TETRA TECH

P.N. 117-3008080

September 25, 2012

Mr. Derrick Golden
Waste Management Division
U.S. Environmental Protection Agency
Region I
5 Post Office Square
Mail Code OSRR07-4
Boston, MA 02109-3912

Ms. Jennifer McWeeney
Bureau of Waste Site Cleanup
Massachusetts Department of
Environmental Protection
One Winter Street, 7th Floor
Boston, MA 02108

RE: Final Landfill Area Groundwater Remedial Action Report
W. R. Grace Superfund Site, Acton, Massachusetts

Dear Mr. Golden and Ms. McWeeney:

Enclosed is the Final Landfill Area Groundwater Remedial Action Report (RA Report). The Interim Landfill Area Groundwater Remedial Action Report dated August 15, 2012 has been updated to respond to your comments provided in the letter *RE: EPA comments on the Draft Landfill Area Remedial Action Report* dated August 27, 2012.

If you have any questions regarding the RA Report, please call me at (978) 952-0120 or Thor Helgason at 781-642-8775.

Sincerely,

Anne Benjamin Sheehan
Project Manager

ABS/enclosures

cc: Lydia Duff, W. R. Grace
Dave Fuerst, O & M
Jack Guswa, JG Environmental
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P.N. 117-3008080.23

September 25, 2012

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Ms. Jennifer McWeeney
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Massachusetts Department of
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One Winter Street, 7th Floor
Boston, MA 02108

RE: Response to 8/27/12 EPA Comments on the Draft Landfill Area Remedial Action Report W. R. Grace Superfund Site, Acton, Massachusetts

Dear Mr. Golden and Ms. McWeeney:

This letter provides responses to your August 27, 2012 comments on the *Draft Interim Landfill Area Groundwater Remedial Action Report* prepared by Tetra Tech GEO, dated August 15, 2012.

1. **Section 1.1.3. Remedial History, p. 1-5: Chronology of Significant Events.** This section needs to include the installation of SELF-2 and the re-evaluation of the capture zone as documented in the August 18, 2010 letter (GeoTrans) and EPA's conditional approval of that letter dated October 29, 2010) be included . Also, see related below comment # 5 that requests additional discussion of the extraction system design and testing efforts.

   ***Response**: The chronology has been updated as indicated above.*

2. **Section 1.1.3. Remedial History, p. 1.5: Chronology of Significant Events — June 24, 2011 - Addition of sodium hydroxide:** The description in this section needs to include additional detail in order to convey why this event is significant; e.g., it could state that the "addition of sodium hydroxide is used to improve arsenic and manganese removal."

   ***Response**: The chronology has been updated as indicated above.*

3. **Section 1.2.2. Landfill Area Groundwater Remedial Action, p. 1.8:**
   Page 2-12, of EPA's guidance entitled: *Close Out Procedures for National Priorities List Sites,* dated May 2011, states that the remedial action objectives (RAOs) need to be included in Remedial Action Reports. The following RAOs need to be included in the final report:

   (a) Prevent potential exposure to concentrations of contaminated groundwater from the Site having carcinogens in excess of ARARs (i.e., MCLs, non-zero MCLGs), and prevent exposure to groundwater that may pose a total excess cancer risk in groundwater in excess of USEPA's cancer risk range of 10-4 to 10-6 and/or which exceed a target noncancer hazard index of one.

   (b) Restore groundwater quality consistent with ARARs and cleanup goals so that the aquifer is suitable as a public water supply and for irrigation purposes without pre-

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treatment for Site-related contaminants.

***Response**: The RAOs have been added to Section 1.1.3 of the report.*

4. **Section 1.2.2. Landfill Area Groundwater Remedial Action, p. 1.8:** Since achievement of the "ROD-Required Capture Zone" is the standard by which the extraction system is judged, the statement that the wells were designed "to capture groundwater generally in the area described as the "ROD Capture Zone on Figures 1-3, 1-5, and 1-6" seems to understate the goal. This section needs to be reworded to better reflect the design requirement for the extraction system.

   ***Response**: Section 1.2.2 has been amended to include additional information regarding the capture zone goals.*

5. **Section 2 Groundwater Extraction System, p. 2.1:** This section omits too much of the sequence of events that comprises the design and testing of the landfill area extraction system. While technical details are not needed in this remedial action report, the text should include the major steps taken and general information about the wells; e.g., additional monitoring wells were installed, SELF-1 (southeast overburden) and SWLF-1 (southwest bedrock) where installed, pumping testing and modeling was done, additional monitoring wells and SELF-2 were subsequently installed, capture zone was re-evaluated, SWLF-1 was replaced with SWLF-2., etc.

   ***Response**: Section 2 has been updated to include a description of the sequence of events related to the Landfill Area extraction system.*

6. **Section 4.2 Treatment System Monitoring, p. 4-3,** toxicity test discussion: A sentence should be added to the end of this paragraph to refer the reader to Section 6.1 Conclusions, where it is stated that additional toxicity testing is planned on a quarterly basis to further evaluate the effects of the treatment system discharge on Sinking Pond.

   ***Response**: The section has been updated as requested.*

7. **Section 5, p. 5-1, first sentence:** The correct terminology is Operational and Functional not Operation and Functional.

   ***Response**: The typo has been corrected.*

8. **Section 5.1, p. 5-1, first paragraph after bulleted list:** The correct construction dates should read "September 2010 and April 2011."

   ***Response**: The typo has been corrected.*

9. **Section 6, General:** EPA's guidance entitled: *Close Out Procedures for National Priorities List Sites,* dated May 2011, table 2-5 recommends that the Operation and Maintenance section include activities that need to be completed to implement institutional controls. A brief summary of the efforts need to be included, i.e., irrigation well moratorium, submittal of draft institutional control plan to the town of Acton.

   ***Response**: A section has been added to describe the institutional controls.*

10. **Section 6.2.1 Water Level and Groundwater Quality Monitoring, p. 6.1:** This section should also include a statement that there is a requirement that the landfill area extraction system capture zone be re-evaluated annually to confirm that the system is achieving its ROD-required goal.

    ***Response**: This section has been updated as requested.*

11. **Section 6.3 System Shut-Down:** The correct statement of work reference should read Section VII, not Section V.

    ***Response**: The typo has been corrected.*

12. **General:** Page 2-6 of EPA's guidance entitled: Close Out Procedures for National Priorities List Sites, dated May 2011, no longer has a requirement for an Interim Remedial Action Report. Therefore when these comments are incorporated and the report is finalized, it should be entitled: Final Landfill Area Remedial Action Report.

    ***Response**: The title has been changed as requested.*

If you have any questions regarding these responses, please call me at (978) 952-0120 or Thor Helgason at 781-642-8775.

Sincerely,

Anne B Sheehan

Anne Benjamin Sheehan
Project Manager

ABS/enclosures

cc: Lydia Duff, W. R. Grace
Dave Fuerst, O & M
Jack Guswa, JG Environmental
Thor Helgason, de maximis
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Bob Medler, Remedium

FINAL LANDFILL AREA GROUNDWATER REMEDIAL ACTION REPORT

W.R. GRACE SUPERFUND SITE
ACTON, MASSACHUSETTS

PREPARED FOR

W.R. GRACE & CO. – CONN.
62 WHITTEMORE AVENUE
CAMBRIDGE, MASSACHUSETTS 02140

PREPARED BY

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SEPTEBMER 25, 2012

TETRA TECH GEO

One Monarch Drive, Suite 202, Littleton, MA 01460

FINAL LANDFILL AREA GROUNDWATER REMEDIAL ACTION REPORT

W.R. GRACE SUPERFUND SITE
ACTON, MASSACHUSETTS

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
ONE CONGRESS STREET SUITE 1100
BOSTON MASSACHUSETTS 02114-2023

MEMORANDUM

Date: September 25, 2012

Subject: Final Landfill Area Remedial Action Report (RA Report), W.R. Grace (Acton Plant) Superfund site, Operable Unit 3, Acton & Concord, Massachusetts

From: Derrick Golden, Remedial Project Manager
Massachusetts Superfund Section

Thru: Bob Cianciarulo, Chief
Massachusetts Superfund Section

To: Larry Brill, Chief
Remediation & Restoration Branch I

Please find enclosed the Final Landfill Area RA report, for the W.R. Grace (Acton Plant) Superfund site.

The RA report documents that the Landfill Area groundwater extraction, treatment and discharge system was constructed in accordance with the 2005 Record of Decision, the 2006 Remedial Design/Remedial Action Statement of Work and various engineering design submittals.

After conducting the final inspection on May 25, 2012, EPA and MassDEP determined that the Landfill Area remedial action is operational and functional.

The RA report contains: a Site History; a description of the Remedial Design; a description of remedy implementation; and the effluent monitoring data which supports that the monthly discharge limits are being achieved.

The RA report also includes the construction quality assurance and quality control measures that were implemented during construction of the system.

I recommend that you sign this memorandum to indicate EPA's acceptance of this as documentation of Remedial Action completion.

Larry Brill, Chief
Remediation and Restoration I Branch

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1 INTRODUCTION

This Final Landfill Area Groundwater Remedial Action Report (the "RA Report") for the W. R. Grace & Co. – Conn. (Grace) Acton Superfund Site (the "Site") is submitted in accordance with the Operable Unit Three (OU-3) Remedial Design/Remedial Action (RD/RA) Statement of Work (SOW), as approved by the United States Environmental Protection Agency (USEPA) and the Massachusetts Department of Environmental Protection (MassDEP) on August 30, 2006. The RA Report documents the installation and start-up of the remedial action for the Landfill Area. The installation and start-up was performed consistent with the provisions of the Landfill Area Groundwater Final Design (GeoTrans and O & M, 2010).

Section 1 of this RA Report describes the Site background and the Landfill Area background. Section 2 of this RA Report describes the groundwater extraction system. Section 3 summarizes the installation of the groundwater treatment system and Section 4 details the start-up of the Landfill Area Remedial Action. Section 5 describes the construction quality control, and the final inspection and certifications. Section 6 presents the conclusions for the RA Report and summarizes the long-term operation and monitoring of the system as well as the conditions for eventual system shut-down, and Section 7 provides references cited in this RA Report.

1.1 SITE BACKGROUND

1.1.1 PROPERTY DESCRIPTION

The Grace property, comprising approximately 260 acres, is located in Acton and Concord, Massachusetts. Figure 1-1 is a map showing the Grace property and the surrounding area. Figure 1-2 is a map showing Site features and sampling locations. The Grace property is bordered by residential property on the northwest, east, and west, and industrial properties to the south and northeast. Sinking Pond, a kettle pond, is located in the southwestern portion of the property, and Turtle and Muskrat Ponds, which occupy former gravel pits, are located south of the property. Fort Pond Brook bounds the property to the northwest and the Assabet River bounds the property to the southeast. The Assabet Wellfield, which supplies water for a portion of the Town of Acton, is located southwest of the property. The School Street Wellfield, which also supplies water for a portion of the Town of Acton, is located northeast of the property.

1.1.2 PROPERTY HISTORY

Former owners of the Grace property include American Cyanamid Company, which manufactured explosives, and the Dewey & Almy Chemical Company (Dewey & Almy). Dewey & Almy acquired the property in 1946 and manufactured synthetic rubber container sealant products. An organic chemical plant that produced latex products, plasticizers, and resins began operating in 1949. A paper battery separator production facility was constructed in 1951 (HSI GeoTrans, 1998).

Grace acquired Dewey & Almy in 1954, and manufacturing operations were continued at the property. Grace produced materials used to make concrete additives, organic chemicals, container sealing compounds, latex products, and paper and plastic battery separators. Process wastewater was disposed of in several on-Site lagoons and solid industrial wastes were disposed of in an on-Site landfill. In addition, the by-products of some chemical processes were disposed of in the Blowdown Pit in the central portion of the property. Discharge to these areas ceased in 1980. Production of organic chemicals ceased in 1982.

In 1978, groundwater contamination, consisting mainly of 1,1-dichloroethene (VDC) and lesser amounts of vinyl chloride, ethylbenzene, and benzene, was detected in two Acton municipal supply wells, Assabet 1 and Assabet 2, located southwest of the property.

1.1.3 REMEDIAL HISTORY

After the groundwater contamination was discovered in 1978, Grace undertook a number of remedial activities. The remedial activities done at the Site are described below.

Aquifer Restoration System

The discovery of groundwater contamination in the Assabet wells in 1978 led to the design of the Aquifer Restoration System (ARS) and its initial installation beginning in 1984. The ARS was designed to mitigate the migration of contaminated groundwater to the Assabet wells, the Assabet River, and Fort Pond Brook.

The ARS created a large hydraulic capture zone beneath the Site. Contaminated groundwater within the capture zone was collected and treated by the ARS. The main ARS became operational in March 1985 and was supplemented in 1987 and 1992. Through most of its period of operation, the ARS consisted of eleven extraction wells pumping a total of approximately 570 gallons per minute (gpm) of groundwater. Groundwater was treated by air

stripping and discharged to Sinking Pond. In late 2002, three extraction wells, NMGP, RP-1, and WRG-1, were removed from service, thereby reducing the volume of groundwater pumped by the ARS to approximately 400 gpm. Between May 2007 and December 2010, six additional recovery wells, ELF, NLGP, NLBR, SLGP, SLBR and RLF, were removed from service, and three new extraction wells, SELF-1, SELF-2 and SWLF-1, were installed and activated downgradient of the Industrial Landfill. As of December 2012, five extraction wells were active downgradient of the Industrial Landfill, MLF, SELF-1, SELF-2, SWLF-2 (replaced SWLF-1 in April 2011) and WLF, pumping approximately 40 to 50 gpm.

The ARS groundwater treatment system (GWTS) was shut down on April 22, 2011 with the start-up of the Landfill Area GWTS described in this report. The ARS GWTS was decommissioned during the summer of 2011. Five Landfill Area groundwater extraction wells (MLF, SELF-1, SELF-2, SWLF-2 and WLF) continue to pump, and are now part of the Landfill Area remedial action as described in Section 2 of this report.

Operable Unit One Record of Decision and Remedy

A Record of Decision (ROD) for the Site was issued on September 29, 1989. In order to implement the Site cleanup under the ROD, the USEPA organized the work into three operable units (OUs) as follows:

- OU-1: Disposal areas and surficial contamination areas at the Site;
- OU-2: Residual contamination in source areas at the Site following implementation of OU-1; and
- OU-3: Contaminated groundwater in the area of the Acton facility that is not contained or adequately addressed by the ARS.

The OU-1 remedy contained in the ROD (USEPA, 1989) was implemented between 1994 and 1997. The remedy included excavation of contaminated material with a) off-Site incineration of the more contaminated sludge and soil; and b) on-Site solidification of less-contaminated soil and sludge, followed by removal of volatile organic compounds (VOCs) by heat, and by on-Site disposal in the Industrial Landfill. The OU-1 remedy also included capping the Industrial Landfill and grading the excavated waste areas (HSI GeoTrans, 1998). Post-excavation sampling of remediated soil demonstrated that the concentrations of contaminants in the remaining soils were below the established Soil Cleanup Goals. Therefore, both the OU-1 and OU-2 remedy goals were achieved without having to implement a separate OU-2 remedy.

Operable Unit Three Record of Decision

The OU-3 ROD (USEPA, 2005), issued September 30, 2005, addressed groundwater, sediment and surface water contamination at the Site to the extent they exist. The major components of the remedy include:

- Cleanup of contaminated sediments and soils posing an unacceptable risk to human health and/or the environment in Sinking Pond and the North Lagoon Wetlands;
- Extraction and treatment of groundwater contamination in the Southeast and Southwest Industrial Landfill Areas on the Grace property and at targeted areas within the Northeast Area;
- A redesigned and/or modified Aquifer Restoration System that will treat extracted groundwater for both metals and organic contaminants;
- Monitored natural attenuation of areas of groundwater not captured by the extraction system;
- Institutional controls such as deed restrictions and/or local ordinances to prevent unacceptable exposures to contaminated groundwater until cleanup levels are met and to protect against unacceptable future exposures to any wastes left in place on-Site; and
- Long-term groundwater, surface water, and sediment monitoring and periodic five-year reviews of the remedy.

The Remedial Action Objectives (RAOs) stated in the ROD for the selected remedy are:

- Prevent potential exposure to concentrations of contaminated groundwater from the Site having carcinogens in excess of ARARs (i.e., MCLs, non-zero MCLGs), and prevent exposure to groundwater that may pose a total excess cancer risk in groundwater in excess of USEPA's cancer risk range of 10^{-4} to 10^{-6} and/or which exceed a target noncancer hazard index of one.
- Restore groundwater quality consistent with ARARs and cleanup goals so that the aquifer is suitable as a public water supply and for irrigation purposes without pretreatment for Site-related contaminants.

This Interim RA Report summarizes the remedy construction for the Landfill Area of the Site for OU-3. A summary of the events leading up to the implementation of the Landfill Area remedial action is detailed below. Details regarding the remedial actions for the Northeast Area and Sinking Pond/North Lagoon Wetland sediment can be found in the Interim Northeast Area Groundwater Remedial Action Report (Revision 01) (GeoTrans and O&M, 2011) and the Final Sediment Construction Summary and Final Sediment Remedial Action Report (Arcadis, 2012), respectively.

Chronology of Significant Events

1978	VOC contamination detected in Assabet public water supply wells.
1978-1984	Investigations into sources of contamination and design of Aquifer Restoration System (ARS)
September 8, 1983	Site added to National Priorities List
March 1985	Operation of ARS begins
September 29, 1989	OU-1 ROD issued
1989-1994	OU-1 remedy designed
1994-1997	OU-1 remedy implemented
1998-2005	OU-3 Remedial Investigations and Feasibility Studies conducted
July 1, 2005	OU-3 Public Review Draft Remedial Investigation/Feasibility Study/Baseline Ecological Risk Assessment/Public Health Risk Assessment submitted
September 30, 2005	OU-3 ROD issued
August 30, 2006	OU-3 RD/RA Statement of Work completed
December 14, 2006	Final limits for effluent discharge to Sinking Pond from Treatment System
January 2007 – November 2009	Landfill Area Groundwater Pre-Design phase
July 2008	Install extraction wells SELF-1 and SWLF-1
September 8, 2009	Landfill Area Groundwater Concept Design submitted
January 22, 2010	EPA approval of Landfill Area Groundwater Concept Design
June 2010	Install extraction well SELF-2 and Re-evaluate Landfill Area groundwater capture zone (GeoTrans, 2010b)
October 29, 2010	EPA conditional approval of Landfill Area capture zone (EPA, 2010)
December 10, 2010	Landfill Area Groundwater Final Design submitted
September 2010 – April 2011	Construction of Landfill Area groundwater treatment system
February 14, 2011	EPA approval of Landfill Area Groundwater Final Design
April 2011	Replace extraction well SWLF-1 with SWLF-2
April 22, 2011	Shut-down ARS groundwater treatment system
May 2, 2011	Start-up Landfill Area groundwater treatment system
May 2011 – May 2012	Shake-down of Landfill Area groundwater treatment system
June 24, 2011	Addition of sodium hydroxide to improve removal of arsenic and manganese

Chronology of Significant Events (continued)

May 3, 10, 17, 24, 26 & 31 2011	Weekly treatment system sampling
June 30, July 15, 18 & 20, August 2 & 4, & September 26, 2011	Weekly - monthly treatment system sampling
September 1– December 13, 2011	Treatment system operated intermittently during most of this time period to clean and evaluate Purifics photocatalytic oxidation unit
September 21, 2011	Replace potassium permanganate with sodium hypochlorite in the metals microfiltration system
December 15, 21 & 29, 2011	Weekly treatment system sampling
January 5, February 23 & 29, March 19, April 11, May 14, 2012	Monthly treatment system sampling
February 8, 2012	Solution of Oxone® added to treatment train after metals removal and prior to Purifics photocatalytic oxidation unit to improve treatment of 1,4-dioxane
March 20 – 27, 2012	Initial whole effluent toxicity test
May 14, 2012	Liquid-phase carbon added to remove excess chlorine resulting from the treatment process
May 15 – 22, 2012	Quarterly whole effluent toxicity test
May 24, 2012	Landfill Area groundwater pre-final and final certification inspection
May 25, 2012	EPA determines that construction is complete and remedial action is "Operational and Functional"
2025	Projected date when clean-up goals expected to be met. (Based on groundwater flow and chemical transport modeling reported in Section 6 of Public Review Draft Feasibility Study (GeoTrans, 2005b).)

1.2 LANDFILL AREA

The following sections describe the nature and extent of groundwater contamination found in the Landfill Area, the Landfill Area remedy specified in the ROD, and discharge requirements for groundwater and air.

1.2.1 NATURE AND EXTENT OF LANDFILL AREA GROUNDWATER CONTAMINATION

The main contaminants found in groundwater downgradient of the Industrial Landfill are VDC, vinyl chloride, benzene, arsenic and manganese. VDC contamination is the most

widespread and is found in two areas, southeast and southwest of the landfill. Figure 1-3 shows the maximum VDC concentration, regardless of depth, detected in groundwater samples collected between September 26, 2011 and October 12, 2011. Southeast of the Industrial Landfill, the VDC contamination is found at concentrations greater than its IGCL only in the unconsolidated deposits. The maximum VDC concentration detected southeast of the Industrial Landfill in 2011 was 32 µg/L in a sample from monitoring well AR-11B2, which is completed in the deep sands and gravels. On the southwestern side of the Industrial Landfill, the VDC contamination is deeper, with the highest concentrations found in the deep unconsolidated deposits and shallow bedrock in the vicinity of the LF-10, LF-02 and LF-19 monitoring well clusters. The maximum VDC concentration detected at the Site in 2011 was 520 µg/L in a sample from monitoring well LF-02A, which is completed in the shallow bedrock. Figure 1-4 is a cross-section showing the vertical distribution of VDC through the southwestern portion of the Industrial Landfill in 2011. The location of section A-A' is shown on Figure 1-3.

The distribution of vinyl chloride is similar to the distribution of VDC, though it is less widespread Site-wide. Overall, the vinyl chloride concentrations are lower than VDC concentrations. Figure 1-5 shows the maximum vinyl chloride concentration, regardless of depth, detected in groundwater samples collected between September 26, 2011 and October 12, 2011. The maximum vinyl chloride concentration detected southeast of the Industrial Landfill in 2011 was 90 µg/L in a sample from monitoring well LF-17D, which is completed in the till. As with VDC, on the southwestern side of the Industrial Landfill, the vinyl chloride contamination is deeper, with the highest concentrations found in the deep unconsolidated deposits and shallow bedrock in the vicinity of the LF-10, LF-02 and LF-19 monitoring well clusters. The maximum vinyl chloride concentration detected at the Site in 2011 was 180 µg/L in a sample from monitoring well LF-02A, which is completed in the shallow bedrock.

The highest benzene concentrations are found southeast of the Industrial Landfill, where the benzene contamination is generally shallow, with the highest concentrations detected in the sands and gravels. Figure 1-6 shows the maximum benzene concentration, regardless of depth, detected in groundwater samples collected between September 26, 2011 and October 12, 2011. Figure 1-7 is a cross-section showing the vertical distribution of benzene through the southeastern portion of the Industrial Landfill in 2011. The location of section B-B' is shown on

Figure 1-6. The maximum benzene concentration detected at the Site in 2011 was 420 µg/L in a sample from monitoring well LF-06C, which is completed in the deep sands and gravels.

In addition to the VOC contamination, groundwater quality data indicate that geochemical changes in groundwater near and downgradient of the Industrial Landfill likely caused dissolution of naturally occurring arsenic and manganese, resulting in elevated concentrations of these compounds in groundwater in portions of the Landfill Area. Additional information regarding the nature and extent of groundwater contamination in the Landfill Area can be found in Sections 4.1.6 and 4.1.10 of the Public Review Draft Remedial Investigation Report (GeoTrans, 2005a) and Sections 1.3.1.6 and 1.3.1.7 of the Public Review Draft Feasibility Study Report (GeoTrans, 2005b).

1.2.2 LANDFILL AREA GROUNDWATER REMEDIAL ACTION

The Remedial Action for the Landfill Area selected in the Record of Decision (ROD) (USEPA, 2005) consists of groundwater extraction and treatment, combined with Monitored Natural Attenuation (MNA) to remediate groundwater contamination not captured by the extraction system. Groundwater extraction wells were designed to capture groundwater generally in the area described as the "ROD Capture Zone" on Figures 1-3, 1-5 and 1-6. The "ROD Capture Zone" represents a goal of the groundwater extraction component of the selected remedy. The ROD capture zone can be separated into two "lobes", the "western lobe" and the "eastern lobe". The "western lobe" of the capture zone was intended to capture groundwater with elevated VDC concentrations (Figure 1-3) in the area of wells LF-02, LF-10 and LF-19. The "eastern lobe" of the ROD capture zone was designed to maintain hydraulic control of the area of wells LF-06, B-08, LF-15, MLF and ELF. This group of wells is approximately coincident with the region of elevated benzene (see Figure 1-6) and arsenic concentrations in groundwater. The capture zone was not designed to capture all contaminated groundwater but only groundwater with the highest concentrations. The groundwater extraction system is described in Section 2.

The groundwater treatment system for the Landfill Area treats extracted groundwater for both metals and organics. The treatment processes for the extracted groundwater includes metals precipitation and photocatalytic oxidation with carbon polish prior to surface water discharge to Sinking Pond. The groundwater treatment system is described in Section 3.

1.2.3 DISCHARGE REQUIREMENTS

Discharge requirements for groundwater and for air are discussed in the following sections.

Groundwater

Treated groundwater from the Landfill Area groundwater extraction and treatment system is discharged to Sinking Pond. Effluent discharge limits proposed in a December 14, 2006 letter from Remedium Group to the USEPA and MassDEP (Remedium Group, 2006), were approved by USEPA in a letter dated December 20, 2006 (USEPA, 2006b). The approved discharge limits for treated effluent discharge to Sinking Pond are summarized in Table 1-1. The discharge limit established for arsenic (4 µg/L) is an interim limit. Within 2 years of the startup of the treatment system, a report will be submitted which summarizes the treatment system optimization efforts and results and the arsenic concentration that the system is capable of achieving on a consistent basis. The concentration documented in this report will be used to establish a final arsenic limit, which may be set at a level above or below the interim limit. As described in Section 4.2, treated groundwater from the Landfill Area groundwater treatment system currently meets the discharge standards for all parameters except the C-NOEC for daphnid.

Air

The photocatalytic oxidation system destroys VOCs and produces no VOC emissions. Therefore, the Landfill Area treatment system presents no significant risk to health, safety, public welfare, and the environment.

2 GROUNDWATER EXTRACTION SYSTEM

The Landfill Area groundwater remedy was designed to extract contaminated groundwater located immediately southeast and southwest of the Industrial Landfill. More specifically, it was intended to capture groundwater with elevated VDC concentrations located southwest of the Landfill in the area of wells LF-02, LF-10 and LF-19, and to maintain hydraulic control of the region of elevated benzene and arsenic concentrations in groundwater located southeast of the Landfill in the area of wells LF-06, B-08, LF-15, MLF and ELF. The capture zone was not designed to capture all contaminated groundwater but only groundwater with the highest concentrations. The groundwater extraction system component of the remedial action consists of five (5) extraction wells (MLF, SELF-1, SELF-2, SWLF-2 and WLF). Well completion logs for the five extraction wells are included in Attachment A.

Each extraction well is outfitted with an electric submersible pump that is compatible with the identified contaminants. The pumps were sized to provide the optimum groundwater extraction rate from the wells based on well development water yield. The target pumping rates are approximately:

SELF-1 – 0.9 to 1.2 gpm
SELF-2 – 1 to 1.4 gpm
SWLF-2 – 4 gpm
MLF – 38 gpm
WLF – 8 gpm

New discharge piping and associated electrical wiring were installed from each of the five (5) Landfill Area extraction wells to a pre-fabricated equalization tank system. Each extraction well pump discharges individually into a single 550-gallon, polyethylene, enclosed dome top equalization tank in an 8 foot by 20 foot steel shipping container located southwest of the Industrial Landfill (Figure 2-1). The purpose of the equalization tank system is to allow control of the groundwater flow rate to the treatment system. Each extraction well discharge line is outfitted with a pressure gauge, flow control/isolation valve, flow meter/totalizer and sample port. These gauges/controls are installed on each discharge line between where the line enters the steel shipping container and where the line discharges to the equalization tank. The motor starter and on/off controls for each extraction pump are installed on the wall near the system control panel. The equalization tank is outfitted with level controls to operate a transfer pump. In addition, a high/high level alarm is installed to stop the extraction well pumps in the event of a

unit operation failure. The system has one centralized control panel. The control panel has an alarm/shutdown indicator light for the high/high level alarm in the equalization tank and an emergency shut off switch. Representative photographs of the equalization tank system are presented in Attachment C, photographs 1 through 3.

The following provides a chronology of the significant steps involved in the installation and evaluation of the Landfill Area extraction system:

- July 2008 – Install and conduct step-drawdown tests on extraction wells SELF-1 and SWLF-1 (GeoTrans, 2009);
- August-September 2008 – Conduct pumping test to evaluate the combined capture zone of extraction wells MLF, WLF, SELF-1 and SWLF-1 (GeoTrans, 2009a);
- September 2009 – Evaluate the capture zone of the four Landfill Area extraction wells MLF, WLF, SELF-1 and SWLF-1 (GeoTrans, 2009b);
- January 22, 2010 – EPA indicates that extraction well SELF-1 is not creating the ROD-required capture zone in the shallow unconsolidated deposits located southeast of the Industrial Landfill and requests the installation of an additional extraction well (USEPA, 2010);
- March 2010 – Install monitoring wells LF-22S and LF-22D to better define the downgradient extent of benzene contaminated groundwater to aid in selecting the location for an additional extraction well (GeoTrans, 2010a);
- May 2010 – Install and conduct step-drawdown test on extraction well SELF-2 to expand the southeastern extent of the Landfill Area groundwater capture zone in the area southeast of the Landfill (GeoTrans, 2010b);
- June 2010 – Conduct pumping test and evaluate the combined capture zone of the five Landfill Area extraction wells MLF, WLF, SELF-1 SELF-2 and SWLF-1 (GeoTrans, 2010b);
- October 2010 – The USEPA agreed with the hydraulic evaluation that the existing extraction system, consisting of extraction wells MLF, WLF, SELF-1 SELF-2 and SWLF-1, has attained the ROD-required capture zone (USEPA, 2010); and
- April 2011 – Extraction well SWLF-1 was replaced with extraction well SWLF-2 due to the inability to restore the declining yield of SWLF-1.

As indicated above, analyses of data collected during a pumping test in June 2010, in which the five extraction wells were pumping at a combined rate of approximately 51 gpm, indicated that extraction from MLF, WLF, SELF-1, SELF-2 and SWLF-1 created a capture zone that satisfies the ROD capture zone requirements (GeoTrans, 2010b). The USEPA agreed with

the hydraulic evaluation that the existing extraction system has attained the ROD-required capture zone in a letter dated October 29, 2010 (USEPA, 2010). The hydraulic monitoring data continue to indicate that the groundwater extraction system is capturing groundwater with the highest VDC and benzene concentrations, both horizontally and vertically, and fulfills the requirements of the ROD (GeoTrans, 2011 and Tetra Tech GEO, 2012). As indicated in Section 6.2.1, water level data will continue to be collected and evaluated annually, to confirm that the ROD-required Landfill Area groundwater capture zone is being achieved.

3 GROUNDWATER TREATMENT SYSTEM

The Landfill Area Groundwater treatment system is a modular-based treatment system containing a metals removal process, followed by a photocatalytic oxidation system and a liquid-phase carbon polish. The groundwater treatment system has been designed to operate at a flow rate up to 100 gpm. The groundwater treatment system was designed to treat VOCs, 1,4-dioxane, arsenic, iron, manganese and phosphorus concentrations to below discharge standards.

3.1 GROUNDWATER TREATMENT SYSTEM

The groundwater treatment system is modular and consists of two (2) main treatment unit operations; metals removal and VOC removal. The treatment system components, which are described further below, include:

- Treatment System Building;
- Metals Microfiltration System;
- Photocatalytic Oxidation System;
- Liquid-Phase Carbon Unit;
- Discharge Equalization Tank and Piping; and
- Ancillary Systems.

3.1.1 TREATMENT SYSTEM BUILDING

Extracted groundwater is piped from the equalization tank system to the treatment system building for treatment prior to discharge to Sinking Pond. The piping from the existing equalization tank system to the new treatment building and from the new treatment building to Sinking Pond was installed in a trench approximately five (5) feet below grade. The piping consists of SDR-21 water gasketed 2.5-inch diameter PVC pipe and fittings (200 psi rating). The new building is a 50-foot by 100-foot metal building with a roof height of 25 feet. The floor is constructed of reinforced coated concrete and incorporates a containment berm around the entire perimeter and select pieces of equipment. The building was installed in accordance with the Landfill Area Construction Quality Assurance Project Plan (CQAPP) (O&M, 2010). All work was documented in the Construction Inspection Reports (Attachment B). A photographic record was maintained and representative photographs of the piping are presented in Attachment C, photographs 4 and 5, while representative photographs of the building installation are presented

in Attachment C, photographs 6 through 8. Figure 2-1 shows the location of the new treatment building as well as the piping from the existing equalization tank system to the new building and from the new building to Sinking Pond. Figure 3-1 shows the process flow diagram and Figure 3-2 shows the equipment and building layout.

3.1.2 METALS MICROFILTRATION SYSTEM

The Siemens metals microfiltration system is designed to remove arsenic, iron, manganese and phosphorus from Site groundwater to below discharge limits. The Siemens metals microfiltration system consists of the following main components:

- Inlet Equalization Tank and Transfer Pump;
- Dual Chemical Reaction System;
- Membrane Microfiltration System with Semi-Automatic Cleaning System;
- Effluent Neutralization System;
- Sludge Storage/Thickening Tank;
- Filter Press System;
- Filtrate Collection/Transfer Tank/Transfer Pump;
- Liquid Chemical Addition System; and
- Powdered Chemical Addition System.

The Siemens metals microfiltration system was installed in accordance with the CQAPP (O&M, 2010). All work was documented in the Construction Inspection Reports (Attachment B). A photographic record was maintained and representative photographs are presented in Attachment C, photographs 9 through 11, 16 through 18. The Siemens microfiltration system is described further below.

Inlet Equalization Tank and Transfer Pump

The inlet equalization tank is a 12,000-gallon molded high-density polyethylene tank with an enclosed dome top. The duplex transfer pump system is a skid-mounted, piped and wired module designed to transfer wastewater from the inlet equalization tank to the first stage of the dual chemical reaction system. Included are two horizontal centrifugal pumps, flow and pressure indicators, isolation valves and piping manifold. A manually adjustable diaphragm throttling valve, in coordination with the flow indicator, is used to ensure proper flow delivery. The system design provides for one pump online and a second pump as a standby alternate pump. Level controls are wired into the overall control system that manages the on/off functions

of the online pump. Manual on/off functions are also provided. A check valve on the discharge of the pump prevents siphoning. Components include:

- 12,000-gallon capacity, HDPE, dome top tank;
- Man way;
- Pump suction connection;
- Duplex, horizontal centrifugal pumps;
- 100 gpm capacity at 50 feet total discharge head;
- 460-VAC, 3-phase, TEFC motors;
- Pump discharge flow meter;
- Pump discharge pressure gauge;
- Ultrasonic level control for pump on/off control; and
- Pump skid with Schedule-80 PVC piping and shutoff valves.

Dual Chemical Reaction System

This is a two stage chemical mixing and reaction system consisting of two chemical mixing modules that are piped, wired and designed as a single operating module. Each module includes HDPE reaction tanks (with hinged covers) mounted under a steel access catwalk. The steel access structure is coated for maximum corrosion protection. The catwalk grating is constructed of fiberglass reinforced plastic (FRP).

The first reaction tank is equipped with an electric mixer, duplex pH sensors, and duplex ORP sensors. Sodium hypochlorite (oxidant) is added volumetrically to optimize the iron and arsenic removal. Sodium hydroxide is added volumetrically to adjust the pH to maintain optimum removal of manganese. This is typically between a pH of 8 to 8.2. A 10-minute reaction time is maintained.

The wastewater flows via gravity to the second reaction tank. This is the solids formation stage. This compartment is equipped with an electric mixer and duplex pH sensors similar to the first reaction stage of the system. A 10-minute reaction time is maintained. By this stage of the process, the contaminants of interest have been converted to filterable solids.

Both reaction tank modules are piped, wired and equipped with instrumentation and chemical injection metering pumps. The mixers, chemical pumps and instrumentation are wired into the overall system Programmable Logic Controller (PLC). The chemical reaction system is contained in a secondary containment structure capable of holding 110% of the capacity of the system. Components include:

- Two 1,000-gallon capacity, heavy-duty, HDPE reaction tanks (with hinged covers);
- Two heavy-duty mixers;
- Two pH monitor/transmitters with four pH probes;
- One ORP monitor/transmitter with two ORP probes in the first reaction tank;
- Five chemical metering pumps; and
- Catwalk with stairs for easy access to the equipment.

Membrane Microfiltration System with Semi-Automatic Cleaning System

The system operates with wastewater flowing by gravity from the second stage of the dual chemical reaction system into the microfilter concentration tank where solids separation begins. Wastewater from the concentration tank is pumped through the microfiltration membrane modules. The membrane is a polyvinylidene difluoride (PVDF) material that is cast on the inside of a 1-inch polyethylene support tube. Several membranes are bundled into a larger housing to form a membrane module. This technology utilizes cross-flow filtration where the waste slurry is pumped at a high velocity through the center of the membrane tubes and returned back to the concentration tank. The filtered water or permeate passes through the membrane and into the effluent neutralization system. Each pass through the membrane concentrates the slurry a little more. To prevent rapid plugging or fouling, the membranes are back-pulsed with air and treated water.

The concentration tank is equipped with an ultrasonic level control that allows the microfilter feed pump to cycle on and off. The purpose of this tank is to ensure that a consistent concentration of solids is pumped to and from the microfiltration membranes. Solids dewatering is automatic. The solids are removed from the concentration tank to a sludge storage/thickener tank by an air diaphragm pump. The duration and frequency control of the air diaphragm pump is automatic.

A flow indicator and totalizing meter is provided on the filtrate line. Once the flow drops below a certain rate, a portion of the system must be taken off-line for cleaning. The semi-automatic cleaning system automates the valves associated with the cleaning process and helps to limit operator intervention during the cleaning cycle. The membranes are flushed with system make-up water prior to being placed back in service. The chemical cleaning tank and system make-up water tank along with a recirculation pump are part of the clean-in-place system. The membrane microfiltration system is contained in a secondary containment structure capable of holding 110% of the capacity of the system. Components include:

- 2,600-gallon capacity, FRP tank with ultrasonic level control;
- Two 30 HP process recirculation pumps;
- Two (2) sets of 24, 10-tube membrane filtration modules;
- Back pulse mechanism;
- Two permeate flow meters;
- Two permeate turbidity meters;
- Semi-automatic cleaning system with cleaning pump;
- System make-up water flush tank, covered cleaning tank, and automated valves; and
- Air operated double diaphragm pump for solids removal.

Effluent Neutralization System

An effluent neutralization system is provided for any required adjustments to the process stream prior to the Purifics photocatalytic oxidation system. The effluent neutralization system is sized to receive and treat the effluent from the membrane microfiltration system. The reaction chamber is sized for a minimum 10-minute retention time at the maximum flow rate. The mixer is designed to ensure proper mixing and homogenous treatment. Dupont Oxone® (monopersulfate) is being added as an oxidant for use in the Purifics photocatalytic oxidation system. The addition of Oxone® takes place automatically. The effluent leaves the system by gravity. Components include:

- One 2,000-gallon capacity, HDPE open top tank with cover;
- One heavy-duty mixer;
- One pH monitor/transmitter with two pH probes; and
- Two chemical metering pumps.

