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July 21, 2015

Mr. Michael Hinton
New York State Department of Environmental Conservation (NYSDEC)
Region 9
270 Michigan Avenue
Buffalo, New York 14203-2399

RE: Ekonol Polyester Resins Site (#V00653-9)
Site Management Plan

Dear Mr. Hinton:

Attached for your approval is the Site Management Plan (SMP) for the Ekonol Polyester Resins Site (Site) in Wheatfield, New York. The SMP provides a summary of Site remedial history, nature of Site contamination, and includes plans for long-term Institutional and Engineering Controls, monitoring, operations and maintenance, and reporting.

If you have any questions, please feel free to contact me at (716) 407-4990.

Sincerely,

George W. Hermance

George Hermance
Project Manager

Attachments

cc: M. Teeling, Atlantic Richfield Co.
S. Fiorenza, BP (e-copy)

Site Management Plan
Ekonol Polyester Resins, NYSDEC # V00653-9
6600 Walmore Road
Town of Wheatfield, Niagara County, New York

SUBMITTED TO:

NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION

DIVISION OF HAZARDOUS
WASTE REMEDIATION

SUBMITTED BY:

Atlantic Richfield Company

A BP affiliated company

201 Helios Way
Houston, TX 77079

PREPARED BY:

PARSONS

40 La Riviere Drive, Suite 350
Buffalo, New York 14202

July 2015

Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date

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SECTION 1
INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at Ekonol Polyester Resins (Site) under the New York State (NYS) Voluntary Cleanup Program (VCP) administered by New York State Department of Environmental Conservation (NYSDEC). The Site was remediated in accordance with Voluntary Cleanup Agreement (VCA) #V00653-9, which was executed between BP America, Inc. (aka Atlantic Richfield Company) and the NYSDEC on September 10, 2003.

1.1.1 GENERAL

Atlantic Richfield Company (ARC) entered into the VCA with the NYSDEC to remediate the property defined in the VCA located in Wheatfield, Niagara County, New York. The VCA required ARC to investigate and remediate contaminated media. Figure 1 shows the Site location. Figure 2 shows the boundaries of the parcels that make up the 15.2 acre Site. The boundaries are more fully described in the metes and bounds (Appendix A) Site description that is part of the restrictive covenant.

After completion of the remedial work described in the Remedial Action Work Plan (Parsons, 2010A), some contamination was left in the subsurface, which is hereafter referred to as ‘remaining contamination.” This Site Management Plan (SMP) was prepared to manage remaining contamination until the restrictive covenant is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. All reports associated with the Site can be viewed by contacting NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared on behalf of ARC, in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated June 10, 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the restrictive covenant.

1.1.2 PURPOSE

The Site contains residual contamination following completion of the remedial action. Engineering Controls have been incorporated into the remedy to mitigate exposure of the residual contamination during the use of the Site to ensure protection of public health and the environment. A deed restriction granted to NYSDEC, and recorded with the Niagara County Clerk, will require compliance with this SMP and all ECs and ICs placed on the Site. The ICs place restrictions on use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the restrictive covenant for residual contamination. This plan has been/will be approved by the NYSDEC, and compliance with this plan is required by the grantor of the restrictive covenant and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of the procedures required to manage residual contamination following completion of the remedial action, including: (1) implementation and management of ECs and ICs; (2) media monitoring; (3) operation and maintenance of treatment, collection, containment, or recovery systems; (4) performance of periodic inspections, certification of results, and submittal of Annual Monitoring Reports; and (5) defining criteria for termination of treatment system operations.

To address these needs, this SMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; and (3) an Operation, Monitoring and Maintenance Plan for continued implementation of the remedy.

This plan also includes a description of reporting requirements for the periodic submittal of data, inspections, and certifications to NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the restrictive covenant. Failure to properly implement the SMP is a violation of the restrictive covenant, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of ECL, 6NYCRR Part 375 and the VCA (Index #V00653-9) for the site, and thereby subject to applicable penalties.

1.1.3 REVISIONS

Revisions to this plan will be proposed in writing to NYSDEC's project manager. In accordance with the restrictive covenant for the site, NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

1.2.1 SITE LOCATION AND DESCRIPTION

The Site is located in the County of Niagara, New York and is part of Lot 53, Township 13, Range 8 of the Holland Land Company's survey. It is located within parent parcel 146.00-1-9.2 on the Town of Wheatfield Tax Map. The parent parcel is an approximately 55.1 acre area bounded by Niagara Falls Air Reserve Station to the north, Bell Aerospace to the south, Walmore Road to the east, and the Niagara Falls International Airport to the west (see Figure 1). The deed restrictions for the Site apply to the identified parcels within the parent parcel. Figure 2 shows the boundaries of the parcels that make up the 15.2 acre Site within the parent parcel covered in this SMP. The boundaries are more fully described in Appendix A – Metes and Bounds.

1.2.2 SITE HISTORY

The former secondary containment tank received wastewater rinsates from floor drains inside the process area of the Ekonol plant. The tank was installed prior to 1977, and remained in use until October 1999. According to Frontier (2000), the tank was constructed of reinforced concrete walls, approximately 9.5 inches thick. The interior dimensions were approximately 18 feet long, 6 feet wide, and 9 feet deep (Frontier, 2000). At capacity, the maximum volume was 7,794 gallons (Frontier, 2000). The tank was an open top, rinsate collection point covered with large steel plates. The walls and floor were sound, with no obvious cracking or fractures.

At the time the tank was removed, there was no protective coating visible on the inside walls or floor (Frontier, 2000). Following the tank removal, additional excavation removed impacted soils surrounding the tank. Approximately 180 cubic yards of material were removed from the area around the tank. Frontier (2000) reported the size of the excavation as 29 feet long (east to west) 16 feet wide (north to south) and 12.7 feet deep (surface to bedrock).

During the tank removal, TCE was detected in concentrations ranging from 1.2 to 200 mg/kg in soil samples collected from the excavation walls (Frontier, 2000). Cis-1,2-DCE was detected at levels ranging from 2.9 to 100 mg/kg. Phenols were detected at concentrations ranging from 4.5 to 12 mg/kg. The reports associated with the previous investigations are listed below in Section 1.3.

1.2.3 GEOLOGIC CONDITIONS

GEOLOGY

The overburden deposits consist of silty red-brown clay, with gray silty clay lenses with a fine sand and gravel at the interface with bedrock. In previous investigations, the observed overburden thickness ranged from 12.5 feet to 18.7 feet below ground surface (bgs).

The Middle Silurian Lockport Group lies beneath overburden throughout the Niagara Falls area and mostly consists of relatively competent dolomitic rock. The Lockport consists of about 160-175 feet of massive to medium bedded, argillaceous dolomite with minor amounts of dolomitic limestone and shale (Brett et. al., 1995). Regionally, the Lockport is dark-grey to brownish-grey, fine to medium grained with medium to thick bedding, poorly preserved fossils, stylolites, carbonaceous partings, vugs, gypsum seams, metal sulfides, and stromatolites. The group strikes approximately east to west dipping south at approximately 25 feet/mile. Fractures consist predominately of horizontal bedding plane fractures with a minor component of near vertical jointing. The Lockport Group is divided into five principal members, of which the Guelph and Eramosa are the uppermost units in the region.

The Lockport Group Zone 1 has a horizontal fracture zone near the stratigraphic contact with Zone 2. Zone 1 is a water-bearing zone. Core samples collected during characterization activities were largely from Zone 1. Downhole geophysical and televiewer surveys completed during the RAR (Parsons, December 2006) identified a significant fracture at approximately 10 to 15 feet below top of rock near the bottom of Zone 1. Zone 2 is described as massive and relatively unfractured; however, intermittent high angle vertical fractures do penetrate Zone 2. Zone 2 is approximately 10 to 25 feet thick (Yager, 1996). A geologic section is shown in Figure 3.

HYDROGEOLOGY

In bedrock, the regional groundwater flow direction is to the south, at a hydraulic gradient of approximately 0.01 feet/foot (Golder, 1991). In the bedrock water-bearing zone, the gradients are low, and groundwater flow is dependent upon the interconnection of fractures. Variability in flow direction may occur due to variability in fractures intercepted and the hydraulic conductivity of the bedrock. Previous investigations at the Site revealed a low hydraulic gradient with flow direction generally to the south (0.001). The range of transmissivity calculated for bedrock during pulse interference testing (RAR 2006) was 5.60×10^1 ft^2/day to 1.17×10^3 ft^2/day. As stated above, downhole geophysical and televiewer surveys during the RAR identified a significant fracture at approximately 10 to 15 feet below top of rock at both MW-7D and MW-21D. This fracture may be continuous across the Site and related to part of a water-bearing zone identified previously during drilling operations and packer testing. Groundwater flow figures are shown in Figure 4 (overburden) and Figure 5 (bedrock).

1.3 SUMMARY OF SITE CHARACTERIZATION FINDINGS

Site Characterization work was performed to characterize the nature and extent of contamination at the site. The results of the Site Characterization are described in detail in the following reports (summarized below):

- A Phase I Site Characterization determined the extent of site contaminants in soil and groundwater proximal to the former containment tank (Parsons, 2001). In soils, concentrations of VOCs (TCE and total 1,2-DCE) and two SVOCs (aniline and phenol) were above NYSDEC TAGM 4046 cleanup objectives in one or more soil samples. In groundwater, concentrations of several VOCs, three SVOCs, lead, and zinc were above their respective standards. The highest concentrations in soil and groundwater were observed nearest the former containment tank or its associated piping, and the approximate limits were defined by the site characterization work.

- A two-stage Phase II site characterization further defined the extent of residual contaminants related to the former containment tank. Data from the first stage of the Phase II investigation showed impacts to groundwater including the presence of dense non-aqueous phase liquid (DNAPL). The second stage of Phase II further defined the extent of impacts to groundwater in both the shallow water-bearing zone in overburden and the deep water-bearing zone in bedrock. The work included groundwater screening at anticipated well locations followed by well installation (Parsons, 2003).

- A Phase III characterization determined the extent of the dissolved phase groundwater plume. During the Phase III work, a qualitative exposure assessment which described the potential exposure setting, exposure pathways, and fate and transport of Site chemicals of concern (COCs) was completed (Parsons, 2004a, Parsons, 2004b).

Subsequent to the Phase III work, the Remedial Alternatives Report (RAR) (Parsons, 2006a, 2006b, and 2007) was completed, comparing various available remedial technologies pertinent to the site. Previous excavation in the source area had removed a significant volume of impacted soils, leaving groundwater as the primary media to address. These documents concluded that a trench bioreactor was the preferred treatment for shallow groundwater, and *in situ* bioremediation using injection of a carbon source with subsequent bioaugmentation was deemed the most appropriate option for bedrock groundwater.

The in situ bioremediation treatment for bedrock groundwater was evaluated with a pilot scale test. Results of the *in situ* bioremediation pilot test in bedrock groundwater were provided to the NYSDEC in April 2009 (Parsons 2009), and updated with subsequent monitoring data reported in August and December 2009. Following the pilot test, NYSDEC approved the remedial action work plans (Parsons, 2010a, 2010b, and 2011) for full-scale implementation of the bioremediation treatments in both shallow and bedrock groundwater.

Full-scale implementation of both bioremediation treatments took place in 2011. Per the RAR, the bioreactor treats shallow groundwater while the bedrock injection wells treat groundwater in bedrock.

1.4 SUMMARY OF REMEDIAL ACTIONS

The site was remediated in accordance with NYSDEC-approved Remedial Alternatives Report (RAR) dated February 2007. Remedial activities were completed at the site in April 2011. The remedial system construction, installation and monitoring are described in the construction completion and initial performance assessment report (August 2012). The primary impacted media at the Site are shallow groundwater within the overburden material, and deeper groundwater within the fractured bedrock. The overall objective of the remedial action was to reduce the concentration of COCs to the point where monitored natural attenuation can be implemented until the concentrations of COCs in groundwater are below the remedial goals outlined in the RAR (Parsons, 2006). The following Remedial Action Objectives (RAOs) were identified in the 2006 Remedial Alternatives Report.

- RAO 1: Eliminate or reduce, to the extent practical, potential risks to human health and the environment from impacted soil and groundwater.

- RAO 2: Reduce the migration of COCs from the soil to the groundwater, to the extent practical.

- RAO 3: Reduce concentrations of COCs in groundwater to be protective of human health, to the extent practical.

To meet these RAOs, three remedial techniques are being used: 1) a bioreactor consisting of parallel overburden trenches filled with a mixture of gravel and organic mulch, 2) injection wells drilled into bedrock with subsequent injection of a soluble/slow-release organic substrate and microorganisms into groundwater, and 3) engineering controls. The following is a summary of the Remedial Actions performed at the site:

- **Installation of a passive bioreactor for treatment of shallow groundwater** The bioreactor is comprised of two parallel trenches backfilled with a mixture of gravel, sand, and wood chip mulch emplaced below the water table downgradient and side gradient of the former secondary containment tank. The location of the bioreactor is shown in Figure 6. Mulch provides organic substrate to support the microbiological growth and enhance the rates of in situ biodegradation of COCs. The limestone gravel provides geotechnical strength and enhances the permeability of the bioreactor. Additionally, eight wells were installed in the excavation in the event that an additional carbon source needs to be added to the bioreactor by injection of substrate. Surface completion of the bioreactor included paving as an engineering control.
- **In situ bioremediation treatment of bedrock groundwater** The bedrock remediation consists of adding emulsified vegetable oil and other nutrients to a fractured bedrock zone. In the bedrock, an emulsified vegetable oil (carbon source) was used to create and sustain a reaction zone that supports contaminant biodegradation, as was observed in the pilot test (Parsons, 2009). The bedrock treatment area, inclusive of the former containment tank, is shown in Figure 7.
- **Performance monitoring (i.e. groundwater sampling) of the remediation systems** In addition to focusing monitoring on the area near the former containment tank, the pilot test area will also be monitored, and if necessary, additional substrate may be added to sustain COC degradation as well as a microbial consortium, including both *Dehalococcoides* and *Dehalobacter* species to either remediation zone (overburden or bedrock) if monitoring data indicate that the conditions warrant it.

The realization of the RAOs will be achieved by targeting the Preliminary Remediation Goals PRGs) established in the RAR. Since the PRGs were developed (2006), NYSDEC has introduced new soils cleanup criteria with the Brownfields Cleanup Program (BCP). The BCP soils criteria will also be considered. These are the PRGs:

- PRG 1: Achieve NYSDEC Technical Administrative and Guidance Memorandum (TAGM) 4046 cleanup objectives for Site soils, to the extent practical. The COCs for soil and the corresponding TAGM values are listed below.
- PRG 2: Achieve NYSDEC Class GA groundwater quality standards for shallow (overburden) and deep (bedrock) groundwater for the COCs, to the

extent practical. The COCs for groundwater, and the corresponding groundwater quality standards, are listed below.

Table 1-1: Preliminary Remediation Goals

COC	**PRG 1 - Soil**	**PRG 2 - Groundwater**
1,1-dichloroethane	200 ug/kg	5 µg/L
1,2-dichloroethene (total)	300 ug/kg	5 µg/L
1,1,1-trichloroethane	800 ug/kg	5 µg/L
trichloroethene	700 ug/kg	5 µg/L
vinyl chloride	200 ug/kg	2 µg/L
aniline	100 ug/kg	5 µg/L
phenol	30 ug/kg or MDL	1 µg/L

SECTION 2
ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

The Engineering and Institutional Control (EC/ICs) Plan describes the procedures for the implementation and management of all EC/ICs at the site. The EC/IC Plan is one component of the SMP and is subject to revision by stakeholders and NYSDEC. This plan provides:

- A description of the Engineering and Institutional Controls (EC/ICs);
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs and ECs set forth in the Declaration of Covenants and Restrictions;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work; and
- Other provisions necessary to identify or establish methods for implementing the EC/ICs required by the remedy.

2.2 INSTITUTIONAL CONTROLS

Institutional Controls (ICs) are required by the Voluntary Cleanup Agreement to: (1) implement, maintain and monitor remedial systems; (2) prevent future exposure to remaining impacts by controlling disturbances of the subsurface; and, (3) limit the use and development of the site to restricted commercial uses. The Declaration of Covenants and Restrictions (see Appendix B), which will be recorded and run with the land, contains the following requirements:

- Limitation to non-residential use;
- Prohibition on the use of groundwater;
- Restrictions on the management of excavated soils; and
- Restrictions on new building construction.

The institutional controls will apply within the environmental easement boundary shown in Figure 8. The survey map and draft description of the easement boundary are provided in Appendix A. The institutional controls imposed on the site include:

- Commercial use of the property provided that the long-term Engineering and Institutional Controls included in this SMP are employed.

- The property may not be used for a higher level of use, such as unrestricted or restricted residential use.
- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- The use of the groundwater underlying the property is prohibited;
- New office or non-manufacturing construction in the areas noted in Figure 8 must have a vapor barrier installed;

Institutional Controls identified in the restrictive Declaration of Covenants and Restrictions may not be discontinued without an amendment to or extinguishment of the covenant.

2.3 ENGINEERING CONTROLS

Within the environmental easement boundary, engineering controls (ECs) will be implemented in the area illustrated in Figure 9. The engineering controls include maintenance of the asphalt cap over the bioreactor. A map and draft description of the engineering control boundary is provided in Appendix A. The Declaration of Covenants and Restrictions containing the description of the ICs and ECs is provided in Appendix B.

