04008768720E

40-8768

THE STATE OF WYOMING

MIKE SULLIVAN
GOVERNOR

DOCKETED
USNRC
FEB 09 1988
MAIL SECTION
DOCKET CLERK

1890-1990 WYOMING CENTENNIAL A LASTING LEGACY

RETURN ORIGINAL TO PDR, HQ.

Department of Environmental Quality

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

Administration	Air Quality Division	Land Quality Division	Solid Waste Management Program	Water Quality Division
(307) 777-7937	(307) 777-7391	(307) 777-7756	(307) 777-7752	(307) 777-7781

Memorandum

FEB 1988 RECEIVED

To File: Sequoyah Fuels Corporation, O-Sand ISL Project, 13 R&D

From: Steve Johnson, Hydrologist SJ

Date: 25 January 1988

Subject: Review of the Third Quarter 1987 Report for Sequoyah Fuels Corporation's O-Sand ISL R&D Project

I. INTRODUCTION

District I requested on 9 November 1987 a review of Sequoyah Fuel Corporation's (SFC) third quarterly report in 1987, received by LQD on 9 November 1987. The period of record for this progress report is from 1 July to 30 September 1987. However, this report also includes data dating back to 17 July 1985.

II. DISCUSSION

Brief History

Sequoyah Fuels Corporation, a subsidiary of Kerr-McGee Corporation of Oklahoma, is currently conducting a R&D project on the recovery of uranium deposits using ISL techniques. The underground uranium mine is located in Converse County, approximately 20 miles northeast of Glenrock (Appendix I). The O-Sand operation is SFC's second R&D project with the State of Wyoming. SFC's first R&D project is the Q-Sand, which completed restoration and stabilization during the summer of 1987. The O-Sand ISL test consists of a conventional five-spot pattern with monitoring wells completed around the test site and in aquifers above and below the O-Sand (production zone). The operation uses a sodium bicarbonate leach solution with hydrogen peroxide as the oxidant. Uranium is recovered by solid resin ion exchange, using barium chloride.

Ground Water Quantity

SFC's report includes water level data from the following monitoring wells (Appendix II shows most of these wells):

M-1	M-5	MO-1
M-2	MS-1	T-1
M-3	MW-1	WW-109
M-4	MM-1	

Under the "Project Status" section of the report, SFC states the following information was collected during the reporting period:

Fluid Production:	17.5 million gallons
Fluid Injection:	16.6 million gallons
Overrecovery:	0.9 million gallons
Waste Water to Evaporation Ponds:	64,020 gallons
Average Production:	42 gallons per minute (gpm)

Using these reported values, an average over-production of 5 percent is calculated. Based on other ISL R&D operations in the State of Wyoming, an over-production of this magnitude is usually considered adequate to maintain a hydraulic gradient towards the producion zone and thereby minimize excursion of any mine fluids. However, due to a major reduction in pumping rate at the Bill Smith Mine (located approximately 6000 feet from the O-Sand wellfield: Appendix III) that occurred in September of 1982, a resultant regional recharge has made it difficult to evaluate the hydraulic gradient of the O-Sand aquifer in the area extending from the production zone out to the monitoring wells. As indicated by Figures B-1 through B-6 of the report (Appendix IV), water levels in the 5 monitoring wells encircling the ISL wellfield and a well completed in an underlying aquifer, have all significantly increased over the last two years.

Table B-1 (Appendix VII) of SFC's quarterly report lists water level data for the 5 excursion monitoring wells and monitor wells: T-1 and MM-1. Because monitor well T-1 is situated between the O-Sand ISL injection/production wellfield and excursion monitoring well M-2 (see Appendix II) and completed in the same formations (see Appendix VI), a comparison of water levels measured on the same date for each of these wells will provide a useful indication of the localized hydraulic gradient existing in the O-Sand ISL wellfield. A review of water level data for these wells (see Appendix VII) indicates the regional hydraulic gradient caused by pumping at the Bill Smith Mine is greater than the localized gradient in the O-Sand ISL wellfield. Therefore, SFC's overproduction of 5% in the O-Sand ISL wellfield does not appear to be adequate to maintain a hydraulic gradient towards the test area.

Typically, water level data from monitoring wells are watched closely during active ISL operations, because an increase in water level of a monitoring well may be an early indication that a lixiviant or pregnant solution plume is migrating off-site. In the event that monitor well water levels are reported

as increasing, the reported data are verified, and if determined to be accurate, the percent over-production is increased as a preventive measure. As a means of facilitating an evaluation of operations at the O-Sand wellfield, SFC is requested to submit evidence that a hydraulic gradient exists towards the production zone of active ISL operations. SFC's submittal should include a potentiometric map of the O-Sand aquifer that encompasses the O-Sand R&D wellfield and the Bill Smith Mine wellfield.

Surface Water Quality

During the reporting period, SFC produced 17.5 million gallons of fluid from the O-Sand wellfield, of which 16.6 million gallons of fluid were treated using electrodialysis reversal (EDR) techniques and reinjected into the O-Sand wellfield. Waste fluid from SFC's over-recovery of 0.9 million gallons (bleed stream) was either routed to passive evaporation ponds (64,020 gallons) or routed to the barium chloride treatment system at the Bill Smith Mine (835,980 gallons) for precipitation of radium. At the barium chloride treatment system, the bleed stream is mixed with waters pumped from the Bill Smith Mine shaft and surrounding dewatering wells. After treatment, the mixed water is routed through a series of three settling ponds prior to being discharged to an unnamed ephemeral tributary of Sage Creek. The point of discharge at the unnamed ephemeral drainage is approximately 22 miles upstream of the North Platte River. Although Sage Creek is a WQD Class IV stream, the reach of the North Platte River, that receives inflows from Sage Creek, is a WQD Class III stream. Water quality and discharge are monitored under the National Pollutant Discharge Elimination System (NPDES) which is regulated by the WQD. The first NPDES sampling point is designated #003 and monitors the bleed stream from the O-Sand ISL operation just prior to mixing with water from the Bill Smith Mine at the barium chloride treatment plant. Effluent limitations and monitoring requirements at NPDES #003 are as follows:

Parameter	units	instantaneous maximum standard	Reporting Period Mean	Reporting Period Maximum	Sampling Frequency	Sample Type
discharge	MGD	N/A	0.013	0.090	continuous	daily total
sodium	mg/L	1,500	310	415	monthly	grab
bicarbonate	mg/L	4,500	1023	1415	monthly	grab
chloride	mg/L	750	124	160	monthly	grab
arsenic	mg/L	N/A	<0.001	<0.001	quarterly	grab
selenium	mg/L	N/A	1.6	1.6	quarterly	grab
pH	s.u.	6-9*	6.9	6.9	quarterly	grab

