Remedium

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Mr. Derrick Golden
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USEPA Region I
One Congress Street, Mail Code HBO
Boston, Massachusetts 02203-0001

Ms. Jennifer McWeeney
Bureau of Waste Site Cleanup
MA DEP
One Winter Street, 5th Floor
Boston, Massachusetts 02108

Dear Derrick and Jennifer,

Re: 2008 Aquifer Restoration System Operations Report

Enclosed is a copy of the Aquifer Restoration System Operations Report for 2008. If you have any questions, please contact me.

Sincerely,

Maryellen C. Johns
Project Engineer

Enclosure

CC: Jane Ceraso/Acton Water District
Doug Halley/Acton BOH
Grady Konieczko/GeoTrans
Jim Okun/OT&O
Barbara Weir/M&E
Mary Michelman/ACES
Dave Fuerst/O&M Inc.
Acton Public Library

Aquifer Restoration System
Operations Report
January 2008 through December 2008

W.R. Grace Site
Acton, Massachusetts

Prepared by:

O & M, Inc.
450 Montbrook Lane
Knoxville, TN 37919

Prepared for:

W. R. Grace
Remedium Group, Inc.
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February 2008

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Section 1 Introduction

1.1 Background

The Aquifer Restoration System (ARS) installed at W.R. Grace & Co.'s (Grace's) Acton property began pumping and treating groundwater on March 22, 1985. ARS Progress Reports have been completed periodically since system operation was initiated. These reports contained results of groundwater sampling which monitored ARS operation, sampling required by MADEP Discharge Permit No. 1-88 for ARS stripping tower monitoring (Discharge Permit No. 1-88 was replaced by "Amended Monitoring Plan – ARS Treatment System," approved by Massachusetts Department of Environmental Protection on October 22, 1996), water level measurements for contour map development, and details of system operation conducted during the reporting period. From 1986 to 1995, ARS Progress Reports were completed semi-annually as independent reports.

From 1996 to 1998, Groundwater Monitoring Reports were submitted containing post-closure monitoring data and ARS operation and maintenance information. Reporting requirements for groundwater monitoring data were temporarily suspended through the duration of the Operable Unit Three Remedial Investigation with the Government Party (GP) approval of the Revisions to the Groundwater Monitoring Programs dated March 9, 1999 submitted by HSI GeoTrans. Since 2002, GeoTrans has been submitting Annual Groundwater Monitoring Reports summarizing the water level and water quality data collected during annual sampling rounds.

This report, prepared by O & M, Inc. on behalf of Grace, provides a summary of activities associated with the operation, maintenance, and monitoring of the ARS groundwater extraction and treatment system. This report also describes changes made to the ARS as part of implementation of the Landfill Pre-Design Work plan (LFPDW) (GeoTrans, July 26, 2007) (LFPDW). It includes information related to permit sampling, recovery well operation and maintenance, air stripping tower operation and maintenance, and a schedule of operation, maintenance, and monitoring activities. More detailed information regarding system changes will be provided in the Landfill Pre-Design Results Report scheduled to be submitted on April 1, 2009.

1.2 Aquifer Restoration System Monitoring

This report summarizes the activities conducted to satisfy the requirements of the Massachusetts Contingency Plan's (MCP) General Provisions for the Management of Remedial Wastewater and/or Remedial Additives described in 310 CMR 40.0041(6). Treatment system contaminant removal efficiency is evaluated through the collection of quarterly permit samples. Monitoring Plan sampling was conducted in March 2008, June 2008, September 2008, and December 2008.

Each quarterly sampling round consisted of two surface water samples, one tower influent sample and one tower effluent sample. Tower influent and effluent samples were analyzed for Volatile Organic Compounds (VOCs) and dissolved metals. Samples collected from two locations within the inlet to Sinking Pond were analyzed for dissolved metals and color/turbidity, respectively.

Laboratory analyses were conducted using the following EPA approved analytical methods:

Analyses	Method
VOCs	Low Level 8360B
Metals	200.7
Color/Turbidity	180.1/110.2

All sampling was undertaken by O & M, Inc. in accordance with the Quality Assurance Project Plan (QAPP) of January 1994. Columbia Analytical Services of Rochester, NY performed the analytical work using methods accepted by the EPA and DEP. Grace verified the laboratory quality control (QC) data to determine that the data was of acceptable quality.