2.4 SOILS MANAGEMENT

Future intrusive work that might penetrate the bioreactor cap, or potentially encounter or disturb potentially impacted soils, including any modifications or repairs to the existing cover system, will require that ARC be notified. The Site Soil Management Plan has been included as Appendix C. A qualified environmental professional will observe the excavation activity as the soils are removed. This person will record their observations regarding the types of soils encountered, and whether there is any visual or olfactory evidence that the soils may have been impacted by COCs. Observations regarding staining of soils, the presence of water, and encountered utilities will be recorded.

Soils that exhibit obvious visual or olfactory signs of impacts or have sustained photoionization detector (PID) readings above 10 PPM will not be used as backfill for excavations. Soils not used as backfill that exhibit visual or olfactory signs of impacts or have sustained PID readings above 10 PPM will be staged for subsequent characterization and proper disposal. Staged soils to be characterized for disposal will be placed on plastic sheeting and covered with plastic, or contained in a roll-off container or drums.

The parties performing the work are responsible for the safe performance of all intrusive work. The Site owner should notify ARC of any site development activities to ensure that they will not interfere with, or otherwise impair or compromise, the engineering controls and remedial systems.

2.5 NEW CONSTRUCTION

The property owner or developer will be responsible for installing a vapor barrier or other mitigation measures on all new building construction as per New York State Department of Health Guidance.

2.6 INSTITUTIONAL AND ENGINEERING CONTROLS OPERATIONS AND MAINTENANCE

Procedures for operating and maintaining the bioreactor, sub-slab depressurization (SDD), and injection well systems are documented in the Operation and Maintenance Plan (Section 4 of this SMP). Procedures for monitoring the systems are included in the Site Monitoring Plan (Section 3 of this SMP). The Site Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls, occurs.

2.7 INSPECTIONS AND NOTIFICATIONS

2.7.1 INSPECTIONS

Inspections of all remedial components installed at the site will be conducted at the frequency specified in the SMP Monitoring Plan schedule (see Section 3). A comprehensive site-wide inspection will be conducted annually. The inspections will determine and document the following:

- Whether Engineering Controls continue to perform as designed;
- If the controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Declaration of Covenants and restrictions;
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- Site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring system.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Inspections, Reporting, and Certifications section (Section 5).

In Case of Emergency: If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the site will be conducted within five days of the event. The inspection will verify the effectiveness of the EC/ICs, and will be conducted by a qualified environmental professional.

2.7.2 NOTIFICATIONS

Notifications will be submitted to NYSDEC by the appropriate party as needed. Notifications will include:

- 60-day advance notice of proposed changes in Site use that are required under the terms of the Voluntary Cleanup Agreement (VCA), 6NYCRR Part 375, and/or Environmental Conservation Law.
- 21-day advance notice of proposed ground-intrusive activities.
- Notice within 48-hours of damage or defect to the foundations or structures that reduces or have the potential to reduce the effectiveness of other ECs. A similar notice should be provided for proposed actions to mitigate the damage or defect.
- Verbal notice by noon of the following day of an emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to an emergency event requiring ongoing responsive action shall be submitted to NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.
- Change in the ownership of the site or the responsibility for implementing the remedy as soon as practical or within 30 days.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.8 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.8.1 EMERGENCY TELEPHONE NUMBERS

In the event of any environmentally related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to a qualified environmental professional. These emergency contact lists must be maintained in an easily accessible location at the site.

Table 2-1: Emergency Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

Table 2-2: Contact Numbers

Remediation Management Incident Reporting List - Ekonol				
All incidents occurring on an RM project or site shall be reported according the HSSE Expectations found on www.gemhse.com				
As a minimum, all injuries, spills greater than 1 barrel and all property damage greater than $500 should be reported to RM management **immediately**.				
Additionally, Notices of Violation and any incident which could be reported in the media should be reported immediately.				
Reporting must be done to a person and not via voice message, email or fax. One must ensure contact is made.				
If you unable to contact the first contact on the list, then you should attempt to call the next person on the list.				
Remediation Management Organization Notification				
Position	**Person**	**Office**	**Cell Phone**	**Home**
Project Manager	Mike Teeling	585-813-8140	585-813-8140	585-813-8140
Deputy Operations Manager	Chuck Stilwell	713-323-0062	713-998-2443	
Operations Manager	Alan Delisle	281-504-4284	281-995-4583	
VP Global Operations	Andy Fiedler	281-366-1892	823-576-0523	
HSSE Advisor	Kevin Murphy	630-420-4328	224-358-5010	
BP Naperville 24 Hour Notification Center		800-321-8642		
Supplier Organization Notification				
Company & Position	**Person**	**Office**	**Cell Phone**	**Home**
Parsons Project Manager	George Hermance	716-407-4990	716-861-7882	
Parsons Program Manager	Scott Hartsough	513-552-7001	513-368-9861	513-759-2588
Parsons Program Safety Manager	Greg Ertel		585-353-2574	
Parsons Project Safety Officer	Robert Piurek	716-541-0737	716-983-9223	
Ekonol Facility Operations				
Company & Position	**Person**	**Office**	**Cell Phone**	**Home**
Emergency Coordinator/Plant Manager, Saint Gobain	Tim Vitorino	716-731-8220	413-230-4132	
Saint Gobain, HSE	Doug Wright	716-731-8208	716-438-8003	
Saint Gobain/Ekonol	Ross Karapidis	716-731-8204	716-536-4685	
Saint Gobain/Regional HSE	Joe Sabbatis	716-691-2067	716-316-3051	
Patriot Equities, property owner	Mike Kolar	484-615-1204	610-955-8909	
Other useful numbers for this portfolio				
Company & Position	**Person**	**Office**	**Cell Phone**	**Home**
BP Gov't and Public Affairs	Maria Antonieta Viso	281-366-4744	281-901-4737	
BP Gov't and Public Affairs	Neil Geary	281-504-8782	281-513-9727	
BP Gov't and Public Affairs	Bob Miner	314-367-8082	314-280-3768	
BP Legal Attorney	Vilia Drazdys	630-420-5918	630-991-8014	
BP Legal Attorney	James Lucari	630-420-5204	630-815-8973	
BP Legal Attorney	Doug Reinhart	630-420-5457	630-815-2658	
Hospital	Emergency	716-297-4800 (main)	716-298-2325 (ER)	

* Note: Contact numbers subject to change and should be updated as necessary

2.8.2 MAP AND DIRECTIONS TO NEAREST HEALTH FACILITY

Site Location: 6600 Walmore Road, Wheatfield, New York

Nearest Occupational Medicine Facility Name: Comprehensive Occupation Medicine

Facility Location: 51 Webster Street, North Tonawanda, New York 14120

Facility Telephone: (716) 692.6541

Directions to the Occupational Health Facility:

1. Start out going towards Niagara Falls Blvd.
2. Turn right onto Cayuga Drive.
3. Turn left onto Williams Road
4. Turn left at NY-265 S/NY S/River Road
5. Slight right at Webster St.
6. End at Comprehensive Occupational Medicine, 51 Webster St.

Total Distance: 7.7 miles

Total Estimated Time: 16 minutes

Full View; Route to Occupational Health Facility

Nearest Hospital Name: Mount Saint Mary's of Niagara Falls

Hospital Location: 5300 Military Road, Lewiston, New York 14092

Hospital Telephone: (716) 298-2325

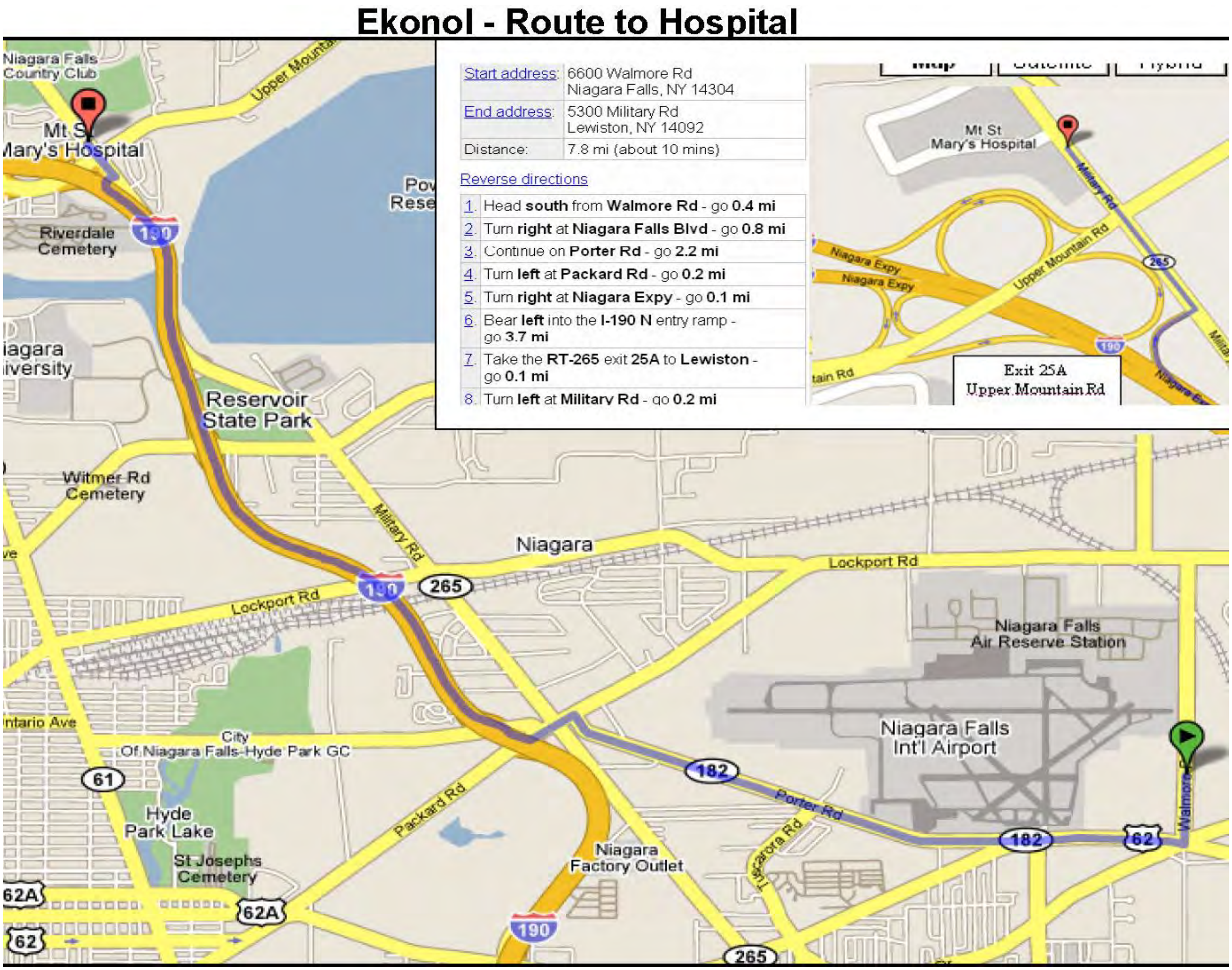
Directions to the Hospital:

1. Start out going SOUTH on WALMORE RD.
2. Turn RIGHT onto NIAGARA FALLS BLVD.
3. Continue on PORTER RD.
4. Turn LEFT at PACKARD RD.
5. Turn RIGHT at NIAGARA EXWY.
6. Bear LEFT into the I-190 NORTH Ramp.
7. Take the RT-265 exit- EXIT 25A- toward LEWISTON.
8. Turn LEFT onto MILITARY RD / NY-265.
9. End at 5300 Military Rd, Lewiston, NY 14092.

Total Distance: 7.8 miles

Total Estimated Time: 10 minutes

Map Showing Route from the site to the Hospital:



Ekonol - Route to Hospital

Start address:	6600 Walmore Rd Niagara Falls, NY 14304
End address:	5300 Military Rd Lewiston, NY 14092
Distance:	7.8 mi (about 10 mins)

Reverse directions

1. Head **south** from **Walmore Rd** - go **0.4 mi**
2. Turn **right** at **Niagara Falls Blvd** - go **0.8 mi**
3. Continue on **Porter Rd** - go **2.2 mi**
4. Turn **left** at **Packard Rd** - go **0.2 mi**
5. Turn **right** at **Niagara Expy** - go **0.1 mi**
6. Bear **left** into the **I-190 N** entry ramp - go **3.7 mi**
7. Take the **RT-265** exit **25A** to **Lewiston** - go **0.1 mi**
8. Turn **left** at **Military Rd** - go **0.2 mi**

2.8.3 RESPONSE PROCEDURES

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan Section (Table 2-1). The list will also be posted prominently at the site and made readily available to all personnel at all times.

In the event of an emergency:

- Leave area if danger exists, move to parking area or other safe locations (e.g., Muster Point).
- Call 911 if warranted, communicate emergency to co-workers and other site personnel.
- Exit the building through the nearest exit.
- All on-site personnel will meet at parking area in front at the new main entrance.
- If evacuation of the site is necessary, all on-site personnel will proceed to the field on the other side of Walmore Road.
- Field health and safety person (or team leader) will conduct a role call and confirm all persons are accounted for.
- Await fire and/or police teams, prepare to guide them and/or inform them of current conditions.

SECTION 3
SITE MONITORING PLAN

3.1 INTRODUCTION

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination, and to monitor the soil cover system and all affected media identified below. Monitoring of other Engineering Controls is described in Section 4 (Operation and Maintenance Plan). This Monitoring Plan may only be revised with the approval of NYSDEC.

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of applicable media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing progress toward the RAOs and the applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater quality standards;
- Assessing achievement of the remedial performance criteria;
- Evaluating information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities.

To address these methods, this Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on designed monitoring systems (e.g., well logs);
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Inspection and maintenance requirements for monitoring wells; and
- Annual inspection and periodic certification.

Monitoring of the performance of the remedy and overall reduction in contamination will be conducted on a semi-annual basis (two times a year). Trends in contaminant levels in shallow and deep groundwater will be evaluated to determine if the remedy continues to be effective in progressing toward remedial goals. Monitoring programs are summarized in Table 3-1 and outlined in detail in Sections 3.2 and 3.3 below.

Table 3-1: Monitoring/Inspection Schedule

Monitoring Program	Frequency*	Matrix	Analysis
Injection and Selected Monitoring Wells	Semi-Annual	Groundwater	VOCs, TOC, dissolved gases (methane, ethane, ethene), and dissolved inorganics (iron and potassium). Sulfate, sulfide, and microbial population sampled annually. See sample matrix.
Bioreactor and Injection/Monitoring Well Inspection	Semi-Annual	Groundwater	See Above
Bioreactor Cover and Injection/Monitoring Well Inspection	Semi-Annual	NA	NA
Sub-slab Depressurization System Operations and Maintenance	Semi-Annual	Soil Vapor	See System O&M Plan (Appendix D)
In Case of Emergency	As Needed	All	NA

* The frequency of events will be as specified until otherwise approved by NYSDEC and NYSDOH

3.2 MEDIA MONITORING PROGRAM

3.2.1 GROUNDWATER MONITORING

Groundwater monitoring will be performed on a semi-annual basis (two times per year) to assess the performance of the remedy. The monitoring wells, performance wells, and injection wells will be sampled in accordance with the Sampling and Inspection Plan and sampling matrix provided in Appendix E. In the spring of each year, the full group of wells identified in the Sampling Plan will be sampled. A subset of these wells will only be sampled during the spring sampling event. For each event, groundwater samples will be submitted to a qualified laboratory for analysis of volatile organic compounds (VOCs), total organic carbon (TOC), dissolved gases (methane, ethane, and ethene) and dissolved inorganic compounds (iron and potassium). An additional number of parameters will be included once per year. Samples will also be submitted to specialty laboratories for analysis of microbial population counts once per year in the spring. Results of the monitoring will be included in an annual monitoring report.

The sampling frequency may be modified with approval from NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

Bioreactor Performance Monitoring Wells

Twenty-two shallow monitoring wells were installed to provide information related to the performance of the bioreactor. The wells were installed in accordance with the February 2010 RAWP. Sixteen wells were installed inside the bioreactor, one well was installed upgradient of the bioreactor, and five wells were installed downgradient. The locations of the bioreactor performance monitoring wells are shown in Figure 10. Boring logs for the bioreactor performance monitoring wells are provided in Appendix E.

Bedrock System Monitoring Wells

The locations of the injection boreholes and bedrock groundwater monitoring wells are shown in Figure 11. The well spacing was based on the area of influence achieved in the pilot test, and an anticipated southern groundwater flow direction.

Eight injection/withdrawal wells (INJ-06D through INJ-13D) were installed to treat the bedrock groundwater in proximity to the former containment tank. The eight wells are distributed across the front of the Ekonol building near the location of the former tank. Monitoring wells PMW-8D through PMW-18D were installed to be used in combination with injection / withdrawal wells INJ-06D through INJ-13D, along with existing monitoring wells, to monitor the performance of the remediation. Boring and well construction information for the wells are provided in Appendix E.

3.2.1.1 SAMPLING PROTOCOL

Monitoring well sampling activities will be recorded in a field book, and a groundwater-sampling log as presented in Appendix E will be completed. Other observations (e.g., well integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network. Sampling protocol details are presented in the Sampling and Inspection Plan (Appendix E).

3.2.1.2 MONITORING WELL REPAIRS, REPLACEMENT AND DECOMMISSIONING

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event or conditions render the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent annual report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be re-installed in the nearest available location, unless otherwise approved by NYSDEC.

3.2.2 IN CASE OF EMERGENCY

In Case of Emergency: If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the site will be conducted within five days of the event. The inspection will verify the effectiveness of the EC/ICs, and will be conducted by a qualified environmental professional.