* range requirements for any single grab sample

The second NPDES sampling point is designated #001. It monitors a mixture of both the O-Sand ISL operation bleed stream and water from the Bill Smith Mine after these waters have been treated with barium chloride and passed through three settling ponds. The "treated" waters are sampled just prior to being discharged to the ephemeral tributary to Sage Creek. Effluent limitations and monitoring requirements at NPDES #001 are as follows:

Parameter	Units	daily average standard	daily maximum standard	instaneous maximum standard	Reporting Period daily average	Reporting Period daily maximum
discharge	MGD	N/A	N/A	N/A	0.29	0.43
TSS	mg/L	20	30	45	3.3	9.0
total zinc	mg/L	0.5	1.0	1.5	< 0.005	< 0.005
dissolved radium-226	pCi/L	3	10	15	1.6	1.8
total radium-226	pCi/L	10	30	45	*	*
total uranium	mg/L as U	2.0	4.0	6.0	4.1	5.1
COD	mg/L as O_2	100	200	300	*	*

* not reported

The previous two tables indicate that: (1) mine fluids are being routed into an ephemeral tributary to the North Platte River at an average discharge of 290,000 gallons per day (0.45 cfs), (2) because this area is primarily used as grazing land for livestock and wildlife, animals using this ephemeral drainage as a drinking water source may be ingesting contaminated water, and (3) these discharged waters are monitored for a considerably reduced list of parameters (compared to LQD Guideline 8, Appendix II) that have no standard or have a standard that may not meet Class I, Class II, Class III, or fisheries standards as established by the WQD and the EPA. Although the WQD is responsible for regulating point discharges to receiving streams, a reevaluation of limitations for effluent discharges from the O-Sand ISL operation appears to be a reasonable request considering LQD is the leading State regulatory agency on ISL R&D projects.

Ground Water Quality

The following upper control limit (UCL) parameters are analyzed in samples collected from each of the monitoring wells:

bicarbonate
chloride
sulfate
conductivity

There are no indications as to whether the units for bicarbonate are "mg/L as HCO_3" or "mg/L as $CaCO_3$," or whether conductivity values are uncorrected or corrected for 25°C. Subsequent quarterly reports should include this information.

The excursion detection program does not appear to be adequately designed. Using completion interval data listed in Table 9-2 and O-Sand cross sections in Figures 9-3, 9-3a, and 9-4 of SFC's permit application, a well completion figure was developed (Appendix V). As displayed in Appendix V, the injection and production wells are completed in the upper O-Sand aquifer, while the monitor wells are completed in the upper and lower O-Sand aquifers. Comparison of baseline water quality data collected from well MO-1 (completed solely in the lower O-Sand aquifer) with baseline data collected from the injection and production wells (completed in the upper O-Sand aquifer), indicate that water quality of the lower O-Sand aquifer consists of lower concentrations of bicarbonate, sulfate and TDS (as indicated by conductivity) than the upper O-Sand. The following conclusions are drawn from a review of Appendix V and SFC's baseline water quality data:

- the lower O-Sand and upper O-Sand are two distinct aquifers with respect to water quality;

- an overproduction in the O-Sand ISL test area may cause water from the lower O-Sand to move into the upper O-Sand as a result of multiple-completed monitoring wells;

- in the event an excursion is detected, pumping of the monitoring wells, as a remedial measure, will involve water removal from both the lower and upper O-Sand aquifers;

- mixing of waters from the lower and upper O-Sand aquifers will most likely result in lower values of bicarbonate, sulfate, and conductivity in samples collected from the monitoring wells as compared with samples collected from these monitoring wells had they been exclusively completed in the upper O-Sand; therefore, excursions may proceed undetected.

Excursion Status

On 18 February 1986, water samples collected from excursion monitoring wells M-4 and M-5 indicate that sulfate concentrations in these wells did not meet the sulfate UCL. The following information is reprinted from SFC's quarterly report:

Monitor Well I.D.	Reported Value	UCL
M-4	340 mg/L as SO_4	334 mg/L as SO_4
M-5	340 mg/L as SO_4	328 mg/L as SO_4

Although these data indicate that mine fluids may have migrated away from the ISL test wellfield, the concentration levels were not elevated enough to place the O-Sand Project in excursion status. Subsequent sulfate concentrations reported for these wells have remained below the sulfate UCLs.

III. CONCLUSION

LQD is aware that SFC's R&D application was approved as 13 R&D with the excursion monitoring program designed as it is operating today. However, a reevaluation of this program using information provided by SFC in their quarterly reports, indicate that SFC's excursion detection system is inadequate to meet LQD's Rules and Regulations regarding R&D ISL Uranium projects.

IV. RECOMMENDATION

The following information should be submitted by SFC within a reasonable time frame:

1. An evaluation of whether the percent over-production maintained at the O-Sand ISL test area is adequate to ensure a hydraulic gradient exists towards the test ISL wellfield. Supporting materials should include a potentiometric map of the O-Sand ISL test area and the Bill Smith Mine.