Section 2 System Operation

2.1 Introduction

This section provides the 42nd progress report on the ARS operations since the groundwater recovery system began operating in 1985. Currently, the operating ARS recovery wells include four original ARS wells (NLGP, NLBR, MLF, WLF) and two new recovery wells installed as part of the LFPDW implementation (SELF-1, SWLF-1). Recovery well ELF was replaced by SELF-1 per approval of the LFPDW as well as GP approval of Grace's September 2007 petition to discontinue pumping from existing recovery wells ELF and RLF on January 15, 2008. This report documents operational and analytical data collected during 2008. Figure 2-1 and Table 2-1 present the key physical features of the groundwater recovery system. Table 2-2 provides a summary of the recovery well flow rates recorded in 2008.

2.2 ARS Performance

Performance of the ARS is evaluated through the following:

- Monitoring of the groundwater recovery wells to verify effective pumping rates and associated capture zones.

- Collection and analysis of influent and effluent samples from the air stripping tower to evaluate contaminant loading and removal efficiency.

- Collection and analysis of surface water samples from the inlet to Sinking Pond to verify compliance with surface water discharge standards.

Separately, GeoTrans will submit an Annual Groundwater Monitoring Report which will evaluate the water level measurements and water quality samples collected in 2008 from monitoring wells in the Groundwater Monitoring Program.

2.3 ARS Monitoring

Scheduled monitoring tasks performed by O & M, Inc. during the past reporting period are summarized below.

Monthly

- Recording flow rates (in-line Signet rotor flow meters), discharge pressures, and pumping well water levels to confirm normal pumping system operation;

- Monitoring and maintaining the hydraulic connection between Muskrat Pond and Turtle Pond.

Weekly

- Checking pump operations and the tower influent flow.

In addition to the scheduled monitoring tasks, O & M, Inc. responded to ARS dial out calls during 2008. ARS dial out calls included low flow and low-pressure alarms on the air stripping tower, power failures, recovery well failures and other unforeseen conditions. Section 2.4 provides a summary of scheduled and response activities conducted by O & M, Inc. in 2008.

2.4 Air Stripping Performance and Maintenance Activities

2.4.1 Air Stripping Tower

Tower cleaning activities were conducted on April 1 and September 29, 2008. The ARS air-stripping tower was cleaned with 550 gallons of 30% hydrogen peroxide.

Low total flow to the tower triggered alarms a total of 5 times in 2008 (March 27, April 18, May 30, October 28, and December 29). These problems were resolved by performing maintenance on the flow sensor or re-starting breakers.

2.4.2 Volatile Organic Removal Efficiency

Table 2-3 summarizes stripping tower cleanings and VOC removal efficiencies in 2008.

2.4.3 Odor Control (Refer to Figure 2-2 for a Schematic)

The activated carbon canisters were replaced on April 24 and November 4, 2008.

2.5 Recovery Well Maintenance Activities

Maintenance was performed on all operational ARS recovery wells during the weeks of May 22 (SLGP, SLBL, NLGP, NLBL, MLF AND WLF) and November 4 (NLGP, NLBR AND SLBR), December 2008 (SELF and SWLF). All well components and well casings were cleaned and inspected and flows were enhanced using a surge block. The cleaning and surging processes are described below:

- Riser pipes, pitless adapters, check valves, pumps and motors were removed from the wells and steam cleaned. All parts were inspected and defective parts were replaced. The well casings were cleaned using a surge block. The surge block was also used to surge water toward and away from the well thereby cleaning the media near the well and improving water recovery rates. Sludge materials and other debris loosened by the surge block were pumped from the well using a portable submersible pump. Pumping continued until the well water became clear.

- Pumping equipment and well components were inspected for damage. Damaged components were either repaired or replaced.

- The pumping equipment was reinstalled and the controls adjusted to maintain optimum flow, pressure, and drawdown.

2.5.1 Recovery Well NLBR and NLGP

Watjus Electric and Soil-Exploration Corp. replaced the pump motor on NLBR on October 3, 2008. NLGP did not require any maintenance.