3.3 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed after severe weather conditions that may affect Engineering Controls or monitoring devices. During these inspections, an inspection form will be completed (Appendix E). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection;
- Compliance with permits and schedules included in the Operation and Maintenance Plan (Section 4); and
- Site records are up to date.

3.3.1 BIOREACTOR AND INJECTION/MONITORING WELL INSPECTION

During each sampling event, the onsite remedial systems will be inspected. To maintain the ECs in the defined area, the surface conditions above the bioreactor trenches will be inspected for settlement. The surface protective casing for injection and monitoring wells will also be inspected for damage. The need for well maintenance and/or repair will be assessed. Any repairs to the asphalt cover for the bioreactor and well maintenance or repair activity will be documented and noted in the annual monitoring report.

3.3.2 SUB-SLAB DEPRESSURIZATION SYSTEM AND MAINTENANCE

During the semi-annual groundwater sampling events, the sub-slab depressurization system installed outside the environmental easement area in the Saint Gobain building will be inspected in accordance with the NYSDEC-approved operations and maintenance plan for the system (see Appendix D). During each visit, inspections will be conducted to document that the system is in good working order. A visual inspection of the system's interior and exterior components will be conducted. Also, during each routine visit, operations monitoring will be conducted. Per the Operations and Maintenance plan (see Appendix D), inspection will consist of recording the U-Tube manometer measurements and smoke-stick testing to check for the presence of back-drafts, leaky fittings, and flow into any visible cracks in the floor or walls. The system will be shut down temporarily to confirm that the audible alarm functions as designed. The property owner will be notified for resolution of any repairs or maintenance needs resulting from the inspection.

3.4 QUALITY ASSURANCE/QUALITY CONTROL

Sampling and analyses will be performed in accordance with the requirements of the Quality Assurance Project Plan (QAPP) (Appendix F). The main components of the QAPP include:

- QA/QC Objectives for Data Measurement;
- Sampling Program;
- Sample Tracking and Custody;
- Calibration Procedures;
- Analytical Procedures;
- Preparation of a Data Usability Summary Report (DUSR);
- Internal QC and Checks;
- QA Performance and System Audits;
- Preventative Maintenance Procedures and Schedules; and
- Corrective Action Measures.

3.5 MONITORING REPORTING REQUIREMENTS

One annual summary report will be prepared following the second semi-annual sampling event. The annual summary report will discuss COC biodegradation and the progress made in groundwater remediation, operations and maintenance activities, and summarize the activities completed as part of this SMP with regard to the engineering controls inspections and certifications of the Institutional controls.

Forms and other information generated during regular monitoring events and inspections will be maintained in project files, and submitted with the annual report, if applicable to the report and data interpretations.

Data collection, field and laboratory analysis, and data management will be conducted in accordance with the procedures described in the approved QAPP (see Appendix F).

For each monitoring event, a data usability summary report (DUSR) will be completed in accordance with the approved RAWP (Parsons, 2010a) and the NYSDEC DUSR guidelines.

Monitoring results will be reported to NYSDEC within 120 days after completion of the fall annual sampling event. The report will include, at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.);
- Copies of applicable field forms completed (e.g., groundwater sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Annual EC/IC certification forms;
- Observations, conclusions, or recommendations; and
- An evaluation as to whether groundwater conditions have changed since the last reporting event.

Laboratory data will be submitted electronically in the NYSDEC-required format, independently of the annual report. A summary of the monitoring program deliverables are summarized in Table 3-2 below.

Table 3-2: Schedule of Monitoring/Inspection Reports

Task	Reporting Frequency*
Groundwater Sampling; Bioreactor and Injection/Monitoring Well Inspection; Sub-slab Depressurization System Operations and Maintenance	Annual
Site Wide Inspection	Included in Annual Monitoring Report (once a year, after annual sampling event)

* The frequency of events will be as specified until otherwise approved by NYSDEC

SECTION 4
OPERATION AND MAINTENANCE PLAN

4.1 INTRODUCTION

This Operation and Maintenance Plan describes the measures necessary to operate, monitor and maintain the various components of the remedy. A copy of this SMP and related documents will be kept with the property owner and ARC. This section on Operation and Maintenance:

- includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the sub-slab depressurization system;
- includes the steps necessary to allow individuals unfamiliar with the site to operate and maintain the engineering and institutional controls defined for the Site;
- includes an operation and maintenance contingency plan; and
- will be updated periodically to reflect changes in or the manner in which the remedial systems are operated and maintained.

4.2 ENGINEERING CONTROLS SYSTEM OPERATION AND MAINTENANCE

A sub-slab depressurization (SSD) system was installed within the office area of the building currently being leased by St. Gobain. The purpose of the SSD system is to limit the potential for migration of volatile organic compounds (VOCs), primarily tetrachloroethene (PCE) from soil gas into indoor air in the office area of the building. The Operations, Maintenance and Monitoring plan for the SSD system is included in Appendix D

The engineering controls also include maintenance of the asphalt cap over the bioreactor. A map and draft description of the engineering control boundary is provided in Appendix A. Maintenance of the asphalt cap includes inspection and pavement repair, as needed, over the bioreactor.

4.3 ENGINEERING CONTROL SYSTEM PERFORMANCE MONITORING

The SSD system, monitoring/injection wells, and asphalt cover will be inspected twice a year, concurrently with the groundwater monitoring. Unscheduled inspections and/or sampling may occur when a suspected failure of the control systems has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

If equipment readings are not within their typical range, equipment is observed to be malfunctioning, or the system is not performing within specifications and needs repair, maintenance and repairs will be instituted as soon as feasible to return the system and controls to normal operations.

The SSD system has a warning device to indicate that the system is not operating properly. In the event that the warning device is activated, applicable maintenance and repairs will be conducted, by the property owner as specified in the Operation and Maintenance Plan (see Appendix D). NYSDEC will be advised of operational problems in subsequent reporting.

4.4 NON-ROUTINE MAINTENANCE REPORTS

In the event of any non-routine maintenance work being completed, a non-routine maintenance report will be submitted to NYSDEC. The following information will be included on the standard inspection form.

- Date;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Presence of leaks;
- Date of leak repair;
- Other repairs or adjustments made to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and,
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

SECTION 5
INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 INSPECTION FREQUENCY

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 and 4 of this SMP. At a minimum, a site-wide inspection will be conducted annually. Inspections of remedial components will also be conducted when a breakdown of any treatment system component has occurred or whenever a severe condition has taken place, to assess whether ECs are affected.

5.1.2 INSPECTION FORMS, SAMPLING DATA, AND MAINTENANCE REPORTS

All inspections and monitoring events will be recorded on the appropriate forms for their respective system: see SSD O&M Plan for the SSD form (Appendix D) and Appendix E for the Bioreactor and Injection/Monitoring Well Inspection form. Additionally, a general site-wide inspection form will be completed during the site-wide inspection (see Appendix E).

Applicable inspection forms and other records, including sampling data and system maintenance reports generated during the reporting period, will be provided in the annual monitoring report.

5.1.3 EVALUATION OF RECORDS AND REPORTING

The results of the inspection and monitoring work will be evaluated as part of the EC/IC certification to confirm that:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented;
- Operation and maintenance activities are being conducted properly; and, based on the above items,
- The site remedy continues to be protective of public health and the environment and is performing as designed in the RAWP (Parsons, 2010a) and the construction completion report.

5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a Professional Engineer or Geologist licensed to practice in New York State will prepare the following certification:

> For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
- The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the institutional control and/or engineering control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site management plan for the institutional control and/or engineering control;
- Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of the institutional control and/or engineering control;
- If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the Site is compliant with the restrictive covenant;
- The engineering control system is performing as designed and is effective;
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and
- The information presented in this report is accurate and complete.

A signed certification will be included in the Annual Monitoring Report described below. The Annual Monitoring Report will be submitted to the Department every year, beginning fifteen months after the Certificate of Completion or equivalent document (e.g., Satisfactory Completion Letter, No Further Action Letter, etc.) is issued. In the event that the site is subdivided into separate parcels with different ownership, a single Annual Monitoring Report will be prepared that addresses the Site described in Appendix A (Metes and Bounds). The report will be prepared in accordance with NYSDEC DER-10 and submitted within 120 days after the second annual sampling event. Media sampling results will also incorporated into the Annual Monitoring Report. The report will include:

- Identification, assessment and certification of ECs/ICs required by the remedy;
- Results of the required annual site inspections and severe condition inspections, if applicable;
- Applicable inspection forms and other records generated during the reporting period in electronic format;
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;

- Data summary tables and graphical representations of COCs by media (groundwater, soil vapor), which include a listing of compounds analyzed, along with the applicable standards. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;
- Results of all analyses, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;
- A Site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;
    - The operation and the effectiveness of all treatment units, including identification of needed repairs or modifications;
    - New conclusions or observations regarding contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
    - Recommendations regarding necessary changes to the remedy and/or Monitoring Plan; and
    - The overall performance and effectiveness of the remedy.

5.3 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a corrective measures plan will be submitted to NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by NYSDEC.

SECTION 6
REFERENCES

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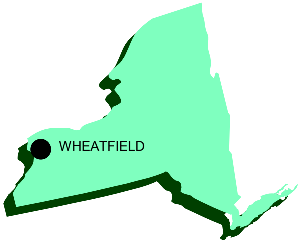
FIGURES



New York

LATITUDE: N43° 06' 21"
LONGITUED: W78° 55' 46"

N

FIGURE 1

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

SITE LOCATION

PARSONS
40 La Riviere Drive, Suite 350, Buffalo, New York 14202

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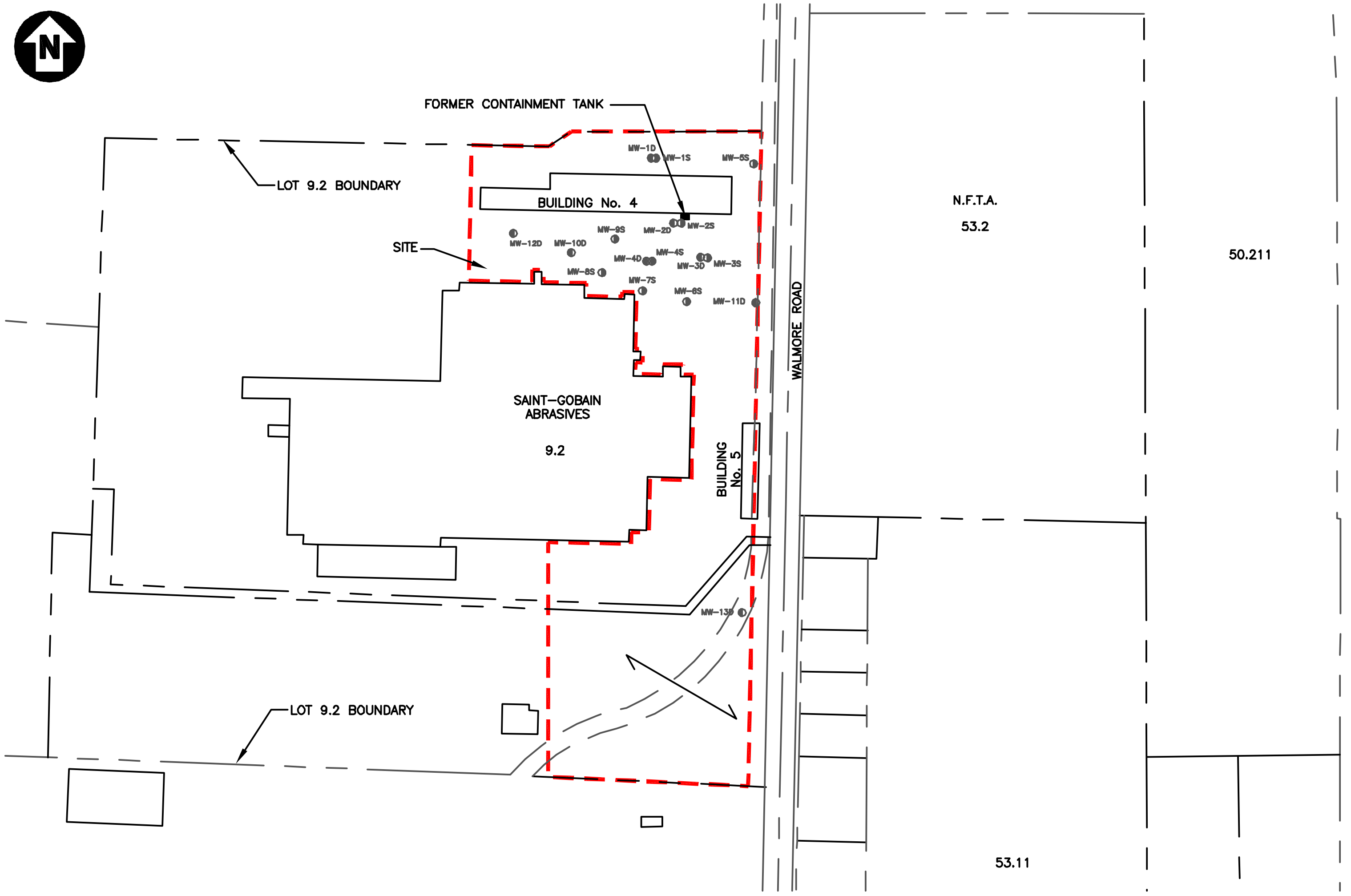

NOTES:

1. SOURCE TAX MAP 146.00, TOWN OF WHEATFIELD, NIAGARA COUNTY, NY, MARCH 1, 2002.
2. BUILDING AND BORING LOCATIONS ARE OVERLAID ON TAX MAP AND ARE APPROXIMATE.

400 200 0 400 800

SCALE: 1"=400'

LEGEND:

◐ MW-1D	EXISTING BEDROCK MONITORING WELL
◑ MW-1S	EXISTING OVERBURDEN MONITORING WELL
🟥 - - -	SITE BOUNDARY
— — — —	PROPERTY LINE
— — — —	RIGHT-OF-WAY

Figure 2

EKONOL POLYESTER
RESINS FACILITY
WHEATFIELD, NEW YORK

SITE BOUNDARIES

PARSONS

40 La Riviere Drive, Suite 350, Buffalo, New York, 14202, Phone 716-541-0730

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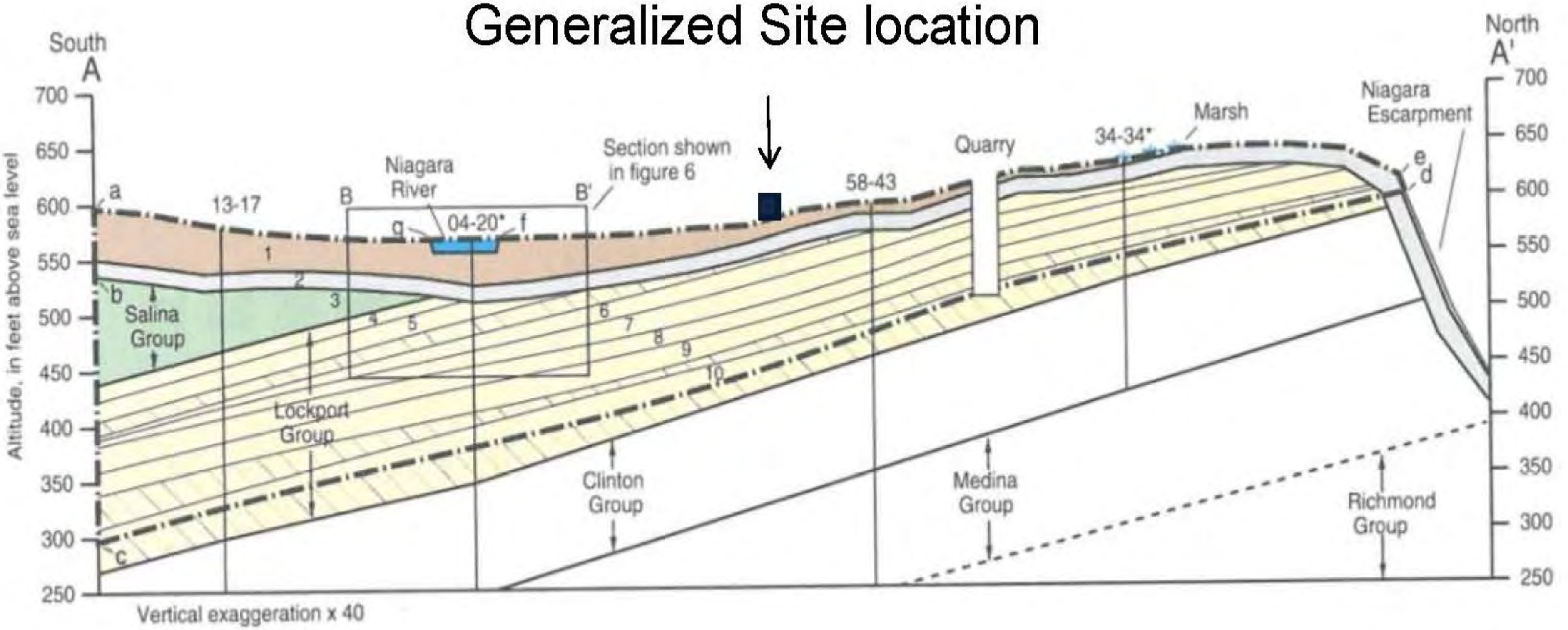
No XREFs

Generalized Site location



EXPLANATION

1	Glacial sediments	13-17 |	Well location (* projected)
2	Weathered bedrock	———	Geologic contact, dashed where inferred
3	Bedrock within model boundary containing horizontal fracture zones	— · —	Model boundary
▨	Massive, unfractured bedrock	10	Model layer