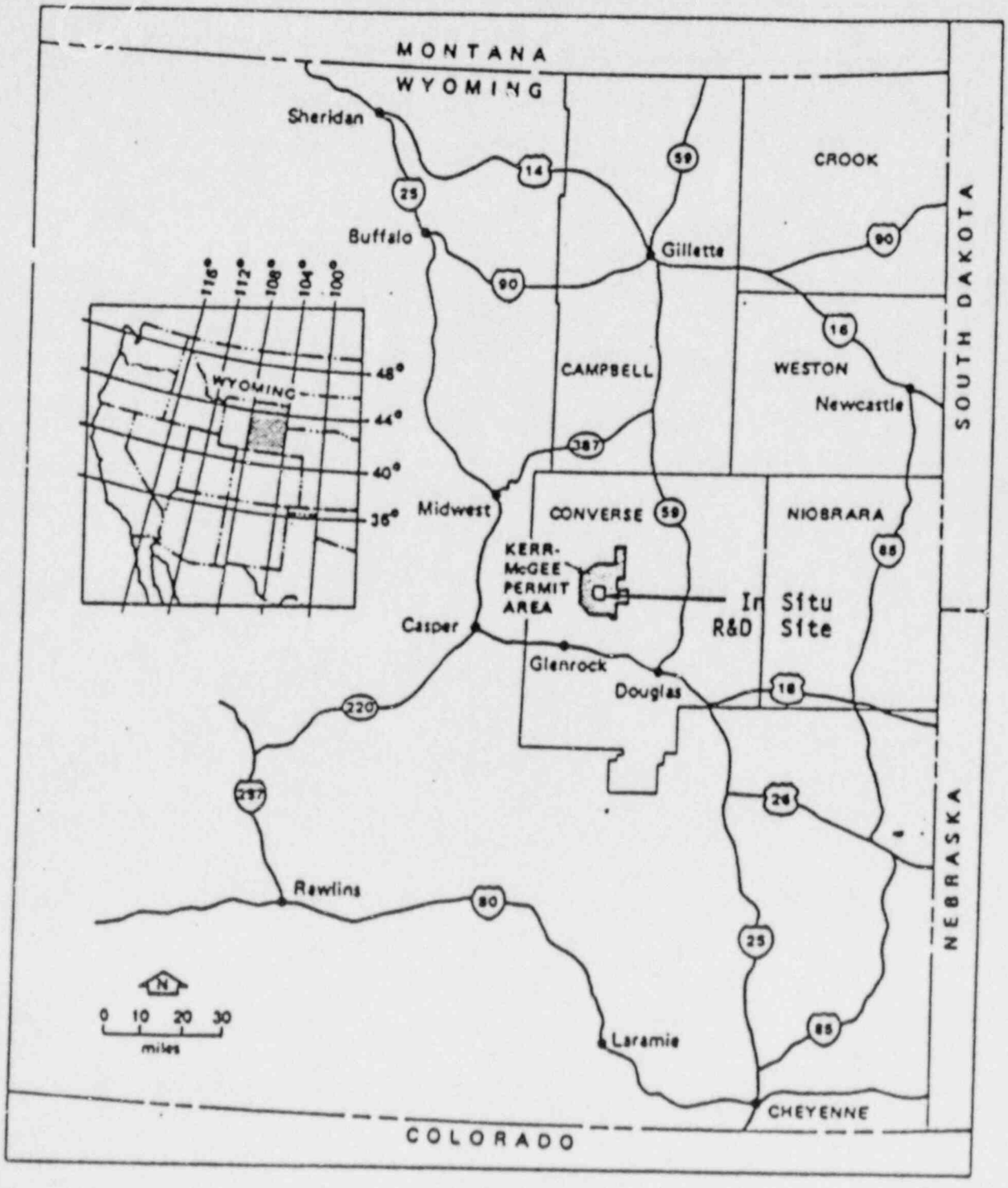
2. A plan for re-completion of monitor well numbers M1 through M5 to ensure that these wells are exclusively completed in the "upper" O-Sand.

3. Subsequent quarterly reports are to provide UCL parameter units as indicated in this memorandum.

LQD is recommended to initiate discussions with WQD personnel regarding a reevaluation of the NPDES effluent limitations at the O-Sand R&D project. The NRC should be consulted regarding their views on this subject.

SJ:ll
Enclosures
pc: Roy Spears
Rick Engelmann
Susan Hogg
Susan Hogg (For the NRC: Scott Grace)

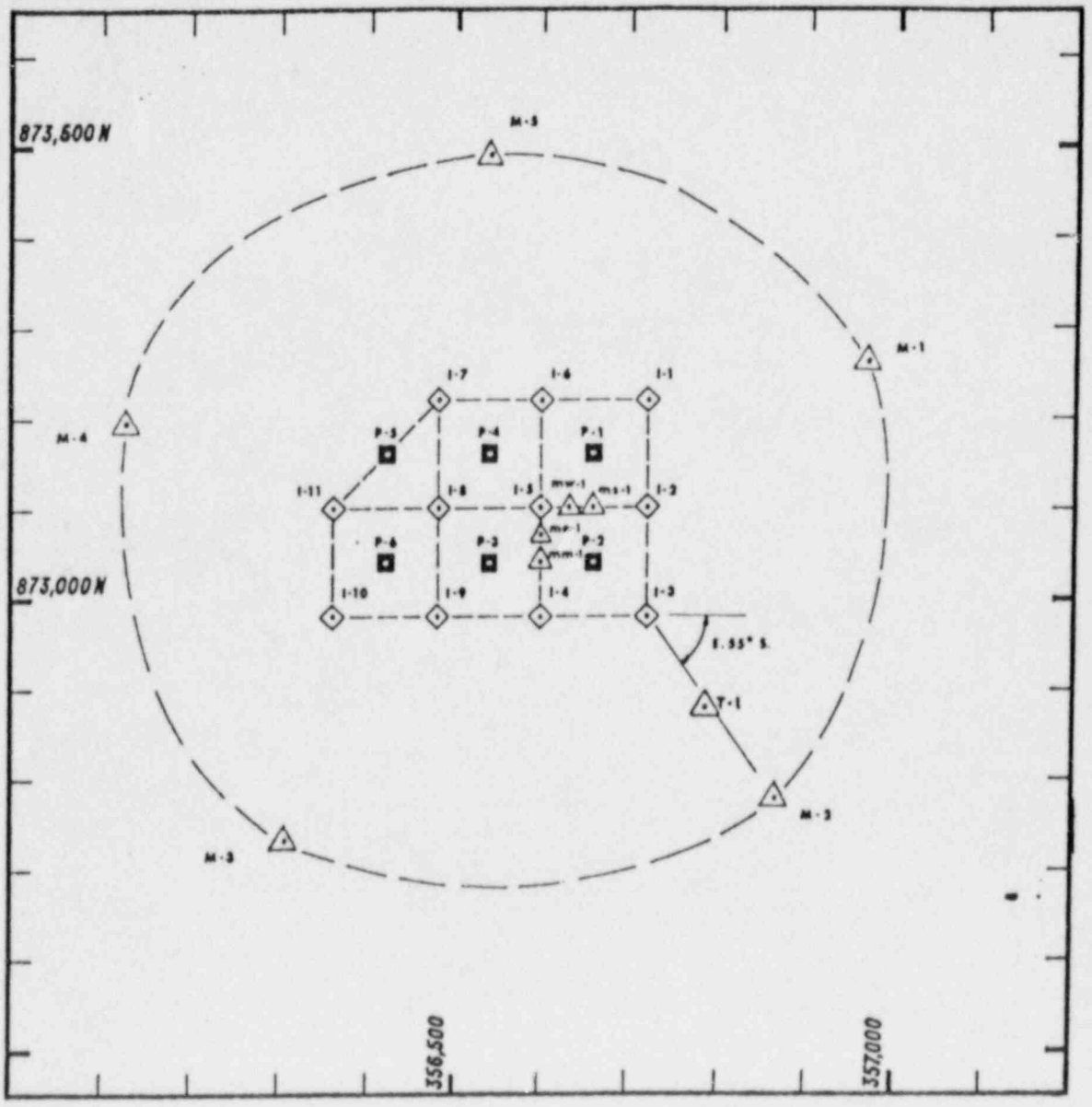
APPENDIX I. Location of O-Sand project site.



APPENDIX II. O-Sand monitoring well locations.