2.5.2 Recovery Well SLGP and SLBR

Watjus Electric and Soil-Exploration Corp. repaired broken wire on SLGP on May 27, 2008. On November 4, 2008 the pump and motor were found to be damaged on SLGP. Once the pump and motor were removed from SLGP, SLBR was shutdown because backflow prevention was no longer provided for SLGP. Grace requested the wells be permanently shutdown by letter to the GPs dated November 17, 2008. The petition to

shutdown SLGP, SLBR, NLGP, NLBR (defined as Former Lagoon Area (FLA) wells) was conditionally approved on January 9, 2009. Both SLGP and SLBR are no longer in use.

2.5.3 Recovery Well ELF

Watjus Electric found the electric cable and motor to be no good on February 28, 2008. Pump, motor and piping were removed in May, 2008. Approval to permanently shutdown ELF was provided by the GPs by letter dated January 15, 2008. The shut down was coordinated as part of the implementation of the LFPDW.

2.5.4 Recovery Well MLF

Replaced pump, motor, riser pipes and electrical wiring and piped to equalization tank and transfer pump as part of the implementation of the LFPDW.

2.5.5 Recovery Well WLF

Replaced pump, motor, riser pipes and electrical wiring and piped to equalization tank and transfer pump as part of the implementation of the LFPDW.

2.6 Quarterly Monitoring Plan Sampling

The sampling program was conducted in accordance with the ARS Amended Monitoring Plan – ARS Treatment System approved by MADEP on October 22. 1996. On a quarterly basis, air stripping tower influent and effluent samples were analyzed for VOCs and dissolved metals, samples from the inlet to Sinking Pond were analyzed for dissolved metals, and samples from Sinking Pond were analyzed for color and turbidity.

Quarterly Monitoring Plan sampling for the ARS air-stripping tower was conducted by O & M, Inc. in March, June, September and December of 2008. This data is presented in Table 2-4.

2.6.1 Volatile Organic Compounds Concentrations

Figure 2-3 shows the trend of total VOCs and 1, 1-dichloroethene (VDC) concentrations versus time at the air stripping tower influent. The total VOC concentration at the influent to the air-stripping tower was between 28.9 ug/1 and 65.3 ug/l in the four quarterly sampling rounds conducted in 2008.

2.6.2 Dissolved Metals

Dissolved iron concentrations reported for samples collected from the tower influent, tower effluent, and at the inlet to Sinking Pond were above the Amended Monitoring Plan limit of 300 ug/1 during three of four sampling rounds.

All other metals concentrations reported in the permit sampling data collected for 2008 were within Amended Monitoring Plan criteria. A summary of the analytical results for metals is provided in Table 2-4.

2.6.3 Color and Turbidity

The turbidity and color in samples collected in Sinking Pond can be attributed to the elevated levels of iron in the groundwater as discussed above.

2.7 Groundwater Flow Controls

Water levels were monitored and maintenance was performed monthly to ensure that Muskrat and Turtle Ponds remained hydraulically connected. This activity has historically been conducted to maintain the ponds at equal elevations, thus reducing the horizontal groundwater gradient under the ponds, thereby helping to shield the Assabet Wells from the residual contaminant plume east of the ponds. Based on changes to ARS system, this task is no longer required and will not be conducted in the future.

2.8 Continuing Actions

The ARS air-stripping tower will be cleaned with a 30% hydrogen peroxide solution approximately every six months. The activated carbon in the canisters will be changed out every six months.

All of the currently operating wells will be checked regularly to minimize system downtime. Recovery well water levels and pumping rates will be measured monthly. Regular cleaning, inspection and maintenance of recovery wells will continue. Repairs will be conducted on an as needed basis. In order to maintain the system capture zone, emphasis will be placed on replacing any pumps, which may be producing low flow rates or showing inadequate drawdown. If the operational parameters indicate that an accumulation of iron deposits have interfered with normal well operations, pumping equipment will be removed and cleaned at more frequent intervals.

Quarterly samples of the tower influent and effluent, and discharge to Sinking Pond will be collected as required by the Amended Monitoring Plan. A summary of field activities scheduled for the year 2009 is provided in Table 2-5.