Model boundary conditions:

ab	no flow	ef	constant flow
bc	constant flow	fg	constant head
cd	no flow	ag	constant flow
de	head-dependent flow		

From Yager, 1997. Simulated Three-Dimensional Ground-Water Flow in the Lockport Group, a Fractured-Dolomite Aquifer near Niagara Falls, New York. U.S. Geological Survey Water Supply Paper 2487. July 1997

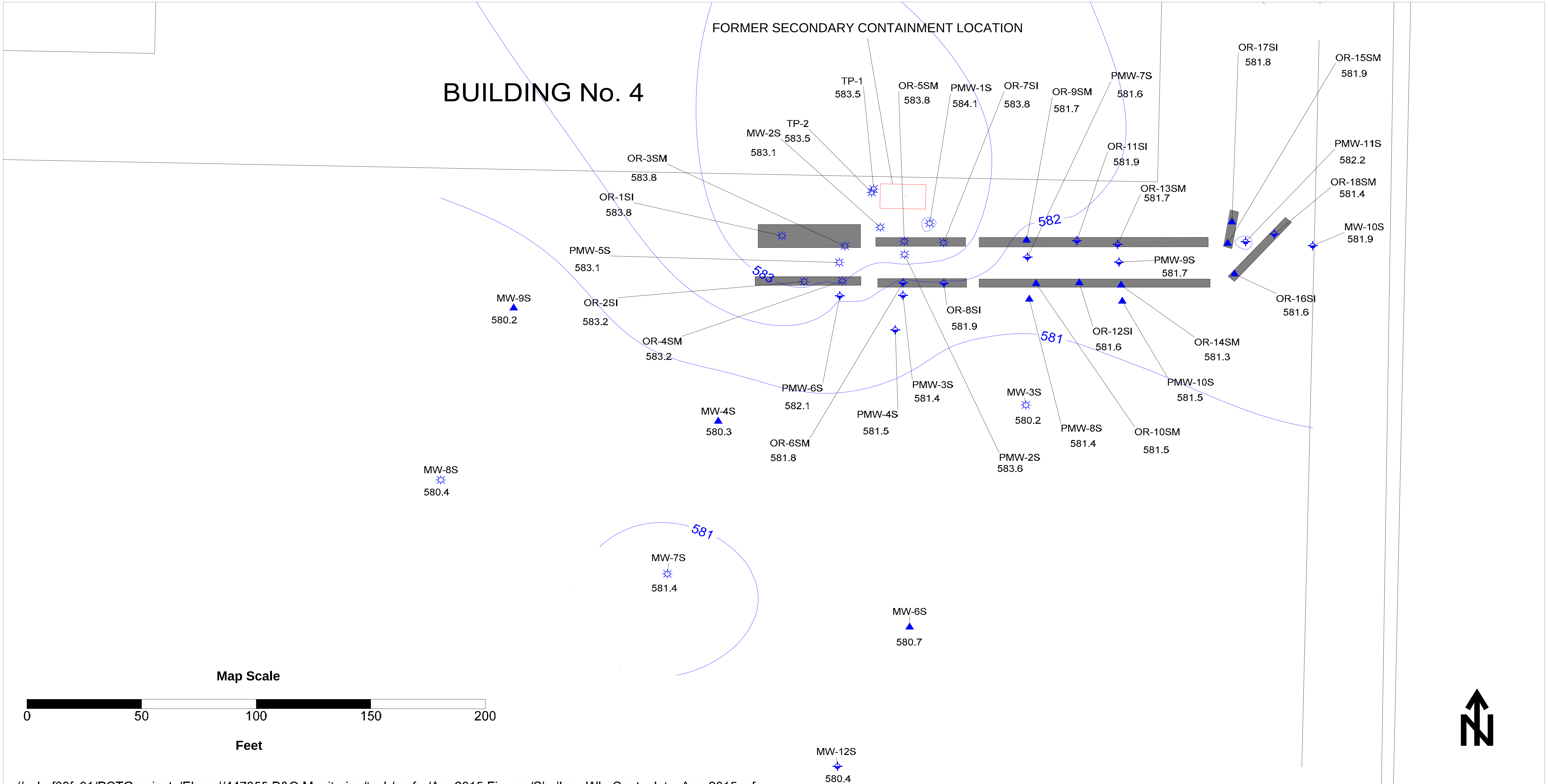
EKONOL POLYESTER
RESINS FACILITY
WHEATFIELD NEW YORK

Figure 3

GENERALIZED REGIONAL GEOLOGIC
CROSS-SECTION

PARSONS

40 La Riviere Drive, Suite 350, Buffalo, New York, 14202, Phone 716-541-0730



//nybuf03fs01/PCTGprojects/Ekonol/447355 P&Q Monitoring/tech/surfer/Apr 2015 Figures/Shallow_WL_Cont_plots_Apr_2015.srf

PARSONS

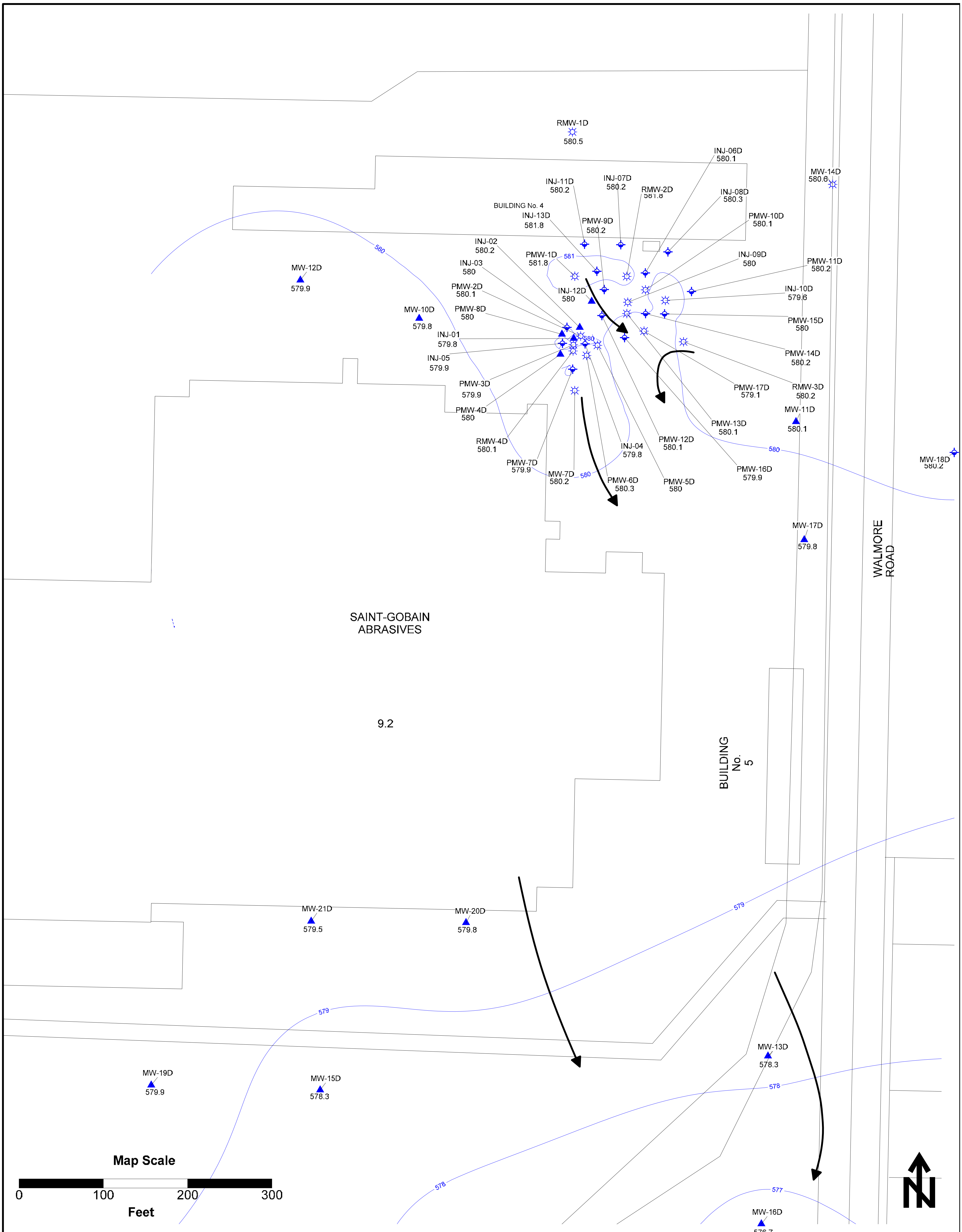
40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730

Created by: DU	Date: 4-10-2015
Checked by: RBP	Date:
Project Manager:GWH	Date:
Job number: 448816.02000	

LEGEND

- ☐ BUILDING
- ═ ROAD
- ⌖ OVERBURDEN BIOREACTOR WELL
- ▲ SITE INVESTIGATION WELL
- ☼ PERFORMANCE MONITORING WELL
- ▬ BIOREACTOR TRENCH
- ∼ GROUNDWATER CONTOUR

FIGURE 4
POTENTIOMETRIC SURFACE MAP
OVERBURDEN - APRIL 23, 2015
EKONOL SITE, WHEATFIELD, NY



//nybuf03fs01/PCTGprojects/Ekonol/447355 P&Q Monitoring/tech/surfer/Apr 2015 Figures/Bedrock_WL_Cont_plots_Apr_2015

PARSONS

40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730

Created by: DU	Date: 4-10-15	Project Manager: GWH	Date:
Checked by: RBP	Date:	Job number: 448816.02000	

LEGEND

▭ **BUILDING**

⊕ **INJECTION WELL**

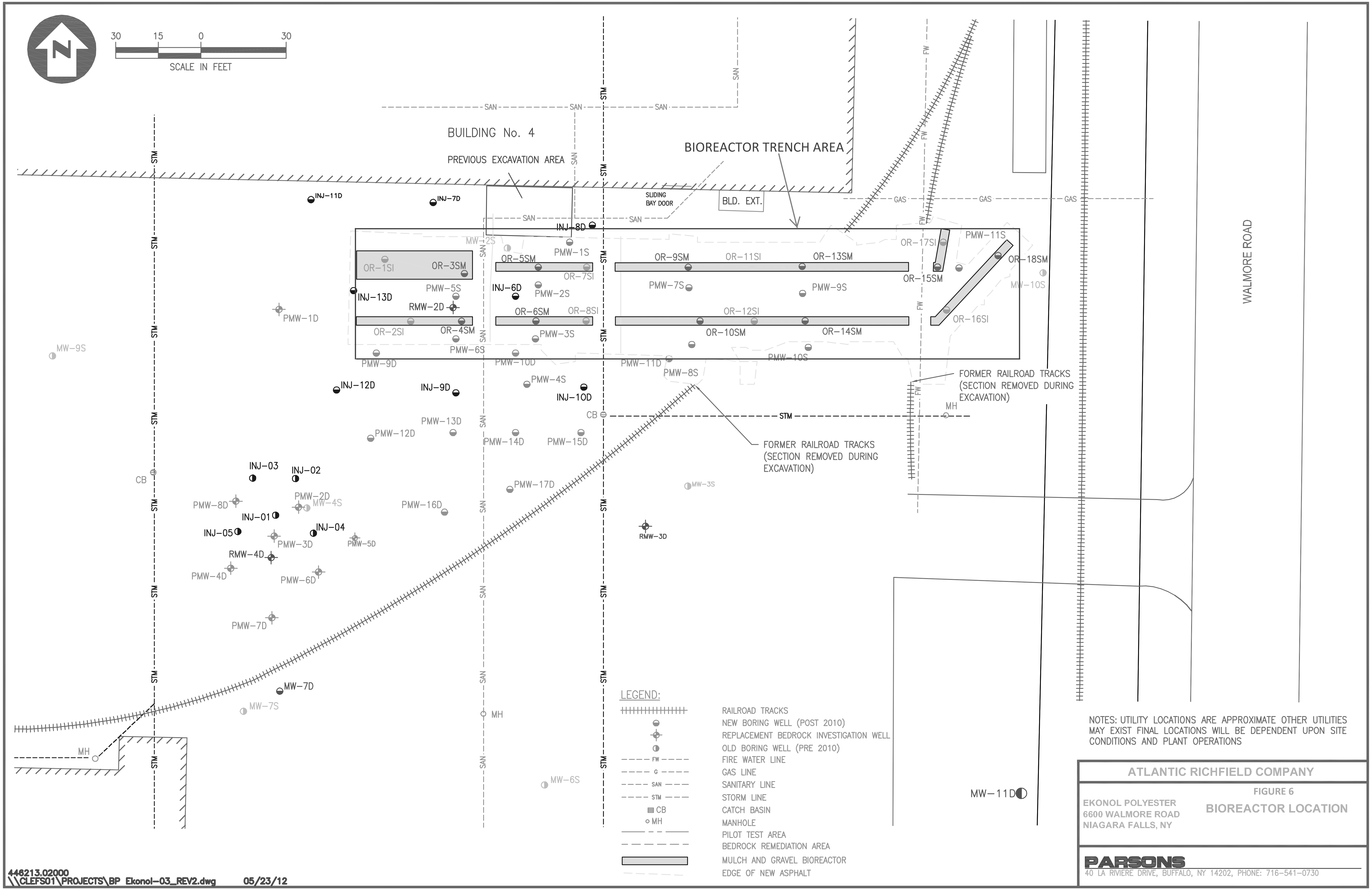
▲ **SITE INVESTIGATION WELL**

☼ **PERFORMANCE MONITORING WELL**

— **GROUNDWATER CONTOUR**

→ **GROUNDWATER FLOW**

FIGURE 5
POTENTIOMETRIC SURFACE MAP
BEDROCK - APRIL 23, 2015
EKONOL SITE, WHEATFIELD, NY



NOTES: UTILITY LOCATIONS ARE APPROXIMATE OTHER UTILITIES MAY EXIST FINAL LOCATIONS WILL BE DEPENDENT UPON SITE CONDITIONS AND PLANT OPERATIONS

ATLANTIC RICHFIELD COMPANY

EKONOL POLYESTER
6600 WALMORE ROAD
NIAGARA FALLS, NY

FIGURE 6

BIOREACTOR LOCATION

PARSONS

40 LA RIVIERE DRIVE, BUFFALO, NY 14202, PHONE: 716-541-0730

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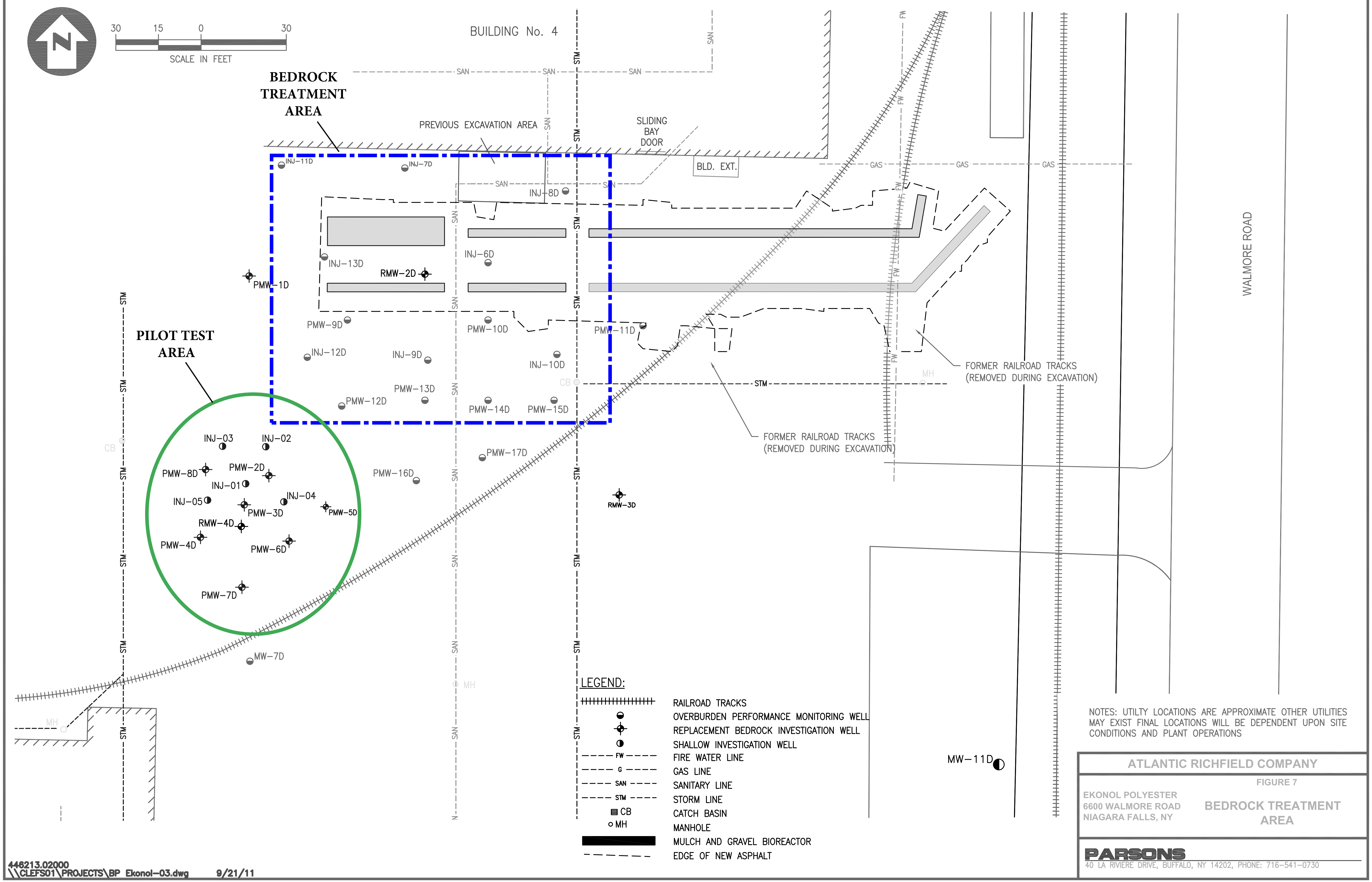