"O" SAND WELL PATTERN

Section 26, T-36N; R-74W



Legend

- Monitor Well
- Production Well
- Injection Well
- Upper Zone Monitor Wells
- Lower Zone Monitor Wells

120 ft. Spacing Between Injection Wells

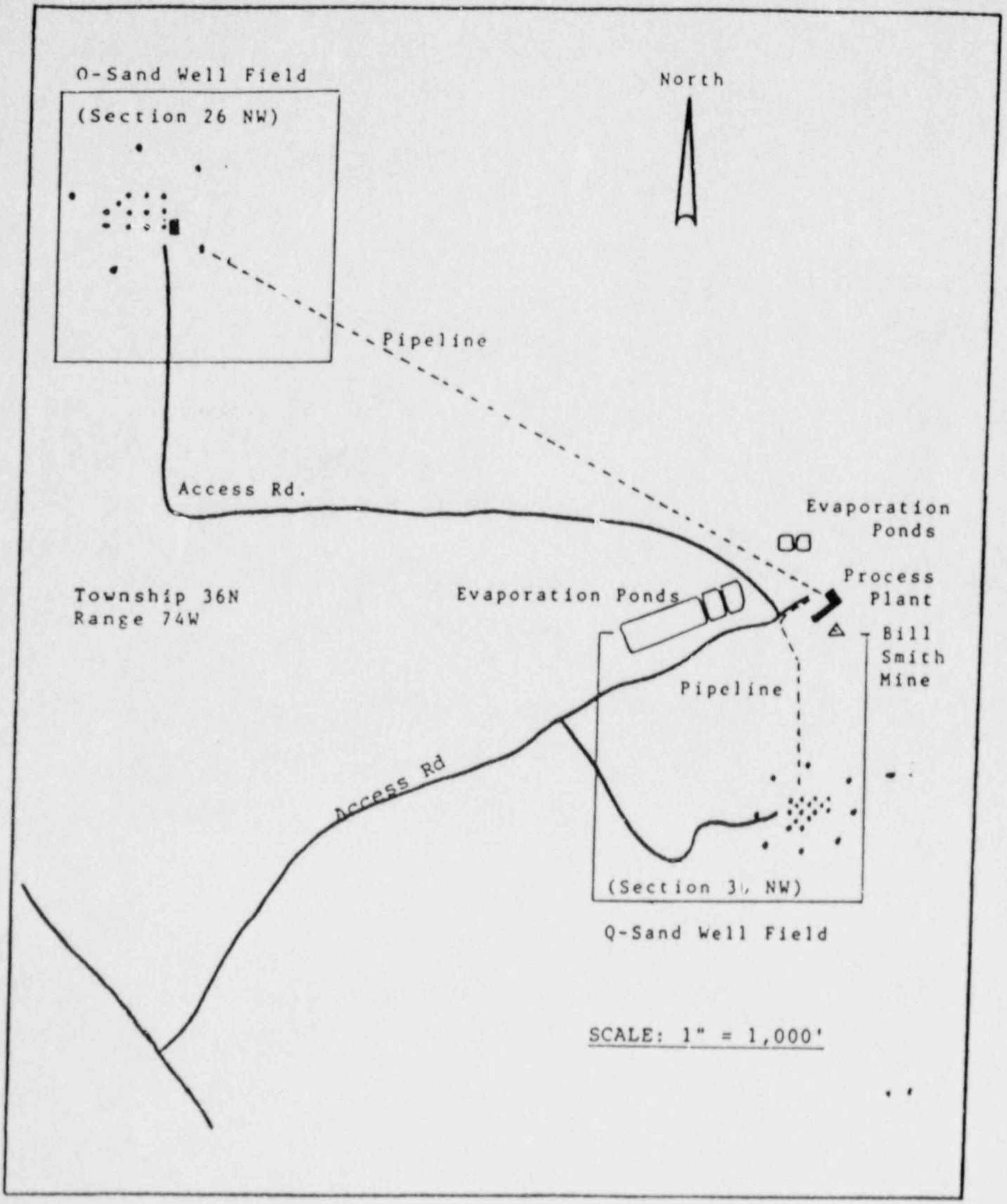
NORTH

9-15-83

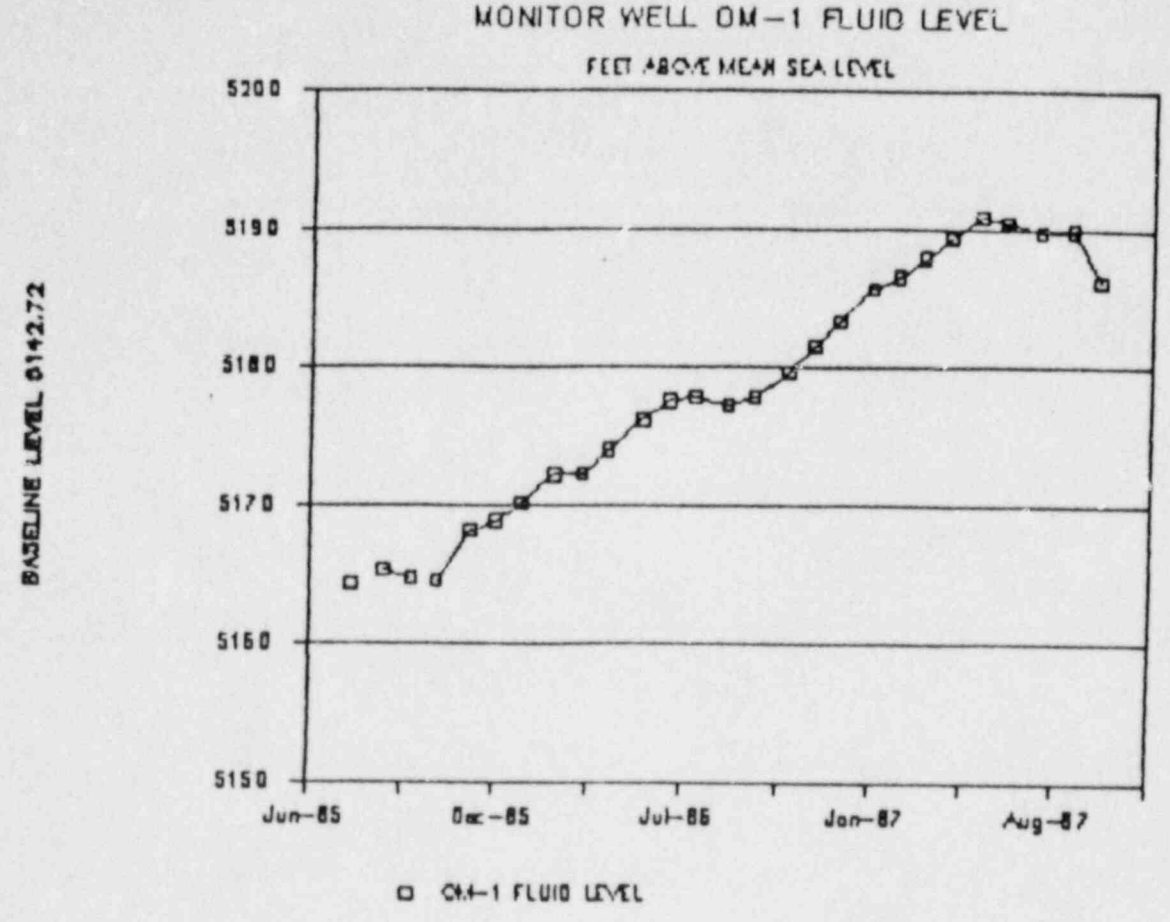
0 100' 200'

