjeldahl (mg/l)	2	2	20	910	
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	
SCN					
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	
Total Alkalinity (pH/1)	To Be Reported				
Total Hardness (pH/1)	To Be Reported				
Fluoride (ppm/1)	To Be Reported				
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	
Selenium (mg/l)	0.04	< 0.02	0.07	0.07	
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	
Boron (mg/l)	0.4	0.3	0.9	0.6	

Cools / SPECTRO-CHEMICAL LABORATORY

[Signature]
 LABORATORY MANAGER

Cools / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278 4000 Ext. 2492

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90901
DATE	10-11-79
CUSTOMER ORDER NO.	OS 17615

	L2 PS2 8130 A-531	L2 PS1 8130 A-532	L1L SC-2 8130 A-533	L1L SW-1 Water 8130 A-534	L1L W3 8130 A-535
TOC (mg/l)	38	52	105	86	60
DOC (mg/l)	26	33	93	80	58
SeO ₃ (mg/l)	< 1	< 1	< 1	< 1	< 1
Nitrogen-Kjeldahl (mg/l)	2	1	15	11	18
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1
Boron (mg/l)	3.4	0.6	< 0.1	0.4	< 0.1
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	< 1
Total Alkalinity (pH/T)	To Be Reported				
Total Hardness (pH/T)	To Be Reported				
Radium (pCi/l)	To Be Reported				
Silver (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Selenium (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02

< = Less than

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END OF REPORT

BY

Cools / SPECTRO-CHEMICAL LABORATORY

LABORATORY MANAGER

Cools / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278 4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

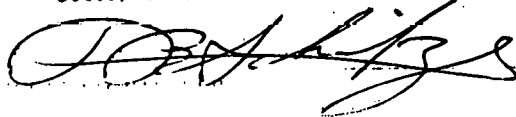
TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501

Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90901
DATE	10-11-79
CUSTOMER ORDER NO.	OS 17615

	ARC-1 8/30 A-536	108 9/5 A-537	32 9/5 A-539	33 9/6 A-540	Water
TOC (mg/l)	75	107	18	27	
DCC (mg/l)	49	95	17	21	
S ₂ O ₃ (mg/l)	< 1	< 1	< 1	< 1	
Nitrogen-Kjeldahl (mg/l)	2	5	1	2	
Fecal Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	
Boron (mg/l)	0.5	0.5	0.3	0.3	
Total Coliform (colonies/100 ml)	< 1	< 1	< 1	< 1	
Total Alpha (pCi/l)	To Be Reported				
Total Beta (pCi/l)	To Be Reported				
Radium 226 (pCi/l)	To Be Reported				
Silver (mg/l)	0.01	< 0.01	< 0.01	< 0.01	
Selenium (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	
Mercury (mg/l)	< 0.02	< 0.02	< 0.02	< 0.02	

< = Less than



Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: • Occidental Oil Shale, Inc.
P. O. Box 2687
• Grand Junction, CO 81501
• Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	98813
DATE	8-8-79
CUSTOMER ORDER NO.	AFE 977901-477901

Logan Wash Samples
Reanalysis

Sample I.D.	Total Coliforms (colonies/100 ml)	TOC (mg/l)	DOC (mg/l)
A-358 108 2/9/79	< 1		
A-359 115 2/14/79	< 1		
A-360 22 2/14/79	< 1		
A-361 101 2/14/79	< 1		
A-362 Roan 2/15/79	< 1		
A-363 108 2/15/79	< 1		
A-365 LILSE2 2/21/79	< 1		
A-366 LILN3 2/21/79	< 1		
A-370 108 2/23/79	< 1		
A-386 Logan 3/21/79		550	220

CORRECTION COPY

Coors / SPECTRO-CHEMICAL LABORATORY

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BY

LABORATORY MANAGER

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501
Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	91016
DATE	10-2-79
CUSTOMER ORDER NO.	OS 17615

Water

Additional Work to CSL 90157

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-449 LW106 5/23	0.1	21	
A-471 Goodwin 6/7	59	52	1.7
A-472 Rat 6 6/8	0.3	0	
A-473 L2PS2 6/13	7.2	10	