Table 2-1

W. R. Grace & Company
Acton, Massachusetts
Aquifer Restoration Program
Key Characteristics of Pumping Wells

Well	Reference Elevation USGS DATUM	Depth to Screen (Ft. below ref. elev.) Top	Bottom
MLF	196.80	74.0	114.0
NLBR	183.10	92.7*	107.7*
NLGP	182.91	72.0	87.0
NMGP	143.22	25.0	40.0
SLBR	181.23	129.0	139.0
SLGP	182.19	97.0	118.0
ELF	197.35	60.6	100.6
SELF	195.70	83.0	101.0
RLF	147.01	32.0	54.0
WLF	197.10	92.0	110.0
SWLF	195.10	167.0	207.0
WRG-1	Approx. 136	45.0	60.0
RP-1	138.88	78.0	88.0

Notes: * Depth to Bedrock. A well screen was not installed in the open bedrock hole.

Table 2-2

W.R. Grace & Company
Acton, Massachusetts
Aquifer Restoration Program
Recovery Well Flow Rate Summary 2008

DATE	NMGP	NLBR	NLGP	SLBR	SLGP	WLF	SWLF	MLF	ELF	SELF	RLF	ARTOT[(1)]	WRG-1	RP-1
28-Jan-08	NA	16.0	8.0	34.0	155.0	19.0	-	33.0	5.0	-	NA	280.0	NA	NA
28-Feb-08	NA	18.0	8.0	32.0	159.0	20.0	-	34.0	-	-	NA	275.0	NA	NA
28-Mar-08	NA	19.0	8.0	37.0	165.0	18.0	-	36.0	-	-	NA	297.0	NA	NA
30-Apr-08	NA	17.0	7.0	35.0	158.0	16.0	-	36.0	-	-	NA	268.0	NA	NA
20-May-08	NA	18.0	7.0	32.0	155.0	15.0	-	36.0	-	-	NA	260.0	NA	NA
17-Jun-08	NA	16.0	6.0	28.0	155.0	-	-	-	-	-	NA	205.0	NA	NA
18-Jul-08	NA	15.0	6.0	25.0	130.0	-	-	-	-	-	NA	165.0	NA	NA
22-Aug-08	NA	NA	6.0	26.0	127.0	-	-	-	-	-	NA	140.0	NA	NA
22-Sep-08	NA	NA	5.0	25.0	125.0	8.8	5.2	38.0	NA	1.5	NA	209.0	NA	NA
21-Oct-08	NA	16.0	5.0	25.0	122.0	8.5	5.0	37.5	NA	1.4	NA	220.0	NA	NA
5-Nov-08	NA	16.0	6.0	24.0	NA	9.5	4.4	38.0	NA	1.1	NA	99.0	NA	NA
29-Dec-08	NA	15.0	5.0	NA	NA	8.2	4.2	37.0	NA	1.4	NA	70.8	NA	NA
Design		36			300	59	5	40	29	5	31	505		

Notes:
All flows are reported in gallons per minute (gpm)
(1) Total flow calculated by adding the flow of each well.
"-" = Not pumping at time of flow measurement.
NA - well is no longer in operation

Table 2-3

W. R. Grace & Company
Acton, Massachusetts
Aquifer Restoration Program
Air Stripping Tower Performance 2008

	Total Volatiles		Removal
Date	**In**	**Out**	**Efficiency**
11-Mar-08	28.93	3.12	99.89
1-Apr-08		Tower Cleaned	
6-Jun-08	39.81	0.5	99.99
29-Sep-08		Tower Cleaned	
30-Sep-08	53.30	0.00	100.00
4-Dec-08	47.31	1.90	99.96

Table 2-4

W.R. Grace Company
Acton, Massachusetts
Aquifer Restoration Program
Quarterly Monitoring Plan Sampling Results

Volatile Organic Compounds (VOCs)