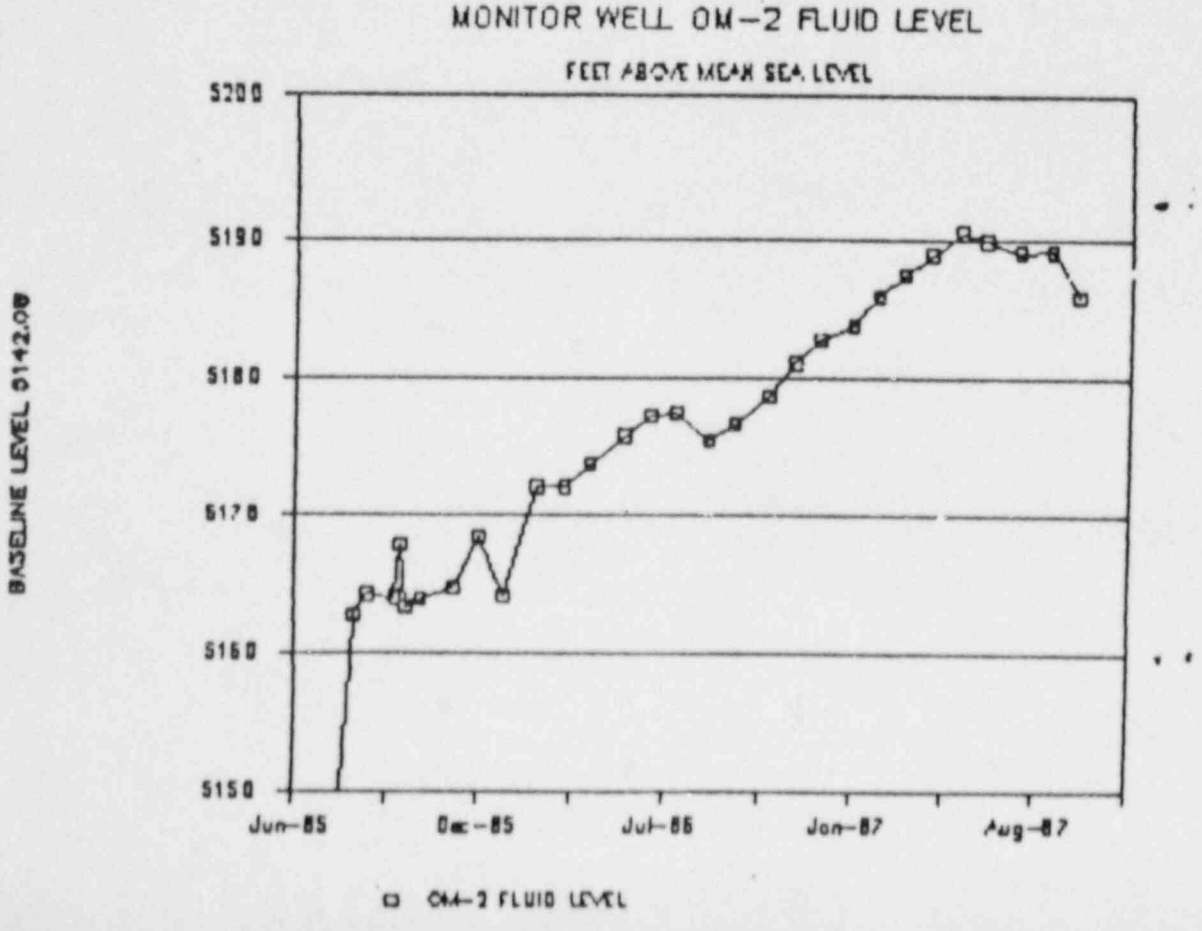
SCALE 1" = 200'

APPENDIX III. Proximity of O-Sand site to Bill Smith mine.