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: . Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501
Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	91015
DATE	10-2-79
CUSTOMER ORDER NO.	OS 17615

Water
Additional Work to CSL 90099

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-450 LOGAN WASH 5/30	21	6	
A-451 LAPS-1 5/30	0.0	17	
A-452 LAPS-2 5/30	9.3	11	
A-453 LAB-1 5/30	4.8	2	
A-454 LW-121 5/31	20	57	1.7
A-455 Bowrah 5/31	0.0	0	
A-456 Wash Upper Room 5/31	7.2	32	2.2
A-457 Lower Room 5/31	1.8	0	
A-458 LIL-SEL 6/1	11	95	0.2
A-459 LIL-N3 6/1	0.0	0	
A-460 112 6/1	1.4	101	0.1
A-464 115 6/6	2.5	1	
A-465 Logan 6/6	2.6	42	0.2
A-466 22 6/6	7.0	17	
A-467 101 6/6	2.1	26	
A-468 Smith 6/7	6.0	52	0.3
A-469 102 6/7	0.9	7	
A-470 121 6/7	11	72	1.8

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: . Occidental Oil Shale, Inc.
P. O. Box 2687
. Grand Junction, CO 81501
Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90541
DATE	10-31-79
CUSTOMER ORDER NO.	OS-17615

Water

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-474 L2PS-1 6/13	20	4	
A-475 LMB-1 6/13	53	35	1.5
A-476 Ret 6 6/15	3.4	14	
A-477 108 6/22	6.0	11	
A-478 L2PS-2 6/27	41	15	0.4
A-479 Ret 6 6/21	0.0	11	
A-480 L2PS-1 6/27	11	1	
A-481 LMB-1 6/27	54	31	0.1
A-482 RRL-1 6/28	1.5	24	
A-483 Ret 6 6/28	23	6	
A-484 108 6/18	7.5	4	
A-485 Ret 6 7/18	3.8	21	
A-486 L2PS-3 7/3	21	0	
A-487 L2PS-1 7/3	39	33	0.1
A-488 Main House water sample 7/3	39	16	0.4
A-489 108 7/3	17	35	3.3
A-490 800015 7/6	66	15	0.5

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Coors / SPECTRO-CHEMICAL LABORATORY

BY

LABORATORY MANAGER

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.

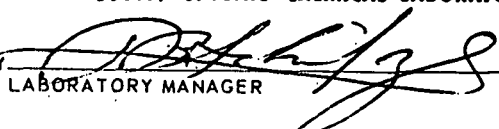
LABORATORY NUMBER	90541
DATE	10-31-79
CUSTOMER ORDER NO.	OS-17615

Water

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-491 Upper Room 7/16	9.5	13	
A-492 Lower Room 7/16	1.5	6	
A-493 Logan 7/17	0.0	8	
A-494 L2 PS-2 7/17	0.5	1	
A-495 L2 PS-1 7/17	0.8	0	
A-496 LIL-SE2 7/19	4.5	13	
A-497 22 7/12	17	5	
A-498 Smith 7/12	16	24	0.3
A-499 102 7/12	6.0	13	
A-500 112 7/12	9.5	9	
A-501 115 7/12	7.5	145	0.2
A-502 101 7/13	4.5	2	
A-503 LIL N3 7/19	15	2	
A-504 PRL-1 7/19	9.5	14	
A-505 LMB-1 7/19	35	13	0.5
A-506 108 7/19	28	15	0.1
A-507 Net 6 7/25	105	9	1.4
A-508 LILSE2 7/26	24	2	

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BY 
LABORATORY MANAGER

Coors / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: Occidental Oil Shale, Inc.