Sample Name Sample Date Chemical Name	MCL Groundwater Standards	Tower Inf. 3/11/2008	Tower Inf. 6/6/2008	Tower Inf. 9/30/2008	Tower Inf. 12/4/2008	Tower Eff 3/11/2008	Tower Eff 6/6/2008	Tower Eff 9/30/2008	Tower Eff 12/4/2008
Volatile Organic Compounds (ug/L)									
Acetone	-	2.6 J	1.5 J	5.0 U	1.7 J	0.92 J	0.5 J	5.0 U	1.9 J
Benzene	5	0.42 J	0.51 J	1.3	12	1 U	1 U	1 U	1.0 U
Bromochloromethane		1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Bromodichloromethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Bromoform	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Bromomethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
2-Butanone	-	5 U	5.0 U	5.0 U	5.0 U	5 U	5 U	5 U	5.0 U
Carbon Disulfide	-	1 U	1 U	1 U	5.0 U	1 U	1 U	1 U	1.0 U
Chlorobenzene	100	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Chloroethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Chloroform	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Chloromethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Dibromochloromethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
1,1-Dichloroethane	-	1 U	1.0 U	1.0 U	0.6 J	1 U	1 U	1 U	1.0 U
1,2-Dichloroethane	5	0.21 J	0.2 J	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
1,1-Dichloroethene	7	**24**	**34**	**50**	**25**	2.2	1 U	1 U	1.0 U
trans-1,2-Dichloroethene	100	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
cis-1,2-Dichloroethene	70	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Dichloromethane		1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
cis-1,3-Dichloropropene	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
trans-1,3-Dichloropropene	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Ethylbenzene	700	1 U	1.0 U	1.0 U	0.5 J	1 U	1 U	1 U	1.0 U
2-Hexanone	-	5 U	1.6 J	5.0 U	5.0 U	5 U	5 U	5 U	5.0 U
4-Methyl-2-pentanone	-	5 U	5.0 U	5.0 U	5.0 U	5 U	5 U	5 U	5.0 U
Styrene	100	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
1,1,2,2-Tetrachloroethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Tetrachloroethene	5	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Toluene	1,000	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
1,1,1-Trichloroethane	200	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
1,1,2-Trichloroethane	5	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Trichloroethene	5	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Trichlorofluoromethane	-	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Vinyl Acetate	-	5 U	5.0 U	5.0 U	5.0 U	5 U	5 U	5 U	5.0 U
Vinyl Chloride	2	1.7 J	**2.2**	**2**	**8.1**	1 U	1 U	1 U	1.0 U
Xylene (M+P)		1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Xylene (O)	10,000	1 U	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1.0 U
Total VOCs		28.93	39.81	53.30	47.31	3.12	0.50	ND	1.90

Notes:

Bold results exceed MCL Groundwater Standards.

- = Not Applicable.

U = Not Detected

J = Estimated value below reporting detection limit.

Sample Name	MCL	Tower Inf.		Tower I	ISP		ISP		ISP x10x1	ISP x10x1	ISP1x10x1	ISP1x10x1
Sample Date	Groundwater	3/11/2008		6/6/200	/2008		12/4/2008		3/11/2008	6/6/2008	9/30/2008	12/4/2008
Chemical Name	Standards											
Metals (ug/L)												
Arsenic	50	44.9		45.7	.4		4.9		-	-	-	-
Beryllium	4	1.0	U	1	1	U	1	U	-	-	-	-
Cadmium	5	1.0	U	1	1	U	1	U	-	-	-	-
Total Chromium	100	3.0	U	2	2	U	2	U	-	-	-	-
Copper [(1)]	1,000	40.7		2.3	.6		1.1		-	-	-	-
Iron [(1)]	300	**12,600**		**13,400**	03		**445.0**		-	-	-	-
Lead	15	1.0	U	1	1	U	1.0	U	-	-	-	-
Nickel [(1)]	100	5.3		4.8	.6		10.5		-	-	-	-
Zinc [(1)]	5,000	10.2		5	3.6		5.8		-	-	-	-
Color (std. units)	-	-							**100**	**50**	**1000**	**30**
Turbidity (NTU)	-	-							**76.7**	**62.1**	**312**	**30.1**

Notes:

Bold results exceed MCL Groundwater Standards.

- = Not Analyzed/Not Applicable.

U = Not Detected

B = Present also in Blank, included in Total

NTU = Nephelometric Turbidity Units.