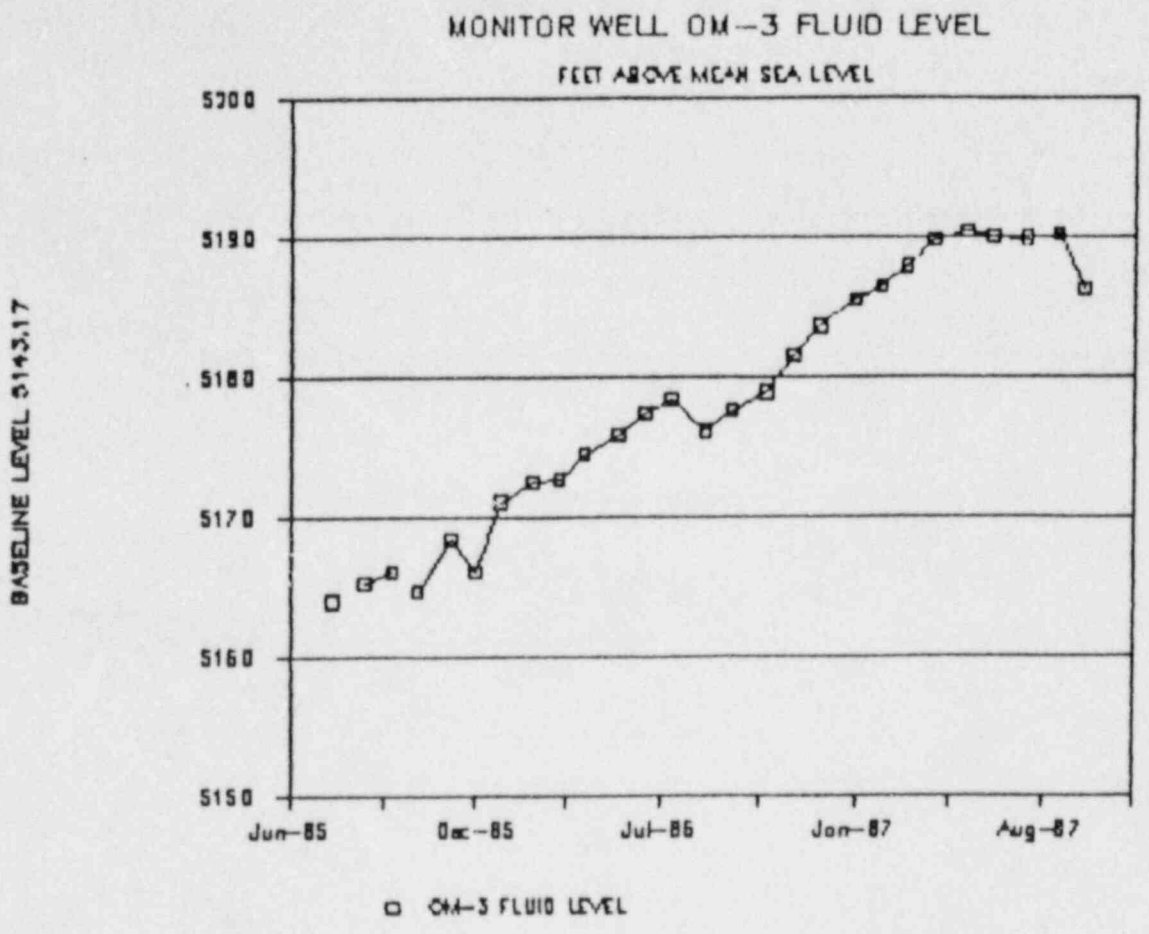


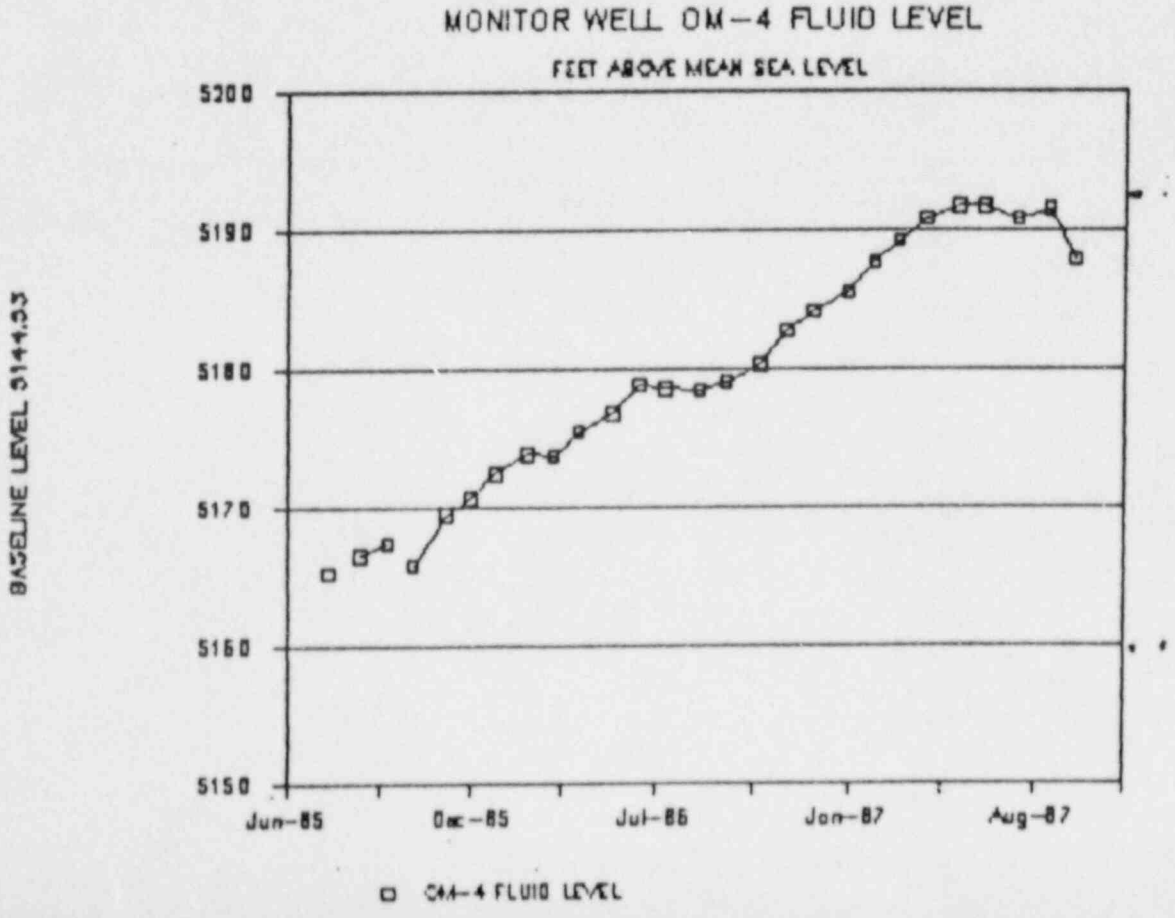
APPENDIX IV. Time series plots of water levels for monitor wells used at the O-Sand site.