LEGEND:

++++++++++++	RAILROAD TRACKS
◒	OVERBURDEN PERFORMANCE MONITORING WELL
⌖	REPLACEMENT BEDROCK INVESTIGATION WELL
◑	SHALLOW INVESTIGATION WELL
---- FW ----	FIRE WATER LINE
---- G ----	GAS LINE
---- SAN ----	SANITARY LINE
---- STM ----	STORM LINE
▤ CB	CATCH BASIN
○ MH	MANHOLE
▬	MULCH AND GRAVEL BIOREACTOR
— — — —	EDGE OF NEW ASPHALT

NOTES: UTILITY LOCATIONS ARE APPROXIMATE OTHER UTILITIES MAY EXIST FINAL LOCATIONS WILL BE DEPENDENT UPON SITE CONDITIONS AND PLANT OPERATIONS

ATLANTIC RICHFIELD COMPANY

FIGURE 7

EKONOL POLYESTER
6600 WALMORE ROAD
NIAGARA FALLS, NY

BEDROCK TREATMENT AREA

PARSONS
40 LA RIVIERE DRIVE, BUFFALO, NY 14202, PHONE: 716–541–0730

446213.02000
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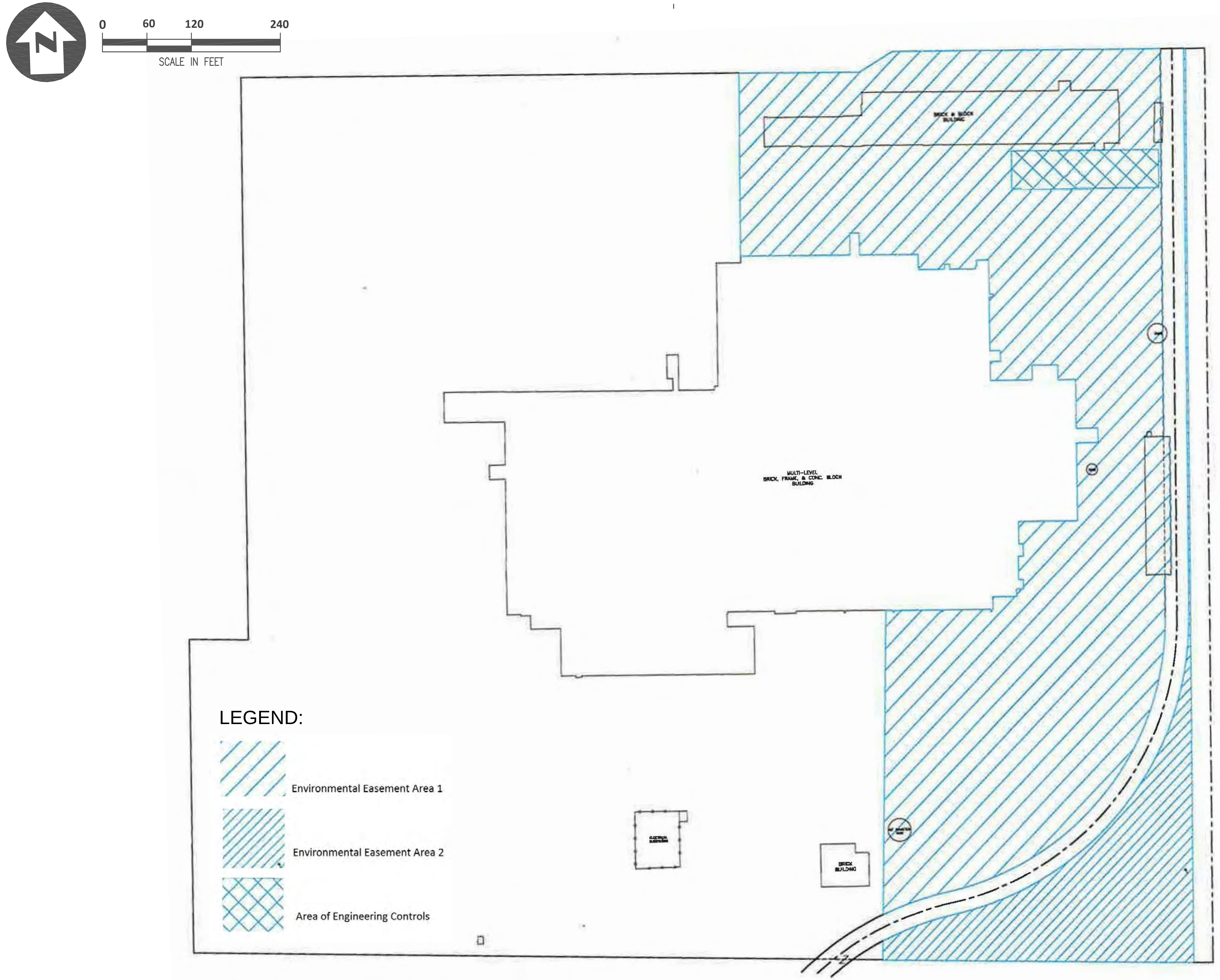


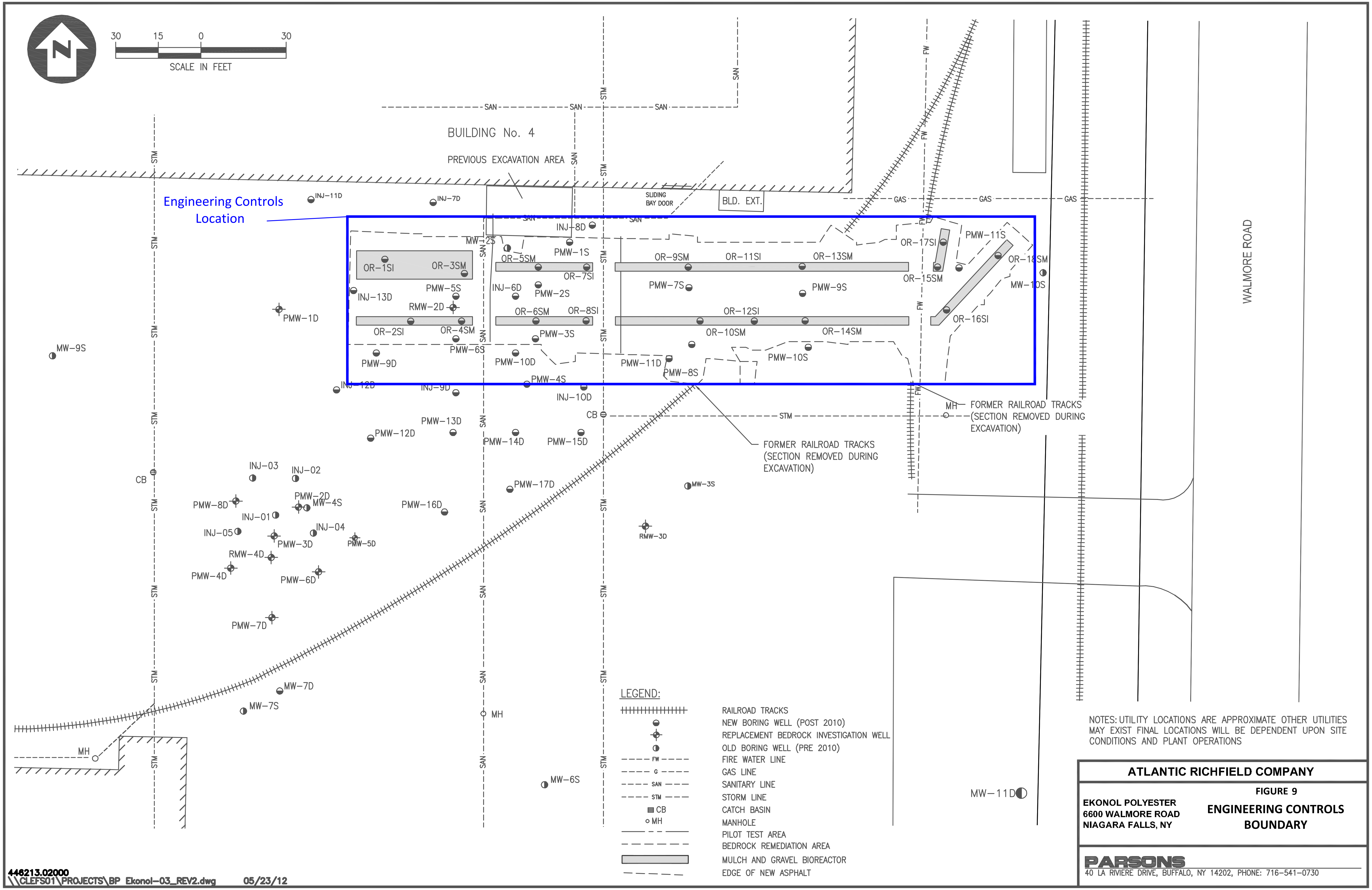
ATLANTIC RICHFIELD COMPANY

EKONOL POLYESTER
6600 WALMORE ROAD
NIAGARA FALLS, NY

Figure 8
ENVIRONMENTAL EASEMENT BOUNDARY

PARSONS
40 LA RIVIERE DRIVE, BUFFALO, NY 14202, PHONE: 716-541-0730

446213.02000
\\CLEFS01\PROJECTS\BP Ekonol-03_REV2.dwg 05/23/12



NOTES: UTILITY LOCATIONS ARE APPROXIMATE OTHER UTILITIES MAY EXIST FINAL LOCATIONS WILL BE DEPENDENT UPON SITE CONDITIONS AND PLANT OPERATIONS

ATLANTIC RICHFIELD COMPANY

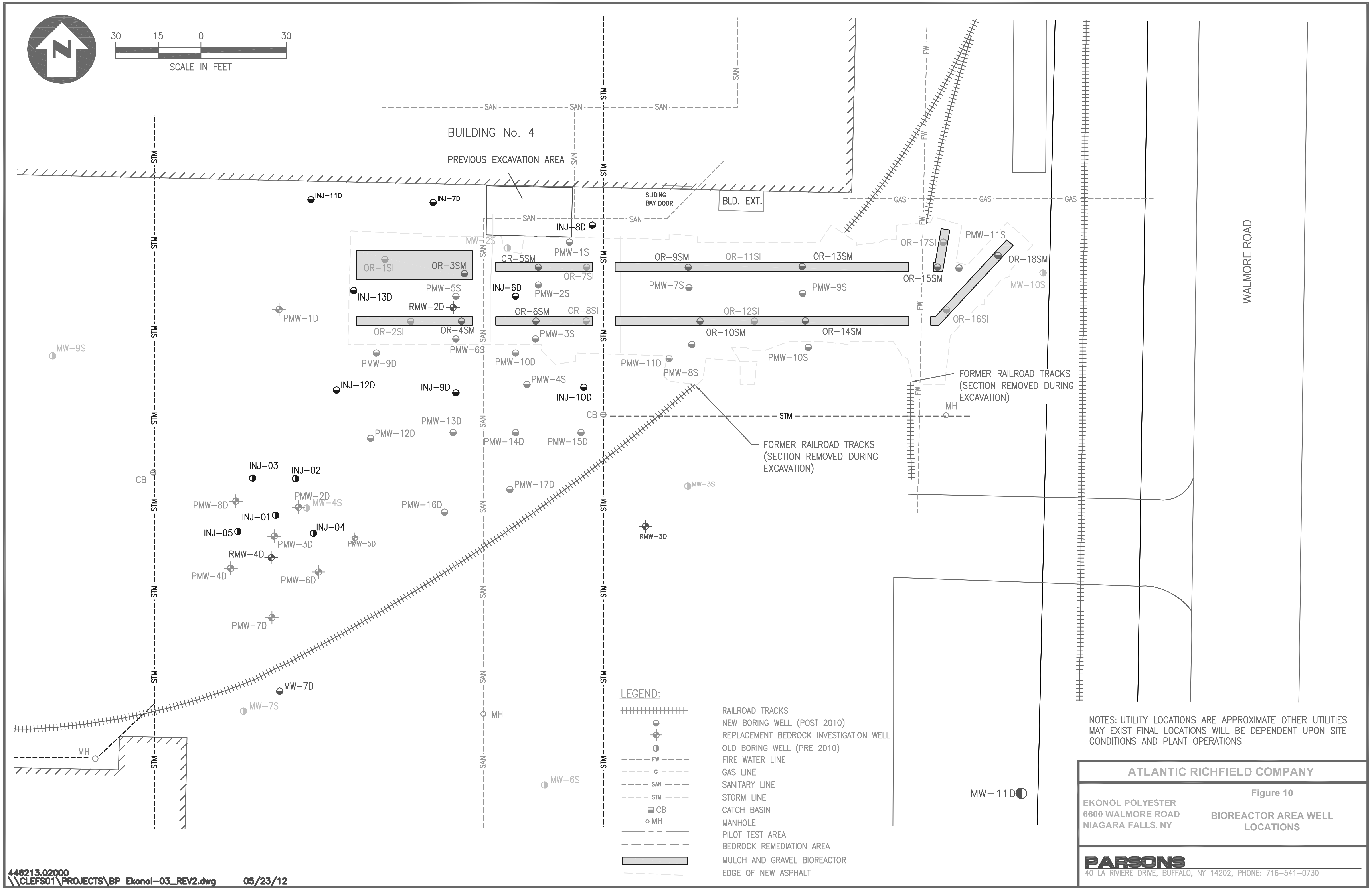
EKONOL POLYESTER
6600 WALMORE ROAD
NIAGARA FALLS, NY

FIGURE 9

ENGINEERING CONTROLS BOUNDARY

PARSONS
40 LA RIVIERE DRIVE, BUFFALO, NY 14202, PHONE: 716-541-0730

446213.02000
\\CLEFS01\PROJECTS\BP Ekonol-03_REV2.dwg **05/23/12**



NOTES: UTILITY LOCATIONS ARE APPROXIMATE OTHER UTILITIES MAY EXIST FINAL LOCATIONS WILL BE DEPENDENT UPON SITE CONDITIONS AND PLANT OPERATIONS

ATLANTIC RICHFIELD COMPANY

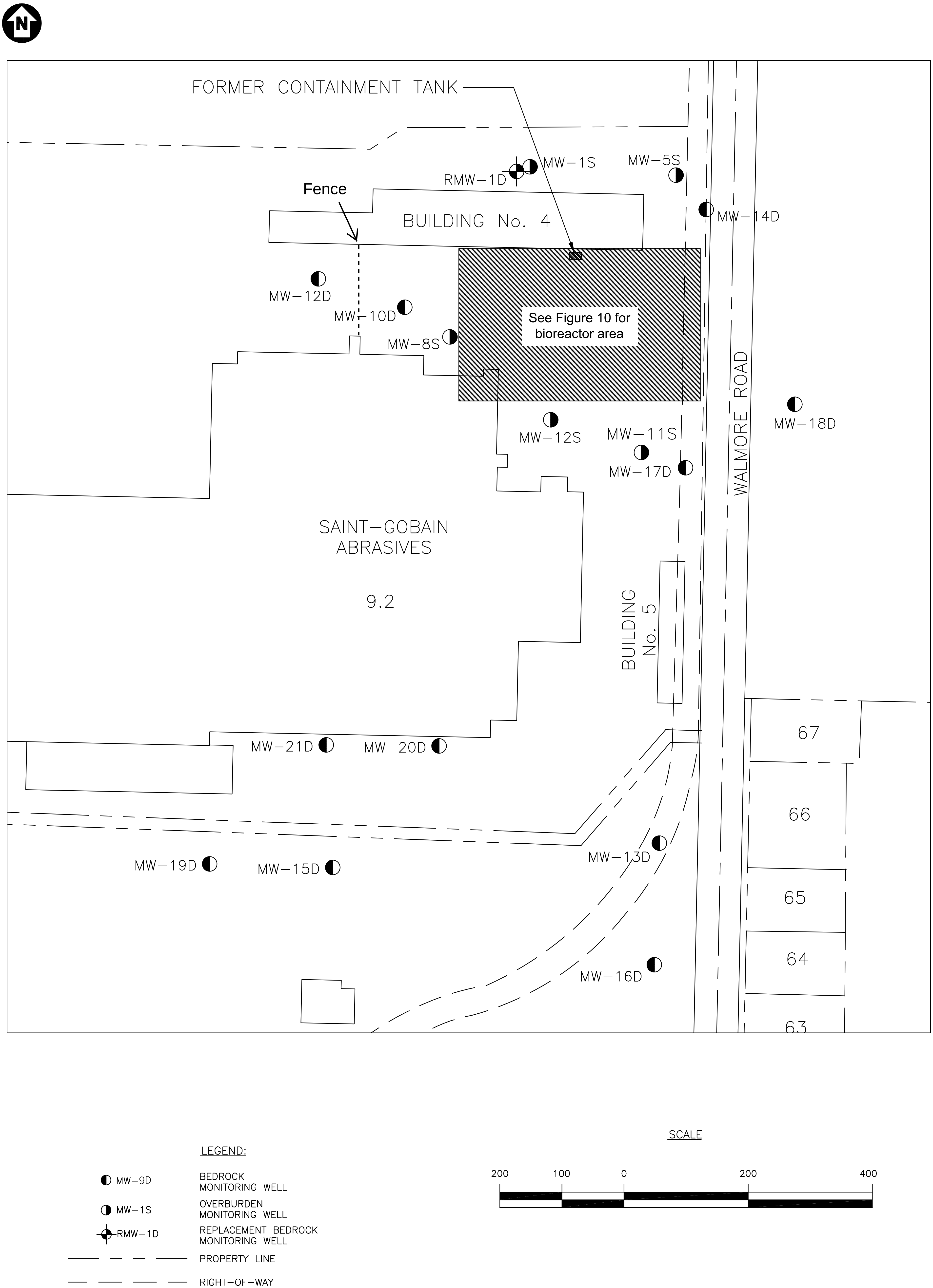
EKONOL POLYESTER
6600 WALMORE ROAD
NIAGARA FALLS, NY