Sludge Storage/Thickening Tank

The sludge thickening tank is designed to store sludge so the filter press can be completely loaded. The sludge from the microfilter concentration tank is pumped to the thickening tank via an air operated diaphragm pump. Once the sludge is in the thickening tank, gravity may further increase the solids concentration. As more sludge is added to the thickening tank, the supernatant gravity flows back to the treatment system for reprocessing. The thickened sludge from the bottom of the thickening tank is then pumped to a filter press. The sludge storage/thickening tank includes a mixer to allow for manual addition of a body feed (if required) for better filter press operation. Components include:

- 3,000-gallon capacity, vertical, cylindrical, FRP tank;
- Conical bottom;
- Mixer;

- Overflow nozzle;
- Ultrasonic level control;
- Flanged bottom nozzle;
- Powder feed chute with dust control hood and fan;
- Scissor lift capable of 96” travel; and
- Operator access platform with ladder.

Filter Press System

The filter press system consists of an air diaphragm transfer pump system and a filter press. The air diaphragm transfer pump system is a skid-mounted, piped and wired module designed to transfer sludge/slurry from the sludge thickening tank to the filter press. The system includes an air diaphragm pump, isolation valves and piping manifold. The filter press dewaters the slurry of sludge to typically between 20 and 30 percent solids. Components include:

- Simplex, air operated diaphragm pump;
- 50 gpm capacity at 50 feet total discharge head;
- Pump skid with Schedule-80 PVC piping;
- 20 cubic foot filter cake capacity;
- 100 psi filtration capacity;
- Center feed;
- Four corner filtrate discharge connection;
- Set of gasketed polypropylene plates;
- Air blow down manifold;
- Semi-automatic plate shifter;
- Painted steel skeleton; and
- Automatic pump control.

Filtrate Collection/Transfer Tank/Transfer Pump

The filter press filtrate collection/transfer tank is a molded high-density polyethylene tank with an enclosed dome top. The tank is sized to provide sufficient volume for collecting filter press filtrate and sludge thickener decant prior to transferring it back to the inlet equalization tank. A graduated scale is molded onto the side of the tank. Liquid level and volume are typically visible through the wall of the tank.

The air diaphragm transfer pump system is a skid-mounted, piped and wired module designed to transfer filter press filtrate from the filtrate collection/transfer tank to the inlet equalization tank for reprocessing through the system. The system includes an air diaphragm pump, isolation valves and piping manifold. The steel frame and platform are coated for

corrosion protection. Level controls are wired into the overall control system to manage the on/off functions of the pump. Manual on/off functions are provided. Components include:

- One 1,000-gallon capacity, heavy-duty, HDPE enclosed dome top tank;
- Man way;
- Inlet connection;
- Pump suction connection;
- Simplex, air operated diaphragm pump;
- 50 gpm capacity at 50 feet total discharge head;
- Ultrasonic level control for pump on/off control; and
- Pump skid with Schedule-80 PVC piping.

Liquid Chemical Addition System

A liquid chemical make-up and delivery system uses liquid feed chemicals (sodium hypochlorite and sodium hydroxide) for controlled and convenient introduction of the reagent into the reaction section of the system. A feed tank is periodically filled with the desired quantity of chemical and is delivered by a metering pump to the reaction tank. Components include:

- Two 300-gallon capacity, heavy-duty, HDPE domed tanks;
- Ultrasonic level control for alarm; and
- Two chemical metering pumps.

3.1.3 PHOTOCATALYTIC OXIDATION SYSTEM

The Purifics photocatalytic oxidation system is designed to remove and destroy dissolved-phase VOCs and 1,4-dioxane from the extracted groundwater. The system consists of the following:

- Photocatalytic Inlet Equalization Tank;
- Powdered Chemical Addition System; and
- Photocatalytic Oxidation Unit.

The Purifics photocatalytic oxidation system was installed in accordance with the CQAPP (O&M, 2010). All work was documented in the Construction Inspection Reports (Attachment B). A photographic record was maintained and representative photographs are presented in Attachment C, photographs 12 and 13. The Purifics photocatalytic oxidation system is described further below.

Photocatalytic Inlet Equalization Tank

The photocatalytic inlet equalization tank is a molded high-density polyethylene tank with an enclosed dome top. The tank is sized to provide sufficient volume for collecting groundwater from the effluent neutralization tank. A graduated scale is molded onto the side of the tank. A centrifugal pump transfers groundwater from the inlet equalization tank to the photocatalytic oxidation system. Components include:

- One 1,000-gallon capacity HDPE, dome top tank;
- Man way; and
- High level shutdown switch.

Powdered Chemical Addition System

A chemical make-up and delivery system dissolves granular chemical reagent (Oxone®) for controlled and convenient introduction of the reagent into the effluent neutralization system. Oxone® is being added as an oxidant for use in the Purifics photocatalytic oxidation system. A tank is periodically filled with the desired quantity of water, and granular powdered chemical is added manually in the prescribed amount. A mixer assures that the reagent is completely dissolved before it is delivered by a metering pump to the reaction tank. Components include:

- One 100-gallon capacity, heavy-duty, HDPE covered tank;
- Ultrasonic level control for alarm;
- One mixer; and
- One chemical metering pump.

Photocatalytic Oxidation Unit

The Purifics photocatalytic oxidation system removes and destroys dissolved-phase VOCs and 1,4-dioxane from the extracted groundwater. The photocatalytic oxidation system, with 3-racks of UV lamps, is currently capable of removing VOCs and 1,4-dioxane to below discharge levels at a maximum of 60-gpm continuous throughput. If needed, additional racks could be added to the unit to increase the continuous throughput rate to 100 gpm. Oxone® (oxidant) is added as a liquid solution in the neutralization tank to enhance the treatment efficiency of the photocatalytic oxidation system. The photocatalytic oxidation system transfer pumps transfer water from the inlet equalization tank to the photocatalytic unit and transfers the treated groundwater from the photocatalytic oxidation system's sump into the discharge equalization tank. Components include:

- Purifics 30kW unit;

- 3 rack unit;
- 460 volt, 3-phase;
- Stainless steel housing;
- Two transfer pumps; and
- 1 to 60 gpm flow capacity.

3.1.4 DISCHARGE EQUALIZATION TANK AND PIPING

The photocatalytic oxidation system discharges into an approximately 12,000-gallon capacity, polyethylene enclosed dome top discharge equalization tank. The purpose of the discharge equalization tank is to allow control of the groundwater discharge and system make-up water. The tank is outfitted with level controls operating two (2) transfer pumps. In addition, a high/high level alarm is used to stop the treatment system in the event of a unit operation failure. The discharge equalization tank transfer pumps transfer the treated groundwater from the equalization tank through the liquid-phase carbon unit then to Sinking Pond and/or to the system make-up water applications. Components include:

- 12,000-gallon polyethylene enclosed dome top tank;
- Two (2) pumps, 460v, 3-phase, 7.5 hp, TEFC motor; and
- 100 gpm flow at 150 feet TDH.

The discharge piping is constructed of two-inch and four-inch diameter, PVC. The piping from the new building to the Sinking Pond discharge point consists of C-900 water gasketed four-inch diameter PVC pipe and fittings (200 psi). The discharge piping was placed approximately five feet below grade, which is below the local freeze line. The piping was pressure tested for integrity before the trenches were backfilled. Figure 2-1 shows the location of the discharge line to Sinking Pond. The two-inch discharge piping is used for system make-up water applications within the treatment building. The discharge equalization tank was installed in accordance with the CQAPP (O&M, 2010). All work was documented in the Construction Inspection Reports (Attachment B). A photographic record was maintained and a representative photograph is presented in Attachment C, photograph 14.

3.1.5 LIQUID-PHASE CARBON UNIT

The liquid phase carbon unit is designed to remove excess total and free chlorine from the discharge stream. Components include:

- 100 gpm nominal flow; and

- 2,000 pounds of AC830C, virgin, coconut shell carbon.

The liquid phase carbon unit was installed in accordance with the CQAPP (O&M, 2010). A photographic record was maintained and a representative photograph is presented in Attachment C, photograph 15.

3.1.6 ANCILLARY SYSTEMS

The ancillary systems were installed in accordance with the CQAPP (O&M, 2010). All work was documented in the Construction Inspection Reports (Attachment B). The ancillary systems are described further below.

Process Controls

The Siemens Water Technologies standard control system consists of a PLC (Programmable Logic Controller) and HMI (Human Machine Interface) graphical display as the main components providing system automation and operator monitoring of the water treatment system.

The HMI display is provided as the central location for an operator to visually monitor equipment status, alarm messaging, and process pH, flow and level values. The adjustment of process set points is performed via the HMI. The HMI allows Hand/Off/Auto (or On/Off) control of devices and display interlock statuses. The HMI also displays all alarm conditions.

The HMI provides the following functionality:

- Real-time flow diagram of the system with device status and process values;
- Ability for the user to “drill down” to get more detail on each module of the system;
- Hand/Off/Auto or On/Off controls (depending upon device) for all devices (excluding values that stay in Auto for safety reasons);
- Status of all interlocks for all devices;
- Current alarm status and historical alarm summary, with button to silence alarm horn and acknowledge alarms;
- Help text to explain screen operation;
- For redundant sensors (pH/ORP), a screen for selecting the current device and enabling/disabling differential alarming;
- Status of all “E-stops” plus a Process Stop button, which stops pumps, but leaves mixers and adjustment chemicals running (for overnight shutdown while keeping particles in suspension);
- Set point entry with password protection; and
- Indication when there is a manual override in the system.

There is no overall System On button. Instead, each device has its own Hand/Off/Auto controls. This is done for safety reasons, because there are remote panels that are not in view of the HMI.

Air Compressor System

Two (2) 25 HP Kaiser rotary screw air compressor systems are utilized for the plant air supply. The air compressor systems provide approximately 112 standard cubic feet per minute (scfm) of compressed air at 125 pounds per square inch (psi) continuously. Key elements are:

- Kaiser Model AS25;
- 460v, 3-phase, TEFC motor;
- High efficiency particulate filters;
- 500-gallon receiver tank;
- Condensate collection and separation system; and
- Desiccant air dryer.

Shower/Eye Wash Station

A safety shower was installed for operator safety. The shower is fed by treated groundwater from the effluent equalization tank. A separate eyewash station was installed. The eye wash station is fed by a dedicated tank filled with de-ionized water

Process Chemicals

Due to the anticipated small quantities of chemicals required for process operations, the chemicals on-Site are limited to the quantities required for immediate use in the treatment system operations. These chemicals are placed next to the specific equipment that require their use and are located within the containment berms. The following are the chemicals that are used in the treatment system process:

- Sodium hypochlorite 12.5% (55-gallon container/liquid);
- Sodium hydroxide 25% (55-gallon container/liquid);
- Oxone® (50 pound bag, granular); and,
- Citric acid (25 pound bucket, granular).

4 LANDFILL AREA GROUNDWATER TREATMENT SYSTEM START-UP

At the end of April 2011, piping for groundwater from the equalization tank system was redirected from the ARS treatment system to the new Landfill Area groundwater treatment system. The Landfill Area groundwater treatment system started operation on May 2, 2011. The following sections summarize treatment system start-up, water quality monitoring and system inspections done between May 2011, when the system began operating, and May 2012, when EPA determined the system was "Operational and Functional".

4.1 TREATMENT SYSTEM START-UP

O & M, Inc. personnel worked closely with Siemens and Purifics personnel during the start-up period to evaluate the systems and make the changes necessary to get the Siemens metals microfiltration and Purifics photocatalytic oxidation systems running efficiently and to achieve the required discharge limits.

The following observations were noted during the first 30 days of operation:

- Good solids production.
- Good filter press filtering characteristics.
- More sludge was produced than anticipated.
- Shorter microfilter operating time between cleanings than anticipated, resulting in more frequent cleanings, likely caused by small particle size of solids.
- Lower pH (0) required for adequate microfilter cleaning.
- The frequent cleanings reduced the systems treatment capacity, resulting in extraction wells turning on and off periodically.
- Good arsenic and iron removal.
- Poor manganese removal.
- Poor 1,4-dioxane removal.

While the metals microfiltration system was removing iron and arsenic as designed, the manganese removal was poor and the system was requiring frequent cleanings, resulting in extraction system downtime. In addition, the photocatalytic oxidation system was not removing 1,4-dioxane to the levels expected. With complex treatment systems such as the Landfill system, discrepancies between treatability testing results and full-scale system operation are expected.

Four major changes were made to the Landfill Area Treatment system during the start-up period, to achieve the required discharge limits and improve operating efficiency:

1) sodium hydroxide was added to adjust the pH and optimize manganese removal;
2) sodium hypochlorite replaced potassium permanganate as the oxidizer for iron and arsenic removal;
3) Oxone® was added to increase the 1,4-dioxane treatment efficiency through the photocatalytic oxidation system; and
4) liquid-phase carbon was added to remove excess oxidizer from the discharge stream.

On June 24, 2011, sodium hydroxide was added to adjust the pH. Testing showed that manganese and arsenic removal was very sensitive to pH and that by adding sodium hydroxide to maintain a pH between 8.0 and 8.2, both manganese and arsenic were removed to desired levels. On September 21, 2011, the metals oxidizing agent was changed from potassium permanganate to sodium hypochlorite because Purifics personnel indicated that they thought that potassium permanganate might be interfering with the catalyst in the photocatalytic oxidation system. These changes had the added benefit of improving solids production and cutting down on the frequency of cleanings needed in the metal microfiltration system.

On February 8, 2012, the addition of Oxone® to the neutralization tank began. The additive Oxone® increased the destruction efficiency of 1,4-dioxane in the photocatalytic oxidation system, resulting in consistent treatment of 1,4-dioxane to below the discharge limit. On May 14, 2012, a liquid-phase carbon unit was added to remove excess oxidizers from the use of the sodium hypochlorite and Oxone®. The excess oxidizers were thought to be causing the adverse effects observed in the whole effluent toxicity testing as discussed in Section 4.2 below.

During the start-up period the following process modifications were made to the treatment system, some of which were discussed above:

- Reconfigure microfilter back wash solution discharge from influent tank to filtrate tank.
    - Discharging the low pH back wash solutions into the influent tank resulted in a labor-intensive sodium hydroxide pH adjustment in the reaction tanks.
    - Neutralizing the solutions in the filtrate tank prior to discharge into the influent tank proved to be a more efficient and lower cost operation.
- Modification from a remote access telemetry system to a standard auto dialer system for the metals microfiltration system.

- Addition of a sodium hydroxide storage tank (300 gallon tank) with a chemical feed pump to address the manganese removal.
- Changing from potassium permanganate to sodium hypochlorite as the metals oxidizing agent.
- Addition of Oxone® for the treatment of 1,4-dioxane in the photocatalytic oxidation system.
- Addition of liquid-phase carbon after the photocatalytic oxidation system.

4.2 TREATMENT SYSTEM MONITORING

To evaluate the performance of the Landfill Area groundwater treatment system, samples were collected weekly or monthly from various points within the treatment train. The sampling frequency was varied as necessary, to adequately monitor the effects of modifications made to the treatment system during start-up. Samples were collected from the treatment system influent and effluent and analyzed for select VOCs, 1,4-dioxane, total arsenic, total beryllium, total chromium, total iron, total lead, total manganese, total nickel, total phosphate and the SVOCs bis (2-chloroethyl) ether and bis (2-ethylhexyl) phthalate. The water quality results from samples collected between May 2011 and May 2012 are summarized in Table 4-1. The treatment system effluent consistently met the discharge limits with the following exceptions. As shown in Table 4-1, the total lead and total phosphate from samples collected on April 11, 2012 and May 4, 2012, respectively, exceeded the discharge limits. These results are believed to be laboratory errors and resampling results (Table 4-1) showed these values to be below discharge limits.

Samples of the treatment system discharge were analyzed for whole effluent toxicity testing in March and May 2012. This testing is done to evaluate the effects of the treatment system discharge on Sinking Pond. The toxicity test results and discharge permit limits are summarized in Table 4-2. The testing consisted of *Ceriodaphnia dubia* (daphnid) and *Pimephales promelas* (fathead minnow) acute and chronic toxicity tests. Effluent samples from the treatment system discharge were collected on March 19, 21 and 23 for use in the whole effluent toxicity testing which was conducted by Aquatec Biological Sciences between March 20 and 27, 2012. The results, summarized in Table 4-2, showed observable adverse effects to both the daphnid and fathead minnow. Evaluation of the effluent water indicated that the adverse effects were likely due to excess chlorine in the water resulting from the addition of sodium

hypochlorite and/or Oxone® during the treatment process. As a result, a liquid-phase carbon unit was added to the treatment system to remove excess chlorine, and the toxicity testing was repeated.

Effluent samples from the treatment system discharge were collected on May 14, 16 and 18 for use in the whole effluent toxicity testing which was conducted by Aquatec Biological Sciences between May 15 and May 22, 2012. The testing results, summarized in Table 4-2, showed significant improvement over the March 2012 results. The LC50, the percent concentration of effluent that would cause death in 50 percent of the test organisms within 48 hours, for both the daphnid and the fathead minnow was greater than a 100 percent effluent concentration. This means that more than 50 percent of the daphnid and fathead minnows survived for 48 hours in a 100 percent concentration of the Landfill Area treatment system effluent. The C-NOEC, the highest percent effluent concentration that causes no observable adverse effects on the test organisms, for the fathead minnow was 100 percent effluent concentration, and for the daphnid was 25 percent effluent concentration. This means that there were no observable adverse effects to fathead minnows living in 100 percent Landfill Area treatment system effluent and no observable adverse effects to daphnid living in 25 percent effluent concentration. There were, however, observable adverse effects to daphnid living in 50 percent and 100 percent effluent concentrations. The test results show that the LC50 discharge limits for daphnid and fathead minnows, and the C-NOEC for fathead minnows were met, however, the C-NOEC discharge limit for daphnid was exceeded. As stated in Section 6.1, additional whole effluent toxicity testing is planned on a quarterly basis to further evaluate the effects of the treatment system discharge on Sinking Pond.

4.3 OPERATION AND MAINTENANCE

System inspections were done daily to weekly for the first eight weeks of operation, then at least weekly. Inspections included a detailed and thorough examination of the entire groundwater treatment system. All equipment, piping and instrumentation were inspected and maintenance was performed, as needed, per manufacturer's specifications. The Landfill Area Start-Up Data Sheets for May and June 2011 are provided in Attachment D.

In general, the Landfill Area treatment system is operating well, with minimal operator attention. The major operation and maintenance activities that must be completed to keep the system operating effectively are:

- Verify that all extraction wells are operating at the required flow rate at least twice weekly.
- Verify that chemical feed pumps for the sodium hypochlorite, sodium hydroxide and Oxone® are operating at the required feed rates at least weekly.
- Refill the chemical feed tanks at least weekly.
- Verify that the pH in the chemical mixing and reaction system tanks are within the required range at least daily.
- Clean and calibrate the pH probes at least weekly.
- Clean the flowmeter probes at least monthly.
- Backflush the microfilter filter unit at least twice weekly.
- Acid wash the microfilter filter unit at least once monthly.
- Wash the microfilter filter unit with sodium hypochlorite as-needed.
- Complete a one hour citric acid cleaning of the photocatalytic oxidation system weekly.
- Replace the inlet bag filter on the photocatalytic oxidation system weekly.
- Run the filter press/solids filtration system at least twice monthly.

5 CONSTRUCTION QUALITY CONTROL, AND FINAL INSPECTION AND CERTIFICATION

This section describes compliance with the CQAPP (O&M, 2010) as well as the final inspection and certification made by USEPA that the Landfill Area Remedial Action is Operational and Functional.

5.1 CONSTRUCTION QUALITY CONTROL

The CQAPP dated December 13, 2010 (O&M, 2010) set forth the responsibilities of the project team and described the inspection activities and documentation that would be done during construction of the remedial action. Installation of the groundwater treatment system was overseen by professional staff from O&M, Inc. Site installation tasks included;

- Removal of the asphalt from the footprint of the treatment building.
- Construction of a concrete foundation and secondary containment structures for the equipment.
- Construction of the Landfill Area Treatment building.
- Obtaining a power drop and installation of an electrical transformer and meter.
- Installation of a phone line.
- Installation of the inlet piping from the extraction well equalization tank system to the treatment building.
- Installation of the discharge piping from the treatment building to Sinking Pond.
- Installation of the Siemens metals microfiltration system.
- Installation of the Purifics photocatalytic oxidation system.
- Installation of all interior electrical and system piping.

The Site construction activities were completed between September 2010 and April 2012 in accordance with the requirements set forth in the CQAPP. Independent, third-party testing of soil structure, concrete work and overall building construction was completed by UTS and Senate Construction. Documentation is presented in Attachment B.

On-Site testing of the Landfill Area Treatment System components and alarms was completed during May 2011. Documentation of the testing is provided in Attachment B.

Groundwater extraction and reinjection piping was placed below grade in trenches. All work was documented in the Construction Inspection Reports (Attachment B).

5.2 FINAL INSPECTION AND CERTIFICATION

On May 24, 2012, the pre-final and final inspection of the Landfill Area Remedial Action was conducted by USEPA to determine if the treatment system was "Operational and Functional" and if the construction had been completed in accordance with the approved design specifications. In a memorandum dated May 25, 2012, USEPA determined that the system was "Operational and Functional". A copy of the memorandum is included in Attachment E. The pre-final inspection served as the final inspection because no operational issues or problems with the Landfill Area treatment system were noted during the pre-final inspection.

6 CONCLUSIONS AND LONG-TERM OPERATION AND MONITORING

This section describes the conclusions for the RA Report and summarizes the long-term operation and monitoring of the treatment system and extraction wells as well as the conditions for eventual system shut-down.

6.1 CONCLUSIONS

This report documents that the Landfill Area Remedial Action was constructed in accordance with the Construction Quality Assurance Project Plan (O&M, 2010) and that, with one exception, the treated groundwater meets the groundwater discharge standards specified in Table 1-1 prior to discharge to Sinking Pond. The toxicity testing for the daphnid showed effects at 50 and 100 percent concentration. Quarterly whole effluent toxicity testing will be done for at least three more quarters to further evaluate the effects of the treatment system discharge on the fathead minnow and daphnid.

6.2 LONG-TERM OPERATION AND MONITORING

The following sections provide a summary of the recommended long-term operation and monitoring for the Landfill Area Remedial Action.

6.2.1 WATER LEVEL AND GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring in the Landfill Area will continue to be performed according to the Operable Unit Three (OU-3) monitoring program, as defined by the Groundwater Monitoring Plan (GeoTrans, 2006) and modified by annual monitoring reports. The current water level monitoring program includes annual measurement of water levels at approximately 90 locations in the Landfill Area. The water level data is used to annually confirm that the ROD-required Landfill Area groundwater capture zone is being achieved. The current groundwater quality monitoring program includes annual sampling and analysis of groundwater from 22 locations in the Landfill Area for VOCs, two locations for 1,4-dioxane, and six locations for geochemical parameters (dissolved arsenic, dissolved manganese, dissolved iron, dissolved oxygen, oxidation-reduction potential, and pH). The groundwater quality monitoring results are used to assess groundwater quality changes within the Landfill Area capture zone and the natural

attenuation of contaminant concentrations in groundwater not being actively captured and treated. Groundwater quality monitoring for the Landfill Area Remedial Action is summarized in Table 6-1.

6.2.2 TREATMENT SYSTEM MONITORING

Groundwater samples will continue to be collected from each extraction well on a quarterly basis. The samples are analyzed for VOCs, 1,4-dioxane, total arsenic, total iron, total manganese and total phosphorus.

Water samples will be collected from the treatment system influent and effluent to monitor the system effectiveness. Water samples will be collected from the influent to the metals microfiltration system and from the effluent from the liquid-phase carbon unit on a monthly basis. These samples will be analyzed for the parameters listed in Table 6-1. The results from these samples will be used to monitor the efficiency of the metals microfiltration, photocatalytic oxidation and liquid-phase carbon systems. The effluent water quality results will be used to evaluate the contaminants of concern listed under the "monitoring only" section of Table 2-1, rather than samples collected from the Pond itself, as the pond water is likely to be made up almost entirely of water discharged from the treatment system. It is possible that the treatment train sampling may change based on operational experience and/or vendor recommendations. However, no changes would be made without approval of USEPA.

Samples of the treatment system discharge will be sent for whole effluent toxicity testing. The whole effluent toxicity testing will consist of *Ceriodaphnia dubia* and *Pimephales promelas* chronic toxicity tests. The laboratory conducting the toxicity tests will also measure water quality parameters of the sample including dissolved oxygen, pH, conductivity, hardness, alkalinity, and total residual chlorine. Whole effluent toxicity testing will be done on a quarterly basis for the first year, after which the frequency and/or need for continued toxicity testing will be evaluated.

No air samples are proposed to be collected since the photocatalytic oxidation system will destroy VOCs, resulting in the groundwater treatment system having no air emissions. Treatment system monitoring for the Landfill Area Remedial Action is summarized in Table 6-1.

6.2.3 EXTRACTION WELL MONITORING

Extraction well monitoring is done weekly with the following data recorded during each monitoring event:

- Record the water level for each extraction well;
- Record totalizer reading for each extraction well; and
- Record flow rate for each extraction well.

6.2.4 OPERATION AND MAINTENANCE

The groundwater treatment system is designed for continuous unattended operation and will require minimal operator assistance. Long-term operation and maintenance of the system will be performed as specified in the Landfill Area Groundwater Operation and Maintenance Plan, Revision 2 dated July 2012 (O&M, 2012).

6.2.5 REPORTING

Long-term monitoring and sampling results related to the Landfill Area Remedial Action will be reported in the:

- *Annual Monitoring Program Report* or
- *Annual Groundwater Treatment System Report.*

These reports are described in Section 5.2 of the Landfill Area Groundwater Operation and Maintenance Plan, Revision 2 dated July 2012 (O&M, 2012).

6.2.6 INSTITUTIONAL CONTROLS

A Draft Institutional Controls (ICs) Plan (Tetra Tech GEO, 2011) has been submitted to USEPA and MassDEP. The plan recommends that ICs be implemented at the Grace Superfund Site to prevent unacceptable exposures to contaminated groundwater and to minimize unnecessary spreading of groundwater contamination. The ICs will limit the installation of public or private extraction or injection wells within the IC Area until Interim Groundwater Cleanup Goals are attained. The IC Area includes the area of groundwater contamination with at least a 100-foot buffer zone. Well installations within this area would be restricted by the Towns of Acton and Concord through their existing permitting processes.

6.2.7 CONTACTS

Table 6-2 provides contact information for Grace and its contractors, as well as for the USEPA and MassDEP personnel associated with the Landfill Area Remedial Action.

6.2.8 LESSONS LEARNED

The use of packaged, pre-built system components proved to be an effective implementation strategy, with respect to both schedule and cost. This strategy allowed for testing of the equipment prior to shipping it to the Site, assuring that the system was fully functional upon arrival. This greatly minimized the time spent trouble-shooting individual system components on-site, following delivery.

The major lessons learned related to the operation of the Purifics photocatalytic oxidation system. Minor concentrations of metals and other compounds significantly affect the operation and efficiency of the unit. The standard treatability test that Purifics performed to indicate that the process could adequately treat 1,4-dioxane to the required treatment standards was not sufficient to identify full-scale operational issues, such as catalyst fouling. For future installations, we recommend that 1) an on-site pilot test be completed to identify any pre-treatment steps that may be needed prior to the photocatalytic oxidation system and that 2) any metals pre-treatment be running smoothly prior to start–up of a Purifics photocatalytic oxidation system.

6.3 SYSTEM SHUT-DOWN

As indicated in the SOW (USEPA, 2006a, Section VII.A.1.j., pg 38-39),

"Grace may petition EPA to approve the discontinuation of the operation of all or portions of the Landfill Area Groundwater extraction system when groundwater quality data in that area of the Site indicate that aquifer geochemical conditions have become less favorable for the dissolution and mobilization of naturally-occurring metals, and that MNA would be as effective in achieving groundwater cleanup goals (and protective) as continued pumping would be. Grace shall prepare a petition setting forth the basis of such a determination, including conditions under which operation must be resumed. The petition should also propose changes to the Groundwater Monitoring Plan, if any are necessary, that will occur should EPA approve the petition."

TABLE 6-1. LONG-TERM MONITORING FOR LANDFILL AREA REMEDIAL ACTION

Location	Analysis	Frequency
Water Level Monitoring		
Monitoring Wells (~90)	Hand measurement	Annually
Extraction Wells (5)	Hand measurement	Weekly
Groundwater Quality Monitoring		
22 locations	VOCs	Annually
2 locations	1,4-dioxane	Annually
6 locations	geochemical parameters (dissolved arsenic, dissolved manganese, dissolved iron, dissolved oxygen, oxidation-reduction potential, and pH).	Annually
Treatment System Monitoring		
Extraction Wells (5)	VOCs 1,4-dioxane Total arsenic Total iron Total manganese Total phosphorus	Quarterly
Influent to Metals Microfiltration System & Effluent from Liquid-Phase Carbon Unit**	chloroethane, MTBE, MEK, VDC, vinyl chloride*, benzene, 1,2-dichloroethane*, 1,2-dichloropropane*, methylene chloride, TCE, bis (2-chloroethyl) ether*, bis (2-ethylhexyl) phthalate*, 1,4-dioxane, total arsenic, total chromium, total iron, total lead, total manganese, total nickel, total beryllium and total phosphorus	Monthly
Effluent from Treatment System	Whole effluent toxicity testing	Quarterly for 1 year; Need/Frequency to be determined thereafter
Air	Odor monitoring	Monthly
Extraction Well Monitoring		
Extraction Wells (5)	Totalizer Reading/Flow Rate	Monthly

* Minimum "Related Numeric Criteria" associated with monitoring only discharge requirement (listed in Table 1-2) is below the reporting limit specified in the QAPP (HSI GeoTrans, 2000).
** Subject to change based on operational experience and vendor recommendations.

TABLE 6-2. LANDFILL AREA REMEDIAL ACTION CONTACTS

W R Grace (responsible party)	Thor Helgason de maximis, inc. 135 Beaver Street Waltham, MA 02452 781-642-8775
Tetra Tech GEO (consultant to Grace dealing with groundwater issues)	Anne Sheehan Tetra Tech GEO One Monarch Drive Littleton, MA 01460 978-952-0120
O&M, Inc. (consultant to Grace maintaining groundwater treatment system)	Dave Fuerst O&M, Inc. 450 Montbrook Lane Knoxville, TN 37919 865-691-5052
USEPA	Derrick Golden Waste Management Division U.S. Environmental Protection Agency, Region 1 5 Post Office Square Mail Code OSRR07-4 Boston, MA 02109-3912 617-918-1448
MassDEP	Jennifer McWeeney Bureau of Waste Site Cleanup Massachusetts Department of Environmental Protection One Winter Street, 7th Floor Boston, MA 02108 617-654-6560

7 REFERENCES

Arcadis, 2012, Final Sediment Construction Summary and Final Sediment Remedial Action Report, June 2012.

GeoTrans, 2003, Groundwater Treatability and Pilot Test Evaluation Report, April 28, 2003.

GeoTrans, 2005a, Public Review Draft Remedial Investigation, July 1, 2005.

GeoTrans, 2005b, Public Review Draft Feasibility Study, July 1, 2005.

GeoTrans, 2006, Groundwater Monitoring Plan, September 12, 2006.

GeoTrans, 2009a, Landfill Area Groundwater Pre-Design Results Report, April 1, 2009.

GeoTrans, 2009b, Letter to USEPA and MassDEP *RE: Landfill Area Groundwater Capture Zone Evaluation*, November 19, 2009.

GeoTrans, 2010a, Letter to USEPA and *MassDEP RE: Proposed Construction for Extraction Well SELF-2* (April 30, 2010).

GeoTrans, 2010b, Letter to USEPA and MassDEP *RE: Installation of Extraction well SELF-2, Decommissioning of Extraction Wells ELF and RLF, and Re-Evaluation of Landfill Area Groundwater Capture Zone*, August 18, 2010.

GeoTrans, 2011, Operable Unit Three Monitoring Program Report, 2010, January 27, 2011.

GeoTrans and O & M, 2010, Landfill Area Groundwater Final Design, December 13, 2010.

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HSI GeoTrans, 1998, Initial Site Characterization Report, August 12, 1998.

O&M, 2010, Landfill Area Construction Quality Assurance Project Plan, December 13, 2010.

O & M, 2012, Landfill Area Groundwater Operation and Maintenance Plan, Revision 2, July 2012.

Remedium Group, 2006, Letter to USEPA and MassDEP *Subject: Final limits for effluent discharge to Sinking Pond from Treatment System*, December 14, 2006

Tetra Tech GEO, 2011, Draft Institutional Controls Plan, May 12, 2011.

Tetra Tech GEO, 2012, Operable Unit Three Monitoring Program Report, 2012, February 28, 2012.

USEPA, 1989, Declaration of Record of Decision, September 28, 1989.

USEPA, 2005. Record of Decision, W. R. Grace & Co. (Acton Plant) Superfund Site, Operable Unit Three, Towns of Acton and Concord, Middlesex County, Massachusetts. September 2005.

USEPA, 2006a. Remedial Design/Remedial Action Statement of Work W.R. Grace (Acton Plant) Superfund Site, Acton & Concord, MA, August 30, 2006.

USEPA, 2006b. Letter to W. R. Grace *Re: Approval of Effluent Discharge Limits to Sinking Pond – W. R. Grace (Acton Plant)*. December 20, 2006.

USEPA, 2010, Letter to de maximis *Re: Conditional Approval of document entitled: Installation of Extraction well SELF-2, Decommissioning of Extraction Wells ELF and RLF, and Re-Evaluation of Landfill Area Groundwater Capture Zone*, October 29, 2010.

TABLES

Table 1-1. Effluent Limitations and Monitoring Requirements for Groundwater Treatment System Discharge to Sinking Pond

Contaminants of Concern	Discharge Limits (Dilution Factor = 1) Maximum Daily µg/l	Average Monthly µg/l	Point of Compliance	Source and Comments	RELATED NUMERIC CRITERIA Freshwater Aquatic life criteria CMC µg/l	CCC µg/l	Human health for the consumption of water and organisms µg/l	organisms only µg/l	Drinking water MCL µg/l	Other µg/l
Limits										
Chromium III (hardness = 67.3 mg/l $CACO_3$) (9)	579.3	27.7	Effluent of treatment plant	Aquatic Life	579.3	27.7	NAC	NAC	NAC	
Iron	NAC	1000.0	Effluent of treatment plant	Aquatic Life	NAC	1000.0	NAC	NAC	NAC	
Lead (hardness = 67.3 mg/l CACO3) (9)	14	0.5	Effluent of treatment plant	Aquatic Life	14	0.5	NAC	NAC	15	
Nickel (hardness = 67.3 mg/l CACO3) (9)	145.2	16.1	Effluent of treatment plant	Aquatic Life	145.2	16.1	610	4600	NAC	
Phosphorus	NAC	18.0(12)	Effluent of treatment plant	Aquatic Life						
Interim Limits										
Arsenic		4.0(1)	Effluent of treatment plant	Best Professional Judgement(1)	340	150	0.018	0.14	10	1.5(7)
Whole Effluent Toxicity		% effluent								
LC50		100.0								
C-NOEC		100.0								
Monitoring only										
Beryllium	monitoring only		in Sinking Pond		NAC	NAC	NAC	NAC	4	50(10)
Chloroethane	monitoring only		in Sinking Pond		NAC	NAC	NAC	NAC	NAC	
Managanese	monitoring only		in Sinking Pond		NAC	NAC	50	100	NAC	
Methyl tertiary-butyl ether (MTBE)	monitoring only		in Sinking Pond		NAC	NAC	NAC	NAC	NAC	70(11)
Methyl ethyl keytone (MEK)	monitoring only		in Sinking Pond		NAC	NAC	NAC	NAC	NAC	4000(11)
1,1-Dichloroethene (1,1-DCE)	monitoring only		in Sinking Pond		NAC	NAC	330	7100	7	
Vinyl Chloride	monitoring only		in Sinking Pond		NAC	NAC	0.025	2.4	NAC	
Benzene	monitoring only		in Sinking Pond		NAC	NAC	2.2	51	5	
1,2,-Dichloroethane	monitoring only		in Sinking Pond		NAC	NAC	0.38	37	5	
1,2,-Dichloropropane	monitoring only		in Sinking Pond		NAC	NAC	0.5	15	5	
Methylene Chloride	monitoring only		in Sinking Pond		NAC	NAC	4.6	590	NAC	
Trichloroethylene (TCE)	monitoring only		in Sinking Pond		NAC	NAC	2.5	30	5	
Bis(2-Chloroethyl)Ether	monitoring only		in Sinking Pond		NAC	NAC	0.03	0.53	NAC	
Bis(2-Ethylhexyl)Phthalate	monitoring only		in Sinking Pond		NAC	NAC	1.2	2.2	NAC	
1,4,-Dioxane	monitoring only		in Sinking Pond		NAC	NAC	NAC	NAC	NAC	3(8)

Notes:

(1) The interim arsenic limit is a goal for the chemical precipitation removal system specified in the ROD (the "Treatment System") and is based on best professional judgement and the current lack of a complete fish consumption pathway. The interim arsenic limit is also, in part, based on the arsenic removal achieved by the jar testing results presented in the Groundwater Treatability and Pilot Test Evaluation Report (GeoTrans, 2003). Within 2 years of the startup of the treatment system, a report will be submitted which summarizes the Treatment System optimization efforts and results. The report will document the arsenic concentration that the Treatment System is capable of achieving on a consistent basis. The concentration documented in this report will be used to establish a final arsenic limit, which may be set at a level above or below the interim limit of 4 µg/L.
(2) Highlighted values represent the criteria used for developing recommended discharge limits or monitoring requirements.
(3) CMC = criterion maximum concentration for acute effects.
(4) CCC= criterion continuous concentration for chronic effect.
(5) Drinking water MCL is maximum contaminant level.
(6) NAC = no applicable criterion.
(7) Based on a bioconcentration factor for bluegill sunfish of 4
(8) Based on proposed drinking water standard for Massachusetts
(9) Recommended discharges limits for metals are for total recoverable metals.
(10) Massachusetts' groundwater standard GW-3 for protection of aquatic life.
(11) Massachusetts' Drinking Water Guideline.
(12) Based on aquatic life, utrification and aesthetics

These values reflect requirements of the NPDES program and not the clean up goals for groundwater.

