Public Service Company of New Mexico
Person Generating Station
Groundwater Treatment System

Treatment Effectiveness Report
Fourth Quarter 1996

February 11, 1997

Report Prepared Pursuant to Requirements Contained in:

The Person Generating Station Corrective Action Directive (NMT 360010342)
and
The New Mexico Environment Department Discharge Plan, DP-1006

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I. Introduction

This report is prepared pursuant to requirements contained in the Person Generating Station Corrective Action Directive (NMT360010342) issued by the New Mexico Environment Department (NMED) Hazardous and Radioactive Materials Bureau, and requirements contained in Discharge Plan DP-1006 issued by the NMED Groundwater Protection and Remediation Bureau.

This report contains information on sampling results and operational activities at the Person Station Groundwater Treatment System (GTS). The GTS is designed to extract volatile organic compound contaminated groundwater, treat through an air stripper and granular activated carbon filter and discharge the treated water to an irrigation pond at the UNM Championship Golf Course.

Figure 1 is a site map of the Person Generating Station vicinity and shows well locations and the location of the pipeline system.

E 382000
E 383000
E 384000
E 385000
E 386000
N 1468000
N 1467000
N 1466000
N 1465000
BROADWAY
RAILROAD TRACK
SOUTH DIVERSION CHANNEL
SCHWARTZMAN TRUST
INTERSTATE 25
TREATED WATER DISCHARGE TO POND
CHAMPIONSHIP GOLF COURSE
UNM PROPERTY
PARKING
UNIVERSITY BLVD.
ETHICON PROPERTY
N.M. STATE HIGHWAY DEPT. (R.O.W.)
APPROX. PIPE ALIGNMENTS
54 SECTION 89 CORNER
CULVERT
PNM
PNM CONCRETE HOLDING POND
APPROXIMATE LOCATION OF VAPOR EXTRACTION SYSTEM
PERSON GENERATING STATION
POWER OPERATIONS BUILDING
CAPITAL LUMBER CO.
RCRA FACILITY BOUNDARY
RIO BRAVO BLVD.
PSMW-1
PSMW-1A
PSMW-1B
PSMW-1R
PSMW-2
PSMW-2A
PSMW-2B
PSMW-3
PSMW-3A
PSMW-3B
PSMW-4
PSMW-5
PSMW-5A
PSMW-6
PSMW-7
PSMW-8
PSMW-8A
PSMW-8B
PSMW-9
PSMW-10
PSMW-11
PSMW-12A
PSMW-12B
PSMW-13A
PSMW-13B
PSMW-14
PSMW-15B
PSMW-16
PSMW-17
PSMW-18
PSMW-19
PSMW-20
PSMW-21
PSMW-22
PSMW-23
PSMW-24
PSMW-25
PSMW-26
PSMW-27
PSMW-28
PSMW-29
PSMW-31
PSMW-32
PSMW-35
PSMW-36
PSMW-37
PSPW-1
PSPW-2
PSPW-3
PSPW-4
PSPW-5
PSPW-6
VEW/DW WELL
P&T WELL
200 100 0 200 400
SCALE: 1" = 200'

LEGEND
- GROUNDWATER PUMPING WELL
- MONITORING WELL
- PRODUCTION WELL (SEALED)
- ROADS
- PROPERTY LINES

SITE MAP

Public Service Company of New Mexico
Person Generating Station
Albuquerque, New Mexico

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

K:\PNM\950N0960, 04/19/95 at 11:48

II. Operational History

The GTS was started on Friday, January 27, 1995, with treated effluent being sent to the UNM Championship Golf Course.

During the first month of operation, a series of groundwater level measurements were taken at monitoring wells in the vicinity of PSMW-16 and the VEW in order to determine the radius of influence of each well on the surrounding aquifer. Results from that data indicate that PSMW-16 has a radius of influence of 600 feet when pumped at 13.3 gpm, and the VEW has a radius of influence of 80 feet when pumped at 5.6 gpm.