Figure 10

BIOREACTOR AREA WELL LOCATIONS

PARSONS
40 LA RIVIERE DRIVE, BUFFALO, NY 14202, PHONE: 716-541-0730

446213.02000
\\CLEFS01\PROJECTS\BP Ekonol-03_REV2.dwg 05/23/12



SITE PLAN

EKONOL POLYESTER
RESINS FACILITY
WHEATFIELD, NEW YORK

Figure 11

SITE-WIDE WELL LOCATIONS

PARSONS

180 LAWRENCE BELL DRIVE, SUITE 104, WILLIAMSVILLE, N.Y. 14221, PHONE: 716-633-7074

\\NYBUF03FS01\PCTGprojects\Ekonol\448816 Ekonol 2014\Site Management Plan\2015 SMP\review\draft figures

APPENDIX A
METES AND BOUNDS SURVEY

DRAFT

PARENT PARCEL DESCRIPTION:

PARCEL I

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Wheatfield, County of Niagara, State of New York, and being part of Lot Number 53,
Township 13 Range 8 of the Holland Land Company's Survey (so-colled), bounded and described as follows:

BEGINNING AT A POINT on the centerline of Walmore Road, said centerline being the east line of Lot Number 53 and said point also being the
northeast corner of land conveyed to Bell Aircraft Corporation by deed recorded April 15, 1947 in Liber 865 of Deeds at Page 529 and which point
of beginning is 1422.87 feet north from the intersection of the centerline of Walmore Road with the south line of Lot Number 53, as measured
along said centerline:
RUNNING THENCE: Westerly, along the north line of land deeded to Bell Aircraft Corporation as aforesaid and at an interior anqle of 88°-59'-50",
1739.66 feet;
RUNNlNG THENCE: Northerly, at an interior angle of 91°-13'-17", 533.82 feet;
RUNNING THENCE: Easterly, at an interior angle of 88°-46'-43", 100 feet:
RUNNING THENCE: Northerly, at an exterior angle of 88°-46'-43", 949.18 feet;
RUNNING THENCE: Easterly, at an interior angle of 89°-54'-53", 1055.18 feet;
RUNNING THENCE: Northeasterly, along a line which deflects toward the North 31°-49' from the previous course 66.39 feet;
RUNNING THENCE.: Easterly, along a line which deflects 31°-49' toward the south from the preceding course 533.01 feet to a point in the centerline
of Walmore Road, which point is distant, 952.81 feet south from the northeast corner of Lot Number 53, being measured along the said centerline.
RUNNING THENCE: Southerly, along the centerline of Walmore Road, 1551.23 feet to the POINT OR PLACE OF BEGINNING.

EXCEPTING THEREFROM all that tract or parcel of land, situate in the Town of Wheatfield, County of Niagara and State of New York, being part of Lot Numbers 53 and 54, Township 13, Range 8 of the Holland Land Company's Survey, bounded and described as follows: A strip of land 40 feet in width, measured at right angles to a centerline more particularly bounded and described as follows:

BEGINNING AT A POINT in the north line of the land described in Parcel II ¡n the deed to Bell Aircraft Corporation recorded in Liber 865 of Deeds at Page 529 being the north line of land formerly owned by Charles C. Thomson and Maurice Thompson which point is 613.95 feet west from the centerline of Walmore Road, being also the east line of Lot Number 53 measured alonq said line;

RUNNING THENCE: Northeasterly, on a line which line is on a curve drawn to the right with a radius of 502.19 feet, the tangent of which curve makes an angle of 39°-25'-l7" measured in the northeast quadrant at the intersection of said line with the north line of said former Thomson land;

RUNNING THENCE: Along said curve 217.56 feet, arc measurement to a po¡nt of reverse curve;

RUNNING THENCE: Along a curve having a radius of 492.73 feet deflecting to the left a distance of 669.31 feet arc measurement to a point of curve is 55.87 feet west of the centerline of Walmore Road measured at right angles thereto;

RUNNING THENCE: Northerly along a line drawn parallel with the centerline of Walmore Road and 55.87 feet west therefrom measured at right angles thereto to the north line of land conveyed to The Carborundum Company by deed recorded in Liber 897 of Deeds at Page 12:

ALSO excepting therefrom that portion conveyed to the County of Niagara by deed recorded in Liber l303 of Deeds at Page 425 affecting Walmore Road.

Parcel II

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Wheatfield, County of Niagara, State of New York, and being part of Lot Number 53, Township 13, Range 8 of the Holland Land Company's Survey (so-called). bounded and described as follows:

BEGINNING on a line drawn at right angles to the centerline of Walmore Road, being the east line of Lot Number 53, from a point ¡n said centerline of the Walmore Road which is 1843.92 feet more or less south of the north line of sad Lot Number 53 measured olong sa¡d centerline of Walmore Road at a distance of 65.27 feet west from the centerline of Walmore Road, said point being the southeast corner of the so called Flow Test Building;

RUNNING THENCE Northerly, 234.4 feet more or less to a line drawn at right angles to the Walmore Road from a point in the centerline of Walmore Road which ¡s 1609.52 feet more or less south from the north line of Lot Number 53 at a point 65.87 feet west from the centerline of Walmore Road being the northeasterly corner of said Flow Test Bu¡ld¡ng;

RUNNING THENCE: Westerly, along the north line of said Flow Test Building l0 feet to the west line of the strip described in the first except¡on to Parcel l;

RUNNING THENCE: Southerly, along the west line of said strip 234.4 feet more or less to the south line of said Flow Test Building at a point therein which is 10.6 feet west from the point of beginning;

RUNNING THENCE: easterly, along the south line of said flow test building l0.6 feet to the POINT OR PLACE OF BEGINNING.

West of rail siding to west edge of proposed easement

DRAFT Environmental EASEMENT (PARCEL 1)

ALL THAT TRACT OR OR PARCEL OF LAND SITUATE IN THE TOWN OF WHEATFIELD, COUNTY OF NIAGARA AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 53, TOWNSHIP 13, RANGE 8 OF THE HOLLAND LAND COMPANY'S SURVEY, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE NORTH LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 987, PAGE 12 WHERE IT INTERSECTS WITH THE WESTERLY LINE OF A FORTY FOOT WIDE EXCEPTION FOR A RAILROAD; THENCE S 01°-12'-22" W ALONG SAID WESTERLY LINE OF EXCEPTION A DISTANCE OF 656.39 FEET TO A POINT IN THE NORTH FACE OF THE "FLOW TEST BUILDING; THENCE S 88°53'-58" E ALONG SAID NORTH BUILDING FACE A DISTANCE OF 10.34 FEET TO THE NORTHEAST CORNER OF SAID "FLOW TEST BUILDING"; THENCE S 01°-06'-12" W ALONG THE EASTERLY FACE OF SAID "FLOW TEST BUILDING" A DISTANCE OF 234.44 FEET TO THE SOUTHEASTERLY CORNER OF SAID "FLOW TEST BUILDING"; THENCE N 89°-03'-18" W ALONG THE SOUTHERLY FACE OF SAID "FLOW TEST BUILDING" A DISTANCE OF 10.76 FEET TO A POINT OF INTERSECTION OF THE SOUTHERLY LINE OF SAID "FLOW TEST BUILDING WITH THE WESTERLY LINE OF SAID 40 FOOT WIDE EXCEPTION PARCEL; THENCE S 01°-12'-22" W ALONG SAID WESTERLY LINE OF 40 FOOT WIDE EXCEPTION PARCEL A DISTANCE OF 72.00 FEET TO A POINT OF CURVATURE TO THE RIGHT; THENCE ALONG SAID CURVE TO THE RIGHT 642.14 FEET, SAID CURVE HAVING A CHORD BEARING OF S 40°-07'-09" W, AND A RADIUS OF 472.73 FEET TO A POINT OF CURVATURE TO THE LEFT; THENCE ALONG SAID CURVE TO THE LEFT 119.69 FEET, SAID CURVE HAVING A CHORD BEARING OF S 72°-28'-23" W, AND A RADIUS OF 522.18 FEET TO A POINT; THENCE N 02°-16'-36" E A DISTANCE OF 517.09 FEET TO A POINT IN THE SOUTHERLY FACE OF A MULTI-LEVEL BRICK, FRAME, AND CONCRETE BLOCK BUILDING; THENCE ALONG SAID BUILDING FACE THE FOLLOWING 63 COURSES

1) S 88°-52'-46" E A DISTANCE OF 11.58 FEET
2) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
3) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
4) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
5) S 88°-52'-46" E A DISTANCE OF 81.00 FEET
6) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
7) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
8) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
9) S 88°-52'-46" E A DISTANCE OF 81.05 FEET
10) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
11) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
12) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
13) S 88°-52'-46" E A DISTANCE OF 1.43 FEET
14) N 01°-07'-14" E A DISTANCE OF 20.83 FEET
15) S 88°-52'-46" E A DISTANCE OF 40.37 FEET
16) N 01°-07'-14" E A DISTANCE OF 12.33 FEET
17) S 88°-52'-46" E A DISTANCE OF 12.03 FEET
18) N 01°-07'-14" E A DISTANCE OF 16.35 FEET

19) N 88°-52'-46" W A DISTANCE OF 8.06 FEET
20) N 01°-07'-14" E A DISTANCE OF 39.40 FEET
21) S 88°-52'-46" E A DISTANCE OF 8.00 FEET
22) N 01°-07'-14" E A DISTANCE OF 20.00 FEET
23) N 88°-52'-46" W A DISTANCE OF 7.33 FEET
24) N 01°-07'-14" E A DISTANCE OF 38.77 FEET
25) S 88°-52'-46" E A DISTANCE OF 100.65 FEET
26) N 01°-07'-14" E A DISTANCE OF 133.15 FEET
27) S 88°-52'-46" E A DISTANCE OF 36.96 FEET
28) N 01°-07'-14" E A DISTANCE OF 24.36 FEET
29) N 88°-52'-46" W A DISTANCE OF 37.00 FEET
30) N 01°-07'-14" E A DISTANCE OF 83.70 FEET
31) N 88°-52'-46" W A DISTANCE OF 26.05 FEET
32) N 01°-07'-14" E A DISTANCE OF 25.00 FEET
33) N 88°-52'-46" W A DISTANCE OF 44.10 FEET
34) S 01°-07'-14" W A DISTANCE OF 25.00 FEET
35) N 88°-52'-46" W A DISTANCE OF 71.35 FEET
36) N 01°-07'-14" E A DISTANCE OF 31.85 FEET
37) S 88°-52'-46" E A DISTANCE OF 17.97 FEET
38) N 01°-07'-14" E A DISTANCE OF 18.55 FEET
39) N 88°-52'-46" W A DISTANCE OF 17.97 FEET
40) N 01°-07'-14" E A DISTANCE OF 17.45 FEET
41) N 88°-52'-46" W A DISTANCE OF 0.35 FEET
42) N 01°-07'-14" E A DISTANCE OF 72.75 FEET
43) S 88°-52'-46" E A DISTANCE OF 6.47 FEET
44) N 01°-07'-14" E A DISTANCE OF 4.83 FEET
45) N 88°-52'-46" W A DISTANCE OF 6.47 FEET
46) N 01°-07'-14" E A DISTANCE OF 57.80 FEET
47) N 88°-52'-46" W A DISTANCE OF 21.30 FEET
48) S 01°-07'-14" W A DISTANCE OF 9.78 FEET
49) N 88°-52'-46" W A DISTANCE OF 1.78 FEET
50) S 01°-07'-14" W A DISTANCE OF 4.95 FEET
51) N 88°-52'-46" W A DISTANCE OF 44.15 FEET
52) N 01°-07'-14" E A DISTANCE OF 8.35 FEET
53) N 88°-52'-46" W A DISTANCE OF 8.73 FEET
54) S 01°-07'-14" W A DISTANCE OF 8.35 FEET
55) N 88°-52'-46" W A DISTANCE OF 43.62 FEET
56) N 01°-07'-14" E A DISTANCE OF 4.57 FEET
57) N 88°-52'-46" W A DISTANCE OF 0.88 FEET
58) N 01°-07'-14" E A DISTANCE OF 20.83 FEET
59) N 88°-52'-46" W A DISTANCE OF 100.07 FEET
60) N 01°-07'-14" E A DISTANCE OF 37.20 FEET
61) N 88°-52'-46" W A DISTANCE OF 16.00 FEET
62) S 01°-07'-14" W A DISTANCE OF 37.20 FEET
63) N 88°-52'-46" W A DISTANCE OF 186.33 FEET

THENCE N 01°-07'-58" E A DISTANCE OF 309.13 FEET TO A POINT IN THE NORTHERLY LINE OF OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12, THENCE ALONG SAID NORTHERLY LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12 THE FOLLOWING 3 COURSES

1) S 88°-52'-02" E A DISTANCE OF 205.30 FEET
2) N 59°-19'-14" E A DISTANCE OF 66.39 FEET
3) S 88°-52'-01" E A DISTANCE OF 457.14 FEET TO THE POINT OR PLACE OF BEGINNING. CONTAINING 13.00 ACRES OF LAND MORE OR LESS

East of Rail Siding to Walmore Road

DRAFT Environmental EASEMENT (PARCEL 2)

ALL THAT TRACT OR OR PARCEL OF LAND SITUATE IN THE TOWN OF WHEATFIELD, COUNTY OF NIAGARA AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 53, TOWNSHIP 13, RANGE 8 OF THE HOLLAND LAND COMPANY'S SURVEY, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE WESTERLY LINE OF WALMORE ROAD WHERE SAID WESTERLY LINE OF WALMORE ROAD INTERSECTS WITH THE NORTHERLY LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12; THENCE S 01°12'-22" W ALONG SAID WESTERLY LINE OF WALMORE ROAD A DISTANCE OF 1550.57 FEET TO IN THE NORTHERLY LINE OF BELL AIRCRAFT CORPORATION AS DESCRIBED IN A DEED FOUND IN LIBER 865, PAGE 529; THENCE N 87°-43'-24" W ALONG SAID NORTH LINE OF BELL AIRCRAFT CORPORATION A DISTANCE OF 530.56 FEET TO A POINT; THENCE N 02°-16'-36" E A DISTANCE OF 32.18 FEET TO A POINT IN OF CUVATURE TO THE RIGHT, SAID POINT ALSO BEING IN THE EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL; THENCE ALONG SAID CURVE TO THE RIGHT AND EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL 130.57 FEET SAID CURVE HAVING A CHORD BEARING OF N 71°-16'-57" E AND A RADIUS OF 482.19 FEET TO A POINT OF CURVATURE TO THE LEFT; THENCE ALONG SAID CURVE TO THE LEFT 696.48 FEET SAID CURVE HAVING A CHORD BEARNG OF N 40°-07'-09" EAST, AND A RADIUS OF 512.73 FEET TO A POINT IN THE EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL; THENCE N 01°-12'-22" E ALONG SAID EASTERLY LINE OF SAID 40 FOOT WIDE EXCEPTION PARCEL A DISTANCE OF 962.91 FEET TO A POINT IN THE NORTH LINE OF LANDS DESCRIBED IN A DEED AND FOUND IN LIBER 897 OF DEEDS AT PAGE 12, THENCE S 88°-52'-01" E ALONG SAID NORTH LINE OF LANDS DESCRIBED IN A DEED AND FOUND IN LIBER 897 OF PAGE 12 A DISTANCE OF 2.87 FEET TO THE POINT OR PLACE OF BEGINNING. CONTAINING 2.21 ACRES OF LAND MORE OR LESS.

Draft

ENGINEERING CONTROL DESCRIPTION

FOR PARCEL LOCATED ON THE
EKONOL SITE IN WHEATFIELD, NY

COMMENCING at the intersection of the north line of lands described in Liber 897 Page 12, with the center line of Walmore Road, also known as the east line of Lot 53;

Thence S 01˚ 12’ 22” W along the centerline of said Walmore Road a distance of 170.46’;

Thence N 88˚ 52’ 01” W, parallel with the north line of said Liber 8897 Page 12, a distance of 80.08’ to the point of beginning;

Thence S 01˚ 12’ 22” W parallel with the centerline of said Walmore Road a distance of 64.50’;

Thence N 88˚ 52’ 01” W, parallel with the north line of said Liber 8897 Page 12, a distance of 251.23’;

Thence N 01˚ 12’ 22” E parallel with the centerline of said Walmore Road a distance of 64.50’;

Thence S 88˚ 52’ 01” E, parallel with the north line of said Liber 8897 Page 12, a distance of 251.23’ to the point of beginning. Containing 0.31 acres of land, more or less.