Table 4-1. Treatment System Water Quality Results During Start-Up

	Discharge Limits	5/3/11	5/10/11	5/17/11	5/24/11	5/26/11	5/31/11	6/30/11	7/15/11	7/18/11	7/20/11	8/2/11	8/4/11	9/26/11	12/15/11	12/21/11	12/29/11
Influent																	
VOCs																	
1,1-Dichloroethene	NA	7.7	8.6	8.7	7.9	7.5 J	8.4	8.6	9.2	7.8 J	8.7	8.4	9 J	9.9	9.4	9.4	8.7
1,2-Dichloroethane	NA	3.5	1.7	1.6	1.9	1.9 J	1.8	1.3	2.2	2 J	2.1	1.6	2.1 J	2	1.8	2.5	2
1,2-Dichloropropane	NA	2.4	1.2	0.54 J	1.2	1.1 J	1.2	1.2	1.5	UJ (1.8)	1.4	U (1)	1.4 J	1.6	1.2	1.6	1.4
2-Butanone	NA	U (5)	U (5)	U (5)	U (5)	UJ (5)	U (5)	U (5)	U (5)	UJ (5)	U (5)	U (5)	UJ (5)	U (5)	U (10)	U (10)	U (10)
Benzene	NA	17	6.7	7.9	7.6	6.2 J	7.1	5.8	8	13 J	8.7	10	14 J	12	10	9.2	8.4
Chloroethane	NA	0.82 J	0.45 J	0.28 J	0.58 J	0.56 J	0.38 J	0.48 J	U (1)	UJ (1)	U (1)	U (1)	UJ (1)	U (1)	U (2)	U (2)	U (2)
Methyl tert butyl ether	NA	U (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (1)	U (1)
Methylene Chloride	NA	U (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (4.6)	UJ (3)	U (3)	U (1)	UJ (1)	U (1)	U (2)	U (2)	U (2)
Trichloroethene	NA	U (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (0.5)	UJ (0.5)	U (0.5)	U (0.5)	UJ (0.5)	U (0.5)	U (1)	U (1)	U (1)
Vinyl Chloride	NA	3.1	3.6	3.1	3.2	3.2 J	3	3.1	4	2 J	2	2.2	3.1 J	3	2.6	3	3.4
1,4-Dioxane	NA	4	2.5	2.1	2.7	2.4	2.4	2.1	NS	NS	4.95	5.31	4.92 J	5.38	3.5	3.3	3.9
SVOCs																	
bis (2-chloroethyl) ether	NA	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	NS	NS	U (2)	NS	NS	NS	NS	NS	NS
bis (2-ethylhexyl) phthalate	NA	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	NS	NS	U (3)	NS	NS	NS	NS	NS	NS
Metals																	
Arsenic	NA	97	42	53.9	41.7	54.6	41.6	31.7	35.5	38.2	44.5	NS	42.9	51	39	33	30
Beryllium	NA	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	NS	NS	U (0.5)	NS	NS	NS	NS	NS	NS
Chromium	NA	2.5	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	NS	NS	U (0.5)	NS	NS	NS	NS	NS	NS
Iron	NA	19800	12900	15500	12800	14100	12400	9030	9600	11000	12000	NS	8600	16000	12000	10000	9700
Lead	NA	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	2.6	NS	NS	1.1	NS	NS	NS	NS	NS	NS
Manganese	NA	3100	3310	3230	3210	3100	3130	3110	3190	3430	3380	NS	3310	3180	3200	3200	3200
Nickel	NA	11.3	12.1	12.3	12.2	11.9	12.3	12.5	NS	NS	13	NS	NS	NS	NS	NS	NS
Other																	
Total Phosphate	NA	434	59.8	62.5	53.5	90.6	54.1	36.7	NS	NS	166	NS	NS	NS	NS	NS	NS
Effluent																	
VOCs																	
1,1-Dichloroethene	MO	2.2	3.3	0.69 J	0.92 J	1.3 J	1.7	1.3	0.54	1.3 J	0.73	1.3	2.7 J	0.84	U (1)	U (1)	U (1)
1,2-Dichloroethane	MO	1.8	1.5	1.1	1.6	1.3 J	1.2	1.1	1.7	1.5 J	1.6	1.5	1.6 J	1.7	1.6	2	2
1,2-Dichloropropane	MO	1.4	1.1	0.36 J	0.88 J	0.95 J	1.1	1.2	1.1	UJ (1.8)	1	U (1)	1 J	1.1	1.1	1.1	1.2
2-Butanone	MO	1.2 J	U (5)	U (5)	U (5)	UJ (5)	U (5)	1.1 J	U (5)	UJ (5)	U (5)	U (5)	UJ (5)	U (5)	U (10)	U (10)	U (10)
Benzene	MO	1.7	1.9	0.31 J	0.48 J	0.66 J	0.7 J	0.67 J	1.2	1.5 J	U (0.5)	3.2	7.1 J	3	3.9	U (1)	2.3
Chloroethane	MO	0.51 J	0.33 J	U (1)	0.27 J	0.3 J	0.27 J	0.36 J	U (1)	UJ (1)	U (1)	U (1)	UJ (1)	U (1)	U (2)	U (2)	U (2)
Methyl tert butyl ether	MO	U (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (1)	U (1)
Methylene Chloride	MO	U (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (4.6)	UJ (3)	U (3)	U (1)	UJ (1)	U (1)	U (2)	U (2)	U (2)
Trichloroethene	MO	U (1)	U (1)	U (1)	U (1)	UJ (1)	U (1)	U (1)	U (0.5)	UJ (0.5)	U (0.5)	U (0.5)	UJ (0.5)	U (0.5)	U (1)	U (1)	U (1)
Vinyl Chloride	MO	0.74 J	1.2	U (1)	0.25 J	0.54 J	0.4 J	0.41 J	U (0.5)	UJ (1)	U (0.5)	U (1)	UJ (1)	U (1)	U (0.5)	U (0.5)	U (0.5)
1,4-Dioxane	MO	3.3	3	U (2)	1.4 J	1.5 J	1.9	U (2)	NS	NS	2.94	3.42	4.09 J	4.05	2.6	1.2	3.4
SVOCs																	
bis (2-chloroethyl) ether	MO	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	NS	NS	U (2)	NS	NS	NS	NS	NS	NS
bis (2-ethylhexyl) phthalate	MO	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	U (9.4)	NS	NS	U (3)	NS	NS	NS	NS	NS	NS
Metals																	
Arsenic	4* / 4*	U (1)	3	U (1)	U (1)	U (1)	U (1)	1.4	U (0.5)	0.6	0.6	NS	1.1	2.2	2.9	U (1)	2
Beryllium	MO	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	NS	NS	U (0.5)	NS	NS	NS	NS	NS	NS
Chromium	579.3 / 27.7	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	U (2)	NS	NS	U (0.5)	NS	NS	NS	NS	NS	NS
Iron	NAC / 1000	U (100)	717	182	U (100)	U (100)	U (100)	U (50)	U (50)	70	U (50)	NS	U (50)	U (50)	U (100)	190	U (100)
Lead	14 / 0.5	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	U (1)	NS	NS	U (0.5)	NS	NS	NS	NS	NS	NS
Manganese	MO	803	3290	3300	1480	1130	3340 J	5040	35	U (10)	U (10)	NS	U (10)	78	U (10)	15	U (10)
Nickel	145.2 / 16.1	10.7	13.8	14.3	13.6	14.1	13.8	12	NS	NS	9.4	NS	NS	NS	NS	NS	NS
Other																	
Total Phosphate	NAC / 18	7.1	3.4	U (6)	U (6)	U (6)	U (6)	U (6)	NS	NS	U (10)	NS	NS	NS	NS	NS	NS

Table 4-1. Treatment System Water Quality Results During Start-Up

	Discharge Limits	1/5/12	2/23/12	2/29/12	3/19/12	4/11/12	4/30/12	5/14/12	5/31/12
Influent									
VOCs									
1,1-Dichloroethene	NA	7.1	8.8	12	8.5	11	NS	9	NS
1,2-Dichloroethane	NA	2.4	1.7	1.5	1.9	1.4	NS	1.9	NS
1,2-Dichloropropane	NA	1.3	1.4	1.1	1.2	1.2	NS	1.1	NS
2-Butanone	NA	U (5)	U (10)	U (5)	U (5)	U (5)	NS	U (5)	NS
Benzene	NA	11	13	11	12	7.7	NS	11	NS
Chloroethane	NA	0.45 J	U (2)	U (1)	0.42 J	0.55 J	NS	0.58 J	NS
Methyl tert butyl ether	NA	U (1)	U (1)	U (1)	U (1)	U (1)	NS	U (1)	NS
Methylene Chloride	NA	U (1)	U (2)	U (1)	U (1)	U (1)	NS	U (1)	NS
Trichloroethene	NA	U (1)	U (1)	U (1)	U (1)	U (1)	NS	U (1)	NS
Vinyl Chloride	NA	3.4	4.4	4.7	3.5	4.2	NS	4.2	NS
1,4-Dioxane	NA	3.72	3.2	3.04	4.28	3.95	NS	3.9	NS
SVOCs									
bis (2-chloroethyl) ether	NA	U (10)	NS	U (9.4)	U (9.4)	U (9.4)	NS	U (9.4)	NS
bis (2-ethylhexyl) phthalate	NA	U (10)	NS	U (9.4)	U (9.4)	U (9.4)	NS	U (9.4)	NS
Metals									
Arsenic	NA	36.6	29	61.6	35.2	31.3	NS	31.2	NS
Beryllium	NA	U (1)	NS	U (1)	U (1)	U (1)	NS	U (1)	NS
Chromium	NA	U (2)	NS	U (2)	U (2)	U (2)	NS	U (2)	NS
Iron	NA	9580	10000	13800	9350	9630	NS	9090	NS
Lead	NA	U (1)	NS	U (1)	U (1)	U (1)	NS	U (1)	NS
Manganese	NA	3580	3300	3400	3450	3490	NS	3410	NS
Nickel	NA	13.7	NS	13.1	13.8	12.5	NS	14.1	NS
Other									
Total Phosphate	NA	76.3	NS	165	71.7	46.5	NS	37.9	NS
Effluent									
VOCs									
1,1-Dichloroethene	MO	U (1)	U (1)	U (1)	U (1)	U (1)	NS	U (1)	NS
1,2-Dichloroethane	MO	2	1.4	1.4	1.2	1.3	NS	U (1)	NS
1,2-Dichloropropane	MO	1.2	1	0.95 J	0.85 J	1.1	NS	U (1)	NS
2-Butanone	MO	U (5)	U (10)	1.7 J	1 J	U (5)	NS	38	NS
Benzene	MO	2.4	1.6	1.2	0.52 J	1.3	NS	U (1)	NS
Chloroethane	MO	U (1)	U (2)	0.31 J	U (1)	U (1)	NS	U (1)	NS
Methyl tert butyl ether	MO	U (1)	U (1)	U (1)	U (1)	U (1)	NS	U (1)	NS
Methylene Chloride	MO	U (1)	U (2)	U (1)	0.29 J	0.21 J	NS	U (1)	NS
Trichloroethene	MO	U (1)	U (1)	U (1)	U (1)	U (1)	NS	U (1)	NS
Vinyl Chloride	MO	U (1)	U (0.5)	U (1)	U (1)	U (1)	NS	U (1)	NS
1,4-Dioxane	MO	2.48	1.8	1.67	1.84	2.33	NS	U (0.196)	NS
SVOCs									
bis (2-chloroethyl) ether	MO	U (9.4)	NS	U (9.4)	U (9.4)	U (9.4)	NS	U (9.4)	NS
bis (2-ethylhexyl) phthalate	MO	U (9.4)	NS	U (9.4)	U (9.4)	U (9.4)	NS	U (9.4)	NS
Metals									
Arsenic	4* / 4*	U (1)	U (1)	U (1)	1.6	1	NS	U (1)	NS
Beryllium	MO	U (1)	NS	U (1)	U (1)	U (1)	NS	U (1)	NS
Chromium	579.3 / 27.7	U (2)	NS	U (2)	2.6	U (2)	NS	U (2)	NS
Iron	NAC / 1000	U (100)	U (100)	U (100)	U (100)	140	NS	U (100)	NS
Lead	14 / 0.5	U (1)	NS	U (1)	U (1)	***38***	U (1)	U (1)	NS
Manganese	MO	U (1)	U (10)	1.2	U (1)	7.3	NS	3.3	NS
Nickel	145.2 / 16.1	10.3	NS	10.5	10.7	10.2	NS	U (1)	NS
Other									
Total Phosphate	NAC / 18	U (6)	NS	U (6)	14.9	6.6	NS	***183***	U (10)

Concentrations in µg/L.
U (1) - not detected at limit indicated in parentheses.
J - Estimated value
MO - Monitoring Only
NA - Not applicable
NAC - No applicable criterion
* Interim arsenic limit
NS - Not sampled
Underlined values exceed discharge limits. These values are thought to be laboratory errors; resampling showed values below discharge limits.

Table 4-2. Whole Effluent Toxicity Testing Results.

	Discharge Limit	March 20-27, 2012	May 15-22, 2012
LC50			
Daphnid (Ceriodaphnia dubia)	100%	70.7%	>100%
Fathead Minnow (Pimephales promelas)	100%	>100%	>100%
C-NOEC			
Daphnid (Ceriodaphnia dubia)	100%	<6.25%	25%
Fathead Minnow (Pimephales promelas)	100%	<6.25%	100%

Discharge limits and results in % effluent concentration.

LC50 - Lethal Concentration, 50 Percent (LC50) is the % effluent concentration that would cause death in 50 percent of the test organisms over a specified period of time. For the Landfill Area treatment system, the specified time period is 48 hours.

C-NOEC - Chronic No Observed Effect Concentration (C-NOEC) is the highest tested % effluent concentration whose effect is not different from the control effect, according to the statistical test used. The NOEC is usually the highest tested % effluent concentration that causes no observable adverse effect on the test organisms (i.e., the highest tested % effluent concentration at which the values for the observed responses do not statistically differ from the controls).

TABLE 6-1. LONG-TERM MONITORING FOR LANDFILL AREA REMEDIAL ACTION

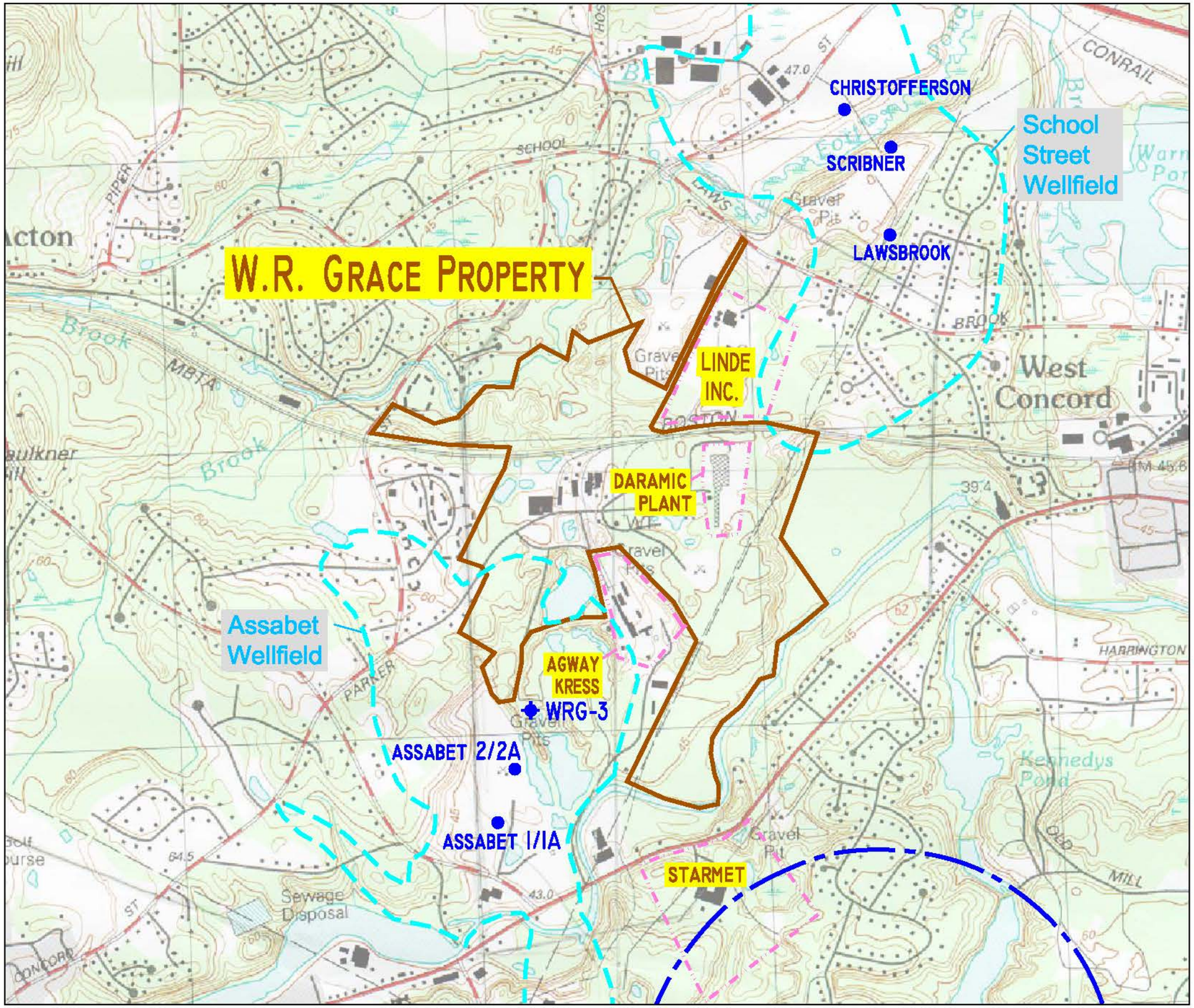
Location	Analysis	Frequency
Water Level Monitoring		
Monitoring Wells (~90)	Hand measurement	Annually
Extraction Wells (5)	Hand measurement	Weekly
Groundwater Quality Monitoring		
22 locations	VOCs	Annually
2 locations	1,4-dioxane	Annually
6 locations	geochemical parameters (dissolved arsenic, dissolved manganese, dissolved iron, dissolved oxygen, oxidation-reduction potential, and pH).	Annually
Treatment System Monitoring		
Extraction Wells (5)	VOCs 1,4-dioxane Total arsenic Total iron Total manganese Total phosphorus	Quarterly
Influent to Metals Microfiltration System & Effluent from Liquid-Phase Carbon Unit**	chloroethane, MTBE, MEK, VDC, vinyl chloride*, benzene, 1,2-dichloroethane*, 1,2-dichloropropane*, methylene chloride, TCE, bis (2-chloroethyl) ether*, bis (2-ethylhexyl) phthalate*, 1,4-dioxane, total arsenic, total chromium, total iron, total lead, total manganese, total nickel, total beryllium and total phosphorus	Monthly
Effluent from Treatment System	Whole effluent toxicity testing	Quarterly for 1 year; Need/Frequency to be determined thereafter
Air	Odor monitoring	Monthly
Extraction Well Monitoring		
Extraction Wells (5)	Totalizer Reading/Flow Rate	Monthly

* Minimum "Related Numeric Criteria" associated with monitoring only discharge requirement (listed in Table 1-2) is below the reporting limit specified in the QAPP (HSI GeoTrans, 2000).
** Subject to change based on operational experience and vendor recommendations.

TABLE 6-2. LANDFILL AREA REMEDIAL ACTION CONTACTS

W R Grace (responsible party)	Thor Helgason de maximis, inc. 135 Beaver Street Waltham, MA 02452 781-642-8775
Tetra Tech GEO (consultant to Grace dealing with groundwater issues)	Anne Sheehan Tetra Tech GEO One Monarch Drive Littleton, MA 01460 978-952-0120
O&M, Inc. (consultant to Grace maintaining groundwater treatment system)	Dave Fuerst O&M, Inc. 450 Montbrook Lane Knoxville, TN 37919 865-691-5052
USEPA	Derrick Golden Waste Management Division U.S. Environmental Protection Agency, Region 1 5 Post Office Square Mail Code OSRR07-4 Boston, MA 02109-3912 617-918-1448
MassDEP	Jennifer McWeeney Bureau of Waste Site Cleanup Massachusetts Department of Environmental Protection One Winter Street, 7th Floor Boston, MA 02108 617-654-6560

FIGURES



U.S.G.S. QUADRANGLE
MAYNARD, MASSACHUSETTS

QUADRANGLE LOCATION

National Geodetic Vertical Datum Of 1929

N

EXPLANATION

- W.R. GRACE PROPERY BOUNDARY (APPROXIMATE)
- APPROXIMATE LOCATION OF NEARBY MCP SITES
- DEP APPROVED WELLHEAD PROTECTION AREA (ZONE 2) (MA. DEP, 2012)
- DEP INTERIM WELLHEAD PROTECTION AREA (IWPA) (MA. DEP, 2012)
- PUBLIC WATER SUPPLY WELL
- PROPOSED PUBLIC WATER SUPPLY WELL

SOURCE:

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1998, MAYNARD QUADRANGLE MCP MAP, 5/6/98

MA.DEP, 2012 HTTP://MAPS.MASSGIS.STATE.MA.US/WSPA/VIEWER.HTM

LOCATIONS ARE APPROXIMATE

0 1,200
Scale in feet

TITLE:
W.R. GRACE PROPERTY AND SURROUNDING AREAS

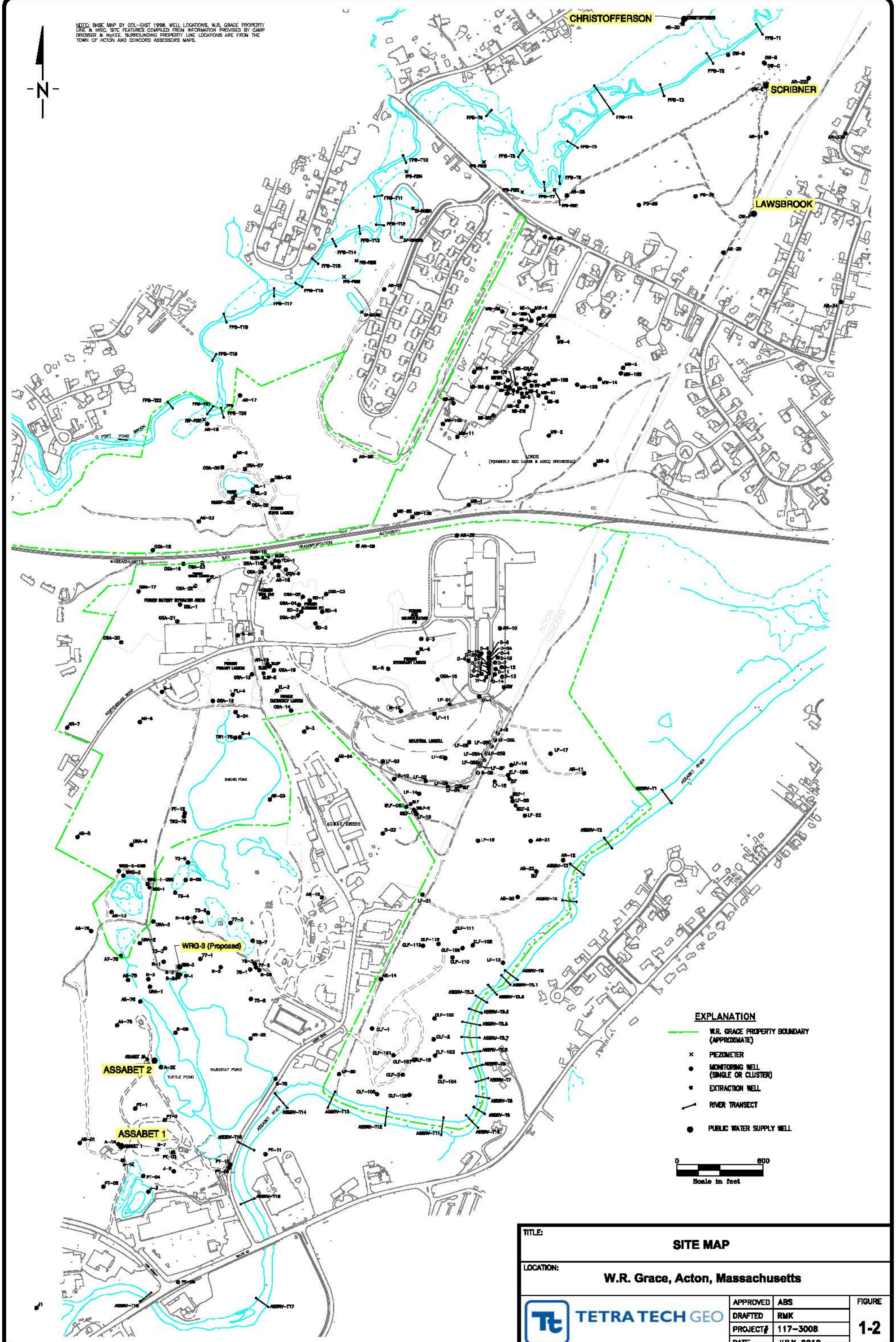
LOCATION:
W.R. Grace, Acton, Massachusetts

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-1
PROJECT#	117-3006	
DATE	AUG. 2012	

G:\WRG-ACT_2012\06-12_LF-RPT\SITE-MAP-D.DWG

NOTE: BASE MAP BY COL-EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.



TITLE:

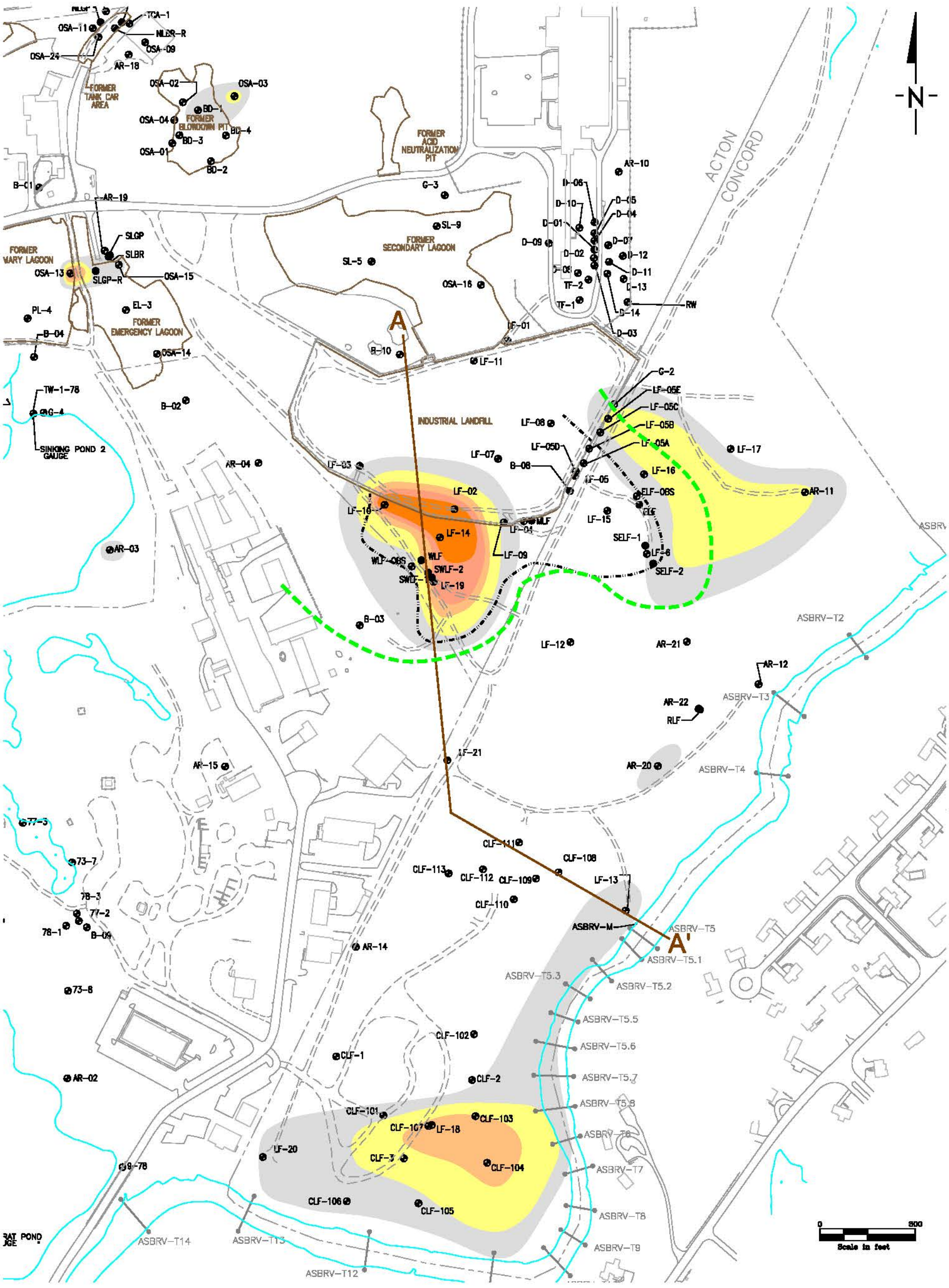
SITE MAP

LOCATION:

W.R. Grace, Acton, Massachusetts

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-2
PROJECT#	117-3008	
DATE	JULY 2012	



EXPLANATION

- FORMER SOURCE AREA
- R-2 MONITORING WELL (SINGLE OR CLUSTER)
- RP-1 EXTRACTION WELL
- RIVER TRANSECT
- A—A' SECTION LOCATION
- MAXIMUM EXTENT OF JUNE 2010 CAPTURE ZONE REGARDLESS OF DEPTH
- ROD CAPTURE ZONE

VDC CONCENTRATION 2011

- >200 – 520 ug/L VDC
- >100–200 ug/L VDC
- >60–100 ug/L VDC
- >30–60 ug/L VDC
- >7–30 ug/L VDC

SAMPLES COLLECTED BETWEEN SEPT. 28 AND OCT. 12, 2011

VDC CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

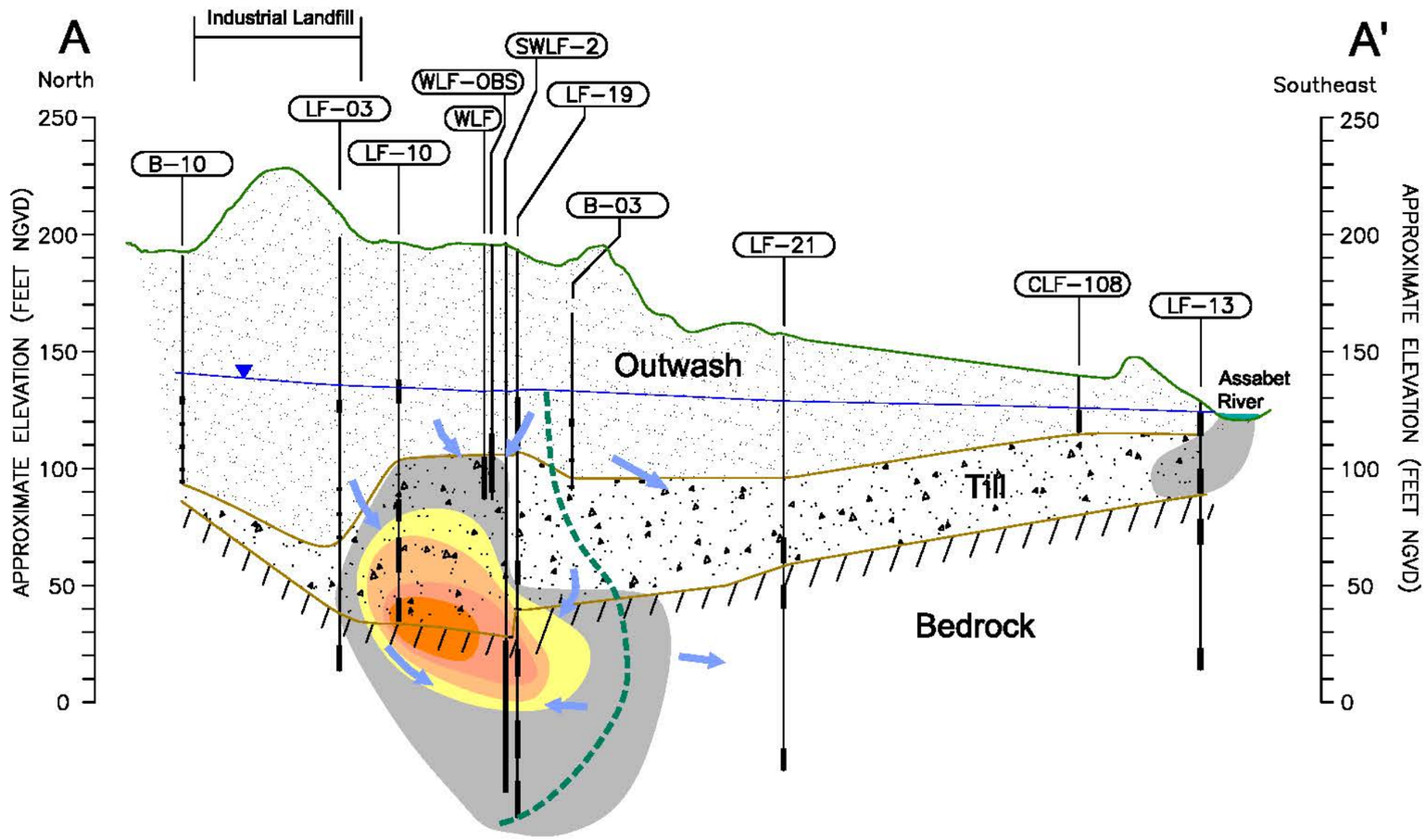
VDC = VINYLIDENE CHLORIDE = 1,1-DICHLOROETHENE

TITLE: **LANDFILL AREA SITE MAP WITH DISTRIBUTION OF VDC IN GROUNDWATER, 2011**

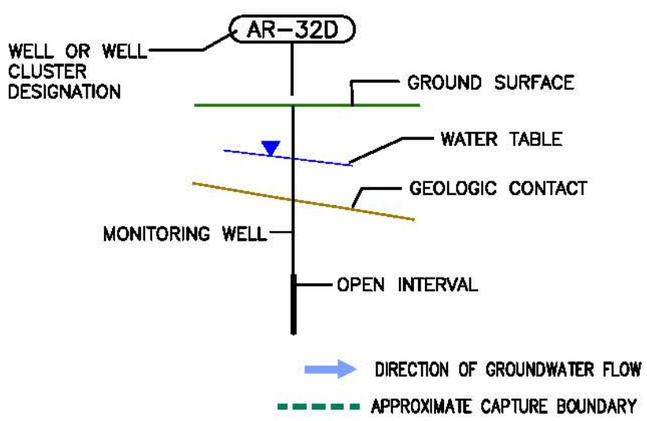
LOCATION: **W.R. Grace, Acton, Massachusetts**

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-3
PROJECT#	117-3008	
DATE	JULY 2012	



Explanation



VDC CONCENTRATION 2011

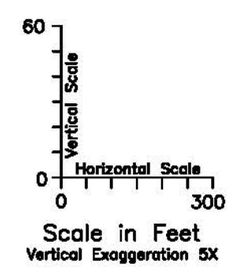
- >200–520 ug/L VDC
- >100–200 ug/L VDC
- >60–100 ug/L VDC
- >30–60 ug/L VDC
- >7–30 ug/L VDC

SAMPLES COLLECTED BETWEEN SEPT. 26 AND OCT. 12, 2011

CONCENTRATION BOUNDARIES ARE APPROXIMATE.

VDC = VINYLIDENE CHLORIDE = 1.1-DICHLOROETHENE

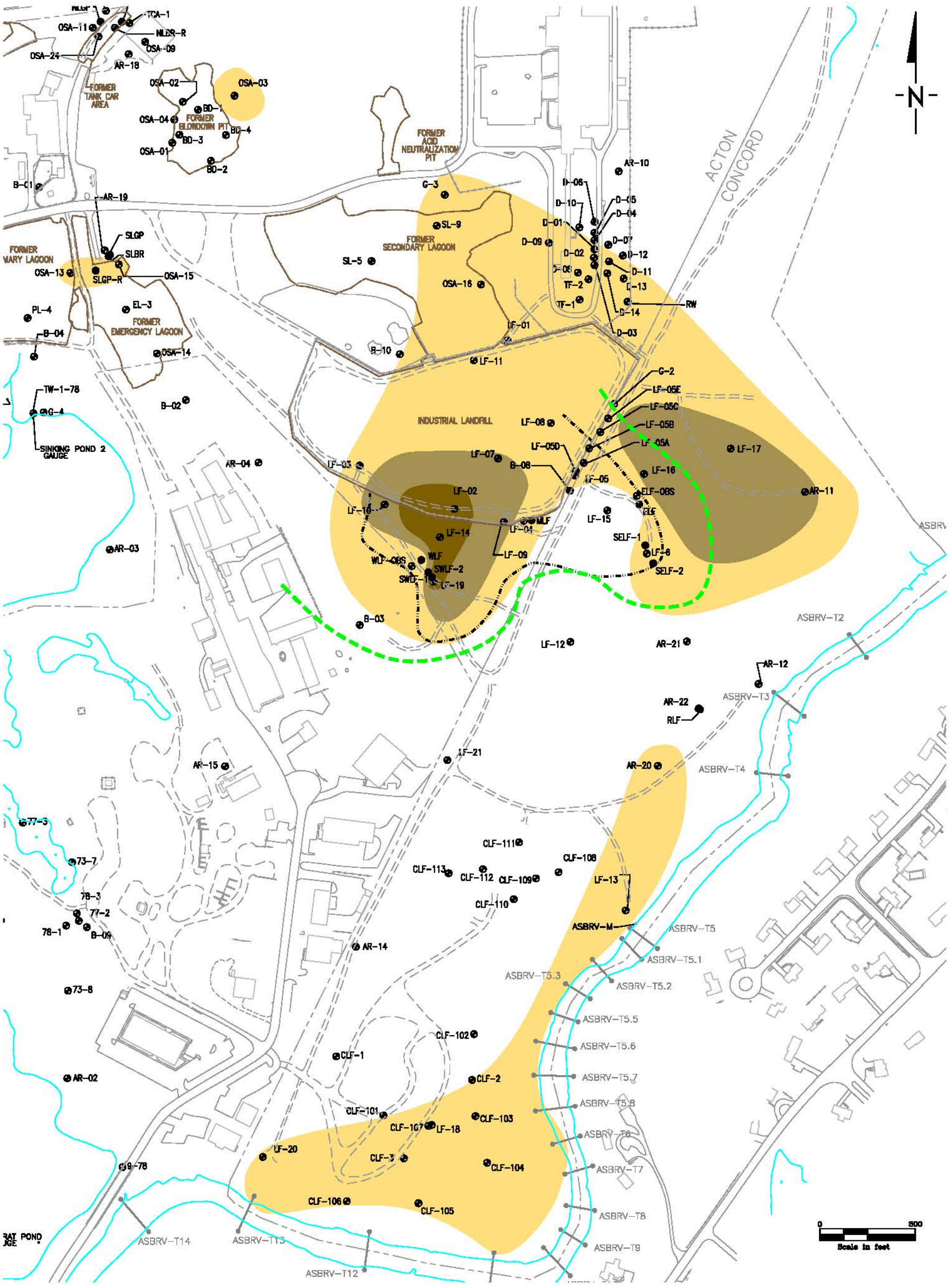
NOTE: ALL ELEVATIONS IN FEET NGVD



TITLE:	2011 VDC CONCENTRATIONS, SECTION A-A'
LOCATION:	W.R. Grace, Acton, Massachusetts

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-4
PROJECT#	117-3008	
DATE	JULY 2012	



EXPLANATION

- FORMER SOURCE AREA
- R-2 MONITORING WELL (SINGLE OR CLUSTER)
- RP-1 EXTRACTION WELL
- RIVER TRANSECT
- MAXIMUM EXTENT OF JUNE 2010 CAPTURE ZONE REGARDLESS OF DEPTH
- ROD CAPTURE ZONE

VINYL CHLORIDE CONCENTRATION 2011

- >100-180 ug/L VINYL CHLORIDE
- >30-100 ug/L VINYL CHLORIDE
- >2-30 ug/L VINYL CHLORIDE

SAMPLES COLLECTED BETWEEN SEPT. 26 AND OCT. 12, 2011

VINYL CHLORIDE CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

TITLE: **LANDFILL AREA SITE MAP WITH DISTRIBUTION OF VINYL CHLORIDE IN GROUNDWATER, 2011**

LOCATION: **W.R. Grace, Acton, Massachusetts**

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-5
PROJECT#	117-3008	
DATE	JULY 2012	

EXPLANATION

- FORMER SOURCE AREA
- R-2 MONITORING WELL (SINGLE OR CLUSTER)
- RP-1 EXTRACTION WELL
- RIVER TRANSECT
- B—B' SECTION LOCATION
- MAXIMUM EXTENT OF JUNE 2010 CAPTURE ZONE REGARDLESS OF DEPTH
- ROD CAPTURE ZONE

BENZENE CONCENTRATION 2011

- >100-420 ug/L BENZENE
- >30-100 ug/L BENZENE
- >5-30 ug/L BENZENE

SAMPLES COLLECTED BETWEEN SEPT. 26 AND OCT. 12, 2011

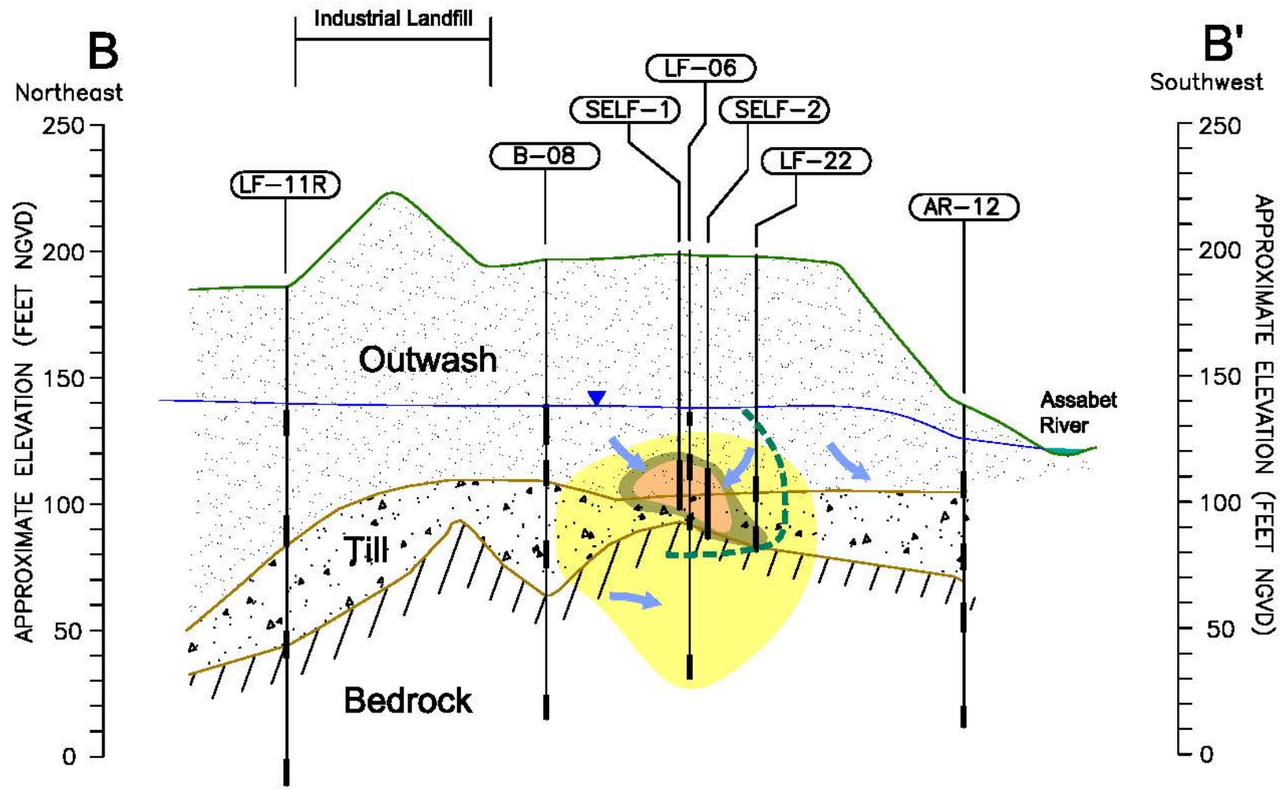
BENZENE CONCENTRATIONS SHOWN ARE MAXIMUM REGARDLESS OF DEPTH. CONCENTRATION BOUNDARIES ARE APPROXIMATE.