LABORATORY NUMBER	90541
DATE	10-31-79
CUSTOMER ORDER NO.	OS-17615

Water

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-509 LIL 123 7/26	1.5	4	
A-510 108 7/27	6.0	3	
A-511 RRL 7/28	11	151	0.3
A-512 112 8/8	3.0	196	2.0
A-513 101 8/8	15	8	
A-514 108 8/8	0.0	12	
A-515 122 8/8	0.0	0	
A-516 Logan 8/8	0.0	1	
A-517 Lower Run 8/9	8.1	14	
A-518 Upper Run 8/9	9.1	13	
A-519 115 8/9	12	14	
A-520 Net 6 8/9	79	45	0.3
A-521 108 8/9	15	9	

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BY

LABORATORY MANAGER

Cools / SPECTRO-CHEMICAL LABORATORY

DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: . Occidental Oil Shale, Inc.
P. O. Box 2687
. Grand Junction, CO 81501
Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90704
DATE	10-31-79
CUSTOMER ORDER NO.	OS-17615

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-522 <i>Smelter 8/19</i>	12	27	0.5
A-523 <i>102 8/19</i>	0.0	0	
A-524 <i>Upper Parachute 9/16</i>	3.0	18	
A-525 <i>Lower Parachute 9/16</i>	0.1	0	
A-526 <i>Kelly 9/16</i>	19	5	
A-527 <i>103 9/16</i>	14	0	
A-528 <i>Riley 8/23</i>	30	17	0.2
A-529 <i>104 8/23</i>	0.0	12	
A-530 <i>Robins 8/23</i>	11.2	32	0.3

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LABORATORY MANAGER

Coors / SPECTRO-CHEMICAL LABORATORY
 DIVISION OF COORS PORCELAIN COMPANY
 GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:
 P.O. Box 500
 Golden, Colorado 80401

Analytical Report

CI-1317-A

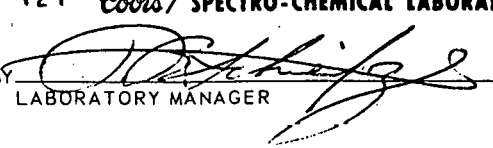
T0: . Occidental Oil Shale, Inc.
 P. O. Box 2687
 . Grand Junction, CO 81501
 . Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	90901
DATE	10-31-79
CUSTOMER ORDER NO.	OS-17615

Water

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-531 L2 PS-2 8/30	26	39	0.5
A-532 L2 PS-1 8/30	6.0	21	
A-533 LILSE-2 8/30	1.5	3	
A-534 LILSW-1 8/30	1.5	7	
A-535 LIL-N3 8/30	3.1	12	
A-536 PLRL 1 8/30	7.5	44	0.8
A-537 108 9/15	0.0	9	
A-539 32 9/15	1.4	21	
A-540 33 9/16	3.0	21	

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 LABORATORY MANAGER

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DIVISION OF COORS PORCELAIN COMPANY

GOLDEN, COLORADO, U.S.A.

303-278-4000 Ext. 2302

Mailing Address:

P.O. Box 500

Golden, Colorado 80401

Analytical Report

CI-1317-A

TO: . Occidental Oil Shale, Inc.
P. O. Box 2687
Grand Junction, CO 81501
Attention: Carol A. Nieuwenhuis

LABORATORY NUMBER	91117
DATE	11-12-79
CUSTOMER ORDER NO.	OS 17615

Water

Sample I.D.	Total Alpha (pCi/l)	Total Beta (pCi/l)	Radium 226 (pCi/l)
A-541 484 9/16	6.8	0	-
A-543 Smith 9/11	0.8	9	-
A-544 102 9/11	3.8	76	0.13
A-545 Logan 9/12	5.3	6	-
A-546 121 9/12	2.3	0	-
A-547 Upper Bean 9/12	5.3	20	-
A-548 Lower Bean 9/12	9.8	10	-
A-549 46 9/13	1.5	78	0.04
A-550 97A 9/13	6.0	5	-
A-551 Act 6 9/13	4.5	9	-
A-552 115 9/20	1.5	62	0.21
A-553 22 9/20	2.2	3	-
A-554 101 9/20	15	40	0.12
A-555 106 9/20	7.5	30	0.17

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LABORATORY MANAGER