In August 1995, a third extraction well was added to the GTS. This well was designated EW-1 and was drilled and completed specifically for extraction purposes.

During 1995, the GTS encountered periodic minor problems as well as a more serious problem with mineralization of the system components down stream from the air stripper. PNM contractor Parsons-Engineering Science, Inc. was asked to evaluate potential solutions for this problem. In late November, the mineralization problem became so severe that the GTS was shut down pending resolution of the problem.

The GTS was kept down during most of the first quarter of 1996 while the mineralization problem was studied. Parsons-Engineering Science, Inc. evaluated several alternatives including chemical treatment by acid addition, chemical treatment by inhibitors, chemical treatment by water softening, and a mixed oxidant process. After discussing the various alternatives with the NMED Groundwater Bureau (as to the effect of treatment on the discharge plan) and the UNM Championship Golf Course superintendent, PNM selected the acid treatment system for implementation.

Installation of the acid treatment system began in early May 1996. In early April, construction activities were initiated to convert monitor wells PSMW-24, PSMW-25, and PSMW-26 to extraction wells. Consequently, the GTS was operated only sporadically during May and June. The GTS resumed regular operation in mid-June and has operated satisfactorily during the third and fourth quarters.

III. Groundwater Treatment Effectiveness

Figures 2, 3, and 4 show graphs of concentration of total VOC's as measured at wells PSMW-16, VEW, and EW-1 over the operation of the GTS. Figure 5 shows a graph of concentration of total VOC's in the combined influent from wells PSMW-24, PSMW-25, and PSMW-26 during the third and fourth quarter operation of the GTS. More detailed data for 1995 and 1996 are shown in Tables 1, 2, 3, and 4. From February 1, 1995, through March 8, 1995, the total Chlorinated VOC's dropped from 318.4 ppb to 128.3 ppb at PSMW-16. During the same period, total Chlorinated VOC's dropped from 6.1 ppb to 1.8 ppb at the VEW. As anticipated, concentrations rose again when the system was restarted in March.

During the remainder of 1995, concentrations have held relatively steady at PSMW-16 prior to GTS shutdown in November. Concentrations at VEW have fluctuated up and down. Concentrations at EW-1 have risen over the period of its operation. At GTS re-start in March 1996, total Chlorinated VOC's rose dramatically at both PSMW-16 and VEW (EW-1 was not re-started at this time and was not tested). In April 1996, prior to the installation of the acid treatment system, total Chlorinated VOC's had dropped at both PSMW-16 and VEW. Total Chlorinated VOC's increased slightly at PSMW-16 and in the combined influent from PSMW-24, PSMW-25, and PSMW-26 once the GTS resumed full operation in July 1996, but had dropped by the end of the third quarter. Total Chlorinated VOC's have continued to drop at VEW. EW-1 total Chlorinated VOC's increased dramatically once the system resumed full operation, but had dropped by the end of the third quarter.

During the fourth quarter total Chlorinated VOC's have remained relatively constant at VEW and PSMW-16. Total Chlorinated VOC's in the combined influent from PSMW-24, PSMW-25, and PSMW-26 increased at the beginning of the fourth quarter, but had decreased markedly by the end of the quarter. Total Chlorinated VOC's have increased at EW-1 during this quarter.

Laboratory reports for this quarter are contained in appendix A.