TITLE: **LANDFILL AREA SITE MAP WITH DISTRIBUTION OF BENZENE IN GROUNDWATER, 2011**

LOCATION: **W.R. Grace, Acton, Massachusetts**

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-6
PROJECT#	117-3008	
DATE	JULY 2012	



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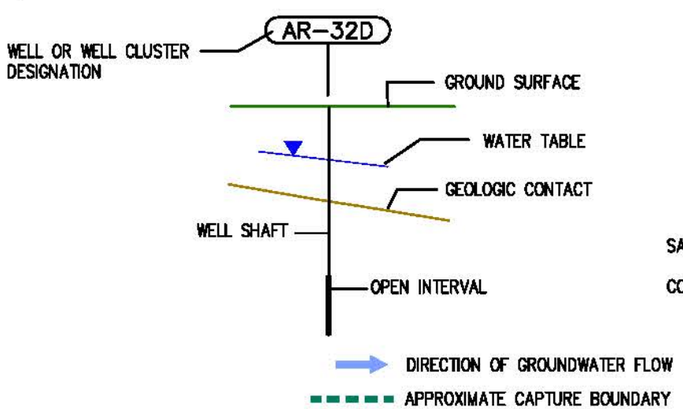
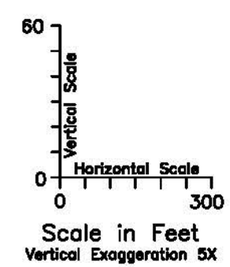


BENZENE CONCENTRATION 2011

- >100–420 ug/L BENZENE
- >30–100 ug/L BENZENE
- >5–30 ug/L BENZENE

SAMPLES COLLECTED BETWEEN SEPT. 26 AND OCT. 12, 2011

CONCENTRATION BOUNDARIES ARE APPROXIMATE.



TITLE: 2011 BENZENE CONCENTRATIONS, SECTION B-B'

LOCATION: W.R. Grace, Acton, Massachusetts

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	1-7
PROJECT#	117-3008	
DATE	JULY 2012	

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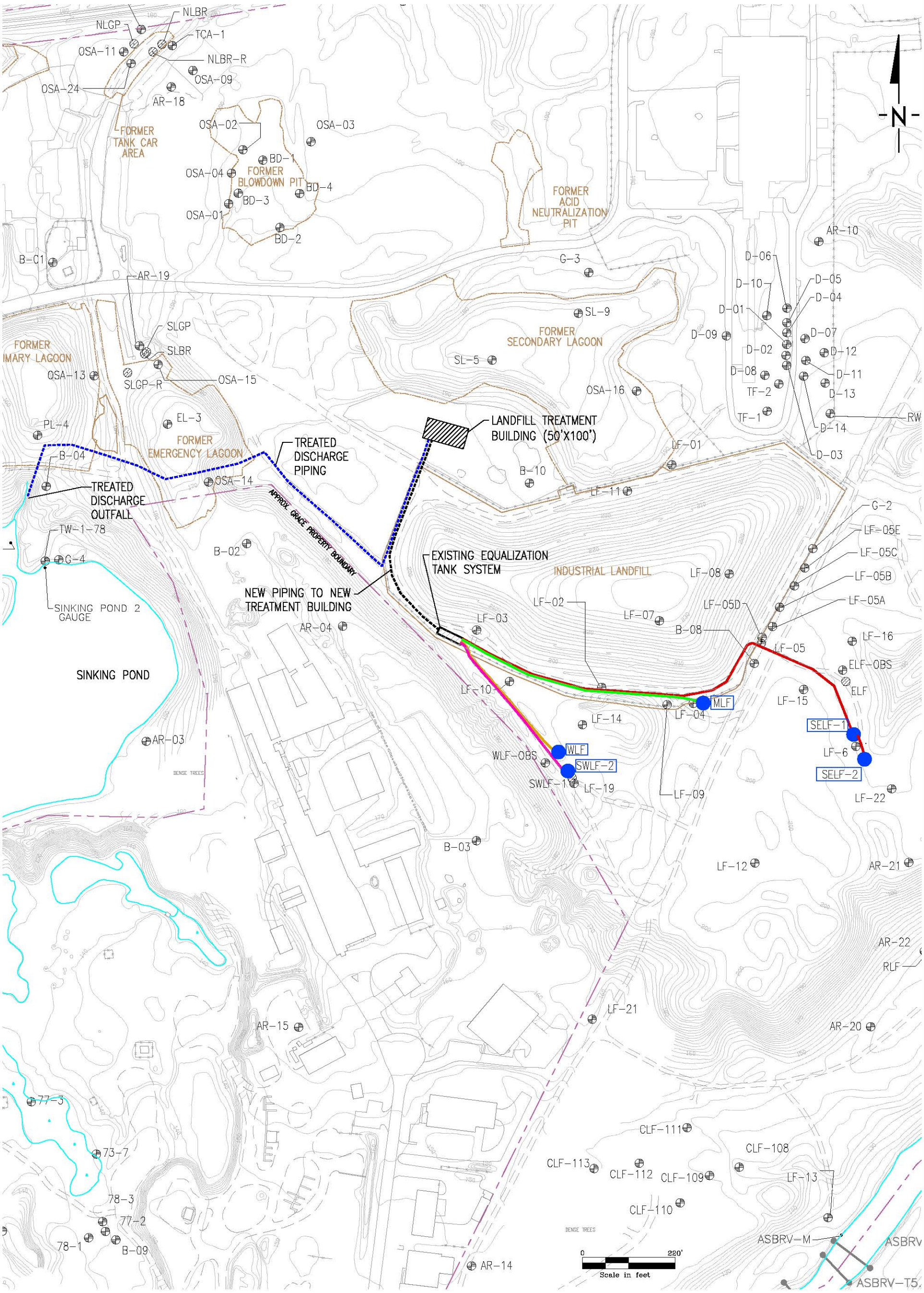


EXPLANATION

- FORMER SOURCE AREA
- R-2 MONITORING WELL (SINGLE OR CLUSTER)
- RP-1 EXTRACTION WELL
- ASSABET 1 PUBLIC WATER SUPPLY WELL
- RIVER TRANSECT

EXTRACTION WELL PIPING

- SELF PIPE LINE
- MLF PIPE LINE
- WLF PIPE LINE
- SWLF PIPE LINE

TITLE:

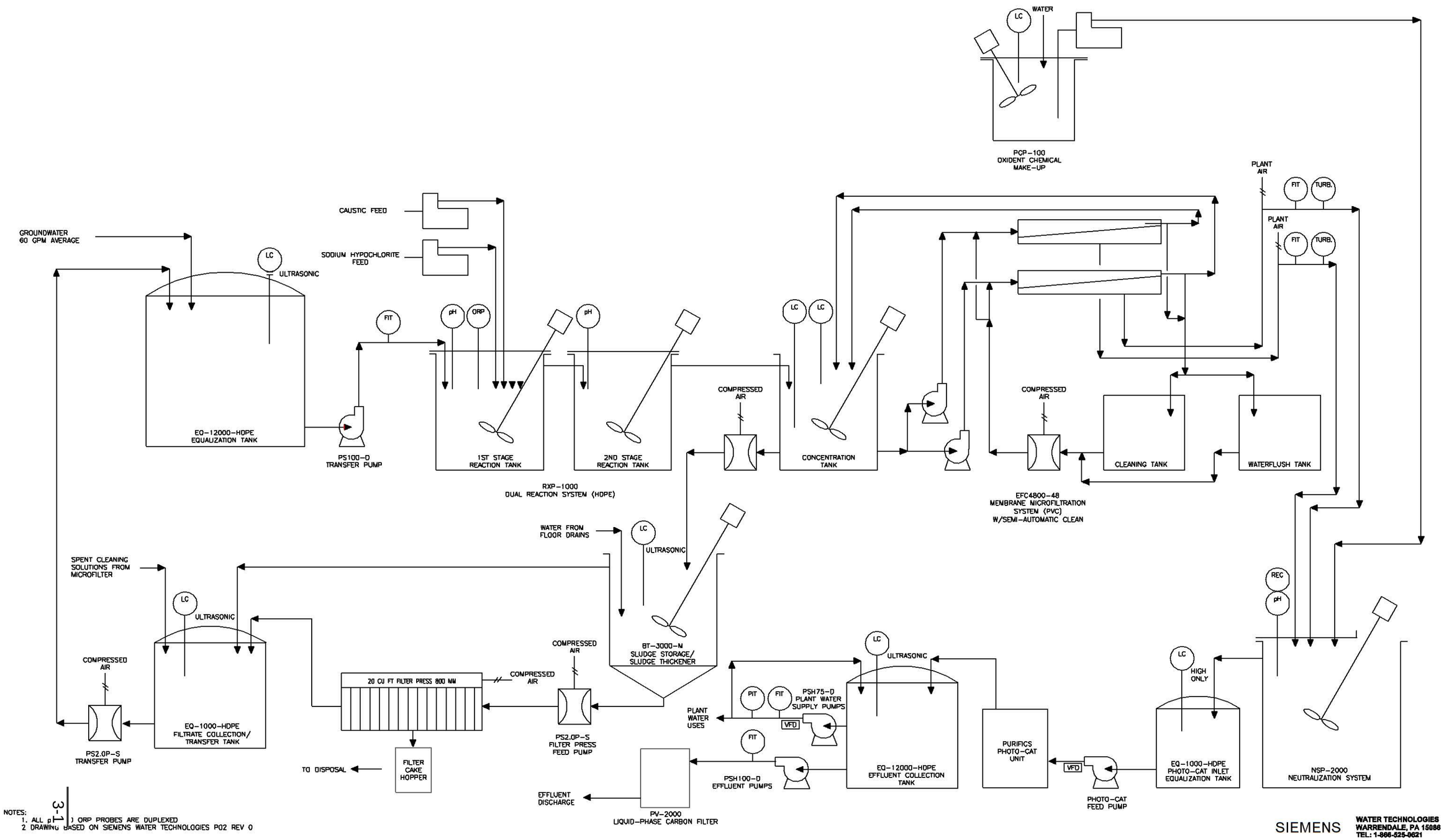
LANDFILL AREA EXTRACTION SYSTEM LOCATION

LOCATION:

W.R. Grace, Acton, MA.

TETRA TECH GEO

APPROVED	ABS	FIGURE
DRAFTED	RMK	2-1
PROJECT#	117-3008	
DATE	APRIL 2012	



NOTES:
1. ALL pH AND ORP PROBES ARE DUPLEXED
2. DRAWING BASED ON SIEMENS WATER TECHNOLOGIES P02 REV 0

SIEMENS WATER TECHNOLOGIES
WARRENDALE, PA 15086
TEL: 1-866-525-0621

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INTL REF:

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	ADDED LIQUID-PHASE CARBON	5/29/12	ALP	DWF		

O & M, Inc.
Environmental Operations and Maintenance Management
450 Montbrook Lane
Knoxville, TN 37919

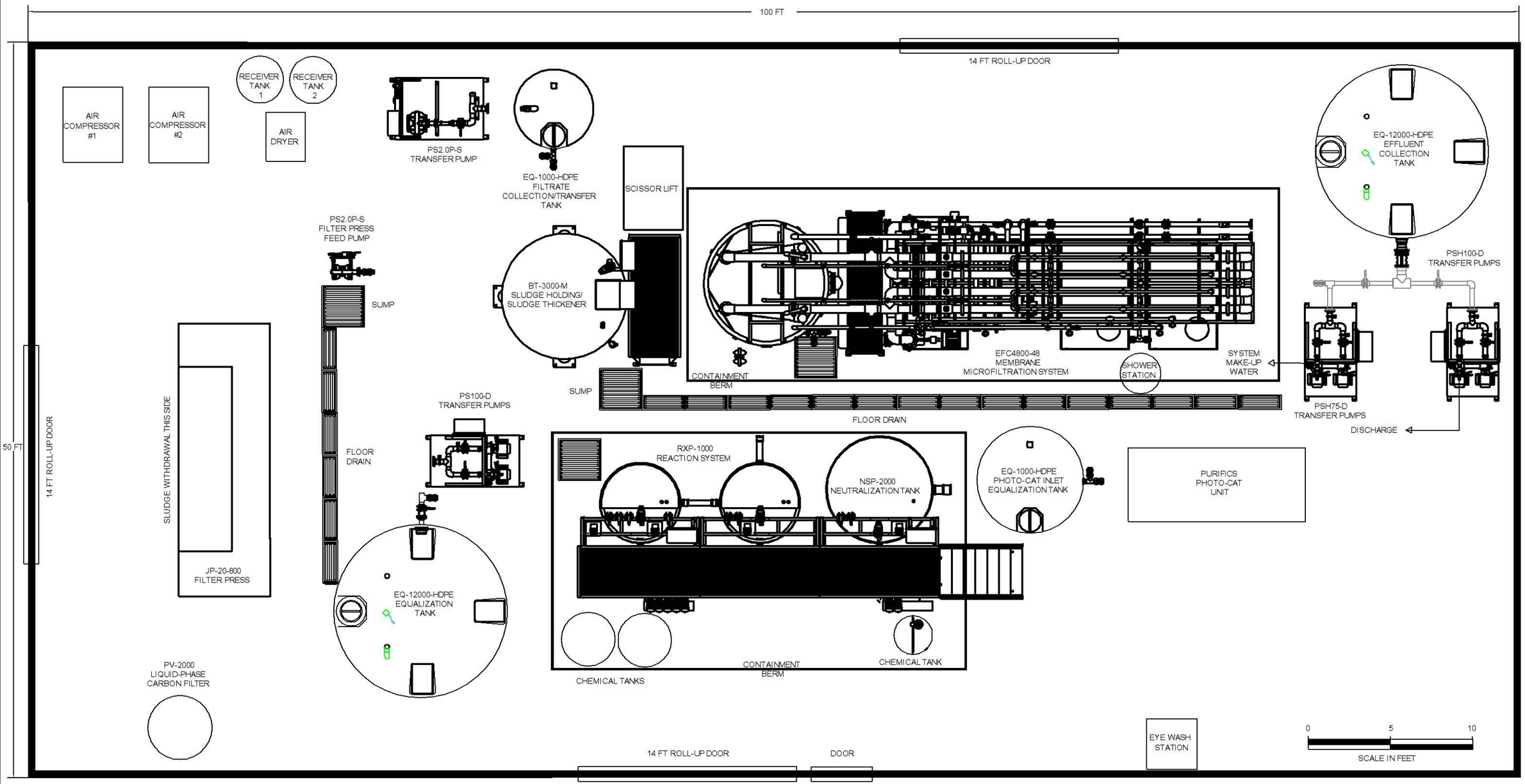
DESIGNER	ALP	DATE 5/29/12
CHECKER	DWF	DATE 5/29/12
ENGINEER		DATE
MANAGER		DATE
FILE:		
SCALE:	NONE	

TITLE: FIGURE 2-2
PROCESS FLOW DIAGRAM

CLIENT: W. R. GRACE - ACTON, MA

LANDFILL AREA

PROJECT	CODE	DRAWING	SHEET	REV
732		2-2	OF	



DRAWING BASED ON SIEMENS WATER TECHNOLOGIES L02 REV A

NOTE: ALL FLOOR DRAINS ARE BE PUMPED INDEPENDENTLY TO THE SLUDGE THICKENER WHEN REQUIRED

3-2

SIEMENS
WATER TECHNOLOGIES
WARRENDALE, PA 15086
TEL: 1-866-525-0621

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INTL REF:

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
2	ADDED LIQUID-PHASE CARBON VESSEL	5-29-12	ALP	DWF		
1	AS-BUILT	3-3-11	ALP	DWF		

O & M, Inc.
Environmental Operations and Maintenance Management
450 Montbrook Lane
Knoxville, TN 37919

DESIGNER	ALP	DATE 5/29/12
CHECKER	DWF	DATE 5/29/12
ENGINEER		DATE
MANAGER		DATE
FILE:		
SCALE:	AS SHOWN	

TITLE
FIGURE 2-3
EQUIPMENT AND BUILDING LAYOUT

CLIENT
W. R. GRACE - ACTON, MA

LANDFILL AREA

PROJECT	CODE	DRAWING	SHEET	REV
732		2-3	OF	

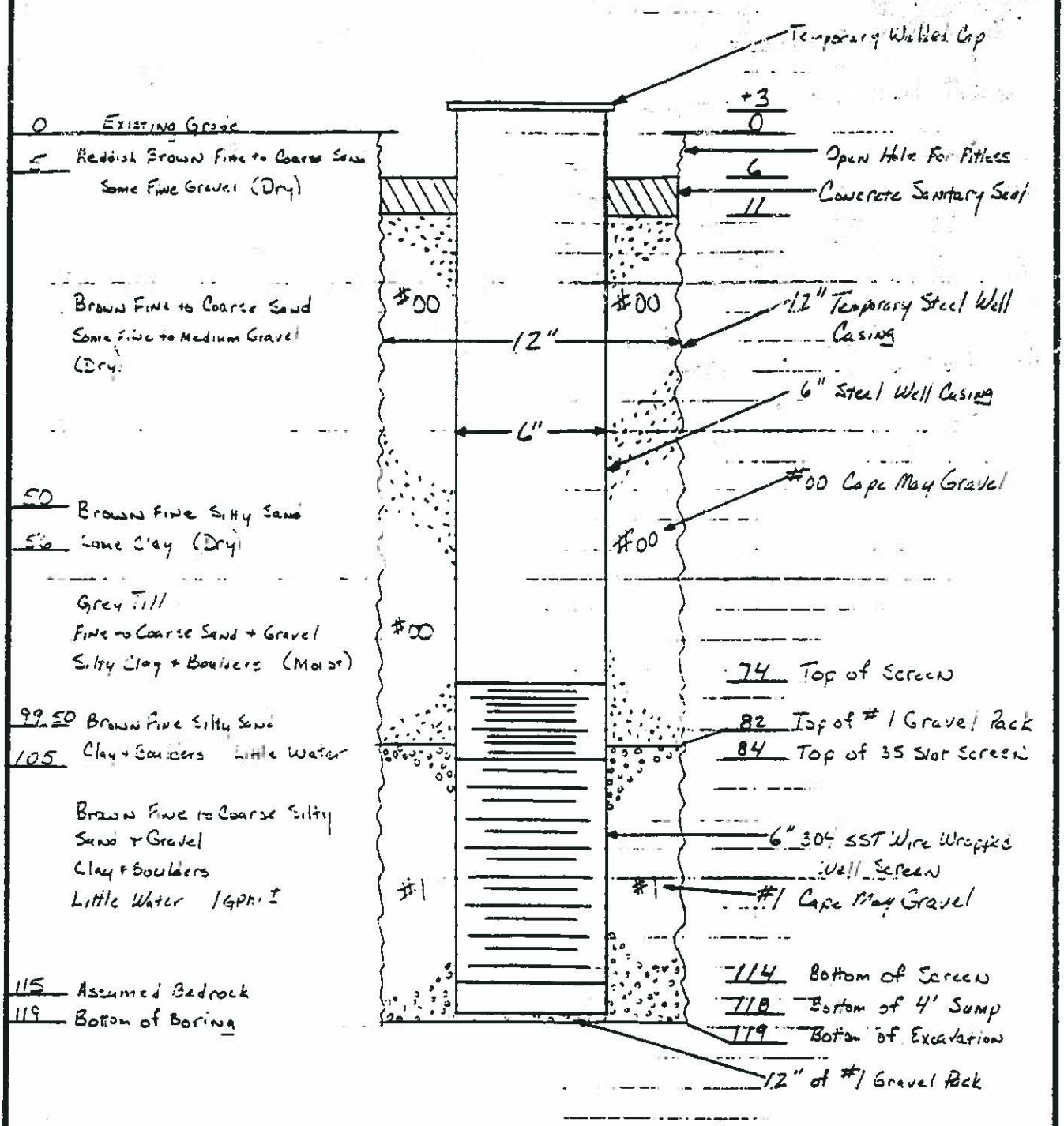
ATTACHMENT A

WELL COMPLETION LOGS

HYDRO GROUP™

WR GRACE
RECOVERY WELL MLF
ACTON MASS

14 Sept 92
REVISION
TBH
Vert 1"=20' NO HORIZ. SCALE



WELL SCREEN DATA

Setting	Slot	Diam.	Length	Transmitting Capacity
74-84	13	6"	10'	12 GPM/FT
84-114	35	6"	30'	26 GPM/FT

TOTAL - 900 GPM

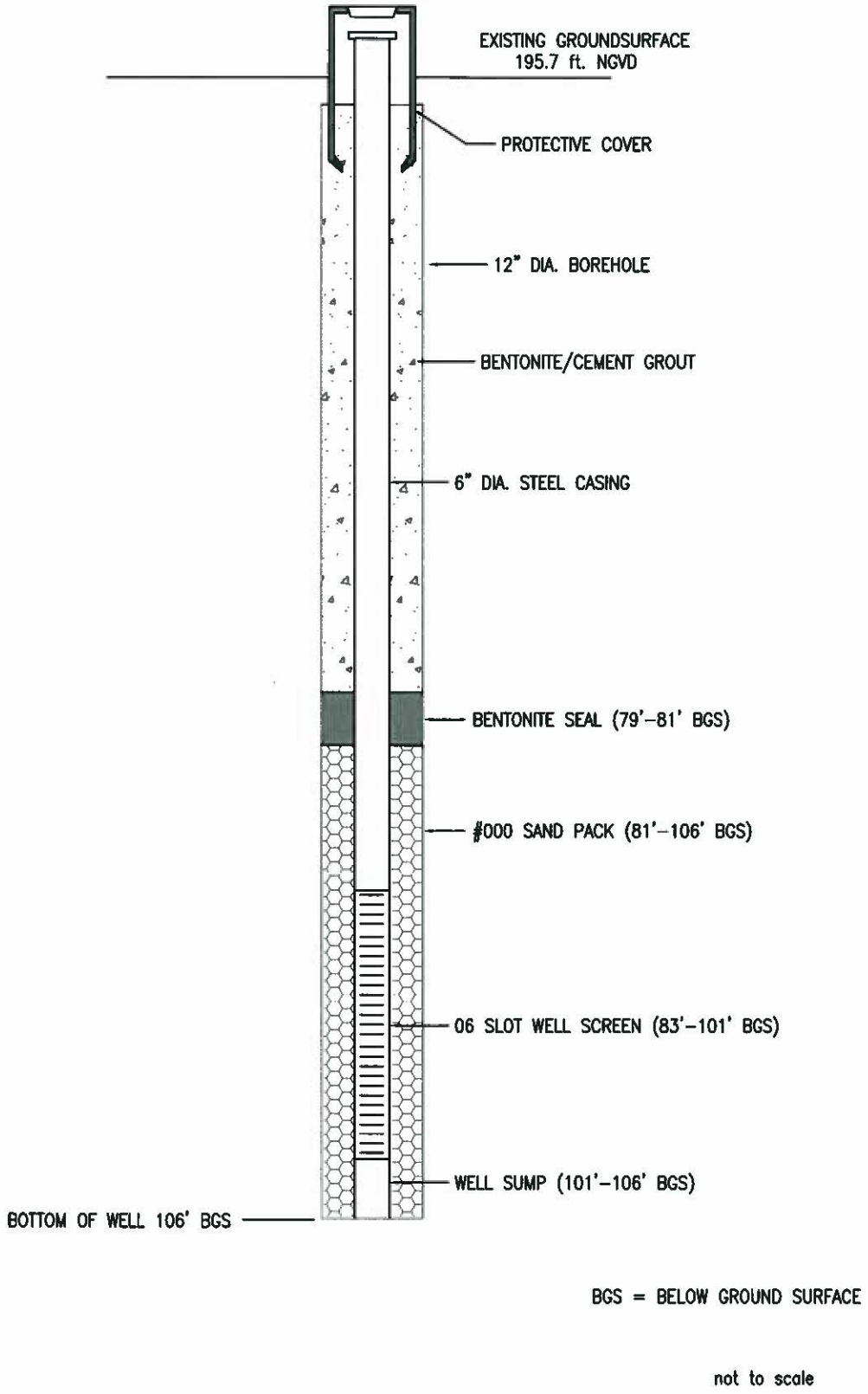


Figure 6 Design of Extraction Well SELF-1

GeoTrans, Inc.
A TETRA TECH COMPANY

G:\VRG-ACT_2009\01-09_ExtWellDetails\LF-Exctr_WellSch.dwg
Jan 07 , 2009 - 10:48am

BORING LOG

PROJECT NUMBER 3008.023.17
PROJECT NAME WR Grace
LOCATION Acton, MA
DRILLING METHOD Mini-Rotosonic
SAMPLING METHOD Mini-Rotosonic
GROUND ELEVATION No survey
MP ELEVATION No Survey
LOGGED BY KGA
NORTHING/EASTING No Survey

BORING/WELL NUMBER SELF-1
DATE DRILLED 10/22/2007
CASING TYPE/DIAMETER NA
SCREEN TYPE/SLOT NA
GRAVEL PACK TYPE NA
GROUT TYPE/QUANTITY Volclay Grout and Bentonite Mix
DEPTH TO WATER 59.1 ft
DRILLING CONTRACTOR Boart Longyear - DL Maher

PID (ppm)	RECOVERY (inches)	SAMPLE ID.	DEPTH (ft. BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
0.1	40				Orange/brown, fine to medium SAND, loose, dry	1.5	
					Grey/brown, fine to medium SAND, loose, dry	5.0	
			5		No Recovery	10.0	
0	25		10		Grey, fine to medium SAND, trace coarse sand, medium dense, wet	15.0	
0	50		15		Grey/brown, fine to medium SAND, loose, dry	20.0	
			20		No Recovery	25.0	Boring Backfilled with Grout and Bentonite Mixture
	50		25		Grey/brown, fine to medium SAND, trace fine gravel, loose, dry	30.0	
	40		30		Grey/brown, fine to coarse SAND, medium dense, moist		
			35				

Continued Next Page

BORING LOG

PROJECT NUMBER 3008.023.17 **BORING/WELL NUMBER** SELF-1

PROJECT NAME WR Grace **DATE DRILLED** 10/22/2007

Continued from Previous Page

PID (ppm)	RECOVERY (inches)	SAMPLE ID.	DEPTH (ft. BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
	48				Brown, fine to medium SAND, medium dense, dry	36.8	
0.2	20		40		Grey/brown, fine to medium SAND, medium dense, dry	40.0	
0.8	40		45		Grey/brown, fine to medium SAND, trace gravel, medium dense, moist	45.0	
0.1	45		50		Grey/brown, fine to medium SAND, some silt, medium dense, moist	50.0	
0.3	28		55		Grey/brown, fine to medium SAND and SILT, dense, moist	55.0	
0	48		60		Brown, fine to medium SAND, trace silt, medium dense, moist	61.0	
			65		no recovery	65.0	
0.4	41		70		Brown, fine SAND and SILT, trace clay, very dense, moist Grey, fine SAND and SILT, some clay, very dense, moist Brown, fine SAND and SILT, trace clay, very dense, moist	70.0 70.5 72.1	
			75			75.0	

Continued Next Page

BORING LOG

PROJECT NUMBER 3008.023.17 **BORING/WELL NUMBER** SELF-1

PROJECT NAME WR Grace **DATE DRILLED** 10/22/2007

Continued from Previous Page

PID (ppm)	RECOVERY (inches)	SAMPLE ID.	DEPTH (ft. BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
1.1	50	SELF-1-76			Grey, fine SAND and SILT, dense, moist		
					Brown/grey, fine SAND and SILT, dense, moist	78.1	
4.8	60	SELF-1-81.5	80				
					Same as above, intermittent layers of oxidized SAND and SILT	82.7	
					Grey, SILT, trace clay, dense, moist		
14	60	SELF-1-88	85				
						89.7	
2..6	48	SELF-1-95	90		Same as above, intermittent layers of oxidized SAND and SILT	91.0	
					Grey, SILT, trace clay, trace cobbles, dense, moist		
4.2	55		95			96.0	
					Grey Till		
			100			100.0	
					Bottom of Boring at 100' BGS		

BORING_WELL_NEAREA_SELF1_030408.GPJ HSI_MA.GDT 3/26/08

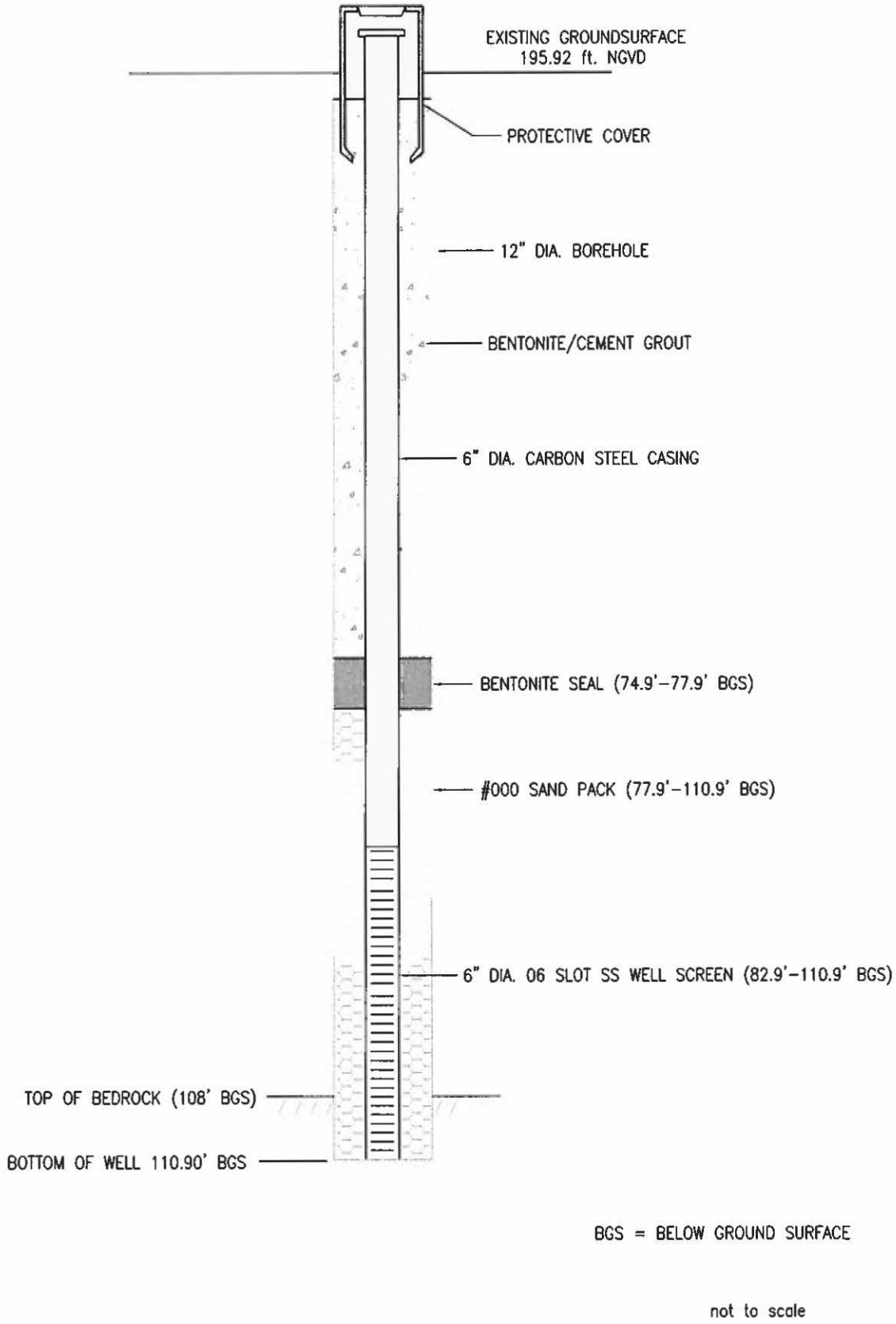
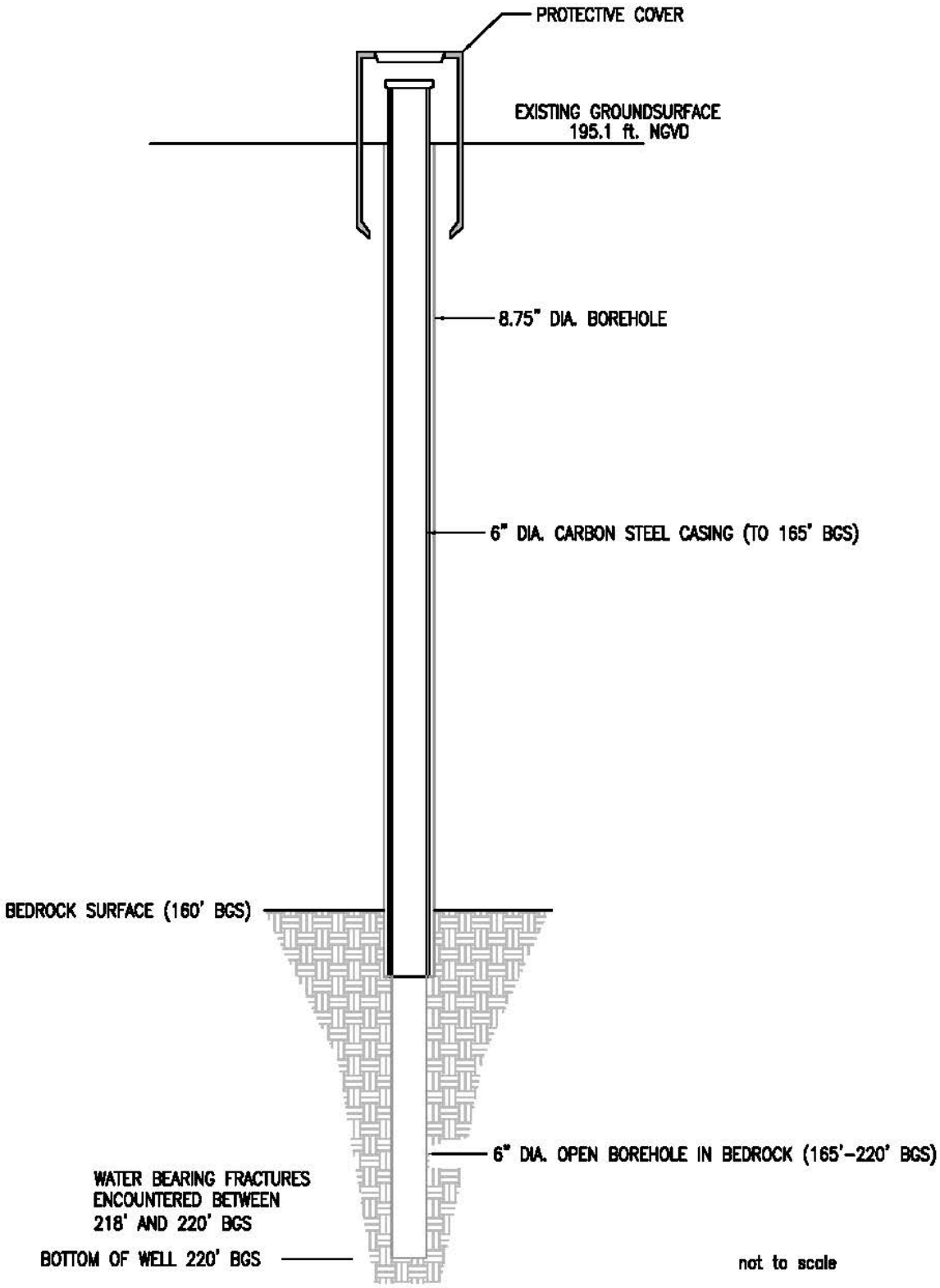


Figure 3 Well Completion Diagram
Extraction Well SELF-2

GeoTrans, Inc.
A TETRA TECH COMPANY

G:\WRG-ACI _010\07-10_LF-PUMP-TEST-RPT\SELF-2_WellSch.dwg
Aug 03 , 2010 - 2:34pm



BGS = BELOW GROUND SURFACE

TITLE: **EXTRACTION WELL SWLF-2**

LOCATION: **W.R. Grace, Acton, Massachusetts**

TETRA TECH GEO

APPROVED	ASB	FIGURE
DRAFTED	RMK	1
PROJECT#	117-3008	
DATE	JUNE 2011	

WLP 1 of 2

LAYNE GROUP

LAYNE WELL & PUMP DIVISIC

LOG OF WELL

Well No. WLP GP Job. No. 412206 Test No.