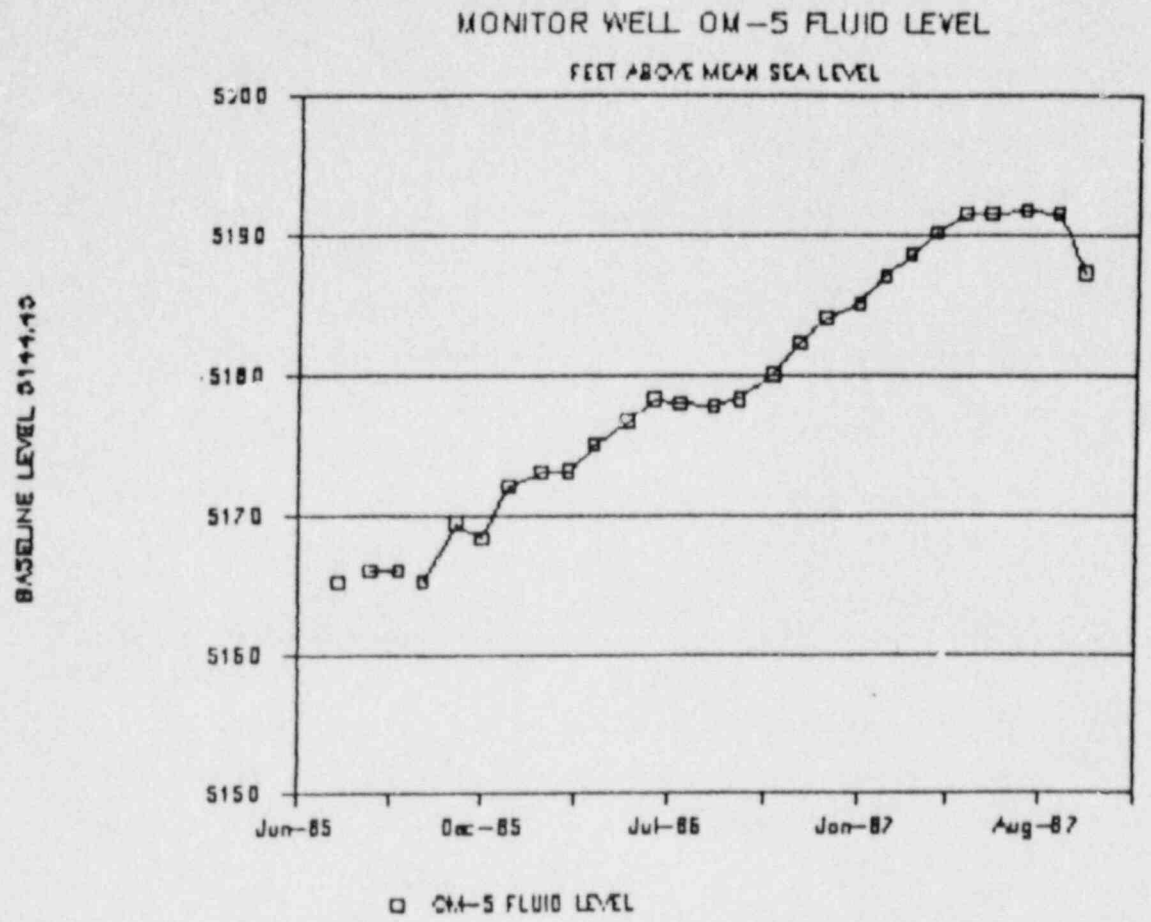


APPENDIX IV. (continued)

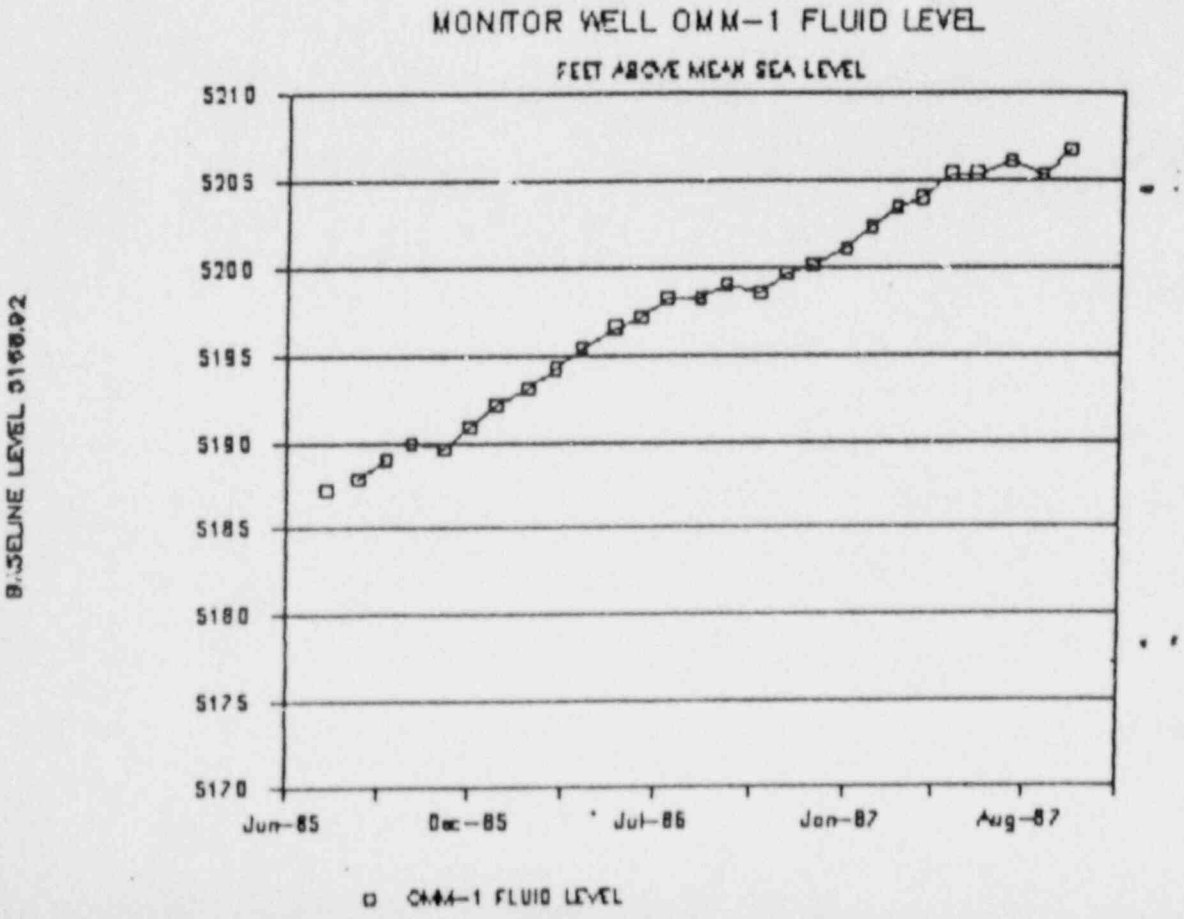




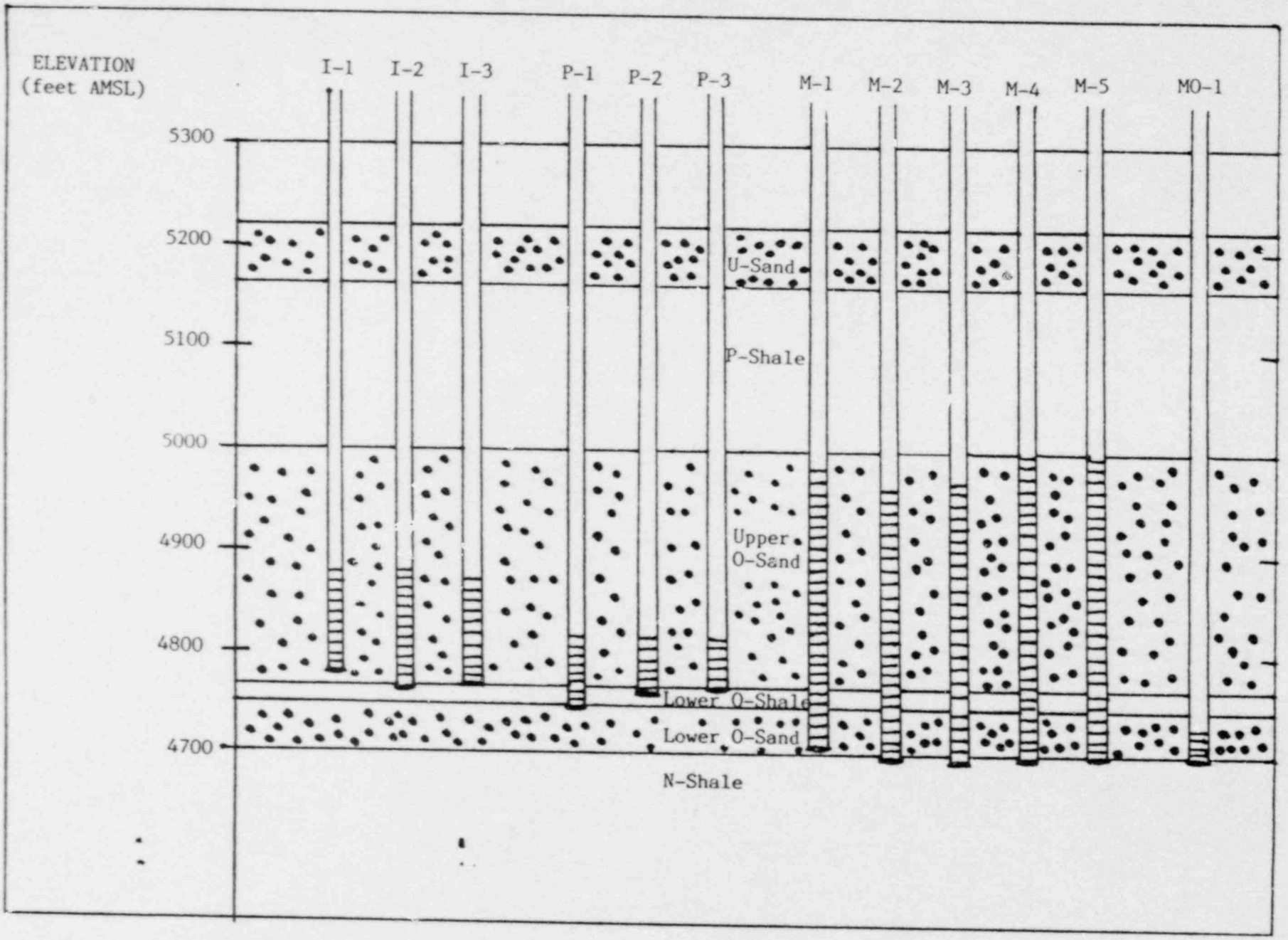
APPENDIX IV. (continued)