Figure 2
Total VOCs at PSMW-16

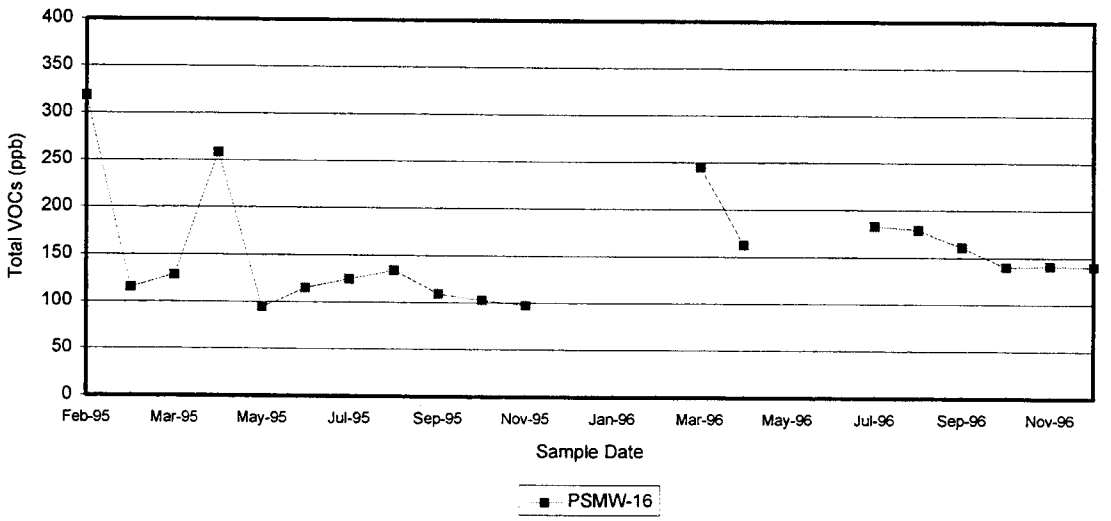

Figure 3
Total VOCs at the VEW

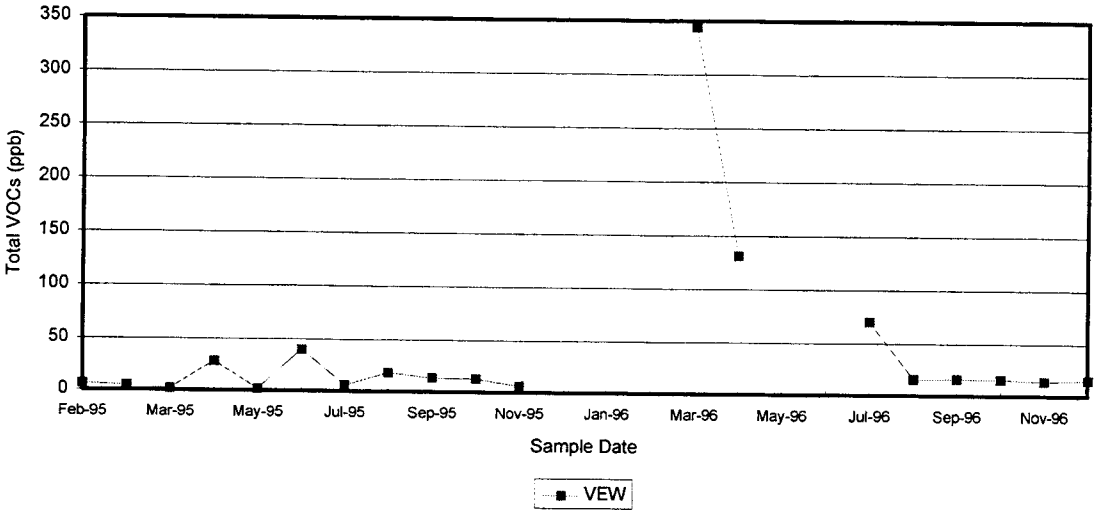

Figure 4
Total VOCs at EW-1

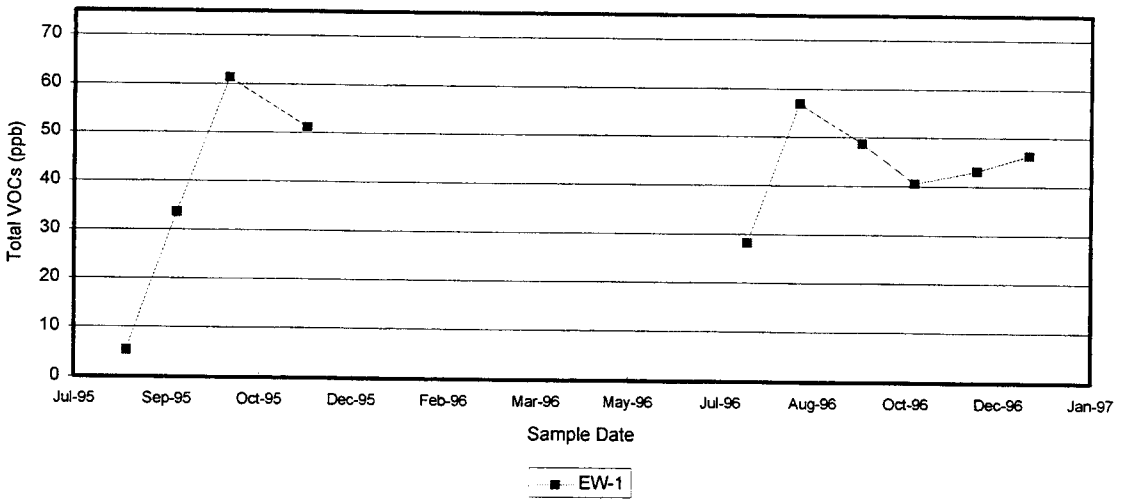

Figure 5
Total VOCs at PSMW-24,25,26

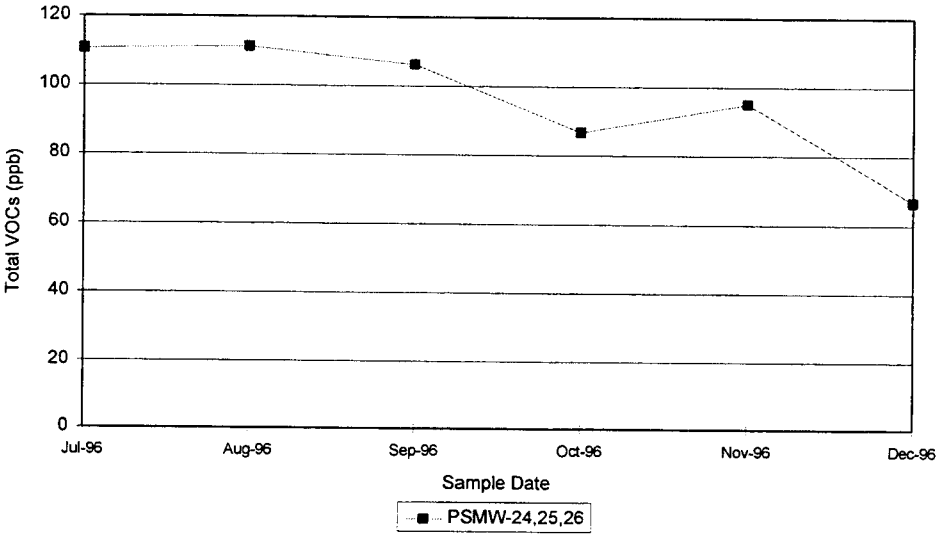

Table 1
Influent Concentrations at PSMW-16

Date	Laboratory Report No.	PCE (ppb)	DCE (ppb)	Total VOC's (ppb)
2/1/95	502304	200	110	318.4
2/15/95	502376	69	39	115.0
3/8/95	503317	78	46	128.3
4/10/95	504341	170	81	258.6
5/18/95	505371	62	30	94.6
6/21/95	506396	76	36	114.8
7/12/95	507327	75	41	124.3
8/17/95	508405	83	45	134.0
9/13/95	509339	69	35	109.2
10/11/95	510335	66	32	102.8
11/22/95	511367	58	35	97.5
3/20/96	603347	180	63	245.3
4/17/96	604367	110	46	162.5
7/18/96	607334	120	54	182.9
8/15/96	608331	120	51	179.1
9/18/96	609338	110	43	160.9
10/16/96	610361	97	37	140.0
11/19/96	611331	94	42	141.0
12/17/96	612331	96	39	140.0