Log of Well for (Owner) W.R. GRACE

Address

Representatives, if any

Well Located at ACTON in County, State of MASS

Furnish sketch of location Date Drilling started Date Test Hole Completed

Total depth to bottom of Well 110' Diameter Test Hole 12" Elevation at Ground Level, if available

Elevation at Ground Level, if available Distance from where measurements were taken to ground level

Water stands when not pumping feet inches from the surface of the ground

All Measurements taken from Ground

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
10'	0'-10'		FINE TO MED. BROWN SAND				
10'	10'-20'		FINE TO COARSE BROWN GRAVEL & SAND				
20'	20'-40		FINE TO MED BROWN SAND				
50'	40'-90'		FINE TO MED. SILTY BROWN SAND				
20'	90'-110'		TILL				
	110'		BED ROCK				

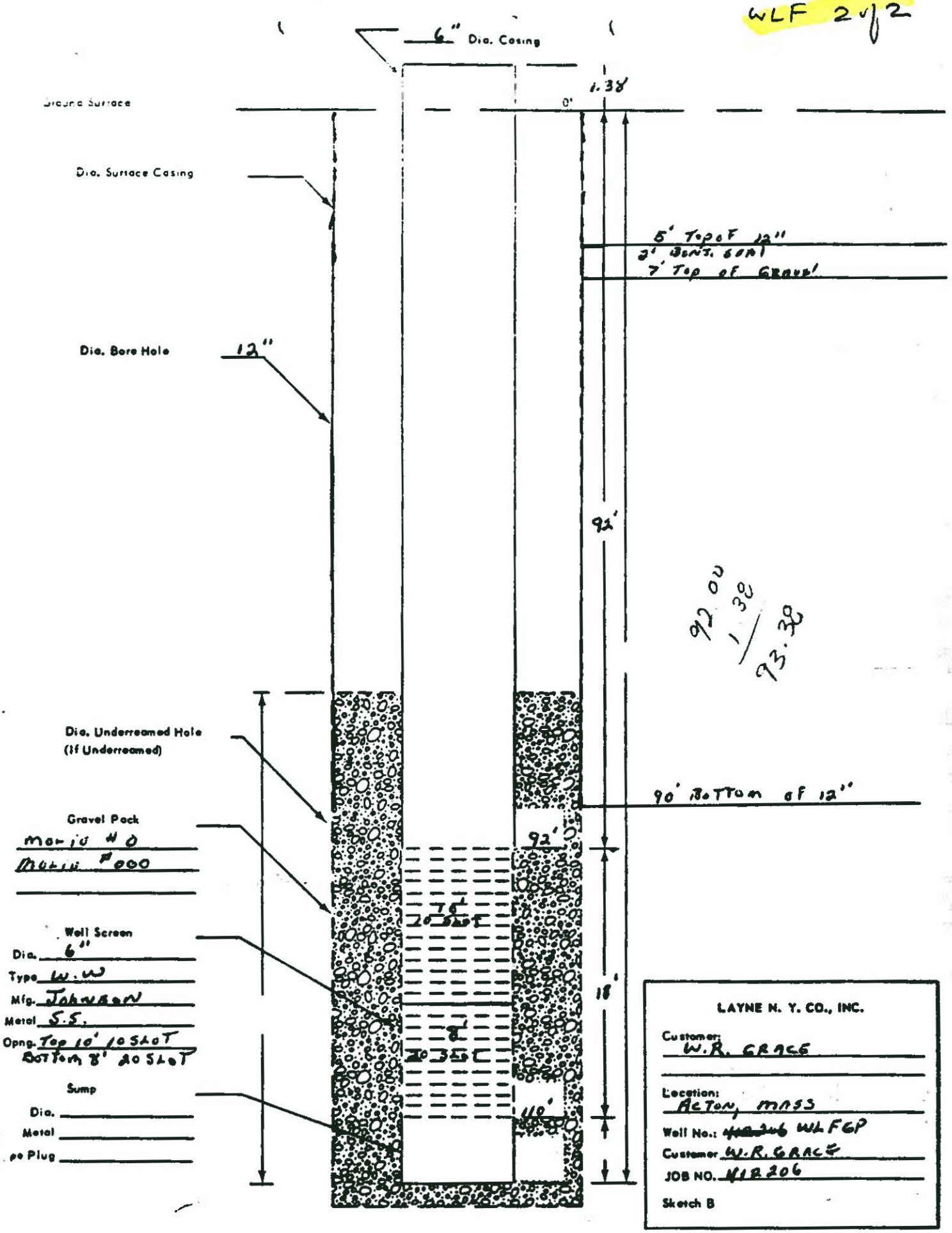
Remarks and opinion of Test

CHECK TYPE OF RIG USED { Reverse / Rotary ✓ / Cable Tool / Wash / Other?

John Vanbuer
Driller

1M-12-83 WB

WLF 2 of 2


6" Dia. Casing
1.38
Ground Surface
0'
Dia. Surface Casing
5' Top of 12"
2' BENT. SOIL
7' Top of GRAVEL
Dia. Bore Hole
12"
92'
92.00
1.38
93.38
Dia. Underreamed Hole
(If Underreamed)
90' Bottom of 12"
Gravel Pack
MORIE #0
MORIE #000
92'
Well Screen
Dia. 6"
Type W.W
Mfg. JOHNSON
Metal S.S.
Opng. Top 10' 10 SLOT
BOTTOM 8' 20 SLOT
76'
20 SLOT
8'
20 SLOT
18'
Sump
Dia.
Metal
Plug
110'
LAYNE N. Y. CO., INC.
Customer: W.R. GRACE
Location: ACTON, MASS
Well No.: WLFGP
Customer W.R. GRACE
JOB NO. 206
Sketch B

ATTACHMENT B

CONSTRUCTION INSPECTION REPORTS

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 10-12-10 Weather: P. Cloudy 60°

Equipment/Personnel On-Site: Jim Champa, Joel from Sennett const., Glavine Construction

Description of Work Performed: Overseeing, inspection of digging and setting forms for Concrete footing and foundation.

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Took Pictures of foundation forms.

Name: Jim Champa Signature: [signature]

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 10-13-10 Weather: P. Cloudy 57°

Equipment/Personnel On-Site: Jim Champa, Joel from Sennett const.

Description of Work Performed: Overseeing, inspection of setting forms for concrete footing and foundation

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Took pictures of foundation and footings.

Name: Jim Champa Signature: Jim Champa

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 10-15-10 Weather: Sunny 65°

Equipment/Personnel On-Site: Jim Champa, Joel from Sennett const
Glavine Construction.

Description of Work Performed: Inspection of foundation

Description of Work Accepted: All of above,

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Took pictures of foundation.

Name: Jim Champa Signature: [signature]

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 10-21-10 Weather: Cloudy 50°

Equipment/Personnel On-Site: Jim Champa / Joel from Sennett const. Glavine. Construction

Description of Work Performed: Inspection of foundation and floor.

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Took pictures of foundation and floor.

Name: Jim Champa Signature: Jim Champa

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 10-25-10 Weather: Cloudy 58°

Equipment/Personnel On-Site: Jim Champa / Joel from Sennett const. Glavine Construction

Description of Work Performed: Inspection of floor and containment walls inside foundation.

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Took pictures of foundation, floor and containment walls.

Name: Jim Champa Signature: Jim Champa

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 11-17-10 Weather: P. Sunny 52°

Equipment/Personnel On-Site: Jim Champa, Joel from Sennett, Sennetts building Crew.

Description of Work Performed: Inspection of Steel building construction - Started framing the walls.

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Took pictures of steel framing, building being erected.

Name: Jim Champa Signature:

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 11-23-10 Weather: P. Cloudy 45°

Equipment/Personnel On-Site: Jim Champa, Joel from Sennett, Sennetts building crew.

Description of Work Performed: Inspection of Steel building construction. Framing walls + roof.

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Pictures of building, walls and roof.

Name: Jim Champa Signature: [signature]

Construction Inspection Report

W. R. Grace Superfund Site, Acton Massachusetts
Landfill Area Remedial Action Construction

Date: 12-2-10 Weather: Sunny, cold 45°

Equipment/Personnel On-Site: Sennett Co. framing crew - Lawn Barber, excavator, bobcat, backhoe

Description of Work Performed: Started trenching and laying pipe in trench from landfill building to new treatment building. Also started trenching from New building to culvert to pond. Also Sennet construction finishing up siding.

Description of Work Accepted: All of above

Description of Corrective Actions to be taken: None

Description of Photographs Taken: Pictures of all of above work.

Name: Jim Champa Signature: Jim Champa

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Soil Testing Results - Transmittal Report

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

Report Date 10/05/2010
Report No. 1
Job Number 13836
Project 50 Independence Road, Acton, MA
PO# 7320-Concrete Testing-001
Contractor Senate Construction

Sample Submitted By

Sample No. 678

- [X] **Our Representative:** Dave Lent
- [ ] **Other:**

Date Submitted: 10-01-10

Source of Sample

- [X] **On-Site Existing @ location:** Center of new building, south wall
- [ ] **Off-Site Borrow from:**

Proposed Use: Below footings, foundation backfill

Material Submitted As:

- [X] **Structural/Granular Fill:**
- [ ] **Ordinary Borrow:** MHD M1.01.0 (Shall be approved by the Architect)
- [ ] **Gravel Borrow:** MHD M1.03.0 Type:
- [ ] **Processed Gravel For Base Course:** MHD M1.03.1
- [ ] **Sand Borrow:** MHD M1.04.0 Type:
- [ ] **Reclaimed Pavement Borrow for Base Course:** MHD M1.11.0
- [ ] **Crushed Stone:** MHD M2.01.0
- [ ] **Dense Graded Crushed Stone for Base Course:** MHD M2.01.7
- [ ] **Common Borrow:**
- [ ] **Drainage Fill:**
- [ ] **Other:**

Requested Testing

- [ ] Atterberg Limits
- [X] Gradation Analysis
- [ ] Hydrometer
- [X] Modified Proctor
- [ ] Permeability
- [X] Wash Sieve Analysis
- [ ] Other:

Material Classification: Silty Sand

Project Specification Conformance Results

- [ ] **Does conform:**
- [ ] **Does NOT conform:**
- [ ] **Marginally does not* conform...Basis:**
  * We suggest the suitability of this soil sample be reviewed for approval by the Architect and the Engineers-of-Record.
- [ ] **No Specifications provided to our office.**
- [ ] **Specifications provided to our office but sample not submitted to a specific use.**
- [ ] **Sample submitted without indication of intended use and without specifications.**

GENERAL REMARKS: Material submitted for the purpose of compaction testing.

REVIEWED BY: Geotechnical Department

Ch

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Soil Testing Results - Transmittal Report

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

Report Date	10/05/2010
Report No.	1
Job Number	13836
Project	50 Independence Road, Acton, MA
	PO# 7320-Concrete Testing-001
Contractor	Senate Construction

---

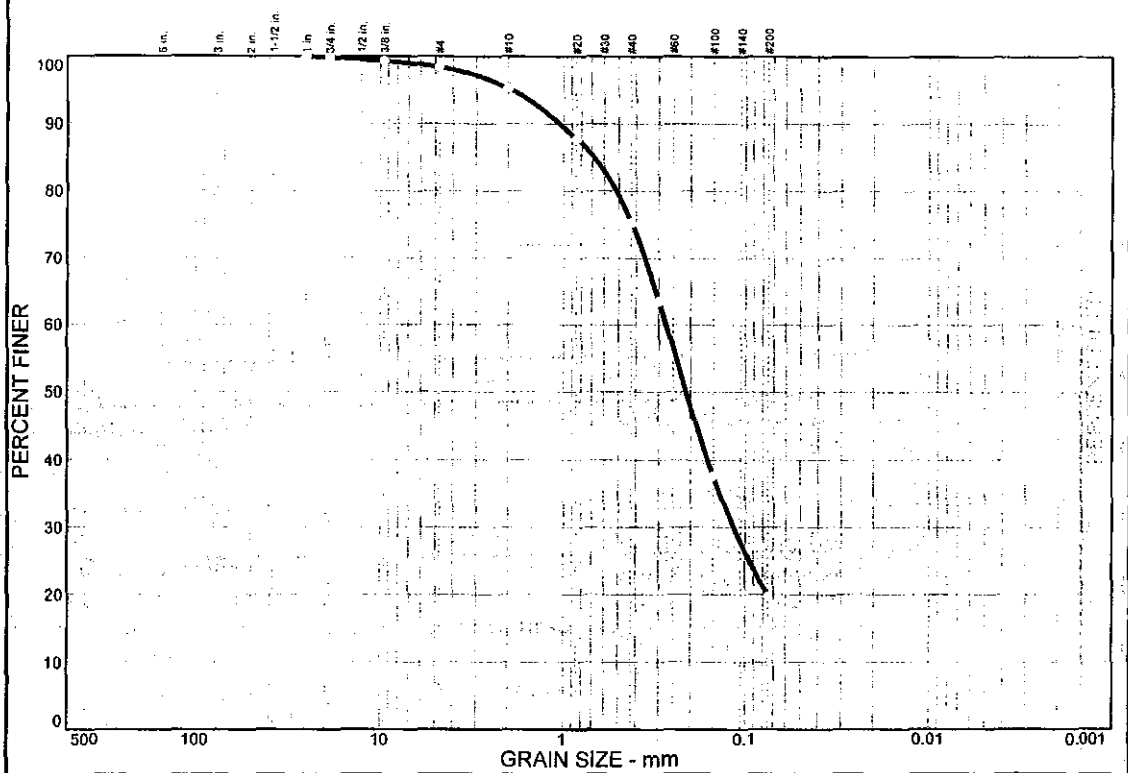
cc: Senate Construction — Brian Trickett
O & M, Inc. — David Fuerst

UTS of Massachusetts, Inc.
5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Report Date	10/05/2010
Report No.	1
Job Number	13836
Project	50 Independence Road, Acton, MA PO# 7320-Concrete Testing-001

Attachment

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.6	78.7	19.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	99.8		
3/8 in.	99.3		
#4	98.4		
#10	95.3		
#20	87.7		
#40	75.3		
#50	63.5		
#100	37.6		
#200	19.7		

* (no specification provided)

Material Description

F-M SAND, LITTLE SILT, TRACE GRAVEL

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.687 D_{60}= 0.274 D_{50}= 0.212
D_{30}= 0.116 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: 678 **Source of Sample:** CENTER OF NEW BLDG. S. WALL **Date:** 10/05/2010
Location: **Elev./Depth:**

UTS OF MASSACHUSETTS, INC. **5 Richardson Lane** **Stoneham, MA 02180**	**Client:** SENATE CONSTRUCTION **Project:** O&M INC., ACTON, MA **Project No:** **Figure** 678

Report Date 10/05/2010
Report No. 1
Job Number 13836
Project 50 Independence Road, Acton, MA
PO# 7320-Concrete Testing-001

Attachment

COMPACTION TEST REPORT

Curve No.: 678

Project No.: **Date:** 10/05/2010
Project: O&M INC., ACTON, MA

Location:
Elev./Depth: **Sample No.** 678
Remarks: CENTER OF NEW BLDG. S. WALL

MATERIAL DESCRIPTION

Description: F-M SAND, LITTLE SILT, TRACE GRAVEL

Classifications - **USCS:** SM **AASHTO:**
Nat. Moist. = **Sp.G. =** 2.75
Liquid Limit = **Plasticity Index =**
% > No.4 = 1.6 % **% < No.200 =** 19.7 %

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 118.0 pcf	117.0 pcf
Optimum moisture = 11.0 %	11.5 %

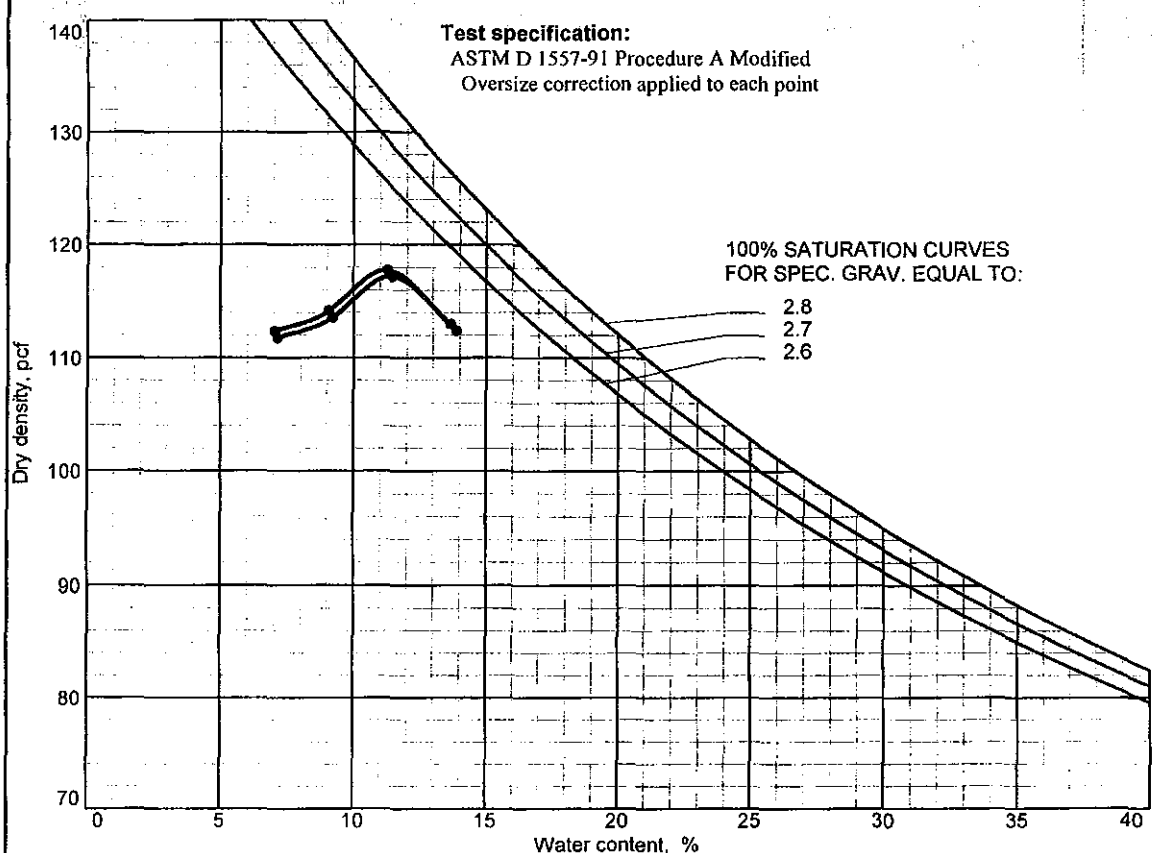


Figure 678

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Soil Inspection Report

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

Report Date 10/06/2010
Report No. 2
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction

WEATHER: Heavy rain/wind, 50 degrees
TIME: 6:30 AM
CONTACT: N/A
PURPOSE: Perform field density tests
EQUIPMENT: None-previously prepared
TEST METHOD: ☒ Sand Cone ☐ Nuclear Densometer
TITLE: ☐ Inspector ☐ Staff Engineer ☐ Engineer

OBSERVATIONS:

This report follows a site visit to observe earthwork for footing base. The undersigned arrived on site to perform field density tests on the bottom of footing. Due to the heavy rain testing could not be performed. A visual inspection was performed on the footing bottom and it appeared to be stable and firm.

Inspector Name	Premium Time	Hours	Travel Time
Erik Irving	No	Min Day	1 Hr(s)

REVIEWED BY: Chuck Fraser

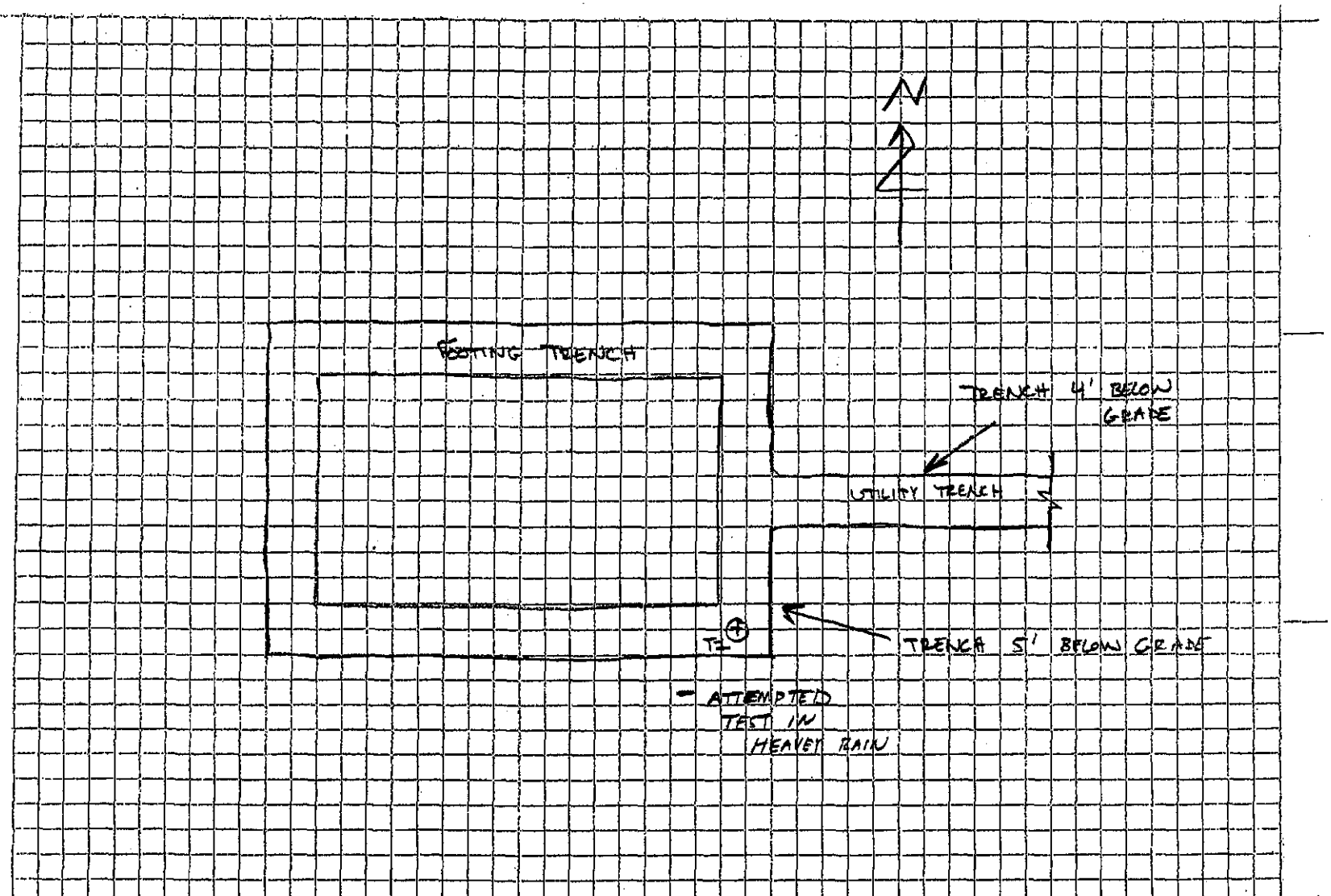
Our reports are available in PDF form via email. Please email us at reports@utsofmass.com for more information.

CC:		
	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

UTS of Massachusetts, Inc.
5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Report Date 10/06/2010
Report No. 2
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001

Attachment



5 Richardson Lane
Stoneham, Ma 02180
"The Construction Testing People"
Of Massachusetts Inc.

JOB NAME: O & M
PROJECT NO.: 13836

NTS
FIELD SKETCH
EI 10-6-10

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Concrete Field Report

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

Report Date 10/13/2010
Report No. 1
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction

WEATHER:

TIME:

CONTACT:

SUMMARY:

Transported 1 set of cylinders cast on 10/8/10 to the lab for testing.

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
D. Boyden	No		

REVIEWED BY: William P. Crabtree

WPC

Our reports are available in PDF form via email. Please email us at reports@utsofmass.com for more information.

CC:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

OCT 25 2010

APPROVED
DATE 10/13 BY LS
PO# 7320

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Compressive Strength Report - Concrete

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

Report Date 10/08/2010
Report No. 1
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction
Concrete Co. Kane Perkins

ALL FIELD TESTS DONE ACCORDING TO ASTM: C-172 C-31 C-143 C-1064

ALL COMPRESSIVE STRENGTH TESTS DONE ACCORDING TO ASTM: C-39

CLASS CONCRETE: 3000# 3/4" | **No. Of Sets:** 1 | **CUBIC YARDS:** 32

SET 1 LOCATION: Footing, column line 1-4

Lab No.	Size (in.)	Area (sq. in.)	Condition	Date Cast	Date Tested	Age Days	Total Load (lbs.)	Unit Load (psi.)	Fracture Type
I083	4 x 8	12.56	Good	10/08/2010	10/15/2010	7	27,000	2,150	4
I084	4 x 8	12.56	Good	10/08/2010	10/22/2010	14			
I085	4 x 8	12.56	Good	10/08/2010	11/05/2010	28			
I086	4 x 8	12.56	Good	10/08/2010	11/05/2010	28			
I087	4 x 8	12.56	Good	10/08/2010	11/05/2010	28			

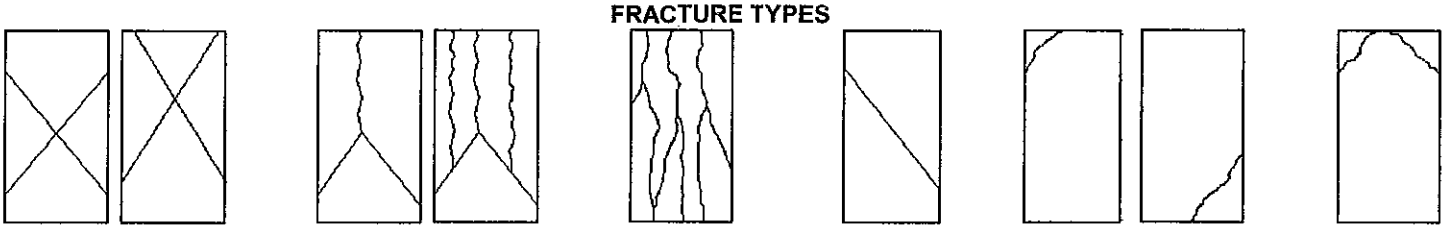
Slump (in.)	4
Air Temp. (F.)	70
Conc Temp (F)	75
Truck No.	54
Ticket No.	162784
Time	2:15
Unit Wt lbs/cu ft	
Air Content (%	

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
Matt Winegar	No	Min Day	1 Hr(s)

REVIEWED BY: Robert S. Granada

FRACTURE TYPES



Type 1 Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking throught caps

Type 2 Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end

Type 3 Columner vertical cracking through both ends, no well-formed cones

Type 4 Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

Type5 Side fractures at top or bottom (occur commonly with unbonded caps)

Type 6 Similar to Type 5 but end of cylinder is pointed

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Compressive Strength Report - Concrete

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

Report Date	10/08/2010
Report No.	1
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

cc:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

Of Massachusetts
"The Construction Testing People"

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Compressive Strength Report - Concrete

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

Report Date 10/08/2010
Report No. 1
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction
Concrete Co. Kane Perkins

FIELD SUMMARY REPORT

Total Pour: Footing, column line 1-4

Method of Placement: ☐ Pump ☒ Chute Discharge ☐ Bucket ☐ Other
Other:

Method of Concrete Consolidation: ☒ Vibrator ☐ Other
Other:

Cylinder Fabrication Location: ☒ Truck Discharge Chute ☐ End of Pump Hose

Cylinder Storage: ☐ Curing Box ☐ Thermal Blanket ☐ Hay/Straw ☐ Trailer ☐ Field
☐ Other

Placement Protection: ☐ Thermal Blankets ☐ Heat ☐ None
☐ Other

Slump Specification (in.) 3
Number of slumps out of specification reported to
If rejected
Approved by

Remarks:

UTS of Massachusetts, Inc.
5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Report Date 10/08/2010
Report No. 1
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001

Attachment

UTS Of Massachusetts Inc.
"The Construction Testing People"

Page #_____

DAILY REPORT OF CONCRETE POUR

PROJECT NAME: [illegible] M PROJECT NO.:_____

DATE: 10/[illegible]/10 AIR TEMP.: 70 TOTAL YARDS: 32

LOCATION OF POUR:_____

Load & Truck #	Slump Inches	Batching In	Batching Out	Time In Minutes	Yards	Concrete Temp.	% of Air	Ticket #	No. of Cylinders
54	4	1:50	3:15	[illegible]	10			162[illegible]	5
53		[illegible]	3:35	90	[illegible]			[illegible]	
46		3:30	5:00	90	30			08112	
[illegible]		4:00	5:15	75	32			[illegible]	
		Di[illegible]							

INSPECTOR: Nathan Wing REMARKS:_____

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Concrete Field Report

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

Report Date 10/15/2010
Report No. 2
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction

WEATHER:

TIME:

CONTACT:

SUMMARY:

Transported 1 set of cylinders cast on 10/13/10 to the lab for testing.

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
Matt Winegar	No		

REVIEWED BY: William P. Crabtree

WPC

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CC:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

Of Massachusetts
"The Construction Testing People"

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Compressive Strength Report - Concrete

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

Report Date 10/13/2010
Report No. 2
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction
Concrete Co. Kane Perkins

ALL FIELD TESTS DONE ACCORDING TO ASTM: C-172 C-31 C-143 C-1064

ALL COMPRESSIVE STRENGTH TESTS DONE ACCORDING TO ASTM: C-39

CLASS CONCRETE: 3000# 3/4" | **No. Of Sets:** 1 | **CUBIC YARDS:** 31 1/2

SET 1 LOCATION: Wall, column line 3 at D

Lab No.	Size (in.)	Area (sq. in.)	Condition	Date Cast	Date Tested	Age Days	Total Load (lbs.)	Unit Load (psi.)	Fracture Type
I421	4 x 8	12.56	Good	10/13/2010	10/20/2010	7	25,000	1,990	2
I422	4 x 8	12.56	Good	10/13/2010	10/27/2010	14			
I423	4 x 8	12.56	Good	10/13/2010	11/10/2010	28			
I424	4 x 8	12.56	Good	10/13/2010	11/10/2010	28			
I425	4 x 8	12.56	Good	10/13/2010	11/10/2010	28			

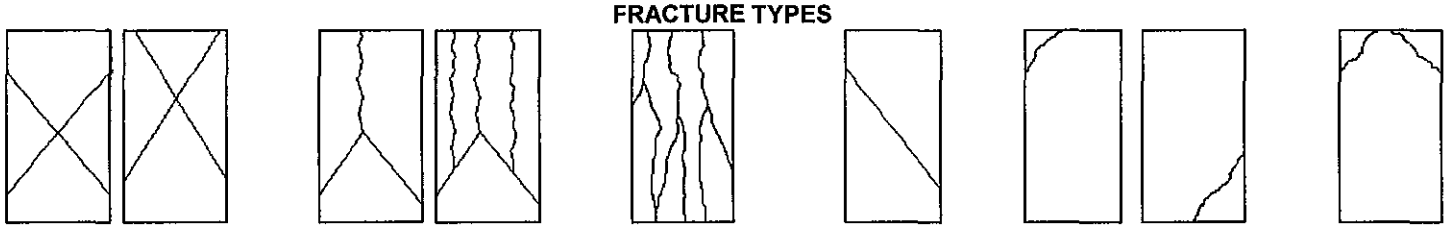
Slump (in.)	4 1/2
Air Temp. (F.)	70
Conc Temp (F)	72
Truck No.	53
Ticket No.	H162871
Time	1:20
Unit Wt lbs/cu ft	
Air Content (%	

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
D. Boyden	No	Min Day	1 Hr(s)

REVIEWED BY: Robert S. Granada

FRACTURE TYPES



Type 1 — Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking throught caps

Type 2 — Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end

Type 3 — Columner vertical cracking through both ends, no well-formed cones

Type 4 — Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

Type5 — Side fractures at top or bottom (occur commonly with unbonded caps)

Type 6 — Similar to Type 5 but end of cylinder is pointed

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Compressive Strength Report - Concrete

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

Report Date	10/13/2010
Report No.	2
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

cc:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

Of Massachusetts
"The Construction Testing People"

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Compressive Strength Report - Concrete

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

Report Date 10/13/2010
Report No. 2
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction
Concrete Co. Kane Perkins

FIELD SUMMARY REPORT

Total Pour: Walls, column line A at 1-2.9, 1 at A-D and D at 1-3.3

Method of Placement: ☐ Pump ☒ Chute Discharge ☐ Bucket ☐ Other
Other:

Method of Concrete Consolidation: ☒ Vibrator ☐ Other
Other:

Cylinder Fabrication Location: ☒ Truck Discharge Chute ☐ End of Pump Hose

Cylinder Storage: ☐ Curing Box ☐ Thermal Blanket ☐ Hay/Straw ☒ Trailer ☐ Field
☐ Other

Placement Protection: ☐ Thermal Blankets ☐ Heat ☐ None
☐ Other

Slump Specification (in.) 4
Number of slumps out of specification reported to (1) 4 1/2
If rejected
Approved by Joel Delorey

Remarks:

UTS of Massachusetts, Inc.
5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Report Date 10/13/2010
Report No. 2
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001

Attachment

UTS Of Massachusetts Inc.
"The Construction Testing People"

Page #_____

DAILY REPORT OF CONCRETE POUR

PROJECT NAME: O+M Bldg. PROJECT NO.: _____

DATE: 10-13-10 AIR TEMP.: 78 TOTAL YARDS: 31.5

LOCATION OF POUR: WALLS & A e/ To 2.9 ; 1e A To D ; De/ To 3.3
KAHE - PERKINS 3000 3/4

Load & Truck #	Slump Inches	Batching In	Batching Out	Time In Minutes	Yards	Concrete Temp.	% of Air	Ticket #	No. of Cylinders
53	4½	12:30	1:30	60	10.5	72		H162871	5A
54		12:45	2:05	80	10.5 / 21			H162872	
49		1:05	2:45	100	10.5 / 31.5			H162874	

INSPECTOR: Dick Boyden REMARKS: _____

Of Massachusetts
"The Construction Testing People"

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NOV-2 2010

Concrete Field Report

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

Report Date	10/19/2010
Report No.	3
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction

WEATHER:

TIME:

CONTACT:

SUMMARY:

Transported 1 set of cylinders cast on 10/18/10 to the lab for testing.

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
R. Lopes	No		

REVIEWED BY: William P. Crabtree

WPC

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CC:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

Of Massachusetts
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Compressive Strength Report - Concrete

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

Report Date	10/18/2010
Report No.	3
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

ALL FIELD TESTS DONE ACCORDING TO ASTM: C-172 C-31 C-143 C-1064

ALL COMPRESSIVE STRENGTH TESTS DONE ACCORDING TO ASTM: C-39

CLASS CONCRETE: 3000# 3/4" | **No. Of Sets:** 1 | **CUBIC YARDS:** 31 1/2

SET 1 LOCATION: Wall, column line 1-3, southeast corner

Lab No.	Size (in.)	Area (sq. in.)	Condition	Date Cast	Date Tested	Age Days	Total Load (lbs.)	Unit Load (psi.)	Fracture Type
J135	4 x 8	12.56	Good	10/18/2010	10/25/2010	7	28,000	2,230	4
J136	4 x 8	12.56	Good	10/18/2010	11/01/2010	14	37,000	2,950	4
J137	4 x 8	12.56	Good	10/18/2010	11/15/2010	28			
J138	4 x 8	12.56	Good	10/18/2010	11/15/2010	28			
J139	4 x 8	12.56	Good	10/18/2010	11/15/2010	28			

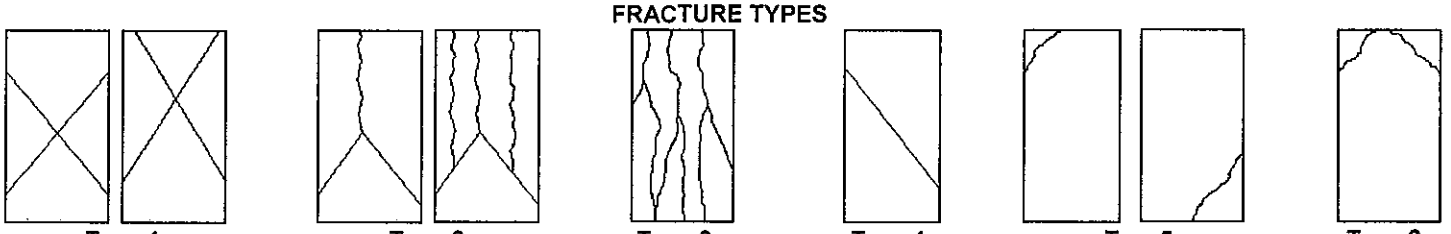
Slump (in.)	4
Air Temp. (F.)	65
Conc Temp (F)	60
Truck No.	54
Ticket No.	162918
Time	1:25
Unit Wt lbs/cu ft	
Air Content (%)	

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
Matt Winegar	No	Min Day	1 Hr(s)

REVIEWED BY: Robert S. Granada

FRACTURE TYPES



Type 1 — Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking throught caps

Type 2 — Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end

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Type 4 — Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1

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Type 6 — Similar to Type 5 but end of cylinder is pointed

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Compressive Strength Report - Concrete

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450 Montbrook Lane
Knoxville, TN 37919

Report Date	10/18/2010
Report No.	3
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

CC:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

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Compressive Strength Report - Concrete

Lori Sillinger
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450 Montbrook Lane
Knoxville, TN 37919

Report Date	10/18/2010
Report No.	3
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

FIELD SUMMARY REPORT

Total Pour: South wall, column line 1-3

Method of Placement: ☐ Pump ☒ Chute Discharge ☐ Bucket ☐ Other
Other:

Method of Concrete Consolidation: ☒ Vibrator ☐ Other
Other:

Cylinder Fabrication Location: ☒ Truck Discharge Chute ☐ End of Pump Hose

Cylinder Storage: ☐ Curing Box ☐ Thermal Blanket ☐ Hay/Straw ☒ Trailer ☐ Field
☐ Other

Placement Protection: ☐ Thermal Blankets ☒ Heat ☐ None
☐ Other

Slump Specification (in.) 4
Number of slumps out of specification reported to
If rejected
Approved by

Remarks:

Report Date 10/18/2010
Report No. 3
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001

Attachment

UTS Of Massachusetts Inc.
"The Construction Testing People"

Page #_____

DAILY REPORT OF CONCRETE POUR

PROJECT NAME: O + M PROJECT NO.:

DATE: 10/18/10 AIR TEMP.: 65 TOTAL YARDS:

LOCATION OF POUR: Foundation Wall S-E S-W

Load & Truck #	Slump Inches	Batching In	Batching Out	Time In Minutes	Yards	Concrete Temp.	% of Air	Ticket #	No. of Cylinders
44	4	12:40	1:55	75	10½	60	X	162918	5
45		12:30	2:00	90	21		X	058161	
47		1:20	2:50	90	31½		X	142920	

INSPECTOR: Mathew Winger REMARKS:

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

NOV 15 2010

Concrete Field Report

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

Report Date 11/02/2010
Report No. 4
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction

WEATHER:

TIME:

CONTACT:

SUMMARY:

Transported 3 sets of cylinders cast on 10/29/10 to the lab for testing.