Bearings are referenced to the New York State Plane Coordinate System (West Zone) as established on site by GPS observations.

NEW YORK STATE DEC
ENVIRONMENTAL EASEMENT
SURVEY
EKONOL PLANT
6600 WALMORE ROAD
TOWN OF WHEATFIELD
NIAGARA COUNTY
STATE OF NEW YORK

PROPOSED DEC ENVIRONMENTAL EASEMENT (PARCEL 1)

ALL THAT TRACT OR PARCEL OF LAND SITUATE IN THE TOWN OF WHEATFIELD, COUNTY OF NIAGARA AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 53, TOWNSHIP 13, RANGE 8 OF THE HOLLAND LAND COMPANY'S SURVEY, BOUNDED AND DESCRIBED AS FOLLOWS:

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1) S 88°-52'-46" E A DISTANCE OF 11.58 FEET
2) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
3) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
4) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
5) S 88°-52'-46" E A DISTANCE OF 81.00 FEET
6) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
7) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
8) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
9) S 88°-52'-46" E A DISTANCE OF 81.05 FEET
10) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
11) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
12) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
13) S 88°-52'-46" E A DISTANCE OF 1.43 FEET
14) N 01°-07'-14" E A DISTANCE OF 20.83 FEET
15) S 88°-52'-46" E A DISTANCE OF 40.37 FEET
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20) N 01°-07'-14" E A DISTANCE OF 39.40 FEET
21) S 88°-52'-46" E A DISTANCE OF 8.00 FEET
22) N 01°-07'-14" E A DISTANCE OF 20.00 FEET
23) N 88°-52'-46" W A DISTANCE OF 7.33 FEET
24) N 01°-07'-14" E A DISTANCE OF 38.77 FEET
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28) N 01°-07'-14" E A DISTANCE OF 24.36 FEET
29) N 88°-52'-46" W A DISTANCE OF 37.00 FEET
30) N 01°-07'-14" E A DISTANCE OF 83.70 FEET
31) N 88°-52'-46" W A DISTANCE OF 26.05 FEET
32) N 01°-07'-14" E A DISTANCE OF 25.00 FEET
33) N 88°-52'-46" W A DISTANCE OF 44.10 FEET
34) S 01°-07'-14" W A DISTANCE OF 25.00 FEET
35) N 88°-52'-46" W A DISTANCE OF 71.35 FEET
36) N 01°-07'-14" E A DISTANCE OF 31.85 FEET
37) S 88°-52'-46" E A DISTANCE OF 17.97 FEET
38) N 01°-07'-14" E A DISTANCE OF 18.55 FEET
39) N 88°-52'-46" W A DISTANCE OF 17.97 FEET
40) N 01°-07'-14" E A DISTANCE OF 17.45 FEET
41) N 88°-52'-46" W A DISTANCE OF 0.35 FEET
42) N 01°-07'-14" E A DISTANCE OF 72.75 FEET
43) S 88°-52'-46" E A DISTANCE OF 6.47 FEET
44) N 01°-07'-14" E A DISTANCE OF 4.83 FEET
45) N 88°-52'-46" W A DISTANCE OF 6.47 FEET
46) N 01°-07'-14" E A DISTANCE OF 57.80 FEET
47) N 88°-52'-46" W A DISTANCE OF 21.30 FEET
48) S 01°-07'-14" W A DISTANCE OF 9.78 FEET
49) N 88°-52'-46" W A DISTANCE OF 1.78 FEET
50) S 01°-07'-14" W A DISTANCE OF 4.95 FEET
51) N 88°-52'-46" W A DISTANCE OF 44.15 FEET
52) N 01°-07'-14" E A DISTANCE OF 8.35 FEET
53) N 88°-52'-46" W A DISTANCE OF 8.73 FEET
54) S 01°-07'-14" W A DISTANCE OF 8.35 FEET
55) N 88°-52'-46" W A DISTANCE OF 43.62 FEET
56) N 01°-07'-14" E A DISTANCE OF 4.57 FEET
57) N 88°-52'-46" W A DISTANCE OF 0.88 FEET
58) N 01°-07'-14" E A DISTANCE OF 20.83 FEET
59) N 88°-52'-46" W A DISTANCE OF 100.07 FEET
60) N 01°-07'-14" E A DISTANCE OF 37.20 FEET
61) N 88°-52'-46" W A DISTANCE OF 16.00 FEET
62) S 01°-07'-14" W A DISTANCE OF 37.20 FEET
63) N 88°-52'-46" W A DISTANCE OF 186.33 FEET

THENCE N 01°-07'-58" E A DISTANCE OF 309.13 FEET TO A POINT IN THE NORTHERLY LINE OF OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12, THENCE ALONG SAID NORTHERLY LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12 THE FOLLOWING 3 COURSES

1) S 88°-52'-02" E A DISTANCE OF 205.30 FEET
2) N 59°-19'-14" E A DISTANCE OF 66.39 FEET
3) S 88°-52'-01" E A DISTANCE OF 457.14 FEET TO THE POINT OR PLACE OF BEGINNING. CONTAINING 13.00 ACRES OF LAND MORE OR LESS

PROPOSED DEC ENVIRONMENTAL EASEMENT (PARCEL 2)

ALL THAT TRACT OR OR PARCEL OF LAND SITUATE IN THE TOWN OF WHEATFIELD, COUNTY OF NIAGARA AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 53, TOWNSHIP 13, RANGE 8 OF THE HOLLAND LAND COMPANY'S SURVEY, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE WESTERLY LINE OF WALMORE ROAD WHERE SAID WESTERLY LINE OF WALMORE ROAD INTERSECTS WITH THE NORTHERLY LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12; THENCE S 01°12'-22" W ALONG SAID WESTERLY LINE OF WALMORE ROAD A DISTANCE OF 1550.57 FEET TO IN THE NORTHERLY LINE OF BELL AIRCRAFT CORPORATION AS DESCRIBED IN A DEED FOUND IN LIBER 865, PAGE 529; THENCE N 87°-43'-24" W ALONG SAID NORTH LINE OF BELL AIRCRAFT CORPORATION A DISTANCE OF 530.56 FEET TO A POINT; THENCE N 02°-16'-36" E A DISTANCE OF 32.18 FEET TO A POINT IN OF CUVATURE TO THE RIGHT, SAID POINT ALSO BEING IN THE EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL; THENCE ALONG SAID CURVE TO THE RIGHT AND EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL 130.57 FEET SAID CURVE HAVING A CHORD BEARING OF N 71°-16'-57" E AND A RADIUS OF 482.19 FEET TO A POINT OF CURVATURE TO THE LEFT; THENCE ALONG SAID CURVE TO THE LEFT 696.48 FEET SAID CURVE HAVING A CHORD BEARNG OF N 40°-07'-09" EAST, AND A RADIUS OF 512.73 FEET TO A POINT IN THE EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL; THENCE N 01°-12'-22" E ALONG SAID EASTERLY LINE OF SAID 40 FOOT WIDE EXCEPTION PARCEL A DISTANCE OF 962.91 FEET TO A POINT IN THE NORTH LINE OF LANDS DESCRIBED IN A DEED AND FOUND IN LIBER 897 OF DEEDS AT PAGE 12, THENCE S 88°-52'-01" E ALONG SAID NORTH LINE OF LANDS DESCRIBED IN A DEED AND FOUND IN LIBER 897 OF PAGE 12 A DISTANCE OF 2.87 FEET TO THE POINT OR PLACE OF BEGINNING. CONTAINING 2.21 ACRES OF LAND MORE OR LESS.

PARENT PARCEL DESCRIPTION:

PARCEL I

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Wheatfield, County of Niagara, State of New York, and being part of Lot Number 53, Township 13 Range 8 of the Holland Land Company's Survey (so-colled), bounded and described as follows:

BEGINNING AT A POINT on the centerline of Walmore Road, said centerline being the east line of Lot Number 53 and said point also being the northeast corner of land conveyed to Bell Aircraft Corporation by deed recorded April 15, 1947 in Liber 865 of Deeds at Page 529 and which point of beginning is 1422.87 feet north from the intersection of the centerline of Walmore Road with the south line of Lot Number 53, as measured along said centerline:
RUNNING THENCE: Westerly, along the north line of land deeded to Bell Aircraft Corporation as aforesaid and at an interior anqle of 88°-59'-50", 1739.66 feet;
RUNNING THENCE: Northerly, at an interior angle of 91°-13'-17", 533.82 feet;
RUNNING THENCE: Easterly, at an interior angle of 88°-46'-43", 100 feet:
RUNNING THENCE: Northerly, at an exterior angle of 88°-46'-43", 949.18 feet;
RUNNING THENCE: Easterly, at an interior angle of 89°-54'-53", 1055.18 feet;
RUNNING THENCE: Northeasterly, along a line which deflects toward the North 31°-49' from the previous course 66.39 feet;
RUNNING THENCE.: Easterly, along a line which deflects 31°-49' toward the south from the preceding course 533.01 feet to a point in the centerline
of Walmore Road, which point is distant, 952.81 feet south from the northeast corner of Lot Number 53, being measured along the said centerline.
RUNNING THENCE: Southerly, along the centerline of Walmore Road, 1551.23 feet to the POINT OR PLACE OF BEGINNING.

EXCEPTING THEREFROM all that tract or parcel of land, situate in the Town of Wheatfield, County of Niagara and State of New York, being part of Lot Numbers 53 and 54, Township 13, Range 8 of the Holland Land Company's Survey, bounded and described as follows: A strip of land 40 feet in width, measured at right angles to a centerline more particularly bounded and described as follows:

BEGINNING AT A POINT in the north line of the land described in Parcel II in the deed to Bell Aircraft Corporation recorded in Liber 865 of Deeds at Page 529 being the north line of land formerly owned by Charles C. Thomson and Maurice Thompson which point is 613.95 feet west from the centerline of Walmore Road, being also the east line of Lot Number 53 measured alonq said line;
RUNNING THENCE: Northeasterly, on a line which line is on a curve drawn to the right with a radius of 502.19 feet, the tangent of which curve makes an angle of 39°-25'-17" measured in the northeast quadrant at the intersection of said line with the north line of said former Thomson land;
RUNNING THENCE: Along said curve 217.56 feet, arc measurement to a point of reverse curve;
RUNNING THENCE: Along a curve having a radius of 492.73 feet deflecting to the left a distance of 669.31 feet arc measurement to a point of curve is 55.87 feet west of the centerline of Walmore Road measured at right angles thereto;
RUNNING THENCE: Northerly along a line drawn parallel with the centerline of Walmore Road and 55.87 feet west therefrom measured at right angles thereto to the north line of land conveyed to The Carborundum Company by deed recorded in Liber 897 of Deeds at Page 12:

ALSO excepting therefrom that portion conveyed to the County of Niagara by deed recorded in Liber 1303 of Deeds at Page 425 affecting Walmore Road.

Parcel II

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Wheatfield, County of Niagara, State of New York, and being part of Lot Number 53, Township 13, Range 8 of the Holland Land Company's Survey (so-called). bounded and described as follows:
BEGINNING on a line drawn at right angles to the centerline of Walmore Road, being the east line of Lot Number 53, from a point in said centerline
of the Walmore Road which is 1843.92 feet more or less south of the north line of sad Lot Number 53 measured olong said centerline of Walmore
Road at a distance of 65.27 feet west from the centerline of Walmore Road, said point being the southeast corner of the so called Flow Test Building;
RUNNING THENCE Northerly, 234.4 feet more or less to a line drawn at right angles to the Walmore Road from a point in the centerline of Walmore Road which is 1609.52 feet more or less south from the north line of Lot Number 53 at a point 65.87 feet west from the centerline of Walmore Road being the northeasterly corner of said Flow Test Building;
RUNNING THENCE: Westerly, along the north line of said Flow Test Building 10 feet to the west line of the strip described in the first exception to Parcel I;
RUNNING THENCE: Southerly, along the west line of said strip 234.4 feet more or less to the south line of said Flow Test Building at a point therein
which is 10.6 feet west from the point of beginning;
RUNNING THENCE: easterly, along the south line of said flow test building 10.6 feet to the POINT OR PLACE OF BEGINNING.

GENERAL NOTES:

1) BEARINGS WITHIN THE PROPOSED DEC CONSERVATION EASEMENT DESCRIPTION ARE REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM (WEST ZONE) AS ESTABLISHED ON SITE BY GPS OBSERVATIONS.

2) THIS SURVEY HAS BEEN REVISED WITH THE BENEFIT OF AN ABSTRACT OF TITLE PROVIDED BY ????, DATED ???

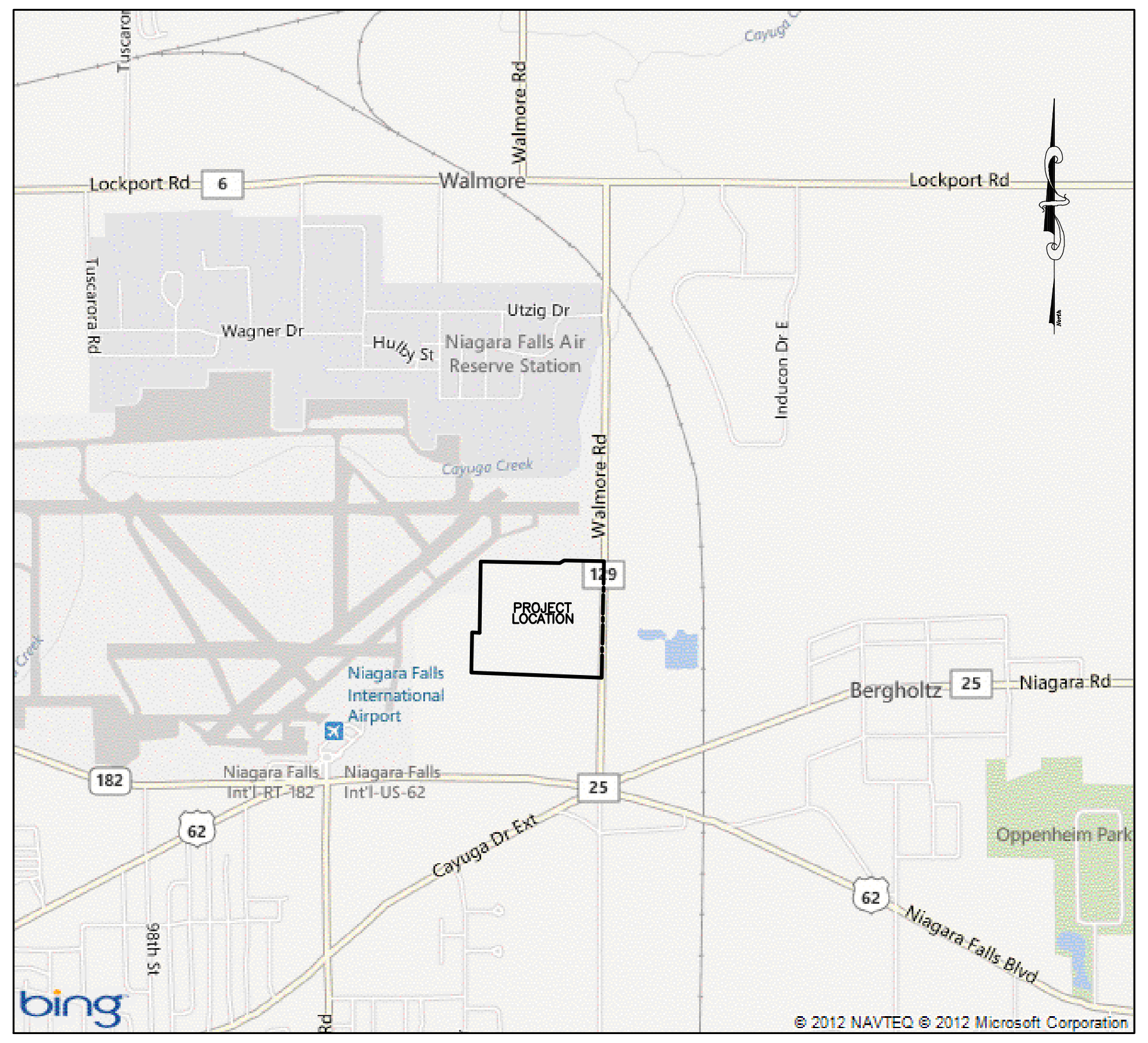
3) THE TOTAL AREA OF LAND COVERED BY THE PROPOSED DEC CONSERVATION EASEMENT IS +/- 15.21 ACRES.

4) THE DEC SITE NAME FOR THIS PARCEL IS ??? AND THE DEC SITE NUMBER IS ????