Table 2
Influent Concentrations at VEW

Date	Laboratory Report No.	PCE (ppb)	DCE (ppb)	Total VOC's (ppb)
2/1/95	502304	5.3	0.8	6.1
2/15/95	502376	4	0.5	4.5
3/8/95	503317	1.5	0.3	1.8
4/10/95	504341	21	5.8	28.1
5/18/95	505371	1.4	<0.2	1.4
6/21/95	506396	25	9.4	39.8
7/12/95	507327	3.5	1.0	5.8
8/17/95	508405	6.4	1.1	17.7
9/13/95	509405	9.7	1.9	12.9
10/11/95	510335	9.3	1.8	12.5
11/22/95	511367	4.6	1.1	6.0
3/20/96	603347	270	72	344.3
4/17/96	604367	94	24	131.2
7/18/96	607334	47	14	70.6
8/15/96	608331	5.0	2.1	15.2
9/18/96	609338	3.1	2.1	15.8
10/16/96	610361	3.2	2.1	15.3
11/19/96	611331	0.8	1.8	13.6
12/17/96	612331	<0.5	2.0	15.0

Table 3
Influent Concentrations at EW-1

Date	Laboratory Report No.	PCE (ppb)	DCE(ppb)	Total VOC's (ppb)
8/17/95	508405	3.5	0.9	5.4
9/13/95	509339	25	6.1	33.6
10/11/95	510335	49	8.8	61.4
11/22/95	511367	38	9.5	51.3
7/18/96	607334	20	5.7	28.2
8/15/96	608331	45	8.4	57.0
9/18/96	609338	37	7.8	48.8
10/16/96	610361	29	7.3	40.6
11/19/96	611331	32	7.0	43.2
12/17/96	612331	33	7.7	46.4

Table 4
Combined Influent Concentrations at PSMW-24, 25, and 26

Date	Laboratory Report No.	PCE (ppb)	DCE(ppb)	Total VOC's (ppb)
7/18/96	607334	49	55	110.6
8/15/96	608331	47	50	111.3
9/18/96	609338	58	44	106.3
10/16/96	610361	41	40	86.8
11/19/96	611331	46	44	95.2
12/17/96	612331	33	30	66.7

IV. Operational Dates

The GTS was not operated from January 1, 1996, through March 19, 1996, due to mineralization problems as discussed above. The GTS was re-started on March 20, 1996. The acid treatment system was installed during the second quarter of 1996. Also during the second quarter, monitor wells PSMW-24, PSMW-25, and PSMW-26 were converted to extraction wells as part of Corrective Action Program Phase II implementation. During the fourth quarter the meter measuring the UNM Championship Golf Course discharge was converted to a more accurate electronic Fisher Porter meter. The table below details significant operational activities for this quarter.

Table 5
Significant Operational Activities

Date	Activity
11/27/96	Conversion of UNM Championship Golf Course discharge meter (Badger meter no. 94398834) to Fisher Porter electronic meter (Fisher Porter meter no. 960307112).

V. Influent and Effluent Flow Volumes

Flow totalizing meters are present on each influent well line and on the effluent flow line. Table 6 below details flow volumes from each influent well and the effluent line. Differences between total effluent and total influent may be attributed to water loss (evaporation) out the stack in the air stripper system and to differences, inaccuracies, and operational problems with the flow meters.