GENERAL REMARKS:

Inspector Name	Premium Time	Hours	Travel Time
Matt Winegar	No		

REVIEWED BY: William P. Crabtree

WPC

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CC:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

DEC 3-2010

Compressive Strength Report - Concrete

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

Report Date 10/29/2010
Report No. 4
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001
Contractor Senate Construction
Concrete Co. Kane Perkins

ALL FIELD TESTS DONE ACCORDING TO ASTM: C-172 C-31 C-143 C-1064

ALL COMPRESSIVE STRENGTH TESTS DONE ACCORDING TO ASTM: C-39

CLASS CONCRETE: 4000# 3/4" * | **No. Of Sets:** 3 | **CUBIC YARDS:** 110

SET 1 LOCATION: S.O.G., column line A at 5

Lab No.	Size (in.)	Area (sq. in.)	Condition	Date Cast	Date Tested	Age Days	Total Load (lbs.)	Unit Load (psi.)	Fracture Type
L809	4 x 8	12.56	Good	10/29/2010	11/05/2010	7	48,000	3,820	1
L810	4 x 8	12.56	Good	10/29/2010	11/12/2010	14	61,000	4,860	3
L811	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	67,000	5,330	3
L812	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	68,000	5,410	1
L813	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	71,000	5,650	2

Slump (in.)	5
Air Temp. (F.)	53
Conc Temp (F)	72
Truck No.	46
Ticket No.	H163128
Time	8:15
Unit Wt lbs/cu ft	
Air Content (%)	

SET 2 LOCATION: S.O.G., column line D at 4

Lab No.	Size (in.)	Area (sq. in.)	Condition	Date Cast	Date Tested	Age Days	Total Load (lbs.)	Unit Load (psi.)	Fracture Type
L814	4 x 8	12.56	Good	10/29/2010	11/05/2010	7	45,000	3,580	2
L815	4 x 8	12.56	Good	10/29/2010	11/12/2010	14	58,000	4,620	4
L816	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	67,000	5,330	2
L817	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	65,000	5,180	1
L818	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	68,000	5,410	3

Slump (in.)	5 1/2
Air Temp. (F.)	59
Conc Temp (F)	70
Truck No.	46
Ticket No.	H163134
Time	10:00
Unit Wt lbs/cu ft	
Air Content (%)	

SET 3 LOCATION: S.O.G., column line A at 1

Lab No.	Size (in.)	Area (sq. in.)	Condition	Date Cast	Date Tested	Age Days	Total Load (lbs.)	Unit Load (psi.)	Fracture Type
L804	4 x 8	12.56	Good	10/29/2010	11/05/2010	7	49,000	3,900	2
L805	4 x 8	12.56	Good	10/29/2010	11/12/2010	14	62,000	4,940	2
L806	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	71,000	5,650	2
L807	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	73,000	5,810	2
L808	4 x 8	12.56	Good	10/29/2010	11/26/2010	28	70,000	5,570	2

Slump (in.)	5 1/2
Air Temp. (F.)	58
Conc Temp (F)	70
Truck No.	54
Ticket No.	H163140
Time	11:20
Unit Wt lbs/cu ft	
Air Content (%)	

GENERAL REMARKS: * 1% polarset; Midrange; Fibermesh

Inspector Name	Premium Time	Hours	Travel Time
D. Boyden	No	Max Day	1 Hr(s)

Of Massachusetts
"The Construction Testing People"

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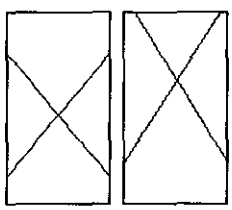
Compressive Strength Report - Concrete

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

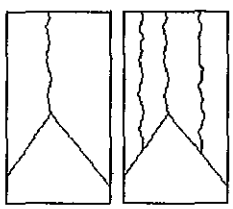
Report Date	10/29/2010
Report No.	4
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

REVIEWED BY: Robert S. Granada

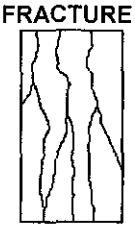
FRACTURE TYPES



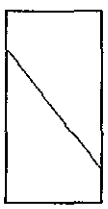
Type 1
Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking throught caps



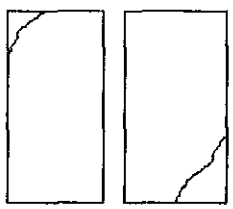
Type 2
Well-formed cone on one end, vertical cracks running through caps, no well-defined cone on other end



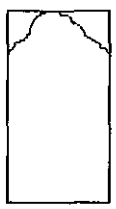
Type 3
Columner vertical cracking through both ends, no well-formed cones



Type 4
Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1



Type5
Side fractures at top or bottom (occur commonly with unbonded caps)



Type 6
Similar to Type 5 but end of cylinder is pointed

Our reports are available in PDF form via email. Please email us at reports@utsofmass.com for more information.

CC:	Senate Construction	Brian Trickett
	O & M, Inc.	David Fuerst
	Senate Construction	Joel Delorey
		Val Prest
	Acton Town Hall	Mark Barbadoro

Of Massachusetts
"The Construction Testing People"

5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Compressive Strength Report - Concrete

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

Report Date	10/29/2010
Report No.	4
Job Number	13836
Project	O & M, 50 Independence Road, Acton PO# 7320-Concrete Testing-001
Contractor	Senate Construction
Concrete Co.	Kane Perkins

FIELD SUMMARY REPORT

Total Pour: S.O.G., column line A-D at 1-5

Method of Placement: ☐ Pump ☒ Chute Discharge ☐ Bucket ☐ Other
Other:

Method of Concrete Consolidation: ☐ Vibrator ☒ Other
Other: power screed

Cylinder Fabrication Location: ☒ Truck Discharge Chute ☐ End of Pump Hose

Cylinder Storage: ☐ Curing Box ☐ Thermal Blanket ☐ Hay/Straw ☐ Trailer ☒ Field
☐ Other

Placement Protection: ☐ Thermal Blankets ☐ Heat ☐ None
☐ Other

Slump Specification (in.) 5-6
Number of slumps out of specification reported to
If rejected
Approved by

Remarks:

UTS of Massachusetts, Inc.
5 Richardson Lane, Stoneham, MA 02180 781-438-7755 (Voice) 781-438-6216 (Fax)

Report Date 10/29/2010
Report No. 4
Job Number 13836
Project O & M, 50 Independence Road, Acton
PO# 7320-Concrete Testing-001

Attachment

UTS Of Massachusetts Inc.
"The Construction Testing People"

Page #_____

DAILY REPORT OF CONCRETE POUR

PROJECT NAME: O+M Bldg PROJECT NO.:

DATE: 10-29-10 AIR TEMP.: 53°-59° TOTAL YARDS: 110

LOCATION OF POUR: SOG ℄ A TO D e 1 TO 5

Load & Truck #	Slump Inches	Batching In	Batching Out	Time In Minutes	Yards	Concrete Temp.	% of Air	Ticket #	No. of Cylinders
46	5	7:35AM	8:30	55	10	72		H163128	5A
45		7:50AM	8:40	50	10/20			H163129	
49		8:15AM	9:00	45	10/30			H163131	
48		8:35AM	9:25	50	10/40			H163132	
54		9:00AM	9:56	50	10/50			H163133	
46	5½	9:15AM	10:10	55	10/60	70		H163134	5B
45		9:30AM	10:20	50	10/70			H163135	
49		9:50AM	10:40	50	10/80			H163138	
48		10:15AM	10:55	40	10/90			H163139	
54	5½	10:40AM	11:25	45	10/100	70		H163140	5C
49		11:20AM	12:15	55	10/110			H163144	

INSPECTOR: Dick Boyden REMARKS:

Hope Air Systems

70 Bearfoot Road • PO Box 840
Northboro, MA 01532-0840
Tel: 508-393-7660 • Fax: 508-393-8203

HOPE NUMBER
CUSTOMER NUMBER

SOLD TO
O+M c/o WR GRACE
50 INDEPENDENCE RD
ACTON MA 01720

CONTACT: JM CAMPA

TELEPHONE #: 865-671-6254

1	Model KAESER SYSTEM	S/N	Hours	Loaded
2	Model	S/N	Hours	Loaded
3	Model	S/N	Hours	Loaded
4	Model	S/N	Hours	Loaded

NATURE OF TROUBLE:
COMPRESSED AIR SYSTEM - ADD PURIFIX MACHINE

WORK PERFORMED		Name/Date	Hours
1	+ PLUMB DISTRIBUTION SYSTEM TO INCLUDE		
2	PURIFIX MACHINE NOT IN ORIGONAL QUOTE		
3			
4	+ APROX 40' 3/4" TYPE L COPPER SUPPLIED		
5	BY UNISTRUT W/ ISOLATION VALVE		
6			
7			
8			
9			
10			
11			
12			
13			
14			

RECOMMENDATIONS

QTY	MATERIAL USED	TS	QTY	MATERIAL NEEDED	DATE

I hereby acknowledge the satisfactory completion of the work above

Customer Signature: Jim Campa

Print Name: Jim Campa

Purchase Order _____

Must be assigned at time of work

C-222 Rev D

White Copy – ORIGINAL Yellow Copy – SERVICE Gold Copy – CUSTOMER

Hope Air Systems

70 Bearfoot Road • PO Box 840
Northboro, MA 01532-0840
Tel: 508-393-7660 • Fax: 508-393-8203

HOPE NUMBER
C 28342
CUSTOMER NUMBER

SOLD TO	CONTACT
O+M INC C/O WR GRACE 50 INDEPENDENCE RD ACTON MA 01720	JIM CHAMPA TELEPHONE # 845-691-0254

1	Model KAESER DS25	S/N	1686	Hours	/	Loaded	/
2	Model " AS25	S/N	1684	Hours	/	Loaded	/
3	Model " " TC31	S/N	1602	Hours	/	Loaded	/
4	Model	S/N		Hours		Loaded	

NATURE OF TROUBLE:

START-UP OF NEW EQUIPMENT

WORK PERFORMED		Name/Date	Hours
1	+ START-UP AND TRAINING OF NEW COMPRESSED		
2	AIR SYSTEM		
3	+ START-UP AND CHECK LISTS AS PER FACTORY		
4	REQUIREMENTS		
5	+ ALL EQUIPMENT INSTALLED AS PER FACTORY		
6	REQUIREMENTS		
7	+ START-UP FORMS ON FILE		
8	+ SYSTEM SET UP AS LEAD / LAG SYSTEM, LEAD		
9	COMPRESSOR LOAD @ 110 PSI UNLOAD @ 125 PSI, LAG		
10	COMPRESSOR LOAD @ 105 PSI UNLOAD @ 120 PSI, COMPRESSORS		
11	IDLE OUT INTO AUTO RESTART STAND BY MODE		
12	WITH LITTLE AIR DEMAND		
13	+ DRYER / FILTER BYPASS VALVE REMAINS CLOSED		
14	+ AIR DRYER SHOULD BE ON AT ALL TIMES (AUTO CYCLE)		

RECOMMENDATIONS

- 1st SERVICE DUE @ 2000 HRS WRENCH ICON ON CONTROLLERS WILL LIGHT, CONDENSATE DRAINS SHOULD BE TESTED WEEKLY, COALER PREFILTERS SHOULD BE CHECKED WEEKING

QTY	MATERIAL USED	TS	QTY	MATERIAL NEEDED	DATE

I hereby acknowledge the satisfactory completion of the work above

Customer Signature: [signature] Print Name: Jim Champa

Purchase Order _____

Must be assigned at time of work

C-222 Rev D

White Copy – ORIGINAL Yellow Copy – SERVICE Gold Copy – CUSTOMER

Hope Air Systems

70 Bearfoot Road • PO Box 840
Northboro, MA 01532-0840
Tel: 508-393-7660 • Fax: 508-393-8203

HOPE NUMBER
C49719
CUSTOMER NUMBER

SOLD TO
O+M INC C/O WR GRACE
50 INDEPENDENCE RD
ACTON MA 01720

CONTACT: JIM CHAMPA
TELEPHONE #: 865-691-6254

1	Model KAESER AS25	S/N 1688	Hours 1	Loaded 1
2	Model " " AS25	S/N 1699	Hours 1	Loaded 1
3	Model " " TC31	S/N 1602	Hours —	Loaded —
4	Model	S/N	Hours	Loaded

NATURE OF TROUBLE: - AS PER QUOTE —
INSTALL AIR COMPRESSORS + DISTRIBUTION SYSTEM

WORK PERFORMED		Name/Date	Hours
1	- INSTALLED (2) KAESER AS 25 AIR COMPRESSOR		
2	(2) 240 GAL RECEIVER TANKS (1) KAESER TC 31		
3	AIR DRYER (1) KAESER KPF 170 PARTICULATE		
4	FILTER (1) KAESER KCR 170 COALESING FILTER		
5	(1) SUMMIT CPF-005 (PLUMBED TO DRAIN)		
6	(2) ACD3 ACCU DRAINS		
7	- RECEIVER TANKS INSTALLED W/ SAFETY RELIF		
8	VALVES, MASS CODE KITS, AND NO LOSS AUTO		
9	DRAINS W/ TEST VALVES		
10	- COMPRESSORS INSTALLED W/ 1½" X 18" FLEX LINES, DRIP		
11	LEGS, ISOLATION VALVES INTO TOP OF HEADER		
12	- AIR DRYER AND FILTERS PLUMBED W/ BYPASS		
13	- ALL DRAIN LINES PLUMBED TO CONDENSATE OIL/WATER		
14	SEPARATOR, SYSTEM TESTED AND LEAK TESTED (OK)		

RECOMMENDATIONS - DISTRIBUTION SYSTEM AS PER QUOTE AND OK'D BY JIM CHAMPA TO EACH PIECE OF EQUIPMENT

QTY	MATERIAL USED	TS	QTY	MATERIAL NEEDED	DATE

I hereby acknowledge the satisfactory completion of the work above

Customer Signature: [signature]
Print Name: Jim Champa

Purchase Order _____
Must be assigned at time of work

C-222 Rev D White Copy – ORIGINAL Yellow Copy – SERVICE Gold Copy – CUSTOMER

SIEMENS

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals:	Assembly Supervisor
Responsibility:	Assembly Department

Use the Tab Key to move between each entry field.

Project (SAP)#: 1090/000444
Serial #: EP00106

Job #: 1112709

Model #: EFC 4800 WWP SYSTEM

Customer: WR GRACE

End User:

Project Mgr: Heckwolf, Uwe

Designer: De Rade, Ron

EE: Fan, Jerry

Application:

Test Date: 1/04/2011

Ship Date: 1/26/2011

Equipment Document Review Check Sheet (DOC00156)

SIEMENS

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Project (SAP) No.: 1090/000444

Serial Number: EP001016

Job Number: 1112709

Identify Product BU	Check Product as Applicable	
☒ DP	☒ Filter Press	*Stranco:*
☒ WWP	☐ GBT	☐ PB Liquid
☐ Intake	☐ BFP	☐ PB Dry
☐ Other _____ (Identify)	☐ TWS/Rake	☐ Dry Feed
		☐ Lime Slaker
NOTE: Centrimax Document check sheet is DOC00350		☐ Chemfeed Skids
		☐ Stranco Sys

	Yes	No
Redline drawings **properly routed**	✓	
Final Audit Complete	✓	
Photos Taken	✓	
EE Testing Required?	✓	

Each question must have a response Y/N.

If "Yes", EE sign-off below MUST be completel

Sign and Date if testing complete and OK to ship

Mfg Testing complete
FP Sections 1-3 & Options; BFP Sections 1-4 **Sign/Date:** Mark Sanchez 1-31-11

Manufacturing will complete Final Lock Down checks after project is completely inspected and being prepped for shipment

EE Testing Sign-off OK to Ship **Sign/Date:** 2/7/11

Field Service Lead Sign-off OK to ship
Anything with an OIT and/or Start-up services included in the contract requires this sign-off **Sign/Date:** /

Project Manager Sign-off OK to ship **Sign/Date:** 12-7-11

Has the Issues List been updated / reviewed? ☒ Yes Date: _____

OK to SHIP Spvr/ Mgr / Team Leader Release _____ Date 2/9/11

Shipped Warehouse Manager _____ Date shipped 2/11/11

All sign-offs must be complete prior to the Warehouse Manager sign-off

To SHIP with Open Issues, missing materials or sign-off missing above – One of the following MUST sign

Director of Operations Or General Manager _____ *Date* _____

Open Issues: *all open issues must show date and an initial when closed if no Sign off is obtained above.*

1. 1- FILTER NEEDS TO BE REPLACED
2. DID NOT RECIEVE IN TIME TO DO HERE
3. SENT WITH ON 3RD TRUCK.
4.
5. TANK COVER ON BATCH TREATMENT.
6. HAS NOT CAME IN YET OPEN PO.
7.
8. JERRY MILLS WILL BE ONSITE WK 2/14-2/18 TO REPLACE MODULE & THE COVER SHIPPED OUT 2/11 TO SITE.

SIEMENS

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals: WWP Standard Products Project Coordinator
Responsibility: Assembly

Job #: 1112709 S/N: EP001016

Skid part #: W3T148918 Inspected By: MS

Section 1: Pre energy supply	Date complete: 1-17-11	By: MS
Section 2: Ops ready	Date complete: 1-18-11	By: MS
Section 3: Final pre-ship check	Date complete: 2-4-11	By: MS

Notes:

SIEMENS

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals:	WWP Standard Products Project Coordinator	Approval Date:	04/04/05
Scope/Purpose:	All WWP Standard Products Pump Skids		
Responsibility:	Assembly		
Reference:	None.		

Job no.: 1112709 *Tested PSI: Running Pressure

Serial no.: EP001016 Held pressure for (1 hour min): NA

Skid part no.: W3T148918

* Refer to the pump manufacture manual for the maximum pressure rating.

Piping material: (PVC) CPVC SS FRP Other _____

Was there any leaks? (No.) Yes.

If yes, describe below:

_____

_____

_____

_____

_____

Tested by: MARK SANTORA Date: 1-31-11

Describe correction action: (Must include re-testing and results)

_____

_____

_____

_____

Re-Tested by: _____ Date: _____

Section 1: Pre–energy supply: ___✓___ Section Complete.

___✓___ Give all equipment manuals (mixer, motor, pump, PLC, etc.) to the engineering project manager.
___✓___ Have all "as built" prints been turned into the engineer? (make copies for F/A first).
- ___✓___ General arrangement.
- ___✓___ P&ID
- ___✓___ Electrical
- ___N/A___ Other updates (specific component drawings, ass'y drawings, BOM's, etc.)

___✓___ Hydrostatic test complete (DOC00132).
___✓___ Turn main disconnect off.
___✓___ General appearance of the machine (all conduits and piping square, all fasteners are installed, wires are neatly run, etc).
___✓___ Air lines have been tested to ___100___ psi.
___✓___ All air regulators have gauges and the unused gauge port is plugged and are turned so they can be read.
___✓___ Liquid lines and fittings are **tight** and routed properly (double check pressure switches and gauges).
___✓___ Pressure switches are the correct range for their application.
___✓___ Electrical cords and seal-tite have an appropriate drip loop.
___✓___ Hoses and wires are off of the shop floor to minimize leaking hazards.
___✓___ Check all terminal boxes for correct grounding to avoid ground loops.
___✓___ DIN connectors are applied in such a way so as not to collect oil, water or other debris.
___✓___ Fuses are the proper size and facing out so that the value can be read.
___✓___ All fuses, breakers, and wires are labeled per the electrical prints.
___✓___ Overloads are proper size and set correctly?
___✓___ Electrical panels are neat and orderly. Doors close without pinching any wires or hoses.
___✓___ Electrical panel doors open an adequate amount without interference.
___✓___ All electrical junctions, instrumentation, and devices have an accessible cover with an appropriate room to work.
___✓___ All piping is run at least 6" away from equipment that could require maintenance. If applicable, use manufacturer literature to determine minimum distances.
___✓___ Processor power select switch/jumper properly set.
___✓___ All conduit bodies have the appropriate cover and gaskets.
___✓___ All Pumps, valves, and instrumentation have the required tagging as per the tag list.
___✓___ Check tags against P&ID.
___✓___ Check P&ID against GA drawing.
___✓___ Non-close coupled pumps have the coupling properly aligned, but backed off for initial rotational bump-start.
___✓___ Cables/wires/sealtight/air lines are routed in such a way that they can't be stepped on (i.e. underneath brackets, conduit, etc
___✓___ All communications cables are properly anchored (PLC rack to rack, OIT, modem, etc.).

Section 2: Continued

Pump Identification #: P-PS100-1 Manufacture: PACER

W2T239181 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
3 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
4.8 F: FLA of motor at the wired voltage.

Pump Identification #: P-PS100-2 Manufacture: PACER

W2T239181 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
3 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
4.8 F: FLA of motor at the wired voltage.

Pump Identification #: PSH100-1 Manufacture: GOULDS

W2T498624 A: DS part number.
NA B: DS purchase order number.
L1002595 C: Manufacture's serial number of the pump.
7.5 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
11 F: FLA of motor at the wired voltage.

Pump Identification #: PSH100-2 Manufacture: GOULDS

W2T498624 A: DS part number.
NA B: DS purchase order number.
L1002594 C: Manufacture's serial number of the pump.
7.5 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
11 F: FLA of motor at the wired voltage.

Pump Identification #: PSH75-1 Manufacture: GOULDS

W2T498621 A: DS part number.
NA B: DS purchase order number.
R1014493 C: Manufacture's serial number of the pump.
7.5 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
11 F: FLA of motor at the wired voltage.

Pump Identification #: PSH75-2 Manufacture: GOULDS

W2T498621 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
7.5 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
11 F: FLA of motor at the wired voltage.

Section 1: Continued

- ✓ Auxiliary power supplies (VDC, Light curtains, OIT, etc.) are wired correctly and dip switches set.
- ✓ Electrical prints show dipswitch settings and proper utilities.
- ✓ Motor rotation stickers are applied to unidirectional motors (not applied to bi-directional motors).
- ✓ Terminal blocks and wire labels have correct orientation (check term. box and main panel).
- ✓ Remove cables from any polarity sensitive devices (xducers, light curtains, etc.)
- ✓ All flanges have gaskets and are bolted properly torqued.
- ✓ All gaskets are of the appropriate type (ex. Viton, EPDM, Teflon, etc.). Check purchased parts also if applicable.
- ✓ All pipe is straight and level or plumb. Must be centered bubble on a spirit level, no exceptions.
- N/A Inspect all stainless welds to be pickled.
- ✓ Piping (process and electrical) has required support.
- N/A Copper piping polished.
- ✓ Connect seal water lines to pumps if applicable.
- ✓ Clean out tanks and debris from air and liquid lines before bringing into service.
- ✓ Add Weatherhead clamps to seal-tite line that transfer movement into their ending devices when wiggled.
- ✓ Safety labels that are needed are applied.
- N/A Check paint with a mil gauge in several areas for the correct paint thickness.
- N/A DFT thickness average.
- ✓ Check paint that there are no aesthetically displeasing areas. This includes runs, drips, dry spots, paint lines, and etc. **Double check inside b-line channels.**
- ✓ **Remove fuses (or disable breaker) from all transformer secondary before applying power!**

Section 2: Ops ready (Elec, pneumatic and water supplies): ____ Section complete.

- ✓ Verify E-Stop string and jumpers. All temporary jumpers are yellow or obviously identified.
- ✓ Install appropriate pig tail and check for correct grounding.
- ✓ Verify voltage levels for incoming power.
- ✓ Verify transformer secondary voltages then turn power off and re-enable fuses/breakers.
- ✓ Verify voltage and pin-outs on any polarity sensitive devices, shut down power, reinstall cables.
- N/A Lube motors while they're turning (if applicable).
- ✓ Check all I/O (force outputs when possible).
- ✓ Manually trip overloads to check function.
- ✓ All mechanical utilities connected:
  - ✓ a: water lines to the pumps with inlet valves open as to not run the pump dry.
  - ✓ b: water recycle away from pumps.
  - ✓ c: inter connect all ancillary equipment. Caution: Do not run pumps dry.

- ✓ Check to see that automated valves fail correctly, and move smoothly throughout their travel, leak free, with the proper air pilot pressure or less. List air pressure applied 100 psi.
- ✓ Turn all manual valves to see that the actuator handle has free, unobstructed movement throughout its required travel.
- ✓ Check to see that filter elements and other purchased parts have, tightened lids, drain plugs installed, elements installed, are connected to pressure or flow switches, etc.
- ✓ Air has been bleed out of the system where applicable.
- ✓ Bump-start pump motors to check for rotation. Do not run pumps dry.
- ✓ All pressure switches/flow controls been preset.

Section 2: Continued

Pump Identification #: P-PS2.OP-1 Manufacture: ARO

W2T338499 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
60 GPM D: HP of the motor.
40-100 PSI E: Voltage/Phase/Hertz of motor.
NA F: FLA of motor at the wired voltage.

Pump Identification #: P-PS2.OP-2 Manufacture: ARO

W2T338499 A: DS part number.
NA B: DS purchase order number.
H02/8728 C: Manufacture's serial number of the pump.
60 GPM D: HP of the motor.
50 PSI E: Voltage/Phase/Hertz of motor.
NA F: FLA of motor at the wired voltage.

Pump Identification #: P-EFC4800-3A Manufacture: ARO

W2T239364 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
20 GPM D: HP of the motor.
40 PSI E: Voltage/Phase/Hertz of motor.
NA F: FLA of motor at the wired voltage.

Pump Identification #: P-EFC4800-2 Manufacture: ARO

W2T239365 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
40 GPM D: HP of the motor.
70-90 PSI E: Voltage/Phase/Hertz of motor.
NA F: FLA of motor at the wired voltage.

Pump Identification #: P-EFC4800-1A Manufacture: GOULDS

W3T41592 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
30 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
40.0 F: FLA of motor at the wired voltage.

Pump Identification #: P-EFC4800-1B Manufacture: GOULDS

W3T41592 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the pump.
30 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
40.0 F: FLA of motor at the wired voltage.

SIEMENS

Truck #1

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals: Shipping Manager
Responsibility: Shipping

Approval Date: 06/26/06

Project No.: 1090/000444 **Job No.:** SP00106 **Task:** NA
Container No.: NA **List Prepared by:** MS **Date:** 2/7/11
Seal No.: NA **List Checked by:** DR **Date:** 2/7/11

QTY.	Part No.	Description	Weight Gross	Weight Net
1		MICROFILTER 4800		
1		CONCENTRATION TANK		
1		EQ1000 HDPE TANK		

Notes:

Copy of this list stays with order to Serial File.

Section 2: Continued

Pump Identification #: P-RX1-V1 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1011371168-1 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44W F: FLA of motor at the wired voltage.

Pump Identification #: P-RX1-P2 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1011371168-1 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44W F: FLA of motor at the wired voltage.

Pump Identification #: P-RX1-P1 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1011371168 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44W F: FLA of motor at the wired voltage.

Pump Identification #: P-RX2-P2 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1011371168-3 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44W F: FLA of motor at the wired voltage.

Pump Identification #: P-RX2-P1 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1011371168-8 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44W F: FLA of motor at the wired voltage.

Pump Identification #: P-PCP100-1 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1011371168-4 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44W F: FLA of motor at the wired voltage.

Section 2: Continued

Pump Identification #: P-NS1-P2 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1013071168-7 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44 W F: FLA of motor at the wired voltage.

Pump Identification #: P-NS1-P1 Manufacture: LMI

WZT337384 A: DS part number.
NA B: DS purchase order number.
1013071168-5 C: Manufacture's serial number of the pump.
NA D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
44 W F: FLA of motor at the wired voltage.

Pump Identification #: _____ Manufacture: _____

_____ A: DS part number.
_____ B: DS purchase order number.
_____ C: Manufacture's serial number of the pump.
_____ D: HP of the motor.
_____ E: Voltage/Phase/Hertz of motor.
_____ F: FLA of motor at the wired voltage.

Pump Identification #: _____ Manufacture: _____

_____ A: DS part number.
_____ B: DS purchase order number.
_____ C: Manufacture's serial number of the pump.
_____ D: HP of the motor.
_____ E: Voltage/Phase/Hertz of motor.
_____ F: FLA of motor at the wired voltage.

Pump Identification #: _____ Manufacture: _____

_____ A: DS part number.
_____ B: DS purchase order number.
_____ C: Manufacture's serial number of the pump.
_____ D: HP of the motor.
_____ E: Voltage/Phase/Hertz of motor.
_____ F: FLA of motor at the wired voltage.

Pump Identification #: _____ Manufacture: _____

_____ A: DS part number.
_____ B: DS purchase order number.
_____ C: Manufacture's serial number of the pump.
_____ D: HP of the motor.
_____ E: Voltage/Phase/Hertz of motor.
_____ F: FLA of motor at the wired voltage.

Section 2: Continued

Mixer Identification #: M-NS2000-1 Manufacture: BRAUN

W2T246143 A: DS part number.
NA B: DS purchase order number.
100575 C: Manufacture's serial number of the mixer.
1 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
2.1 F: FLA of motor at the wired voltage.

Mixer Identification #: M-PCP100-1 Manufacture: NEPTUNE

W2T246145 A: DS part number.
NA B: DS purchase order number.
NA C: Manufacture's serial number of the mixer.
1-20 D: HP of the motor.
120-1-60 E: Voltage/Phase/Hertz of motor.
1.62 F: FLA of motor at the wired voltage.

Mixer Identification #: M-BT3000-1 Manufacture: BRAUN

W3T154636 A: DS part number.
NA B: DS purchase order number.
100576 C: Manufacture's serial number of the mixer.
2 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
3.4 F: FLA of motor at the wired voltage.

Mixer Identification #: M-RX1000-1 Manufacture: BRAUN

W2T245965 A: DS part number.
NA B: DS purchase order number.
10057402 C: Manufacture's serial number of the mixer.
1/2 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
1.1 F: FLA of motor at the wired voltage.

Mixer Identification #: M-RX1000-2 Manufacture: BRAUN

W2T245965 A: DS part number.
NA B: DS purchase order number.
10057401 C: Manufacture's serial number of the mixer.
1/2 D: HP of the motor.
480-3-60 E: Voltage/Phase/Hertz of motor.
1.1 F: FLA of motor at the wired voltage.

Mixer Identification #: _____ Manufacture: _____

_____ A: DS part number.
_____ B: DS purchase order number.
_____ C: Manufacture's serial number of the mixer.
_____ D: HP of the motor.
_____ E: Voltage/Phase/Hertz of motor.
_____ F: FLA of motor at the wired voltage.

Section 3: Final pre-ship list: ✓ Section complete.

- ✓ All sections in the above lists are checked as complete.
- ✓ ALL "as builts" have been delivered to appropriate people.
- ✓ P&ID is updated and accurate.
- ✓ Sensitive instrumentation are packed up, labeled and hardware is locked down.
- ✓ Last inspection of all hardware painted, tight, & accounted for.
- ✓ Piping has adequate support for shipment.
- ✓ Control Cabinet has adequate support for shipment.
- N/A Redlines are in cabinet and is in protective wrapping.
- ✓ CE / UL label (as required).
- ✓ All jam nuts for flow controls, pressure controls, etc. are secure.
- ✓ All guards are still on the machine.
- ✓ Electrical panels are clean, jumpers removed, desiccant installed (when req.) and doors fastened.
- ✓ All openings such as extra knock-outs, air supplies to boxes etc., have been plugged for shipping.
- ✓ Disconnect all utilities.
  - ✓ a: Air lines removed and openings plugged for shipment.
  - ✓ b: Water lines removed and temporary flanged for shipment.
  - ✓ c: Electrical interconnect and main pigtails removed. All covers back on disconnect lead terminals.

- ✓ Removed all temporary jumpers.
- ✓ Re-tighten <u>all</u> terminals.
- ✓ Has the entire system been winterized (lines pulled loose, drained, compressed air dried when necessary). Note: This may include adding anti-freeze solution if water was run thru the membranes.
- N/A All valves are in the closed position.
- ✓ All couplings, seals, and guards are with the pump.
- ✓ All pipe ends and valves are sealed off for shipping.
- ✓ Hardware from disconnected equipment is enclosed in a bag with proper labeling. (This must also go on a ship loose sheet).
- N/A Address label is visible on the inside and the outside of loose part containers.
- N/A A copy of the ship loose paperwork inside of loose part containers. The line item number associated with the container must be clearly displayed.
- ✓ Met with the shipping personnel responsible for the shipment to discuss what parts go with what line items. A copy of all the ship loose sheets has been discussed with the shipper.
- N/A Photos taken of all the paperwork and all the loose parts that go with each container.
- ✓ Open punch list is complete.
- ✓ Equipment has been taped and shrink wrapped.
- ✓ Photos taken for shipping purposes.
- ✓ Photos taken for machine building purposes.
- ✓ Deliver a copy of all paperwork to Project Management. This includes all instrumentation cut sheets and CE/UL paperwork, manufacturers certifications, ship loose lists, inspection paperwork, etc.

SIEMENS

TRUCK #2

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals: Shipping Manager
Responsibility: Shipping

Approval Date: 06/26/06

Project No.: 1090/000444
Job No.: 8800106
Task: 1A
Container No.: 1A
List Prepared by: MS
Date: 2/7/11
Seal No.: 1A
List Checked by: DR
Date: 2/7/11

QTY.	Part No.	Description	Weight Gross	Weight Net
1		RX AND NS CATWALK		
1		MICROFILTER CATWALK		
2		AOD PUMPS		
1		MICROFILTER PIPING		
1		PCP TANK ASSEMBLY		

Notes:

Copy of this list stays with order to Serial File.

SIEMENS

Truck #3

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals: Shipping Manager
Responsibility: Shipping

Approval Date: 06/26/06

Project No.: 1090/000444 **Job No.:** SP00106 **Task:** 1A
Container No.: 1A **List Prepared by:** MS **Date:** 2/7/11
Seal No.: 1A **List Checked by:** DR **Date:** 2/7/11

QTY.	Part No.	Description	Weight Gross	Weight Net
1		MICROFILTER TANK Support Bridge		
1		1/S TANK		
2		RX TANKS		
1		PSH75 Pump Skid		
1		PS100 Pump Skid		
1		PSH100 Pump Skid		
1		TRANSFER Pump Skid		
1		BATCH TREATMENT CATWALK		
1		SCISSOR Lift		
1		DUST Shaker TOTE		

Notes:

Copy of this list stays with order to Serial File.

SIEMENS

Truck #4

Siemens Water Technologies Corp.
2155 112th Avenue
Holland, MI 49424

TELEPHONE 616-772-9011
FACSIMILE 616-772-4516

Approvals: Shipping Manager
Responsibility: Shipping

Approval Date: 06/26/06

Project No.: 1090/000444
Job No.: EP 00106
Task: NA
Container No.: NA
List Prepared by: MS
Date: MS 2/7/11
Seal No.: NA
List Checked by: DR
Date: 2/7/11

QTY.	Part No.	Description	Weight Gross	Weight Net
1		BATCH TREATMENT TANK w/Support frame		
1		EQ 1000 TANK		
1		FILTER Press Shoot		
		MISC. PLATFORM PARTS		

Notes:

Copy of this list stays with order to Serial File.

Wastewater Products Functional Acceptance Test (FAT – DOC00262)

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

☐ If box is checked, identification of Tag# is a customer requirement and the Tag# must be noted on the FAT.

		Factory Test	
		Owner	**Date**
Prework	1. Did Final Assembly complete their Standard Products Check List (DOC00133) ☐ Yes ☐ No		
	2. Refer to the Engineering FAT page for guides on preparing the control system (PLC/HMI download, etc.) and process equipment (analog transmitter configuration, chart recorder setup, etc.).		
E-Stop	3. Check all conditions that remove MCR power. For each, verify the following: ☑ Verify that all outputs other than alarm light and/or horn are disabled on the PLC. ☑ Verify that the HMI indicates a loss of MCR power. ☑ Verify that no devices work in Hand mode when an E-Stop is pressed.		

List of conditions that remove MCR power:

Panel	Condition	OUTPUTS	HMI	HAND
PS100-1&2	E-Stop PB Pressed	✓	✓	✓
RXP1000	E-Stop PB Pressed	✓	✓	✓
EFC4800	E-Stop PB Pressed	✓	✓	✓
NSP2000	E-Stop PB Pressed	✓	✓	✓
PSH100-1&2	E-Stop PB Pressed	✓	✓	✓
PSH75-1&2	E-Stop PB Pressed	✓	✓	✓
BT3000	E-Stop PB Pressed	✓	✓	✓
		✓	✓	✓

Input Tests

4. Configure pH, ORP, and conductivity analog transmitters. Use control solutions (buffers) to calibrate the transmitters. For each transmitter, complete the following:
☑ Verify that the value on the HMI matches the local display.
☑ Vary the analog reading and verify that the HMI matches the different values.

List of pH, ORP, and Conductivity sensors:

DEVICE	Address	Measurement	HMI	Calibrated
AE_NS_1_A_pH	PIW 224	✓ 6.26	6.26	5/6/11 0-14
AE_NS_1_C_pH	PIW 226	6.29	6.31	5/6/11 0-14
AE_RX_1_A_pH	PIW 256			
AE_RX_1_B_ORP	PIW 258			
AE_RX_1_C_pH	PIW 260			
AE_RX_1_D_ORP	PIW 262			
AE_RX_2_A_pH	PIW 264			
AE_RX_2_C_pH	PIW 266			

5. Check level, flow, temperature, and other analog transmitters. For each transmitter, complete the following:
☑ Verify that the transmitter has been configured.
☑ Verify that the value on the HMI matches the local display.

List of level, flow, temperature, and other analog transmitters:

DEVICE	Address	Measurement	HMI	Calibrated
PE_P_PSH75_1	PIW 192	N/A	48	0-300
FE_P_PSH75_1	PIW 194			
LIT_EQ1200_2_A	PIW 196			
FE_P_PSH100_1	PIW 198			
LIT_EQ1200_1_A	PIW 200			
FE_P_PS100_1	PIW 202			
FIT_EF_1_A	PIW 208			

Filled out by Jason Bruce of Seimans on 5-6-11

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

					Factory Test	
					Owner	Date
AE_EF_T1_TURBIDITY	PIW 210					
FIT_EF_1_B	PIW 216					
AE_EF_T2_TURBIDITY	PIW 218					
LIT_EFC_1_A	PIW 220					
LIT_ACID_1	PIW 228					
LIT_CAUSTIC_1	PIW 230					
LIT_FC_1	PIW 268					
LIT_PCP100_2	PIW 270					
LIT_BT_1_A	PIW 320					
LIT_EQ100_2_A	PIW 322					

6. Check all digital inputs. For each device, complete the following:
- ☑ Verify that the HMI displays the correct status for both states.
- ☑ Verify that the device is fail-safe: a loss of the connection from the device should result in a safe condition (alarm or interlocking a device).
- ☑ For level floats, verify that the proper model of float is installed per the P&IDs. Also verify that the P&IDs are using the correct model (1H for low level alarms, 1L for high level alarms, 2H for pump down, 2L for pump up).