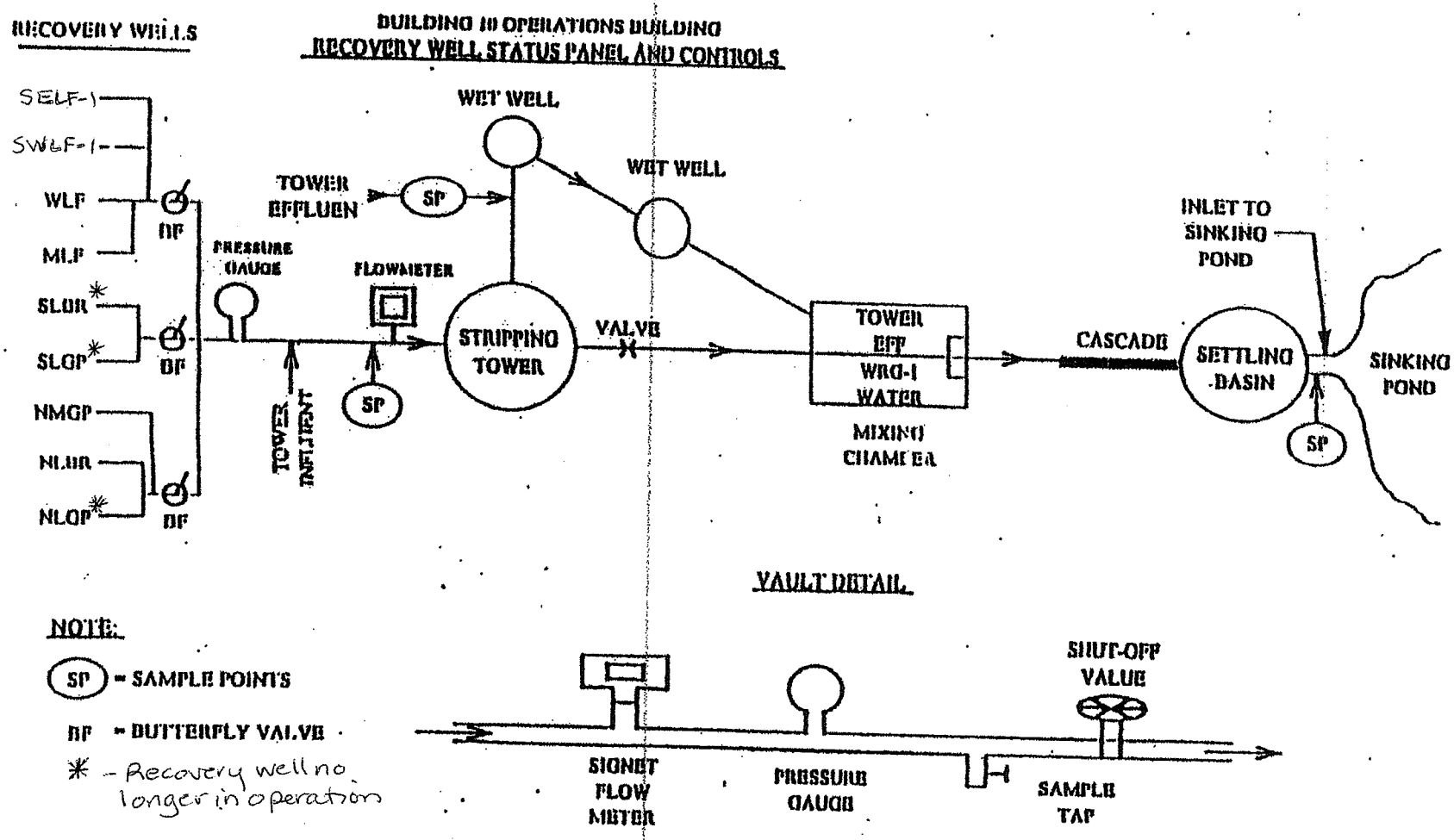
(1) Standards based on ARS Ammended Monitoring Plan Requirements.

Table 2-5

W. R. Grace & Company
Acton, Massachusetts
Aquifer Restoration Program
ARS Monitoring and Sampling Activities

Monitoring Frequency	Location	Task
Monthly	WLF SWLF SELF MLF	Measure groundwater levels Record flow and pressure
Quarterly	Stripping Tower Influent Stripping Tower Effluent	Collect VOC sample and dis metals; 10-day TAT Collect VOC sample; 10-day TAT
	Sinking Pond Influent (ISP)	Collect Dissolved metals sample; 10-day TAT
	10 x 1 ISP	Collect color and turbidity sample; 10-day TAT
Every 8 Weeks	Air Stripping Tower	Clean packing
Every 6 Months	Air Stripping Tower	Change Activated Carbon