Table 6
Influent and Effluent Flow Volumes

Source	Meter Number	Start Reading	End Reading	Volume (Gallons)
Flow Volumes for October 1996:				
Influent (VEW)	Badger Meter No. 94976130	1,819,757	1,966,116	146,359
Influent (PSMW-16)	Hayes Meter No. 29408700	826,336	1,032,626	206,290
Influent (EW-1)	Hayes Meter No. 29408732	643,292	797,917	154,625
Influent (PSMW-24)	Fisher Porter Meter No. 960307112	536,480	676,750	140,270
Influent (PSMW-25)	Fisher Porter Meter No. 960307112	158,110	192,340	34,230
Influent (PSMW-26)	Fisher Porter Meter No. 960307112	273,720	354,570	80,850
Monitor Well Sample Purge	NA	NA	NA	913
Effluent (to Golf Course)	Badger Meter No. 94398834	6,431,040	7,209,800	778,760
Flow Volumes for November 1996:				
Influent (VEW)	Badger Meter No. 94976130	1,966,116	2,126,735	160,619
Influent (PSMW-16)	Hayes Meter No. 29408700	1,032,626	1,265,780	233,154
Influent (EW-1)	Hayes Meter No. 29408732	797,917	968,639	170,722
Influent (PSMW-24)	Fisher Porter Meter No. 960307112	676,750	859,090	182,340
Influent (PSMW-25)	Fisher Porter Meter No. 960307112	192,340	216,670	24,330
Influent (PSMW-26)	Fisher Porter Meter No. 960307112	354,570	450,190	95,620
Effluent (to Golf Course)	Badger Meter No. 94398834	7,209,800	7,412,500	202,700
Effluent (to Golf Course)	Fisher Porter Meter No. 960307112	0	660,733	660,733
Flow Volumes for December 1996:				
Influent (VEW)	Badger Meter No. 94976130	2,126,735	2,282,738	156,003
Influent (PSMW-16)	Hayes Meter No. 29408700	1,265,780	1,464,622	198,842
Influent (EW-1)	Hayes Meter No. 29408732	968,639	1,139,948	171,309
Influent (PSMW-24)	Fisher Porter Meter No. 960307112	859,090	1,102,128	243,038
Influent (PSMW-25)	Fisher Porter Meter No. 960307112	216,670	274,570	57,900
Influent (PSMW-26)	Fisher Porter Meter No. 960307112	450,190	526,530	76,340
Effluent (to Golf Course)	Fisher Porter Meter No.960307112	660,733	1,505,362	844,629
Quarterly Total for Influent (VEW+PSMW-16+EW-1+PSMW-24+PSMW-25+PSMW-26+MW Purge)				2,533,754
Quarterly Total for Effluent:				2,486,822
Annual Totals				
Annual Cumulative Influent Total for 1996:				5,662,956
Annual Cumulative Effluent Total for 1996:				5,681,822

VI. Laboratory Analysis

A. Influent/Effluent Sampling for VOC's (8010 analysis)

During the fourth quarter, influent and effluent sampling was conducted pursuant to the routine schedule outlined in the NMED approved discharge plan, i.e., once each month. (The GTS was not operational during January or February 1996, and was operated only sporadically during May and June 1996, thus no influent/effluent samples were collected.) Total VOC analysis of GTS Influent and Effluent (after GAC units) is shown graphically in Figure 6. More detailed data are shown in Table 7 below. Laboratory analytical data reports are contained in appendix A. All influent/effluent sampling results show that the GTS has consistently removed chlorinated VOC contaminants in the 50 to 200 ppb range to levels below laboratory detection limits in the effluent sent to the golf course. Laboratory analysis of the water stream at a point after the air stripper and before the granular activated carbon treatment also show that at these influent concentrations and a flow rate of approximately 20 to 25 gpm, the air stripper alone is capable of treating the groundwater to concentrations consistently below or near laboratory detection limits for chlorinated VOC's.