List of digital inputs:

DEVICE	Address	Fail State	HMI	NOTES
OK_TO_RUN_EFFLUENT_PUMP	I 2.0			
MCR_OK_PSH75_1_2	I 11.0			
P_PSH75_1_MSP_OK	I 11.1			
P_PSH75_2_MSP_OK	I 11.2			
MCR_OK_EFC	I 26.0			
P_EF_1A_RUNNING	I 26.1			
PS_1A_SEAL_PRESSURE_OK	I 26.2			
LSHH_EF_1_A_ClnTnk_Not Hi	I 26.3			
LSHH_EF_2_A_WtrTnk_Not Hi	I 27.0			
P_EF_1B_RUNNING	I 27.1			
PS_EF_1_AIR_PRESSURE_OK	I 27.2			
PS_2A_SEAL_PRESSURE_OK	I 27.3			
MCR_OK_NSP	I 31.0			
M_NS_1_RUNNING	I 31.1			
LSHH_EQ100_1_B	I 32.0			
MCR_OK_RXP	I 41.0			
M_RX_1_RUNNING	I 41.1			
M_RX_2_RUNNING	I 41.2			
LSL_PCP100_1_NotLo	I 42.0			
MCR_OK_BTP	I 61.0			
M_BT_1_RUNNING	I 61.1			
DC_BT_1_Motor_Overload	I 61.2			
MCR_OK_PSH100_1_2	I 90.0			
P_PSH100_1_RUNNING	I 90.1			
P_PSH100_2_RUNNING	I 90.2			
LSLL_EQ1200-2-B	I 90.3			
MCR_OK_PS100_1_2	I 93.0			
P_PS100_1_RUNNING	I 93.1			
P_PS100_2_RUNNING	I 93.2			

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

						Factory Test	
						Owner	**Date**

Output Tests

7. Check all devices (pumps, valves, mixers, etc.) in Hand mode. Remove all conditions that would remove MCR power. For each device, complete the following:
- ☑ If there is a motor starter protector for the device, turn it on.
- ☑ Put the device into Hand or On mode, either through physical or HMI Hand/Off/Auto or On/Off switches.
- ☑ Verify that the any panel lights and HMI show the device energized.
- ☑ Verify that the device energizes.
- ☑ Verify rotation direction for three-phase motors.
- ☑ If there are HMI Hand/Off/Auto or On/Off buttons, verify that the description text for each device is correct.

8. Test PLC control of devices in automatic mode. For each device where an Auto/Remote mode is available, complete the following:
- ☑ Put the device into Auto/Remote mode, either through physical or HMI Hand/Off/Auto switches.
- ☑ Verify that the device is energized or de-energized based on the PLC output.
- ☑ Fulfill all permissives and remove all interlocks and verify that the device energizes. For customer input interlocks, use jumpers.
- ☑ Enable each interlock in succession to verify that the device de-energizes. Verify the state of each permissive and interlock on the HMI.
- ☑ Disable each permissive in succession to verify that the device energizes. Verify the state of each permissive and interlock on the HMI.

Device	Address	Energized State	Auto Mode Permissives/ *Interlocks*	Hand/ On	Auto
P_EF_1A_ENABLE_PROCESS_P	Q 26.0	Pump On	LIT_EFC_1_A.On_High_Off_Low, LSHH_EQ100_1_B, MF Pump 1A in Process */MF Skid 1A Backpulse On, NS-1-A_pH Out Of Spec, Air Pressure Fault, Seal Presure Fault*		
V_EF48_EV4A_SEAL_WTR	Q 26.1	Valve on	Process Pump Enable	-na-	
P_EF_3_ENABLE_SLUDGE_P	Q 26.2	Pump On	Frequency-Duration timer based on Process run.		
P_EF_2_CLEANING_PUMP	Q 27.0	Pump On	Run Per Microfilter Sequency	-na-	
V_EF48_EV2A_BPULSE_SOL	Q 27.1	Valve On	Energize per Backpulse sequence	-na-	
P_EF_1B_ENABLE_PROCESS_P	Q 27.3	Pump Run	LIT_EFC_1_A.On_High_Off_Low, LSHH_EQ100_1_B, MF Pump 1A in Process */MF Skid 1A Backpulse On, NS-1-A_pH Out Of Spec, Air Pressure Fault, Seal Presure Fault*		
V_EF48_EV4B_SEAL_WTR	Q 28.0	Valve On	Process Pump Enable	-na-	

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

						Factory Test	
						Owner	Date
V_EF48_EV2B_BPULSE_SOL	Q 28.1	Valve on	Energize per Backpulse sequence	-na-			
M_NS_1_ENABLE	Q 31.0	Mixer Run	none		-na-		
P_NS1_P1_ACID	Q 31.2	Pump Run	T-NSP2000-1 pH High				
P_NS1_P2_CAUSTIC	Q 31.3	Pump Run	T-NSP2000-1 pH Low				
M_RX_1_ENABLE	Q 41.0	Mixer Run	none		-na-		
M_RX_2_ENABLE	Q 41.1	Mixer Run	none		-na-		
P_RX1_P1_ENABLE_ACID	Q 41.2	Pump Run	T-RXP1000-1 pH High				
P_RX1_P2_ENABLE_CAUSTIC	Q 41.3	Pump Run	T-RXP1000-1 pH Low				
P_RX1_V1_ENABLE_FeCl3	Q 42.0	Pump Run	P-PS100 Pump Running				
P_RX2_P1_ENABLE_ACID	Q 42.1	Pump Run	T-RXP1000-2 pH High				
P_RX2_P2_ENABLE_CAUSTIC	Q 42.2	Pump Run	T-RXP1000-2 pH Low				
P_PCP100_1_ENABLE_KMnO4	Q 42.3	Pump Run	T-RXP2000-1 ORP Low */T-PCP100-1 Level Low*				
M_BT_1_ENABLE	Q 61.0	Mixer Run	T-BT3000-1 Minimum level for mixer run		-na-		
LAHH_EQ100_2_A_APCS	Q 61.2	Relay On	T-EQH100-2 Level High High	-na-			
P_PS20P_2_ENABLE	Q 61.3	Pump Run	T-EQH100-2 Pump Level On High Off Low				
P_PSH100_1_ENABLE	Q 90.0	Pump Run	T-EQH1200-2 Pump Level On high Off Low, Customer Interlock – OK to Run Effluent Pump				
P_PSH100_2_ENABLE	Q 90.1	Pump Run	T-EQH1200-2 Pump Level On high Off Low, Customer Interlock – OK to Run Effluent Pump				
P_PS100_1_ENABLE	Q 93.0	Pump Run	T-EQH1200-1 Pump Level On High Off Low, LIT_EFC_1_A.On_Low_Off_High */RX-1-A_pH Out Of Spec, RX-1-B_ORP, RX-2-A_pH Out Of Spec*				
P_PS100_2_ENABLE	Q 93.1	Pump Run	T-EQH1200-1 Pump Level On High Off Low, LIT_EFC_1_A.On_Low_Off_High */RX-1-A_pH Out Of Spec, RX-1-B_ORP, RX-2-A_pH Out Of Spec*				
1V-3A	Q 100.0	Valve Open	Energized per microfilter sequence	-na-			
1V-3B	Q 100.1	Valve Open	Energized per microfilter sequence	-na-			
1V-4A	Q 100.2	Valve Open	Energized per microfilter sequence	-na-			
1V-4B	Q 100.3	Valve Open	Energized per microfilter sequence	-na-			
1V-5A	Q 100.4	Valve Open	Energized per microfilter sequence	-na-			
1V-5B	Q 100.5	Valve Open	Energized per microfilter sequence	-na-			

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

							Factory Test	
							Owner	Date
Customer Interlocks	1V-6A	Q 100.6	Valve Open	Energized per microfilter sequence	-na-			
	1V-6B	Q 100.7	Valve Open	Energized per microfilter sequence	-na-			
	1V-7A	Q 101.0	Valve Open	Energized per microfilter sequence	-na-			
	1V-7B	Q 101.1	Valve Open	Energized per microfilter sequence	-na-			
	1V-22A	Q 101.2	Valve Open	Energized per microfilter sequence	-na-			
	1V-22B	Q 101.3	Valve Open	Energized per microfilter sequence	-na-			
	1V-12	Q 101.4	Valve Open	Energized per microfilter sequence	-na-			
	1V-13	Q 101.5	Valve Open	Energized per microfilter sequence	-na-			
	1V-14	Q 101.6	Valve Open	Energized per microfilter sequence	-na-			
	1V-15	Q 101.7	Valve Open	Energized per microfilter sequence	-na-			
	1V-16	Q 102.0	Valve Open	Energized per microfilter sequence	-na-			
	1V-17	Q 102.1	Valve Open	Energized per microfilter sequence	-na-			
	1V-18	Q 102.2	Valve Open	Energized per microfilter sequence	-na-			
	1V-19	Q 102.3	Valve Open	Energized per microfilter sequence	-na-			
	1V-21A	Q 102.4	Valve Open	Energized per microfilter sequence	-na-			
	1V-21B	Q 102.5	Valve Open	Energized per microfilter sequence	-na-			
	1V-3C	Q 104.0	Valve Open	Energized per microfilter sequence	-na-			
	1V-3D	Q 104.1	Valve Open	Energized per microfilter sequence	-na-			
	1V-4C	Q 104.2	Valve Open	Energized per microfilter sequence	-na-			
	1V-4D	Q 104.3	Valve Open	Energized per microfilter sequence	-na-			
	1V-5C	Q 104.4	Valve Open	Energized per microfilter sequence	-na-			
	1V-5D	Q 104.5	Valve Open	Energized per microfilter sequence	-na-			
	1V-6C	Q 104.6	Valve Open	Energized per microfilter sequence	-na-			
	1V-6D	Q 104.7	Valve Open	Energized per microfilter sequence	-na-			
	1V-7C	Q 105.0	Valve Open	Energized per microfilter sequence	-na-			
	1V-7D	Q 105.1	Valve Open	Energized per microfilter sequence	-na-			
	1V-22C	Q 105.2	Valve Open	Energized per microfilter sequence	-na-			
	1V-22D	Q 105.3	Valve Open	Energized per microfilter sequence	-na-			
	1V-26A	Q 105.4	Valve Close	Energized per microfilter sequence	-na-			
	1V-26B	Q 105.5	Valve Close	Energized per microfilter sequence	-na-			

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

							Factory Test	
							Owner	Date
	1V-27A	Q 105.6	Valve Open	Energized per microfilter sequence	-na-			
	1V-27B	Q 105.7	Valve Open	Energized per microfilter sequence	-na-			
	1V-10	Q 106.0	Valve Open	Energized per microfilter sequence	-na-			
	1V-11	Q 106.1	Valve Open	Energized per microfilter sequence	-na-			
	1V-20	Q 106.2	Valve Open	Energized per microfilter sequence	-na-			
	1V-28	Q 106.3	Valve Open	Energized per microfilter sequence	-na-			
	1V-30	Q 106.4	Valve Open	Energized per microfilter sequence	-na-			

9. Verify that all customer output interlocks are working properly.

List of customer output interlocks:

Description	Address	Conditions	Notes
Alarm_Horn	Q 2.0	Fault Active	
OK TO RUN INFLUENT PUMP-Relay	Q 2.1	Not LAHH EQ1200-1-A	YES
"No Alarm" Relay	Q 2.2	No Fault Active	
LAHH_EQ1200_1_A	Q 3.0	T-EQ1200-1 Level High High	
LAHH_EQ1200_2_A	Q 3.1	T-EQ1200-2 Level High High	

Security

10. Log in to the HMI with each login name and password. For each login, verify the following:
- ☑ It is possible to log out
- ☑ The login has the proper permissions

Login Name	Permissions	Password
Default	View, use Hand/Off/Auto	
Super	Change setpoints	EP00106
Admin	Exit HMI Runtime	2155

- ☐ Verify that all logins other than the default include an automatic 10 minute logoff.

Setpoints

11. Enter a different value for each setpoint on the HMI. For each setpoint field, complete the following:
- ☑ Verify that the value displayed is the same as the value entered.
- ☑ Verify that values outside the input range are not accepted.

List of setpoints on HMI:

Setpoint Name	Minimum Value	Maximum Value	Units
T-EQ1200-1 LEVEL	0	100	%
PS100-1&2 FLOW HI ALARM	0	150	GPM
FERRIC CHLORIDE TOTE LEVEL	0	100	%
SODIUM HYDROXID TOTE LEVEL	0	100	%
SULFURIC ACID TOTE LEVEL	0	100	%
T-RXP1000-1 pH	0	14	

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

					Factory Test	
					Owner	Date
	T-RXP1000-1 ORP	-1500	1500	mV		
	T-RXP1000-2 pH	0	14			
	T-EFC4800-1 LEVEL	0	100	%		
	EFC 1A FLOW	0	200	GPM		
	EFC 1B FLOW	0	200	GPM		
	EFC 1A TURBIDITY	0	100	NTU		
	EFC 1B TURBIDITY	0	100	NTU		
	T-NSP2000-1 pH	0	14			
	T-EQH1200-2 LEVEL	0	100	%		
	P-PSH100-1&2 FLOW HI ALARM	0	200	GPM		
	P-PSH75-1&2 FLOW HI ALARM	0	100	GPM		
	P-PSH75-1&2 SPEED COMMAND	0	100	%		
	P-PSH75-1&2 PRESSURE	0	300	PSI		
	T-PCP100-1 LEVEL	0	100	%		
	T-BT-1-A LEVEL	0	100	%		
Device Timers	12. Verify that all devices controlled by on/off timers (sludge pumps, backpulse, etc.) energize and de-energize at the proper times based on the timer setpoints. If there is log-linear control, change setpoints and delta values to verify the timer setpoints in each delta band. List of devices controlled by on/off timers: ☑ Sludge Pump [KC_P-EF-3] ☐ _____ [tag#]					
Alarms	13. Check all alarms. For each alarm, complete the following: ☑ Verify that the alarm banner appears on the HMI with the correct text. ☑ Verify that the alarm history on the HMI displays the correct text. ☑ Verify that any secondary indication on the HMI displays properly. ☑ For digital alarms, when possible test by changing the state of the sensing device instead of simulating using jumpers. When this is not possible, use jumpers and note that the alarm could not be fully verified. ☑ For analog alarms, trip the alarm in some way (vary the alarm setpoints, simulate an analog signal, change the measured value by using buffers, etc.) ☑ Test the motor faults by disabling the starter, then enabling the device in Auto/Remote mode. Verify the device status on the HMI. List of alarms:					

Alarm	Text	HMI	Notes
1	Influent EQ1200 Tank Level High High		
2	Influent EQ1200 Tank Level High High		
3	Influent Pump P-PS100-2 Motor Fault		
4	Influent Transfer Pump Flow High		
5	Ferric Chloride Tank Level Low Low		
6	Sodium Hydroxide Tank Level Low Low		
7	Sulfuric Acid Tank Level Low Low		
8	RX1 pH High High		

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

					Factory Test	
					Owner	Date
	9	RX1 pH Low Low				
	10	RX1 pH Sensor Fault				
	11	RX1 ORP High High				
	12	RX1 ORP Low Low				
	13	RX1 ORP Sensor Fault				
	14	RX1 Mixer Motor Fault				
	15	RX2 pH High Hgih				
	16	RX2 pH Low Low				
	17	RX2 pH Sensor Fault				
	18	RX2 Mixer Motor Fault				
	19	Concentration Tank Level High High				
	20	Pump P-EF4800-1A Motor Fault				
	21	Pump P-EF4800-1B Motor Fault				
	22	Pump P-EF4800-1A Seal Pressure Low				
	23	Pump P-EF4800-1B Seal Pressure Low				
	24	Microfilter System Air Pressure Low				
	25	Microfilter Train#1,2 Permeate Flow Low Alarm				
	26	Microfilter Train#3,4 Permeate Flow Low Alarm				
	27	Microfilter Train#1,2 Permeate Turbidity High Alarm				
	28	Microfilter Train#3,4 Permeate Turbidity High Alarm				
	29	NS pH High High				
	30	NS pH Low Low				
	33	NS pH Sensor Fault				
	34	Collection Tank T-EQH100-1 Level High High				
	35	Effluent Collection Tank T-EQH1200-2 Level High High				
	36	Effluent Pump P-PSH100-1 Motor Fault				
	37	Effluent Pump P-PSH100-2 Motor Fault				
	38	Effluent Transfer Pump Flow High				
	39	Water Supply Pump P-PSH75-1 Motor Fault				
	40	Water Supply Pump P-PSH75-2 Motor Fault				
	41	Water Supply Pump Flow High				
	42	Water Supply Pump Pressure High				
	43	Water Supply Pump Pressure Low				
	44	PCP100-1 Tank Level High High				
	45	PCP100-1 Tank Level Low				
	46	Sludge Storage Tank Level High High				
	47	Sludge Storage Tank Mixer Motor Fault				
	48	Filtrate Collection Tank Level High High				
	49	RX1 pH Signal Diverge Fault				
	50	RX1 pH Signal Delta Fault				

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

		Factory Test	
		Owner	**Date**

51	RX1 ORP Signal Diverge Fault		
52	RX1 ORP Signal Delta Fault		
53	RX2 pH Signal Diverge Fault		
54	RX2 pH Signal Delta Fault		
55	NS pH Signal Diverge Fault		
56	NS pH Signal Delta Fault		
57	PS100-1&2 Panel E-Stop Pressed		
58	RXP1000 Panel E-Stop Pressed		
59	EFC4800 Panel E-Stop Pressed		
60	NSP2000 Panel E-Stop Pressed		
61	PSH100-1&2 Panel E-Stop Pressed		
62	PSH75-1&2 Panel E-Stop Pressed		
63	BT3000 Panel E-Stop Pressed		
64			
65			
66			
67			

For one alarm, verify that the alarm horn sounds, the alarm acknowledge button removes the audible alarm, and the alarm remains on the HMI until the alarm condition is removed.

Sequences

14. Check operation of sequences. For each sequence, complete the following:

☑ Sequence: **EFC Backpulse**

Verify	Conditions	
The sequence initiates under the proper conditions.	EFC Run Time	
Steps change under the proper conditions.		
Device statuses in each step.		
Skip Button (if exists).	-na-	
Pause Button (if exists).	-na-	
Abort Button (if exists).	-na-	
Step Time Remaining display.		

☑ Sequence: **EFC Clean**

Verify	Conditions	
The sequence initiates under the proper conditions.	Manual Start	
Steps change under the proper conditions.	Step change by Time	
Device statuses in each step.		
Skip Button (if exists).		
Pause Button (if exists).		
Abort Button (if exists).		
Step Time Remaining display.		

Totalizers

15. Verify any flow totalizers. For each totalizer, run at a fixed rate for a known amount of time, verify the total, and verify that the clear total button works.

List of totalizers: **-NA-**

DEVICE	**Units**	**Time period**	**Total**	**CLEAR PB**

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

		Factory Test	
		Owner	**Date**
Data Logging	16. Check all data logs and trends required by the project. List of data logs and trends: **-NA-** **DEVICE** | **Units** | **Time period** | **NOTES**		
Process Stop	17. Verify that the proper devices remain energized when the Process Stop is enabled. **DEVICE** | **Remain enabled?** | **Verified** Mixer | Yes | Transfer Pump | No | Chemical dosing (for pH, ORP adjustment) | Yes |		
Current Reading	18. Take a current reading on the infeed of each AC electrical skid in a normal operating mode. **Panel** | **Current Reading (A)** Main Control Panel | PS100-1&2 Panel | RXP1000 Panel | EFC4800 Panel | NSP2000 Panel | PSH100-1&2 Panel | PSH75-1&2 Panel | BT3000 Panel |		
Labels	19. Verify that all nameplates match schematics and P&IDs. If enclosures require UL508a labeling, verify that the UL508a sticker has been applied. List of enclosures requiring UL 508a labeling: ☑ Main control panel ☑ PS100-1&2 Panel ☑ RXP1000 Panel ☑ EFC4800 Panel ☑ NSP2000 Panel ☑ PSH100-1&2 Panel ☑ PSH75-1&2 Panel ☑ BT3000 Panel ☑		
Modem/ Web Access	20. Verify that the modem and/or web access provides the proper level of access to the controls. List of modems/web access: **-NA-** **Connection** | **Access Provided** | **Verified** Modem | | SmartService | |		
Project Close-Out	21. Complete the Startup Information from Engineering form on the EE homepage. Save in Commissioning under Serial History folder.		
	22. Save program to non-volatile memory (EEPROM, flash card, etc.) if included (Siemens PLCs do this automatically).		
	23. Verify that all notes on drawing set were followed.		
	24. Save PLC and HMI files to network.		

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

		Factory Test	
		Owner	**Date**
	25. Give redlined drawings to EE manager for updating.		
	26. If any changes were made to control or fault logic, inform EE product lead to evaluate for inclusion in the product standard.		
	27. Document any VFD settings.		

Project: EP00106
Applicable P&IDS:
Customer: O&M for WR GRACE
Schematic set:202983xx~202990xx

Siemens project manager: Uwe H.
Siemens lead machine builder:
Siemens lead mechanical engineer: Ron D.
Siemens lead electrical engineer: Jerry F.
Siemens FAT lead: Jerry F.

Post FAT Open Issue				
Issue #	**FAT Item #**	**Issue**	**Owner**	**Resolution/Date**

4.1 Photo-Cat® System Check List

Model #: 480-0096-025 **Serial #: 1007**

On Site

ELECTRICAL	CHECK	INITIALS	DATE	
Verify grounds – Doors	☑	[illegible]	Mar 5/11	TP
Verify voltage 480VAC/277/3/60Hz	☑	[illegible]	Mar 5/11	TP (498V, 3.8) 277
Verify phase currents balanced	☑	[illegible]	Mar 5/11	TP
Verify no in-rush faults	☑	[illegible]	Mar 5/11	TP
Approval QB # QE	☑	[illegible]	Mar 5/11	TP
Verify power ground to all back planes and racks	☑	[illegible]	Mar 5/11	TP
Verify in-rush rating matches fusing	☑	[illegible]	Mar 5/11	TP
CABINETS				
Verify lamp and lamp driver operation	☑	[illegible]	Mar 5/11	TP
Verify cooling fan rotation & flow direction	☑	[illegible]	Mar 5/11	TP
Verify system shuts down when turned off by switch on SCADA	☑	[illegible]	Mar 5/11	TP
Verify flow meter calibration	☑	[illegible]	Mar 5/11	TP
Verify VFD programming & Profibus operation	☑	[illegible]	Mar 5/11	TP
ACCUMULATOR				
Ensure level probe is calibrated prior to initial start-up	☑	[illegible]	Mar 5/11	TP
Verify high level cut out	☑	[illegible]	Mar 5/11	TP
Verify low level cut out	☐	[illegible]	Mar 5/11	TP
Verify vent cap is vented sufficiently	☐	[illegible]	Mar 5/11	TP (No Cap)
Verify flow reduction at high accumulator levels	☑	[illegible]	Mar 5/11	TP
PIPING				
Leak check water	☑	[illegible]	Mar 5/11	TP
Leak check air	☑	[illegible]	Mar 5/11	TP
Verify air pressure sensor; set-point is 310 kPa (75 psi)	☑	[illegible]	Mar 5/11	TP
Labeling	☑	[illegible]	Mar 5/11	TP
Vent air from piping	☑	[illegible]	Mar 5/11	TP
PUMPS				
Reactor Feed Pump (RFP) Verify voltage 480VAC/3/60Hz	☑	[illegible]	Mar 5/11	TP
Verify rotation	☑	[illegible]	Mar 5/11	TP

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TP April 27/11
T Powell

Set thermal cut-out (9.2A)	☑	[illegible]	Mar 5/11	TP
Slurry Loop Pump (SLP)	☑	[illegible]	Mar 5/11	TP
Verify voltage 416(460)/3ph/60Hz	☑			
Verify rotation (CCW)	☑			
Verify Head 50 psi (N/A kPa)	☑			
CRU				
Verify Permeate Pressure sensor reading signal and range	☑	[illegible]	Mar 5/11	TP
Verify DPCV has air	☑	[illegible]	Mar 5/11	TP
Verify setting is at automatic for all valves	☑	[illegible]	Mar 5/11	TP
Verify pressure reading on slurry loop and DPCV	☑	[illegible]	Mar 5/11	TP
Verify that slurry loop control valve is open when system is initially flooded	☑	[illegible]	Mar 5/11	TP
Verify SFCV is open when system is initially flooded	☑	[illegible]	Mar 5/11	TP
Verify that BPD valve properly oriented	☑	[illegible]	Mar 5/11	TP
Verify air check valve upstream of BPD	☑	[illegible]	Mar 5/11	TP
Verify BPD duration is 1.0 or greater	☑	[illegible]	Mar 5/11	TP
Verify no dirt can enter in BPD	☑	[illegible]	Mar 5/11	TP
Verify system will shut down within 30 seconds of loss of air pressure	☑	[illegible]	Mar 5/11	TP
Verify operation and scaling of Slurry Flow Meter	☑	[illegible]	Mar 5/11	TP
Verify low slurry feed flow fault shutdown	☑	[illegible]	Mar 5/11	TP
Verify influent fault shutdown	☑	[illegible]	Mar 5/11	TP
Verify effluent fault shutdown	☑	[illegible]	Mar 5/11	TP
Verify system will not start without air pressure	☑	[illegible]	Mar 5/11	TP
SCADA				
Verify system shut down when turned off by SCADA	☑	[illegible]	Mar 5/11	TP
Verify Tags function	☑	[illegible]	Mar 5/11	TP
Verify CRU ΔP cannot exceed maximum through setpoints	☑	[illegible]	Mar 5/11	TP
Verify correct slurry feed flow setpoint calculated by PLC	☑	[illegible]	Mar 5/11	TP
Verify remote monitoring	☑	[illegible]	Mar 5/11	TP
Verify PCAnywhere	☑	[illegible]	Mar 5/11	TP

Tony Powell
April 27/11

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	CHECK	INITIALS	
Leak Test Wetted Components	☑	[illegible]	TP
Leak Test Air System	☑	[illegible]	TP
Software Verification	☑	[illegible]	TP
Flow Verification 240 Lpm (Full Flow)	☑	[illegible]	TP
Control Panel Verification	☑	[illegible]	TP

Troy Powell
April 27/11

Client Acceptance:			
Date:	March 5/2011	Run Time Hours:	8 hrs.
Notes:	Client Not present, FAT testing completed by JP/Rod/Dave.		
Released for Shipment:	Rob Stubbs		
Date:	March 5/11		

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BUILDING PERMIT

No. 03U284 Date 10/1/10 20 10

This certifies that Senate Const. Corp.

has permission to Place concrete footings + foundation

on 50 Independence Rd.

Remarks All approved plans req'd at all insp.

* 10/25/10 FULL PERMIT foundation only 10/1/10

provided that the person accepting this permit shall, in every respect conform to the terms of the application therefore, on file in this office, to the provisions of the Laws of the Commonwealth and to the By-Laws of the Town of Acton relating to the Location, Inspection, Erection, Enlarging, Altering, Raising, Moving, Repairing, or Tearing down of a building or structure.

Fire Department	Plumbing & Heating	Electrical	Building Department	
Rough Date	Rough Date	Rough Date	Excavation NB Date 10/22/10	Foundation Certification Must Be Submitted Prior to Placing of Sill
Final Date	Final Date	Final Date	Foundation NB Date 10/22/10	Rough Framing Date
				Final Date
				Insulation Building Approved for Lathing Date

THIS CARD MUST BE DISPLAY IN A CONSPICUOUS PLACE ON THE PREMISES, MAINTAINED IN GOOD CONDITION AND MUST NOT BE REMOVED UNTIL ALL WORK HAS BEEN APPROVED.

Spaces must be initialed and dated at the time of approval of the inspecting authority before any work is covered up or any lathing is done. Each department must be notified when its portion of the work is ready for inspection.

Allow 48 hours for inspections.

Building Dept. Telephone: 978-929-6633

OWNERS PULLING THEIR OWN PERMIT OR DEALING WITH UNREGISTERED CONTRACTORS FOR APPLICABLE HOME IMPROVEMENT WORK DO NOT HAVE ACCESS TO THE ARBITRATION PROGRAM OR GUARANTY FUND UNDER MGL c. 142A

NO WALL OF CEILING SHALL BE LATHED OR OTHERWISE COVERED UNTIL THIS CARD BEARS ENDORSEMENT BY THE BUILDING DEPARTMENT IN THE SPACE PROVIDED

BUILDING SHALL NOT BE OCCUPIED UNTIL ALL INSPECTION HAVE BEEN COMPLETED AND OCCUPANCY PERMIT IS ISSUED BY THE BUILDING COMMISSIONER

Frank Rams Sullivan

Building Commissioner

ATTACHMENT C

REMEDIATION SYSTEM INSTALLATION PHOTOGRAPHS

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
1

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Landfill Area groundwater equalization tank system container.

Photo Number:
2

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Piping of recovery wells inside groundwater equalization tank system container.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
3

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Groundwater transfer tank between wells and treatment system.

Photo Number:
4

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Piping trench from groundwater equalization tank system container to Landfill Area Treatment System.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
5

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Construction of the treated groundwater discharge line from the Landfill Area Treatment System to Sinking Pond.

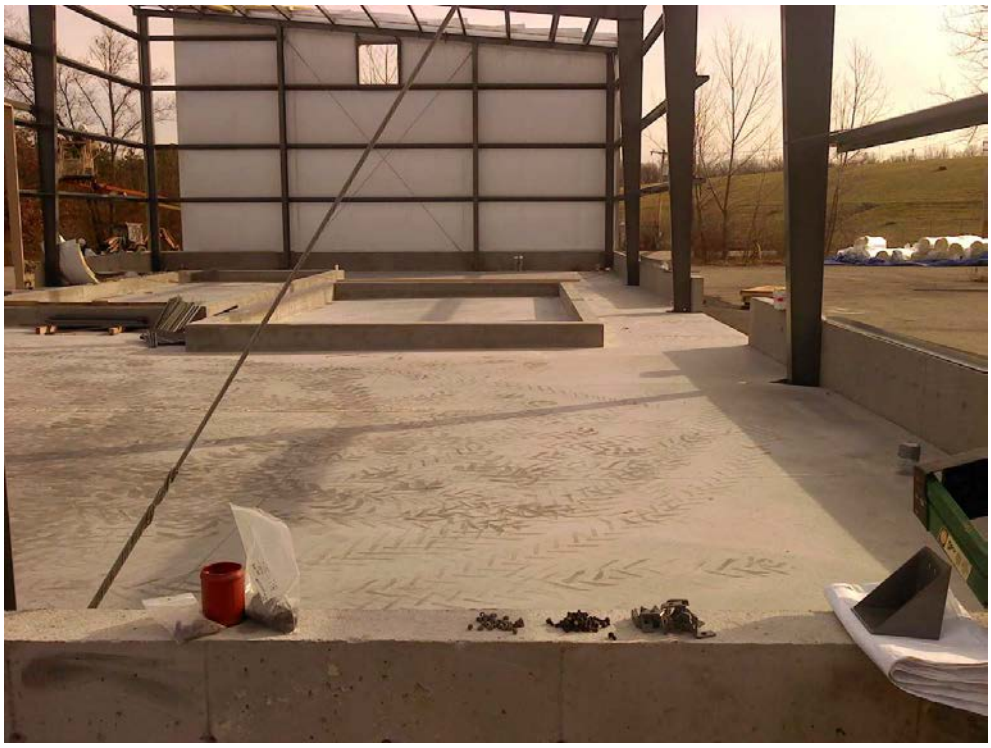
Photo Number:
6

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Construction of the Landfill Area groundwater treatment system building.



Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
7

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Interior construction of the Landfill Area groundwater treatment system building.

Photo Number:
8

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Landfill Area groundwater treatment system building.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
9

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Influent tank (background) and filter press (foreground).

Photo Number:
10

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Chemical addition to reaction-tank system.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
11

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Membrane microfiltration unit.

Photo Number:
12

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Neutralization tank and Photo-Cat influent tank.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
13

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Purifics Photo-Cat photocatalytic oxidation unit

Photo Number:
14

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Effluent discharge tank and transfer pumps.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
15

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Liquid-phase carbon vessel and discharge piping.

Photo Number:
16

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Air compressor system.

Photographic Record

Client:	W.R. Grace & Co. – Conn.	**Site Name:**	Landfill Area
Project Number:	732	**Site Location:**	Acton, Massachusetts

Photo Number:
17

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Sludge storage / thickening tank (center).

Photo Number:
18

Photographer:
A. Plaines

Date:

Direction:
n/a

Comments:
Landfill Area groundwater treatment system.

ATTACHMENT D

LANDFILL AREA START-UP DATA SHEETS

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5/2/11

	Time	1510					
Influent Transfer Pump 1	Flow Rate(gpm)	95 gpm					
	Pressure (psi)	16					
Influent Transfer Pump 2	Flow Rate(gpm)	off					
	Pressure (psi)						
RXN Tank 1:	pH	6.16					
	ORP	780					
RXN Tank 2:	pH	6.26					
	ORP	—					
Potassium Permanganate Feed Rate ~~(gph)~~ ~~spd~~ ~~stroke~~		70 ~~15~~					
Ferric Chloride Feed Rate (gph)		N/A					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	15					
	Permeate Flow Rate (gpm)	32					
pfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	12					
	Permeate Flow Rate (gpm)	44					
Neutralization Tank:	pH	6.64					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm)	100					
	Pressure (psi)	60					
Effluent Transfer Pump 2:	Flow Rate (gpm)	off					
	Pressure (psi)	—					
Plant Water Pump 1:	Flow Rate (gpm)	17					
	Pressure (psi)	50					
Plant Water Pump 2:	Flow Rate (gpm)	off					
	Pressure (psi)	off					
Sludge Thickener Feed Pump: (AIR)	Pressure (psi)	62					
Filter Press Feed Pump:	Pressure (psi)	off					
Filtrate Tank Pump:	Pressure (psi)	off					
Other Conditions:							

Table 4-1

W.R. Grace Superfund Site
;ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-3-11

	Time	9:20					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	95 18					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)						
RXN Tank 1:	pH ORP	6.15 531					
RXN Tank 2:	pH ~~ORP~~	6.30					
Potassium Permanganate Feed Rate (gph)	Speed ~~Stroke~~	72% 12					
Ferric Chloride Feed Rate (gph)		N/A					
Microfiltration Trains 1 & 2 Concentrate (guage 1 between square tanks)	~~Process Pump Inlet~~ Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	15 50 psi 28					
·ofiltration Trains 3 & 4 Concentrate	~~Process Pump Inlet~~ Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	13 48 42					
Neutralization Tank: (3rd tank)	pH	6.4					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	112 58					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	17 42					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	~~OFF~~ N/A ~~N/A~~					
Sludge Thickener Feed Pump:	Pressure (psi)	~~OFF~~ 65					
Filter Press Feed Pump:	Pressure (psi)	~~OFF~~ 80					
Filtrate Tank Pump:	Pressure (psi)	~~OFF~~ 60					
Other Conditions:							

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Date: 5-4-11

Landfill Area Start-Up Data

	Time	14:10					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	93 17					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	589 520					
RXN Tank 2:	pH ~~ORP~~	591					
Potassium Permanganate Feed Rate (gph)		72 12					
Ferric Chloride Feed Rate (gph)	Speed Stroke	15 25					
Microfiltration Trains 1 & 2	Concentrate ~~Process Pump Inlet~~ Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	 15 49 26					
ofiltration Trains 3 & 4	Concentrate ~~Process Pump Inlet~~ Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	 12 46 39					
Neutralization Tank:	pH	6.20					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	115 56					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	23 49					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	100					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	30					
Other Conditions:							

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-9-11

	Time	12:00	15:30				
Influent Transfer Pump 1	Flow Rate(gpm)	98	98				
	Pressure (psi)	17	0				
Influent Transfer Pump 2	Flow Rate(gpm)	N/A	N/A				
	Pressure (psi)						
RXN Tank 1:	pH	6.18	6.16				
	ORP	313	314				
RXN Tank 2:	pH	6.23	6.23				
	~~ORP~~						
Potassium Permanganate Feed Rate (gph)		75/15	75/15				
Ferric Chloride Feed Rate (gph)		25/17	25/15				
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	14	48				
	Process Pump Outlet Pressure (psi)	49	48				
	Permeate Flow Rate (gpm)	48	53				
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	12	11				
	Process Pump Outlet Pressure (psi)	42	12				
	Permeate Flow Rate (gpm)	52	45				
Neutralization Tank:	pH	6.12	6.20				
Purifics System Operating? Y / N		Y	Y				
Effluent Transfer Pump 1:	Flow Rate (gpm)	113	116				
	Pressure (psi)	55	55				
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A	N/A				
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	25	27.2				
	Pressure (psi)	50	50				
Plant Water Pump 2:	Flow Rate (gpm)	N/A	N/A				
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	75	75 ~~67~~				
Filter Press Feed Pump:	Pressure (psi)	0	69				
Filtrate Tank Pump:	Pressure (psi)	58	58				
Other Conditions:							

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5/10/11

	Time	0900	1430	~~15~~			
Influent Transfer Pump 1	Flow Rate(gpm)	97	83				
	Pressure (psi)	17	17				
Influent Transfer Pump 2	Flow Rate(gpm)	N/A	N/A				
	Pressure (psi)						
RXN Tank 1:	pH	6.21	6.20				
	ORP	299	299				
RXN Tank 2:	pH	6.26	6.25				
	~~ORP~~						
Potassium Permanganate Feed Rate (gph)		15/25	15/25				
Ferric Chloride Feed Rate (gph)		15/30	15/30				
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	50	49				
	Process Pump Outlet Pressure (psi)	15	14				
	Permeate Flow Rate (gpm)	34.8	49				
·ofiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	46	~~50~~ 46				
	Process Pump Outlet Pressure (psi)	12	12				
	Permeate Flow Rate (gpm)	41.1	50				
Neutralization Tank:	pH	6.13	6.16				
Purifics System Operating? Y / N		y	y				
Effluent Transfer Pump 1:	Flow Rate (gpm)	~~114~~ 250	~~26.0~~				
	Pressure (psi)	52	~~50~~				
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A	N/A				
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	~~50~~ 23.3	26				
	Pressure (psi)	50	50				
Plant Water Pump 2:	Flow Rate (gpm)	N/A	N/A				
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	75	75				
Filter Press Feed Pump:	Pressure (psi)	60	60				
Filtrate Tank Pump:	Pressure (psi)	58	58				
Other Conditions:							

Table 4-1

W.R. Grace Superfund Site
cton, Massachusetts

Date: 5-11-11

Landfill Area Start-Up Data

	Time	11:55					
Influent Transfer Pump 1	Flow Rate(gpm)	102					
	Pressure (psi)	18					
Influent Transfer Pump 2	Flow Rate(gpm)	N/A					
	Pressure (psi)						
RXN Tank 1:	pH	619					
	ORP	304					
RXN Tank 2:	pH	627					
	ORP	—					
Potassium Permanganate Feed Rate (gph)	Speed	75					
	Stroke	15					
Ferric Chloride Feed Rate (gph)	Speed	12					
	Stroke	25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	15					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	48					
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	47					
	Permeate Flow Rate (gpm)	48					
Neutralization Tank:	pH	608					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm)	115					
	Pressure (psi)	54					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	24					
	Pressure (psi)	56					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	65					
Filtrate Tank Pump:	Pressure (psi)	55					
Other Conditions:							

5-11-11

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	12:15					
Bag Filter	Inlert (psi)	35					
	Outlet (psi)	62					
	Differential (psi)	27					
Flow	Flow Rate (gpm)	47					
	Total Flow (gallons)	451353					
Accumulator Tank Level	%	63					
DPCV (PV)	psi	47					
CRU (PV)	psi	50					

Lamps 8, 19, 23, 13, 17

Table 4-1

W.R. Grace Superfund Site
:cton, Massachusetts

Landfill Area Start-Up Data

Date: 5-12-11

	Time	9:20	12:35				
Influent Transfer Pump 1	Flow Rate(gpm)	102	102				
	Pressure (psi)	17	16				
Influent Transfer Pump 2	Flow Rate(gpm)	N/A	N/A				
	Pressure (psi)						
RXN Tank 1:	pH	614	614				
	ORP	316	315				
RXN Tank 2:	pH	620	620				
	~~ORP~~	—					
Potassium Permanganate Feed Rate (gph)	Speed	75	75				
	Stroke	15	15				
Ferric Chloride Feed Rate (gph)	Speed	15	15				
	Stroke	25	25				
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	15	14				
	Process Pump Outlet Pressure (psi)	50	50				
	Permeate Flow Rate (gpm)	49	46				
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	12	12				
	Process Pump Outlet Pressure (psi)	48	46				
	Permeate Flow Rate (gpm)	48	48				
Neutralization Tank:	pH	6.01	5.97				
Purifics System Operating? Y / N		Y	Y				
Effluent Transfer Pump 1:	Flow Rate (gpm)	115	120				
	Pressure (psi)	52	53				
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A	N/A				
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	27	27				
	Pressure (psi)	50	50				
Plant Water Pump 2:	Flow Rate (gpm)	—	—				
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	78	78				
Filter Press Feed Pump:	Pressure (psi)	0	68				
Filtrate Tank Pump:	Pressure (psi)	58	58				
Other Conditions: Shut system down @ * 9:30 to replace bag filter in Purifics unit. Restarted system @ 10:20							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics		Time	9:30	12:40				
Bag Filter	Inlert (psi)		32	49				
	Outlet (psi)		62	49				
	Differential (psi)		30	0				
Flow	Flow Rate (gpm)		44	60				
	Total Flow (gallons)		507795	517089				
Accumulator Tank Level	%		65	52				
DPCV (PV)	psi		47	45				
CRU (PV)	psi		50	50				

Lamps 8, 19, 23, 17, 13 / @ 12:40 only lamps 8, 19, 17 are out

Table 4-1

W.R. Grace Superfund Site
;cton, Massachusetts

Landfill Area Start-Up Data

Date: 5-13-11

	Time	10:30					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	96 16					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	NA					
RXN Tank 1:	pH ORP	6.13 316					
RXN Tank 2:	pH ORP	6.19					
Potassium Permanganate Feed Rate (gph)		13/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		12 46 45					
·ofiltration Trains 3 & 4 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		14 50 46					
Neutralization Tank:	pH	5.95					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	115 54					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	33 50					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	75					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	11:60					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	48					
	Differential (psi)	0					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	594270					
Accumulator Tank Level	%	54					
DPCV (PV)	psi	44					
CRU (PV)	psi	50					
Lamps							

Table 4-1

W.R. Grace Superfund Site
cton, Massachusetts

Landfill Area Start-Up Data

Date: 5-17-11

	Time	15:00					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	97 16					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	6.04 371					
RXN Tank 2:	pH ~~ORP~~	6.06 ~~1~~					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		11 48 48					
rofiltration Trains 3 & 4 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		14 50 48					
Neutralization Tank:	pH	5.92					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	~~28~~ 115 ~~50~~ 54					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	28 50					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	15:15					
Bag Filter	Inlert (psi)	44					
	Outlet (psi)	45					
	Differential (psi)	-1					
Flow	Flow Rate (gpm)	58					
	Total Flow (gallons)	612576					
Accumulator Tank Level	%	78					
DPCV (PV)	psi	47					
CRU (PV)	psi	50					

Lamps 17

Table 4-1

W.R. Grace Superfund Site
cton, Massachusetts

Landfill Area Start-Up Data

Date: 5-18-11

	Time	13:34					
Influent Transfer Pump 1	Flow Rate(gpm)	100					
	Pressure (psi)	16					
Influent Transfer Pump 2	Flow Rate(gpm)	N/A					
	Pressure (psi)						
RXN Tank 1:	pH	6.10					
	ORP	352					
RXN Tank 2:	pH	6.12					
	ORP	—					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	14					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	48					
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	12					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	48					
Neutralization Tank:	pH	5.97					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm)	118					
	Pressure (psi)	52					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	25					
	Pressure (psi)	52					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	14:50					
Bag Filter	Inlert (psi)	49					
	Outlet (psi)	50					
	Differential (psi)	-1					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	656832					
Accumulator Tank Level	%	67					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					

Lamps 13

Table 4-1

W.R. Grace Superfund Site
cton, Massachusetts

Landfill Area Start-Up Data

Date: 5-19-11

	Time	1600					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	103 16					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	7.25 399					
RXN Tank 2:	pH ~~ORP~~	7.05					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	14 50 48					
rofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	12 48 49					
Neutralization Tank:	pH	6.50					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	115 50					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	25 52					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	56					
Other Conditions: Rudy from Seimens added the Caustic soda today - so PH has changed.							