BASELINE LEVEL 5144.15



BASELINE LEVEL 5168.92



APPENDIX V. Completion intervals for selected O-Sand wells.

APPENDIX VI. Well completion information for the O-Sand ISL Project.

Well I.D.	Elevation of Land Surface (feet AMSL)	Completion Interval Depth (feet)	Completion Interval Depth (feet AMSL)	Completion Interval Range (feet)
I-1	5507.6	671-730	4836-4777	59
I-2	5510.8	672-750	4839-4761	78
I-3	5507.4	675-740	4832-4767	65
I-4	5500.1	670-742	4830-4758	72
I-5	5503.9	672-730	4832-4774	58
I-6	5503.3	684-742	4819-4761	58
I-7	5500.6	672-731	4829-4770	59
I-8	5497.7	662-715	4836-4783	53
I-9	5496.2	673-736	4823-4760	63
I-10	5497.1	712-737	4785-4760	25
I-11	5498.6	713-736	4886-4763	23
P-1	5503.9	675-755	4829-4749	80
P-2	5504.3	672-745	4832-4759	73
P-3	5501.1	670-736	4831-4765	66
P-4	5501.0	674-742	4827-4759	68
P-5	5498.5	674-742	4825-4757	68
P-6	5497.8	710-738	4788-4760	28
M-1	5521.2	529-812	4992-4709	283
M-2	5505.0	545-808	4960-4697	263
M-3	5506.0	534-815	4972-4691	281
M-4	5525.2	530-825	4995-4700	295
M-5	5512.4	519-810	4993-4702	291
MM-1	5503.3	877-899	4626-4604	22
MO-1	5504.5	775-805	4730-4700	30
MS-1	5504.6	285-320	5220-5185	35
MW-1	5504.6	120-220	5385-5285	100
T-1	5506.9	565-805	4851-4702	240

APPENDIX VII. O-SAND ISL MONITOR WELL FLUID LEVEL DATA
FEET ABOVE MSL

DATE	OM-1	OM-2	OM-3	OM-4	OM-5	OT-1	OMM-1
17-Jul-85	5164.27	5143.57	5163.98	5165.25	5165.33	5145.45	5187.22
06-Aug-85		5162.76				5162.41	
21-Aug-85	5165.26	5164.23	5165.26	5166.57	5166.02	5163.88	5187.88
18-Sep-85	5164.69	5163.97	5166.05	5167.46	5166.04	5164.18	5189.02
23-Sep-85		5167.78				5165.06	
30-Sep-85		5163.30				5163.75	
16-Oct-85	5164.53	5163.96	5164.74	5165.92	5165.25	5163.16	5189.93
20-Nov-85	5168.28	5164.75	5168.43	5169.48	5169.48	5167.83	5189.63
18-Dec-85	5168.88	5168.41	5166.04	5170.70	5168.37	5168.41	5190.90
15-Jan-86	5170.18	5164.11	5171.09	5172.46	5172.15	5170.72	5192.17
18-Feb-86	5172.28	5172.07	5172.56	5173.84	5173.12	5172.02	5193.06
19-Mar-86	5172.34	5172.07	5172.71	5173.79	5173.22	5172.02	5194.27
16-Apr-86	5174.02	5173.71	5174.56	5175.54	5175.05	5173.75	5195.45
21-May-86	5176.22	5175.80	5175.84	5176.80	5176.77	5175.56	5196.60
18-Jun-86	5177.59	5177.22	5177.50	5178.81	5178.31	5177.53	5197.20
16-Jul-86	5177.94	5177.42	5178.40	5178.56	5178.00	5177.63	5198.27
20-Aug-86	5177.24	5175.57	5176.23	5178.45	5177.84	5176.09	5198.29
17-Sep-86	5177.94	5176.65	5177.70	5179.04	5178.38	5177.53	5199.02
22-Oct-86	5179.56	5178.65	5178.96	5180.33	5180.15	5178.35	5198.62
19-Nov-86	5181.52	5181.12	5181.52	5182.80	5182.43	5181.08	5199.67
17-Dec-86	5183.35	5182.78	5183.66	5184.10	5184.12	5182.76	5200.14
21-Jan-87	5185.74	5183.72	5185.55	5185.54	5185.08	5185.52	5201.13
18-Feb-87	5186.59	5185.92	5186.55	5187.66	5187.06	5185.63	5202.32
18-Mar-87	5187.99	5187.57	5188.00	5189.31	5188.62	5187.53	5203.42
15-Apr-87	5189.43	5188.95	5189.84	5190.82	5190.22	5188.84	5204.02
20-May-87	5191.02	5190.52	5190.39	5191.74	5191.68	5188.63	5205.42
17-Jun-87	5190.62	5189.96	5190.00	5191.74	5191.62	5189.91	5205.42
22-Jul-87	5189.83	5189.14	5189.95	5190.83	5191.75	5189.23	5206.10
26-Aug-87	5189.95	5189.17	5190.22	5191.51	5191.64	5188.99	5205.30
23-Sep-87	5186.34	5185.97	5186.24	5187.91	5187.38	5185.41	5206.79