Notes
VOCs - Volatile Organic Compounds
Metals - Arsenic, Beryllium, Cadmium, Copper, Iron, Lead, Nickel, Zinc
TAT - Turn around time



W.R. GRACE & CO.
Acton, Massachusetts

FIGURE 2-1
FLOW DIAGRAM
ARS RECOVERY WELLS AND STRIPPING TOWER

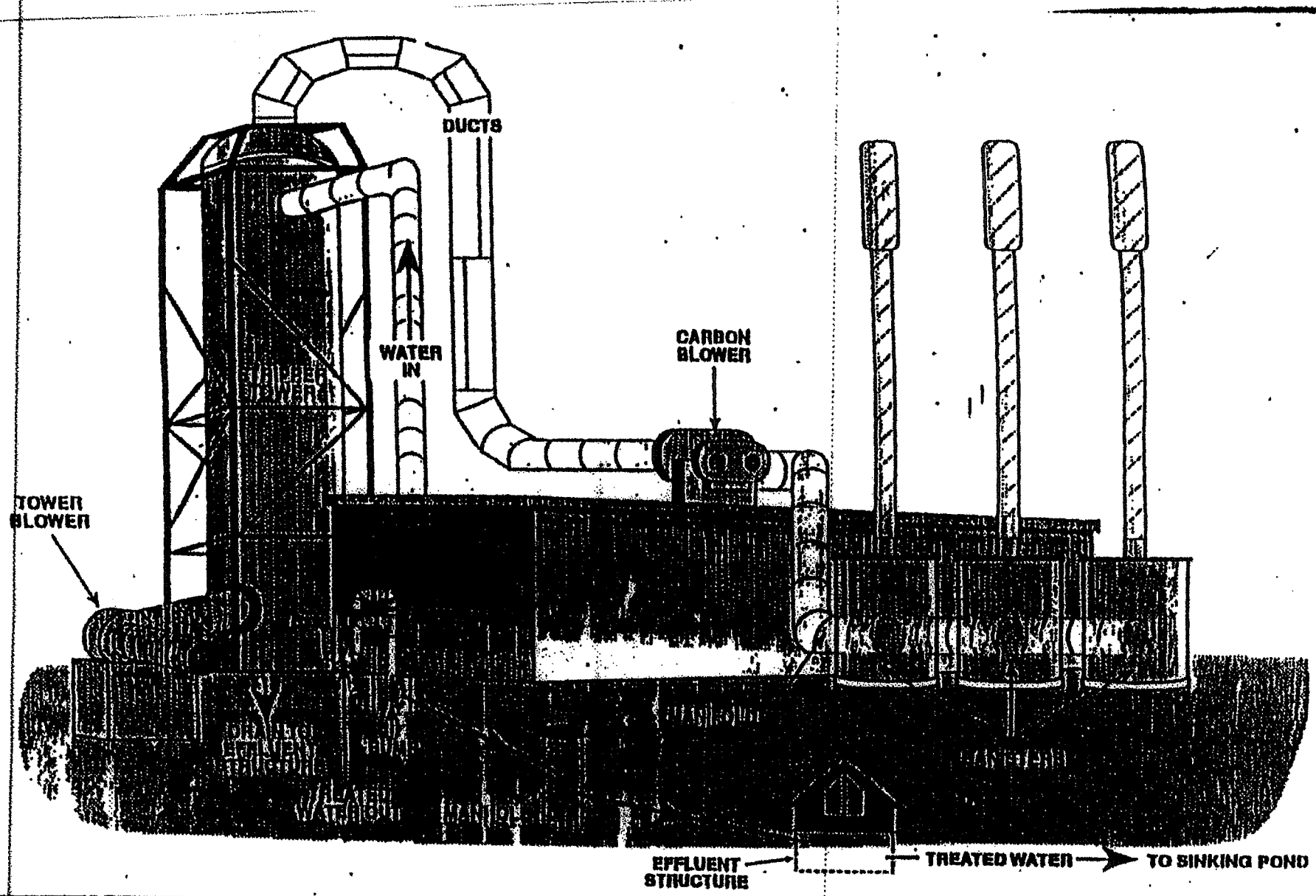


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FIGURE 2-2
ODOR CONTROL SYSTEM