5-19-11

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	14:15					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	714055					
Accumulator Tank Level	%	53					
DPCV (PV)	psi	42					
CRU (PV)	psi	50					
Lamps							

Table 4-1

W.R. Grace Superfund Site
cton, Massachusetts

Landfill Area Start-Up Data

Date: 5-20-11

	Time	13:00					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	98 16					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	7.49 292					
RXN Tank 2:	pH ~~ORP~~	6.49					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	14 50 42					
rofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)	12 46 45					
Neutralization Tank:	pH	6.84					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	115 52					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	25 54					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	13:15					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	783353					
Accumulator Tank Level	%	55					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					

Lamps 8, 13

Table 4-1

W.R. Grace Superfund Site
ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-23-11

	Time	1:50					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	—					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	8.10 383					
RXN Tank 2:	pH ORP	7.03					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)							
' ofiltration Trains 3 & 4 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)							
Neutralization Tank:	pH	6.82					
Purifics System Operating? Y / N							
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)						
Filter Press Feed Pump:	Pressure (psi)						
Filtrate Tank Pump:	Pressure (psi)						
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time						
Bag Filter	Inlert (psi)						
	Outlet (psi)						
	Differential (psi)						
Flow	Flow Rate (gpm)						
	Total Flow (gallons)						
Accumulator Tank Level	%						
DPCV (PV)	psi						
CRU (PV)	psi						
Lamps							

15 min

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-24-11

	Time	10:15					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	96 16					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	5.70 527					
RXN Tank 2:	pH ORP	5.73 —					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		14 56 45	Total 415274				
·ofiltration Trains 3 & 4 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		12 48 47	Total 482789				
Neutralization Tank:	pH	5.89					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	120 50					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	25 52					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	78					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

5-24-11

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	10:40					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	859846					
Accumulator Tank Level	%	50					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					
Lamps							

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-25-11

	Time	10:00					
Influent Transfer Pump 1	Flow Rate(gpm)	96					
	Pressure (psi)	16					
Influent Transfer Pump 2	Flow Rate(gpm)	N/A					
	Pressure (psi)						
RXN Tank 1:	pH	5.70					
	ORP	536					
RXN Tank 2:	pH	5.70					
	~~ORP~~						
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	14					
	Process Pump Outlet Pressure (psi)	50	451263				
	Permeate Flow Rate (gpm)	48					
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	46	521606				
	Permeate Flow Rate (gpm)	48					
Neutralization Tank:	pH	5.86					
Purifics System Operating? Y / N							
Effluent Transfer Pump 1:	Flow Rate (gpm)	119					
	Pressure (psi)	50					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	25					
	Pressure (psi)	52					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	78					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

5-25-11

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	10:15					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	59					
	Total Flow (gallons)	938031					
Accumulator Tank Level	%	50					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					

Lamps 8, 13

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-26-11

	Time	16:00					
Influent Transfer Pump 1	Flow Rate(gpm) Pressure (psi)	98 15					
Influent Transfer Pump 2	Flow Rate(gpm) Pressure (psi)	N/A					
RXN Tank 1:	pH ORP	5.72 538					
RXN Tank 2:	pH ~~ORP~~	572					
Potassium Permanganate Feed Rate (gph)		75/15					
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		14 50 49	497762				
·ofiltration Trains 3 & 4 Process Pump Inlet Pressure (psi) Process Pump Outlet Pressure (psi) Permeate Flow Rate (gpm)		~~[illegible]~~ 12 ~~[illegible]~~ 46 46	571877				
Neutralization Tank:	pH	5.86					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm) Pressure (psi)	119 49					
Effluent Transfer Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Plant Water Pump 1:	Flow Rate (gpm) Pressure (psi)	26 54					
Plant Water Pump 2:	Flow Rate (gpm) Pressure (psi)	N/A					
Sludge Thickener Feed Pump:	Pressure (psi)	78					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	14:10					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	1037129					
Accumulator Tank Level	%	50					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					
Lamps							

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Landfill Area Start-Up Data

Date: 5-27-11

	Time	13:15					
Influent Transfer Pump 1	Flow Rate(gpm)	99					
	Pressure (psi)	16					
Influent Transfer Pump 2	Flow Rate(gpm)	N/A					
	Pressure (psi)						
RXN Tank 1:	pH	6.15					
	ORP	440					
RXN Tank 2:	pH	6.13					
	~~ORP~~						
Potassium Permanganate Feed Rate (gph)		60/50	* Changed out pump + changed settings				
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	14					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	47	529166				
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	12					
	Process Pump Outlet Pressure (psi)	48					
	Permeate Flow Rate (gpm)	46	605650				
Neutralization Tank:	pH	5.95					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm)	122					
	Pressure (psi)	48					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	25					
	Pressure (psi)	54					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	78					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

5-27-4

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	13:30					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	1104082					
Accumulator Tank Level	%	55					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					
Lamps							

Table 4-1

W.R. Grace Superfund Site
:ton, Massachusetts

Date: 6-1-11

Landfill Area Start-Up Data

	Time	15:00					
Influent Transfer Pump 1	Flow Rate(gpm)	98					
	Pressure (psi)	16					
Influent Transfer Pump 2	Flow Rate(gpm)	N/A					
	Pressure (psi)						
RXN Tank 1:	pH	6.43					
	ORP	490					
RXN Tank 2:	pH	6.29					
	~~ORP~~						
Potassium Permanganate Feed Rate (gph)		50/60	*Changed pump				
Ferric Chloride Feed Rate (gph)		15/25					
Microfiltration Trains 1 & 2	Process Pump Inlet Pressure (psi)	14					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	45	605956				
·ofiltration Trains 3 & 4	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	42	691448				
Neutralization Tank:	pH	6.32					
Purifics System Operating? Y / N		Y					
Effluent Transfer Pump 1:	Flow Rate (gpm)	120					
	Pressure (psi)	48					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	24					
	Pressure (psi)	46					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	15:15					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	1275295					
Accumulator Tank Level	%	52					
DPCV (PV)	psi	49					
CRU (PV)	psi	50					
Lamps							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-3-11

Landfill Area Start-Up Data

Siemens System

	Time	15:38					
Influent Transfer Pump 1:	Flow Rate (gpm)	99					
	Flow (total)	1397000					
	Pressure (psi)	16					
Influent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
RXN Tank 1: pH		6.20					
RXN Tank 1: ORP		495					
RXN Tank 2: pH		6.37					
Potassium Permanganate Feed (speed/stroke)		5/60					
Ferric Chloride Feed Rate (speed/stroke)		15/25					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	25					
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	14					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	25					
Neutralization Tank: pH		6.49					
Effluent Transfer Pump 1:	Flow Rate (gpm)	119					
	Flow (total)	1610254					
	Pressure (psi)	48					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	25	933895				
	Pressure (psi)	46					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Purifics	Time	15:40					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Total Flow (gallons)	1367019					
Accumulator Tank Level	%	44					
DPCV (PV)	psi	49					
CRU (PV)	psi	50					

Lamps 8, 13

6/5/11 HP

TABLE 7-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Operations Data

system running upon arrival	Time	0900					
Influent Transfer Pump 1:	Flow Rate (gpm)	58-69					
	Pressure (psi)	26					
Influent Transfer Pump 2:	Flow Rate (gpm)	off					
	Pressure (psi)						
RXN Tank 1: pH		6.84					
ORP		486					
RXN Tank 2: pH		6.30					
ORP		—					
Potassium Permanganate Feed Rate (gph)		68 gal level = 68% ✓✓					
Ferric Chloride Feed Rate (gph)		—					
Microfiltration Trains 1 & 2							
Process Pump Inlet Pressure (psi)							
Process Pump Outlet Pressure (psi)							
Permeate Flow Rate (gpm)		~23					
Microfiltration Trains 3 & 4							
Process Pump Inlet Pressure (psi)							
Process Pump Outlet Pressure (psi)							
Permeate Flow Rate (gpm)		~23					
Neutralization Tank: pH		6.57					
Purifics System Operating? Y / N		356 gpm					
Effluent Transfer Pump 1:	Flow Rate (gpm)	118					
	Pressure (psi)	48					
Effluent Transfer Pump 2:	Flow Rate (gpm)	off					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	22					
	Pressure (psi)	47					
Plant Water Pump 2:	Flow Rate (gpm)	off					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	64					
Filter Press Feed Pump:	Pressure (psi)	off					
Filtrate Tank Pump:	Pressure (psi)	off					
Other Conditions:	Conc. tank	74%		TiO_2 color ~ Tan/orange			
	Inf Eq	34%		(prob needs more acid wash)			
	Sludge Thick.	62%		may need to add some			
	filtrate	13%					

Imhoff prob > 80% was ~ 80% Sat morn.
Hydroxide ~ empty

SYSTEM OPERATED ALL WEEKEND.

see back →

FRI 6/3/11 : • removed 25 gal to purifics accumulator. Added 3 "scoops" TiO_2 & did 30 min acid wash beforehand.
• Acid washed Trains 1-2, Flow increased to 40-50 gpm

SAT 6/4/11 : 1) With higher strength acid wash, was tougher to treat inf. tank water w/o ph swings in RXN-1 tank. Used up almost all the hydroxide. Have one on order, but may not arrive this week.

2) Acid washing purifics unit for 30 min made plant water ph = 2.5 !

⊛ Do not allow acid washing of purifics if going to acid wash microfilter.

• Took a long time to get plant water ph up.

3) Try and get Inf tank level to 40-45% before acid washing MMF, so pH swing may not be so bad

SUN 6/5/11 : MMF Trains 1-2 back down to ~23 gpm, so acid wash benefit lasted only a day.

⊛ Prob. because solids content is too high in conc. tank

ISSUES: ① We need to process sludge at a higher rate.

② We need more hydroxide on hand to neutralize inf. tank ph.

well control: off at 40% on @ 30 on blow

③ Inf. pump flow may not be keeping up w/ well flow by a small amt. Open valve very small increments.

④ see where inf. pH is in RXN-1 when hydroxide runs out control is at 6.6, but can prob let it swing to 7.2 or so.

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6-6-11

Siemens System

	Time	10:00					
Influent Transfer Pump 1:	Flow Rate (gpm)	70					
	Flow (total)	1504270					
	Pressure (psi)	22					
Influent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
RXN Tank 1: pH		5.61					
RXN Tank 1: ORP		535					
RXN Tank 2: pH		5.65					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		15/25					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	24	717444				
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	15					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	22	802653				
Neutralization Tank: pH		5.83					
Effluent Transfer Pump 1:	Flow Rate (gpm)	116					
	Flow (total)	1736292					
	Pressure (psi)	48					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	24	1019767				
	Pressure (psi)	46					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-6-11

Landfill Area Start-Up Data

Purifics System

	Time	10:45					
Bag Filter	Inlert (psi)	32					
	Outlet (psi)	34					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	25					
	Flow (total)	148227					
	Total Flow (gallons)						
Accumulator Tank Level	%	51					
DPCV (PV)	psi	54					
CRU (PV)	psi	50					
Inspect catalyst color		Pale Orange					
Lamps	8-13 out						

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-7-11

Landfill Area Start-Up Data

Siemens System

	Time	11:15					
Influent Transfer Pump 1:	Flow Rate (gpm)	70					
	Flow (total)	1549666					
	Pressure (psi)	22					
Influent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
RXN Tank 1: pH		5.61					
RXN Tank 1: ORP		538					
RXN Tank 2: pH		5.60					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		15/25					
Microfiltration Trains 1 & 2		14					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	23					
	Permeate Flow Rate (gpm)	741976					
Microfiltration Trains 3 & 4		13					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	22					
	Permeate Flow Rate (gpm)	831539					
Neutralization Tank: pH		5.77					
Effluent Transfer Pump 1:	Flow Rate (gpm)	125					
	Flow (total)	1790051					
	Pressure (psi)	46					
Effluent Transfer Pump 2:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	25	1051564				
	Pressure (psi)	48					
Plant Water Pump 2:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:		* Switch to pump #2 after readings.					

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-7-11

Landfill Area Start-Up Data

Purifics System

	Time	11:20					
Bag Filter	Inlert (psi)	46					
	Outlet (psi)	53					
	Differential (psi)	-7					
Flow	Flow Rate (gpm)	55					
	Flow (total)	1530836					
	Total Flow (gallons)						
Accumulator Tank Level	%	54					
DPCV (PV)	psi	46					
CRU (PV)	psi	50					
Inspect catalyst color	Pale orange						
Lamps	8, 13						

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-8-11

Landfill Area Start-Up Data

Siemens System

	Time	10:00					
Influent Transfer Pump 1:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	68					
	Flow (total)	1589502					
	Pressure (psi)	22					
RXN Tank 1: pH		5.49					
RXN Tank 1: ORP		545					
RXN Tank 2: pH		5.47					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		15/25					
Microfiltration Trains 1 & 2		14					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	23					
	Permeate Flow Rate (gpm)	775285					
Microfiltration Trains 3 & 4		13					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	23					
	Permeate Flow Rate (gpm)	857365					
Neutralization Tank: pH		5.63					
Effluent Transfer Pump 1:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	119					
	Flow (total)	1840630					
	Pressure (psi)	44					
Plant Water Pump 1:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	26/54					
	Pressure (psi)	1083168					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-8-11

Landfill Area Start-Up Data

Purifics System

	Time	10:15					
Bag Filter	Inlert (psi)	36					
	Outlet (psi)	40					
	Differential (psi)	-4					
Flow	Flow Rate (gpm)	32					
	Flow (total)	1575946					
	Total Flow (gallons)						
Accumulator Tank Level	%	50					
DPCV (PV)	psi	49					
CRU (PV)	psi	50					
Inspect catalyst color	orange						
Lamps 8, 13							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6/16/11

Siemens System

	Time	1605					
Influent Transfer Pump 1:	Flow Rate (gpm)	82					
	Flow (total)	01698881					
	Pressure (psi)	220					
Influent Transfer Pump 2:	Flow Rate (gpm)	0					
	Flow (total)	0169888					
	Pressure (psi)	0					
RXN Tank 1: pH		6.43					
RXN Tank 1: ORP		510					
RXN Tank 2: pH		6.08					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		15/25					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	~~11~~ 60					
	Process Pump Outlet Pressure (psi)	~~46~~ 14					
	Permeate Flow Rate (gpm)	32					
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	~~[illegible]~~ 11					
	Process Pump Outlet Pressure (psi)	~~46~~					
	Permeate Flow Rate (gpm)	28					
Neutralization Tank: pH		6.30					
Effluent Transfer Pump 1:	Flow Rate (gpm)	0					
1610	Flow (total)	01966072					
	Pressure (psi)	10.					
Effluent Transfer Pump 2:	Flow Rate (gpm)	~~0132398~~					
~~1611~~	Flow (total)						
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	~~88.6~~					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	88.6					
	Pressure (psi)	45.					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)						
Filtrate Tank Pump:	Pressure (psi)	60					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6/16/11

Landfill Area Start-Up Data

Purifics System

	Time	1615					
Bag Filter	Inlert (psi)	41					
	Outlet (psi)	48					
	Differential (psi)	7					
Flow	Flow Rate (gpm)	42					
	Flow (total)						
	Total Flow (gallons)	1696848					
Accumulator Tank Level	%	47					
DPCV (PV)	psi	45					
CRU (PV)	psi	48					
Inspect catalyst color							
Lamps	8/13						

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6-17-11

Siemens System

	Time	8:30					
Influent Transfer Pump 1:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	85					
	Flow (total)	1749112					
	Pressure (psi)	22					
RXN Tank 1: pH		6.15					
RXN Tank 1: ORP		514					
RXN Tank 2: pH		6.02					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		N/A					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	15					
	Process Pump Outlet Pressure (psi)	49					
	Permeate Flow Rate (gpm)	26.2	865930				
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	48					
	Permeate Flow Rate (gpm)	25.9	942433				
Neutralization Tank: pH		6.24					
Effluent Transfer Pump 1:	Flow Rate (gpm)	N/A					
	Flow (total)						
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	125					
	Flow (total)	2013986					
	Pressure (psi)	42					
Plant Water Pump 1:	Flow Rate (gpm)	N/A					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	93	1415248				
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-17-11

Landfill Area Start-Up Data

Purifics System

	Time	8:40					
Bag Filter	Inlert (psi)	42					
	Outlet (psi)	50					
	Differential (psi)	-8					
Flow	Flow Rate (gpm)	45					
	Flow (total)						
	Total Flow (gallons)	1739951					
Accumulator Tank Level	%	61					
DPCV (PV)	psi	49					
CRU (PV)	psi	50					
Inspect catalyst color pale orange							
Lamps 8, 13							

MHOF 250@ 10am

TABLE 4-1

MHOF 260@ 1545

W. R. Grace Superfund Site
Acton, Massachusetts

Date: June 20, 2011

Landfill Area Start-Up Data

Remote:

Siemens System

	Time	0920	1530				
Influent Transfer Pump 1:	Flow Rate (gpm)	2					
	Flow (total)	N/A	N/A				
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	91.1	89.2				
	Flow (total)	01925733	01940432				
	Pressure (psi)	24	23				
RXN Tank 1: pH		6.27	6.46				
RXN Tank 1: ORP		503 mv	503				
RXN Tank 2: pH		6.53	6.12				
Potassium Permanganate Feed (speed/stroke)		50/60	60/77				
Ferric Chloride Feed Rate (speed/stroke)		26/15	26/15				
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	15	14				
	Process Pump Outlet Pressure (psi)	50	48				
~~Tank 8~~ Tank @ 80%	Permeate Flow Rate (gpm)	23	24				
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	13	13				
	Process Pump Outlet Pressure (psi)	47	46				
	Permeate Flow Rate (gpm)	23	26				
Neutralization Tank: pH		6.35	6.37				
Effluent Transfer Pump 1:	Flow Rate (gpm)	N/A	N/A				
	Flow (total)						
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	128	128				
	Flow (total)	02133590	02194461				
	Pressure (psi)		42				
Plant Water Pump 1:	Flow Rate (gpm)	N/A	N/A				
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	85	93				
	Pressure (psi)	50	50				
Sludge Thickener Feed Pump:	Pressure (psi)	80	74				
Filter Press Feed Pump:	Pressure (psi)	120	120				
Filtrate Tank Pump:	Pressure (psi)	58	58				

Other Conditions:
System shut down 6/20/11 @ 0347
Due to high concentration tank.

Tank 8

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 06/20/11

Landfill Area Start-Up Data

Purifics System

	Time	0920	1530				
Bag Filter	Inlert (psi)	30	43				
	Outlet (psi)	34	51				
	Differential (psi)	-4	-8				
Flow	Flow Rate (gpm)	23	48				
	Flow (total)	1892800	47				
	Total Flow (gallons)		1904873				
Accumulator Tank Level	%	51	56				
DPCV (PV)	psi	49	45				
CRU (PV)	psi	49	49				
Inspect catalyst color							
Lamps	8 (Driver Error)	13 (Driver Error)	→				

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6-21-11

Siemens System

	Time	10:15					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	86					
	Flow (total)	1988850					
	Pressure (psi)	22					
RXN Tank 1: pH		6.19					
RXN Tank 1: ORP		506					
RXN Tank 2: pH		6.08					
Potassium Permanganate Feed (speed/stroke)		60/76					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2		15					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	24					
	Permeate Flow Rate (gpm)	98144	2				
Microfiltration Trains 3 & 4		13					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	25					
	Permeate Flow Rate (gpm)	1055	419				
Neutralization Tank: pH		6.28					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	0					
	Flow (total)	2242285					
	Pressure (psi)	0					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	110					
	Pressure (psi)	50	1957856				
Sludge Thickener Feed Pump:	Pressure (psi)	75					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-21-11

Landfill Area Start-Up Data

Purifics System

	Time	10:20					
Bag Filter	Inlert (psi)	35					
	Outlet (psi)	40					
	Differential (psi)	-5					
Flow	Flow Rate (gpm)	31					
	Flow (total)	1948506					
	Total Flow (gallons)						
Accumulator Tank Level	%	65					
DPCV (PV)	psi	49					
CRU (PV)	psi	50					
Inspect catalyst color	pale orange						
Lamps 8/13							

TABLE 4-1 m-HOF - 300mL after 30min.

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-23-11

Landfill Area Start-Up Data

Siemens System

	Time	10:00					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	93					
	Flow (total)	2089967					
	Pressure (psi)	22					
RXN Tank 1: pH		6.21					
RXN Tank 1: ORP		481					
RXN Tank 2: pH		614					
Potassium Permanganate Feed (speed/stroke)		60/76					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	15					
	Process Pump Outlet Pressure (psi)	49					
	Permeate Flow Rate (gpm)	26	1031575				
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	12					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	25	1103707				
Neutralization Tank: pH		6.31					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	127					
	Flow (total)	2339531					
	Pressure (psi)	41					
Plant Water Pump 1:	Flow Rate (gpm)						
	Pressure (psi)	—					
Plant Water Pump 2:	Flow Rate (gpm)	96	2226287				
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	92					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-23-11

Landfill Area Start-Up Data

Purifics System

	Time	10:30					
Bag Filter	Inlert (psi)	44	* Changed bag filter 6-22-11				
	Outlet (psi)	44					
	Differential (psi)	0					
Flow	Flow Rate (gpm)	49					
	Flow (total)	2038269					
	Total Flow (gallons)						
Accumulator Tank Level	%	66					
DPCV (PV)	psi	45					
CRU (PV)	psi	50					
Inspect catalyst color	pale orange						
Lamps	8, 13						

TABLE 4-1 M-HOF - 250 ml. after 30 min

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6-24-11

Siemens System

	Time	9:10					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)						
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	84					
	Flow (total)	2148690					
	Pressure (psi)	22					
RXN Tank 1: pH		6.22	* Turned on caustic pump after readings.				
RXN Tank 1: ORP		455					
RXN Tank 2: pH		6.16					
Potassium Permanganate Feed (speed/stroke)		60/76					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	15					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	24	1060844				
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	24	1132074				
Neutralization Tank: pH		6.31					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	127					
	Flow (total)	2397090					
	Pressure (psi)	42					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	101	2354080				
	Pressure (psi)	56					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	95					
Filtrate Tank Pump:	Pressure (psi)	56					

Other Conditions:
Backflushed both trains but had no effect on flows.

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-24-11

Landfill Area Start-Up Data

Purifics System

	Time						
Bag Filter	Inlert (psi)	33					
	Outlet (psi)	33					
	Differential (psi)	0					
Flow	Flow Rate (gpm)	30					
	Flow (total)						
	Total Flow (gallons)	2089489					
Accumulator Tank Level	%	45					
DPCV (PV)	psi	49					
CRU (PV)	psi	50					
Inspect catalyst color	Pale orange						
Lamps	8, 13						

* Turned Caustic pump back on 6-24-11 - seems to have been solid

*M-Hof 4/50ml. @ 30m

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-27-11

Landfill Area Start-Up Data

Siemens System

	Time	9:30					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	/					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	88					
	Flow (total)	2325193					
	Pressure (psi)	22					
RXN Tank 1: pH		7.32					
RXN Tank 1: ORP		~~[illegible]~~	590				
RXN Tank 2: pH		7.31					
Potassium Permanganate Feed (speed/stroke)		60/76					
Ferric Chloride Feed Rate (speed/stroke)							
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	15					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	24	1152264				
Microfiltration Trains 3 & 4		13					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	25					
	Permeate Flow Rate (gpm)	122008	7				
Neutralization Tank: pH		7.57					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	NM					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	120					
	Flow (total)	2571091					
	Pressure (psi)	40					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	105					
	Pressure (psi)	50	2754981				
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	56					
Other Conditions:							

* After readings turned Permanganate pump back down to 50/60.

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-27-11

Landfill Area Start-Up Data

Purifics System

	Time	9:50					
Bag Filter	Inlert (psi)	46					
	Outlet (psi)	47					
	Differential (psi)	-1					
Flow	Flow Rate (gpm)	55					
	Flow (total)	22475	90				
	Total Flow (gallons)						
Accumulator Tank Level	%	58					
DPCV (PV)	psi	44					
CRU (PV)	psi	50					
Inspect catalyst color							
Lamps	8-13						

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-28-11

Landfill Area Start-Up Data

Siemens System

	Time	11:60					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	85					
	Flow (total)	2403780					
	Pressure (psi)	22					
RXN Tank 1: pH		7.78					
RXN Tank 1: ORP		360					
RXN Tank 2: pH		7.29					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2		14					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	37					
	Permeate Flow Rate (gpm)	1197670					
Microfiltration Trains 3 & 4		13					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	25					
	Permeate Flow Rate (gpm)	1252966					
Neutralization Tank: pH		7.51					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	130					
	Flow (total)	2650900					
	Pressure (psi)	40					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	99					
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	94					
Filtrate Tank Pump:	Pressure (psi)	56					
Other Conditions:							

TABLE 4-1 MHDF Cone Reading 450ml. @ 30min.

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-28-11

Landfill Area Start-Up Data

Purifics System

	Time	11:10					
Bag Filter	Inlert (psi)	49					
	Outlet (psi)	51					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Flow (total)	2320262					
	Total Flow (gallons)						
Accumulator Tank Level	%	53					
DPCV (PV)	psi	46					
CRU (PV)	psi	50					
Inspect catalyst color	pale orange/brown						
Lamps	8, 13						

* Sent yesterdays metal samples + TSS sample off to Alpha Lab.

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-29-11

Landfill Area Start-Up Data

Siemens System

	Time	9:00					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	82					
	Flow (total)	2445392					
	Pressure (psi)	22					
RXN Tank 1: pH		880					
RXN Tank 1: ORP		305					
RXN Tank 2: pH		829					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2		14					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	37					
	Permeate Flow Rate (gpm)	1222894					
Microfiltration Trains 3 & 4		12					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	25					
	Permeate Flow Rate (gpm)	12696	94				
Neutralization Tank: pH		7.59					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	0					
	Flow (total)	26940	92				
	Pressure (psi)	0					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	101	3018625				
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	56					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-29-11

Landfill Area Start-Up Data

Purifics System

	Time	9:15					
Bag Filter	Inlert (psi)	46					
	Outlet (psi)	48					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	56					
	Flow (total)						
	Total Flow (gallons)	2359	039				
Accumulator Tank Level	%	65					
DPCV (PV)	psi	46					
CRU (PV)	psi	50					
Inspect catalyst color	Orange/brown						
Lamps 8-13							

* MtOF Cone @ 450ml. after 30 min.
** Acid washed (cleaned) Trains 3+4 of microfilter.

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6-29-11

Siemens System

	Time	3:15					
Influent Transfer Pump 1:	Flow Rate (gpm)	✓					
	Flow (total)						
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	92					
	Flow (total)	22					
	Pressure (psi)						
RXN Tank 1: pH		7.72					
RXN Tank 1: ORP		420					
RXN Tank 2: pH		7.91					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2		14					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	48					
	Permeate Flow Rate (gpm)	1232	853				
Microfiltration Trains 3 & 4		12					
	Process Pump Inlet Pressure (psi)	48					
	Process Pump Outlet Pressure (psi)	47					
	Permeate Flow Rate (gpm)	1273	280				
Neutralization Tank: pH		7.14					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	127					
	Flow (total)	2704360					
	Pressure (psi)	40					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	105					
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	56					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-29-11

Landfill Area Start-Up Data

Purifics System

	Time	3:25					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Flow (total)						
	Total Flow (gallons)	237212	7				
Accumulator Tank Level	%	58					
DPCV (PV)	psi	44					
CRU (PV)	psi	50					
Inspect catalyst color	Brown/orange						
Lamps 8-13							

Hach Readings

Influent Mn = .620 mg/L } 25% sample - 75% DI wate
Effluent Mn = .019 mg/L }
Influent Fe = 1.03 mg/L } 10% sample - 90% DI wate
Effluent Fe = .01 mg/L }

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-30-11

Landfill Area Start-Up Data

Siemens System

	Time	8:40					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	93					
	Flow (total)	25267	37				
	Pressure (psi)	22					
RXN Tank 1: pH		7.65					
RXN Tank 1: ORP		331					
RXN Tank 2: pH		7.55					
Potassium Permanganate Feed (speed/stroke)		50/60					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2		14					
	Process Pump Inlet Pressure (psi)	50					
	Process Pump Outlet Pressure (psi)	33					
	Permeate Flow Rate (gpm)	12678	58				
Microfiltration Trains 3 & 4		13					
	Process Pump Inlet Pressure (psi)	46					
	Process Pump Outlet Pressure (psi)	32					
	Permeate Flow Rate (gpm)	13016	53				
Neutralization Tank: pH		7.64					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	124					
	Flow (total)	2773	266				
	Pressure (psi)	46					
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	95					
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-30-11

Landfill Area Start-Up Data

Purifics System

	Time	8:55					
Bag Filter	Inlert (psi)	48					
	Outlet (psi)	50					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	60					
	Flow (total)						
	Total Flow (gallons)	24357	37				
Accumulator Tank Level	%	69					
DPCV (PV)	psi	43					
CRU (PV)	psi	50					
Inspect catalyst color	[redacted]	Clear (just acid washed 4320 gallons)					
Lamps 8-13							

MHOF - 450 ml. after 30 min.

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Landfill Area Start-Up Data

Date: 6-30-11
Afternoon Readings

Siemens System

	Time	13:41					
Influent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)	—					
	Pressure (psi)						
Influent Transfer Pump 2:	Flow Rate (gpm)	92					
	Flow (total)						
	Pressure (psi)	~~22~~					
RXN Tank 1: pH		8.56	*				
RXN Tank 1: ORP		340					
RXN Tank 2: pH		7.28					
Potassium Permanganate Feed (speed/stroke)		60/60					
Ferric Chloride Feed Rate (speed/stroke)		—					
Microfiltration Trains 1 & 2							
	Process Pump Inlet Pressure (psi)	14					
	Process Pump Outlet Pressure (psi)	50					
	Permeate Flow Rate (gpm)	35					
Microfiltration Trains 3 & 4							
	Process Pump Inlet Pressure (psi)	13					
	Process Pump Outlet Pressure (psi)	46					
	Permeate Flow Rate (gpm)	26					
Neutralization Tank: pH		6.63					
Effluent Transfer Pump 1:	Flow Rate (gpm)						
	Flow (total)						
	Pressure (psi)						
Effluent Transfer Pump 2:	Flow Rate (gpm)	128					
	Flow (total)	40					
	Pressure (psi)						
Plant Water Pump 1:	Flow Rate (gpm)	—					
	Pressure (psi)						
Plant Water Pump 2:	Flow Rate (gpm)	95					
	Pressure (psi)	50					
Sludge Thickener Feed Pump:	Pressure (psi)	76					
Filter Press Feed Pump:	Pressure (psi)	0					
Filtrate Tank Pump:	Pressure (psi)	58					
Other Conditions:							

* pH off because of Caustic drum transfer - should stabilize shortly. Off from [redacted] to 1:30 to 2:15

TABLE 4-1

W. R. Grace Superfund Site
Acton, Massachusetts

Date: 6-30-11

Landfill Area Start-Up Data

Purifics System

	Time	13:50					
Bag Filter	Inlert (psi)	45					
	Outlet (psi)	47					
	Differential (psi)	-2					
Flow	Flow Rate (gpm)	50					
	Flow (total)						
	Total Flow (gallons)	2449999					
Accumulator Tank Level	%	50					
DPCV (PV)	psi	44					
CRU (PV)	psi	50					
Inspect catalyst color	Clear						
Lamps	8-13						

Hach readings -

Mn IN = .670 mg/L } 25% sample
Mn Eff = .466 mg/L } 75% DI water

Fe IN = .90 mg/L } 10% sample
Fe Eff = .02 mg/L } 90% DI water

DRAFT

ATTACHMENT E

OPERATIONAL AND FUNCTIONAL MEMORANDUM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON MASSACHUSETTS 02109-3912

Memorandum

Date: May 25, 2012

Subj: W. R. Grace (Acton Plant) Superfund Site, Acton & Concord, Massachusetts

Re: Operational & Functional Determination (O&F) for the Landfill Area Groundwater Treatment System (LATS) Remedial Action, Operable Unit Three

From: Derrick Golden – Remedial Project Manager – OSRR 1

To: W. R. Grace (Acton Plant) Site File

cc: Bob Cianciarulo – Chief Massachusetts Superfund Section – OSRR 1
Larry Brill – Branch Chief – OSRR 1
Jenifer McWeeney – MassDEP
Barbara Weir - AECOM
Thor Helgason - De Maximis/W. R. Grace

In accordance with the *2006 Remedial Design/Remedial Action Statement of Work,* a pre-final/final inspection of the LATS remedial action was conducted by EPA at the site on May 24, 2012. The pre-final inspection shall also serve as the final inspection because there are no remaining punch list items to complete.

The purpose of this inspection was to determine if the system is operational and functional, in accordance with EPA OSWER Directive 9320.2-22, entitled: *Close Out Procedures for National Priorities List Sites*, dated May, 2011.

The following personnel were present for the final LATS inspection:

- **Derrick Golden – EPA**
- **Jenifer McWeeney – MassDEP**
- **Barbara Weir – AECOM**
- **Thor Helgason – De Maximis//W. R. Grace**
- **Bart Hoskins – EPA**
- **Deb Roberts - Roberts Environmental**

The above personnel made a visual inspection of the landfill area treatment system, located on the southeast portion of the W.R. Grace site, near the former Industrial landfill.

Upon our arrival, the LATS was extracting, treating and discharging to Sinking Pond at approximately 50 gallon per minute. The most recent effluent sampling

results from April 2012, indicate that all of the effluent discharge limits are being achieved. Also, the first round of toxicity testing was completed and three more toxicity tests will be conducted quarterly, to ensure the continued protection of aquatic life within Sinking Pond.

EPA, in conjunction with MassDEP has determined that the Landfill Area Groundwater Pump and Treatment System is now Operational and Functional.