Figure 6
Total VOCs GTS Influent vs. Effluent

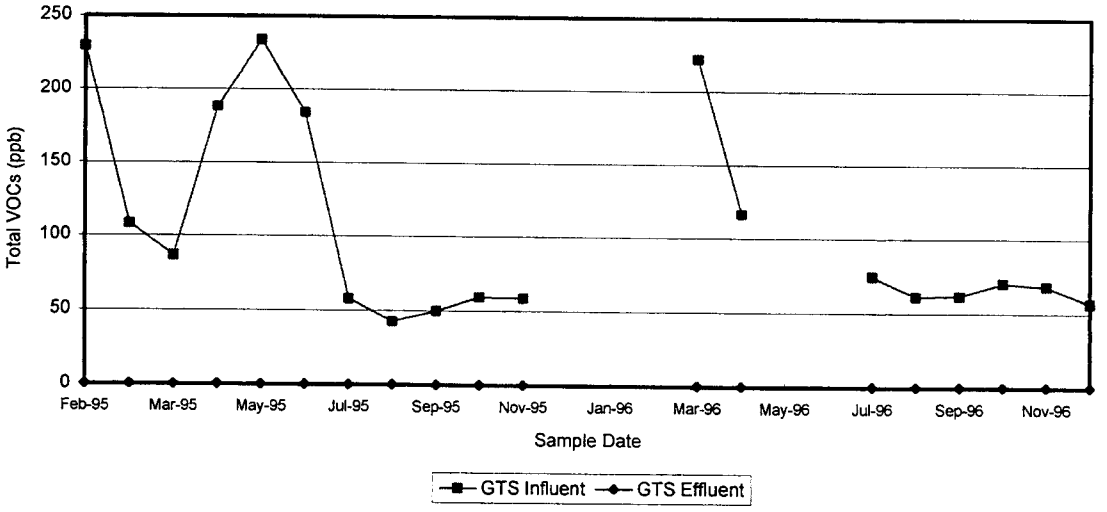

Table 7
Influent and Effluent VOC Concentrations

Sampling Date: 10/16/96	Lab Report Number: 610361		
VOC Compound	Influent (ppb)	Effluent After Air Stripper (ppb)	Effluent After GAC Unit (ppb)
Chloroform	2.0	< 0.5	< 0.5
1,1-Dichloroethane	1.0	< 0.3	< 0.3
1,1-Dichloroethene	22	< 0.2	< 0.2
Tetrachloroethene	43	< 0.5	< 0.5
1,1,1-Trichloroethane	2.4	< 1.0	< 1.0
TOTAL VOC'S	70.4	BDL	BDL

Sampling Date: 11/19/96	Lab Report Number: 611331		
VOC Compound	Influent (ppb)	Effluent After Air Stripper (ppb)	Effluent After GAC Unit (ppb)
Chloroform	1.6	< 0.5	< 0.5
1,1-Dichloroethane	1.0	< 0.3	< 0.3
1,1-Dichloroethene	21	< 0.2	< 0.2
Tetrachloroethene	42	< 0.5	< 0.5
1,1,1-Trichloroethane	2.6	< 1.0	< 1.0
TOTAL VOC'S	68.2	BDL	BDL

Sampling Date: 12/17/96	Lab Report Number: 612331		
VOC Compound	Influent (ppb)	Effluent After Air Stripper (ppb)	Effluent After GAC Unit (ppb)
Chloroform	1.4	< 0.5	< 0.5
1,1-Dichloroethane	0.9	< 0.3	< 0.3
1,1-Dichloroethene	18	< 0.2	< 0.2
Tetrachloroethene	34	< 0.5	< 0.5
1,1,1-Trichloroethane	2.5	< 1.0	< 1.0
TOTAL VOC'S	56.8	BDL	BDL

B. Golf Course Pond Sampling

The GTS NMED Discharge Plan (DP 1006) requires monthly sampling of the east and west ponds for 8010 analysis during each month of operation. During the fourth quarter, the ponds were sampled three times pursuant to this requirement. No EPA Method 8010 parameters were detected in the samples. Copies of the laboratory reports are contained in appendix A.

VII. Groundwater Sampling

Under the RCRA permit, a network of groundwater monitoring wells are sampled on a twice per year schedule (normally in the spring and fall). Once sampling is complete and analytical results have been received, contour maps showing the distribution of the contaminants in the groundwater are prepared. Contour maps for PCE, DCE, and TCA for the most recent sampling event are shown in Figures 7, 8, and 9.