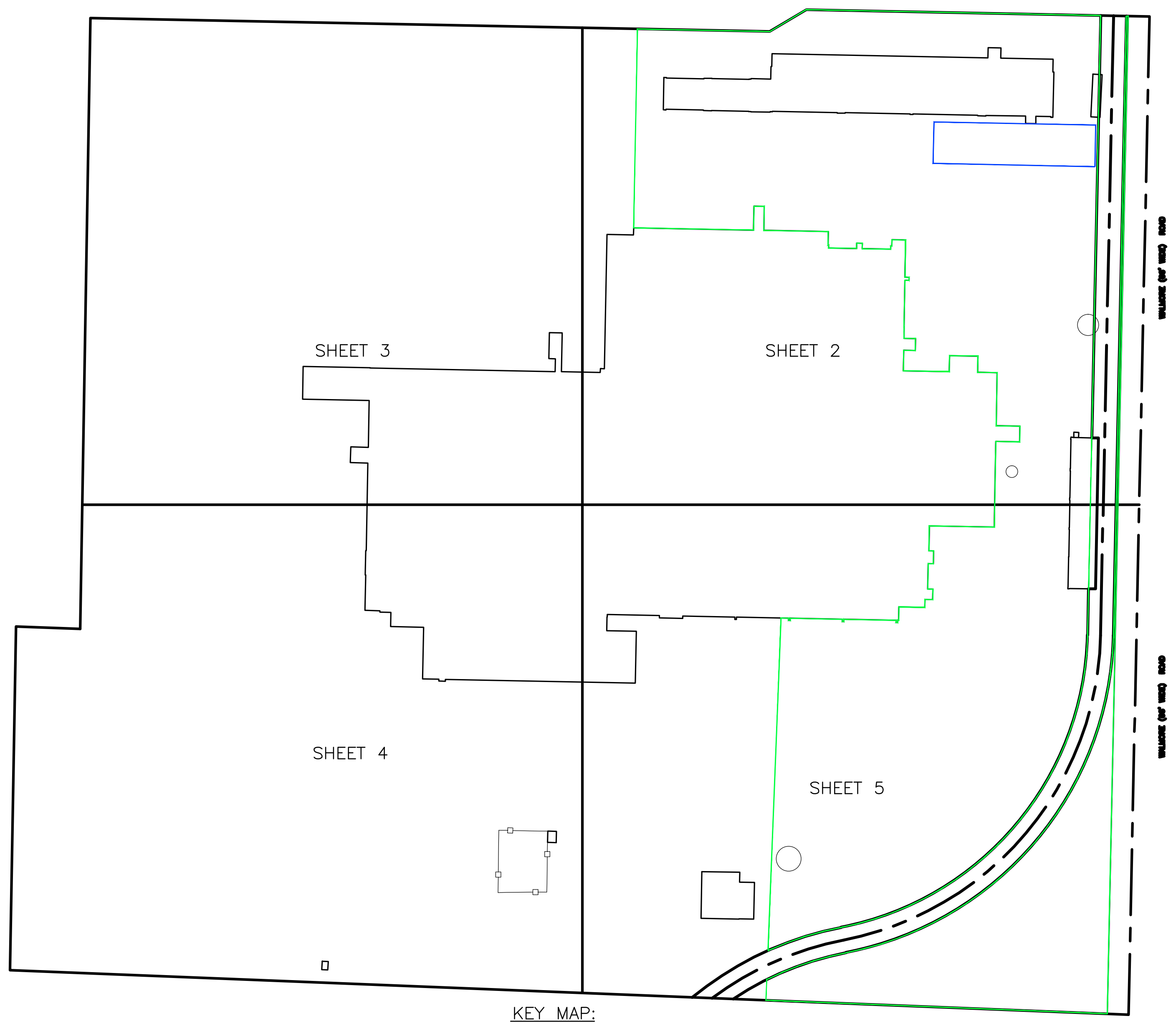
5) THE TAX ID NUMBER FOR THIS SITE IS 146.00-1-9.2

CERTIFICATION:

I HEREBY CERTIFY TO THE PEOPLE OF THE STATE OF NEW YORK ACTING THROUGH ITS COMMISIONER OF THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, AND TO (TITLE COMPANY) THAT THIS SURVEY MAP WAS PREPARED BASED UPON AN ACTUAL FIELD SURVEY.



LOCATION MAP:
NOT TO SCALE



KEY MAP:
NOT TO SCALE

🟩 ENVIRONMENTAL EASEMENT AREA

🟦 AREA OF ENGINEERING CONTROL

PRELIMINARY
DATE July 31, 2012

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law.

REV	DESCRIPTION	DATE	BY

REV	DESCRIPTION	DATE	BY

NOTES:
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THESE PLANS ARE NOT SUITABLE FOR MACHINE GUIDANCE USE OR PURPOSES.

Field Date: *JUNE 8, 2012*
Office Date: *JUNE 15, 2012*
Job No. *2012.0305.00*
Book:
Page:
Map: *58867*
File Name: *EKONOL DEC.DWG*

Designed by:
Drawn by: *JMP*
Checked by: *MR*
Dwg Scale:
Horiz: *1"=30'*
Vert: *N/A*

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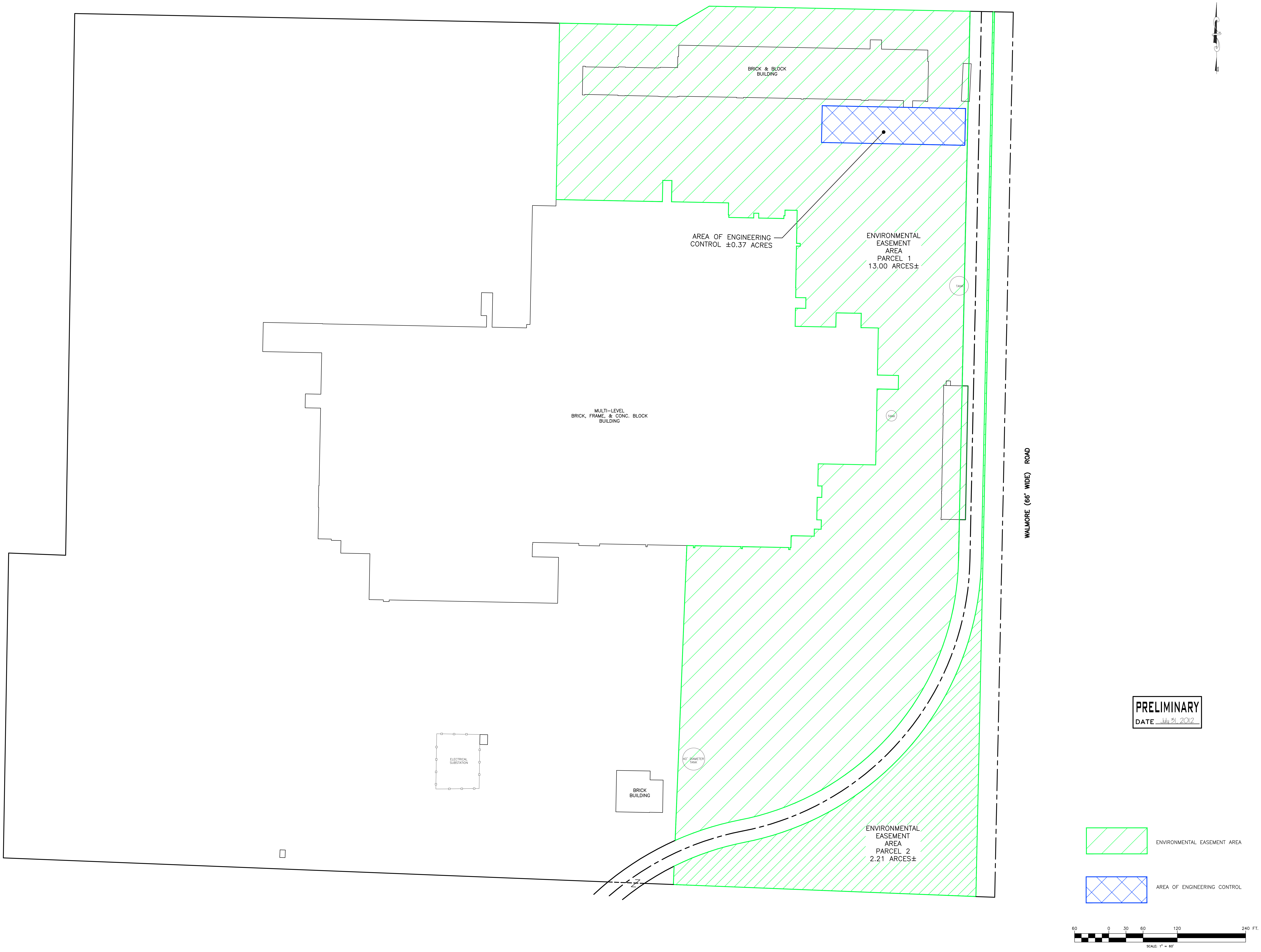
NEW YORK STATE
TOWN OF WHEATFIELD
NIAGARA COUNTY

EKONOL PLANT DEC BOUNDARY SURVEY
6600 WALMORE ROAD
TOWN OF WHEATFIELD

MAP NUMBER:
58867
Sheet 1 of 6



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REV	DESCRIPTION	DATE	BY

REV	DESCRIPTION	DATE	BY

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Drawn by: *JMP*	Job No. *2012.0305.00*
Checked by: *MR*	Book: Page: Map: *58867*
Dwg Scale: Horiz: *1"=60'* Vert: *N/A*	File Name: *EKONOL DEC.DWG*

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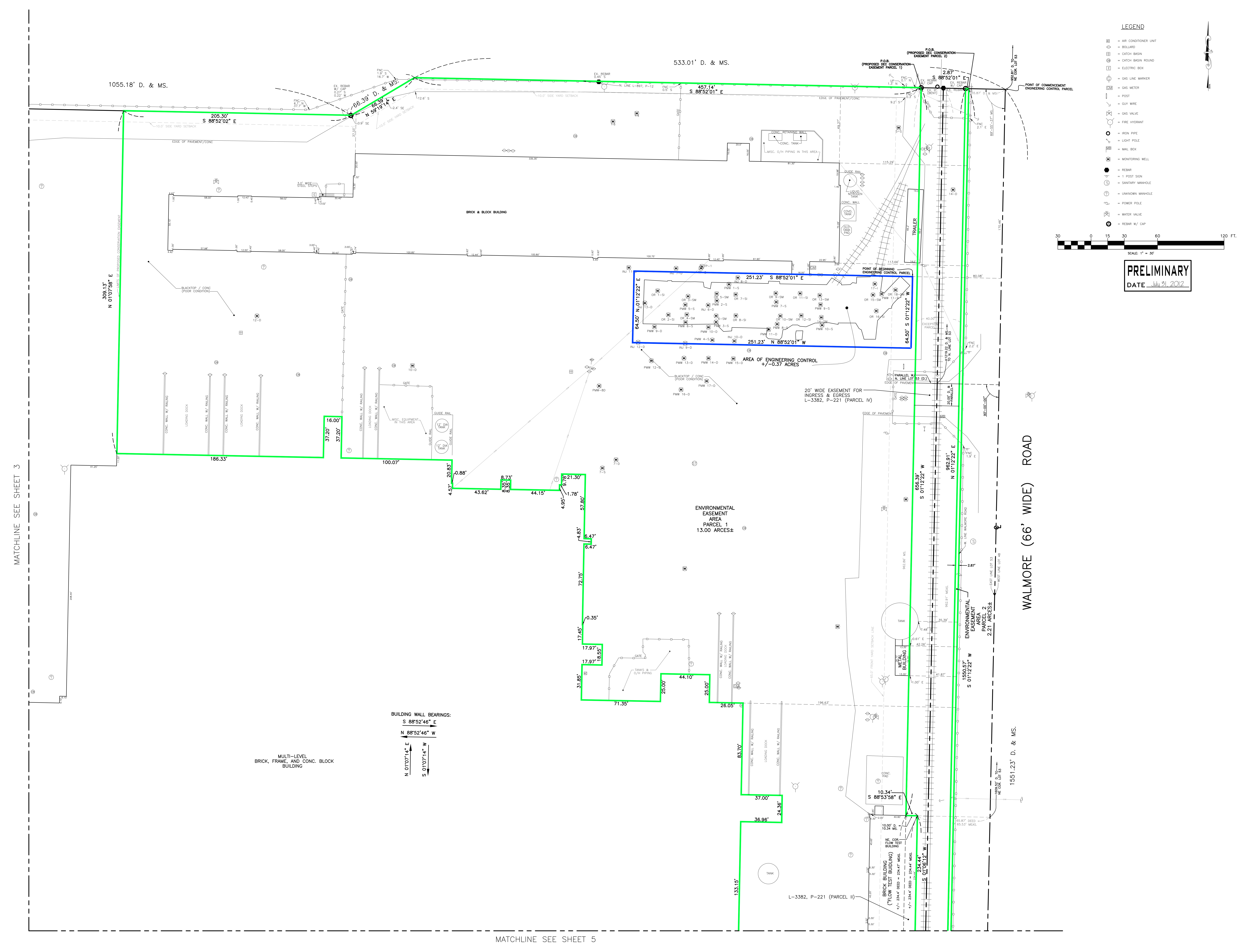

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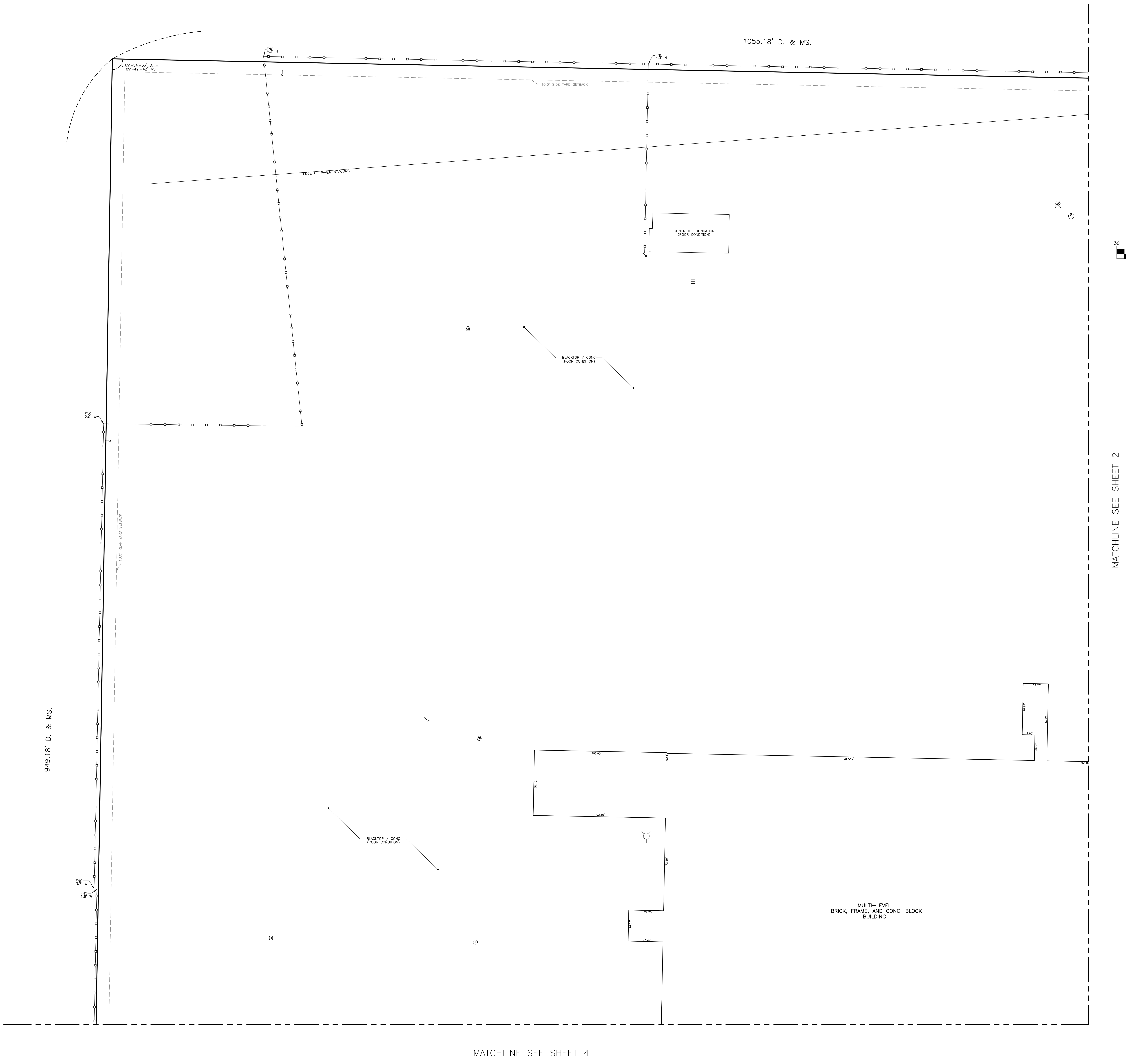
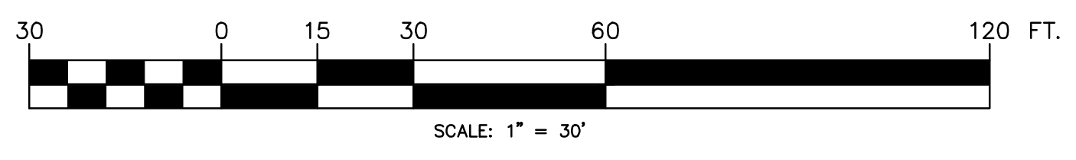


LEGEND

AC	= AIR CONDITIONER UNIT
⊙	= BOLLARD
⊞	= CATCH BASIN
CB	= CATCH BASIN ROUND
E	= ELECTRIC BOX
G	= GAS LINE MARKER
GM	= GAS METER
|	= POST
↘	= GUY WIRE
G	= GAS VALVE
⊙	= FIRE HYDRANT
◉	= IRON PIPE
⊸	= LIGHT POLE
MB	= MAIL BOX
⊗	= MONITORING WELL
⬢	= REBAR
⊸	= 1 POST SIGN
S	= SANITARY MANHOLE
?	= UNKNOWN MANHOLE
⊸	= POWER POLE
W	= WATER VALVE
◉	= REBAR W/ CAP



SCALE: 1" = 30'

PRELIMINARY

DATE July 10 2012

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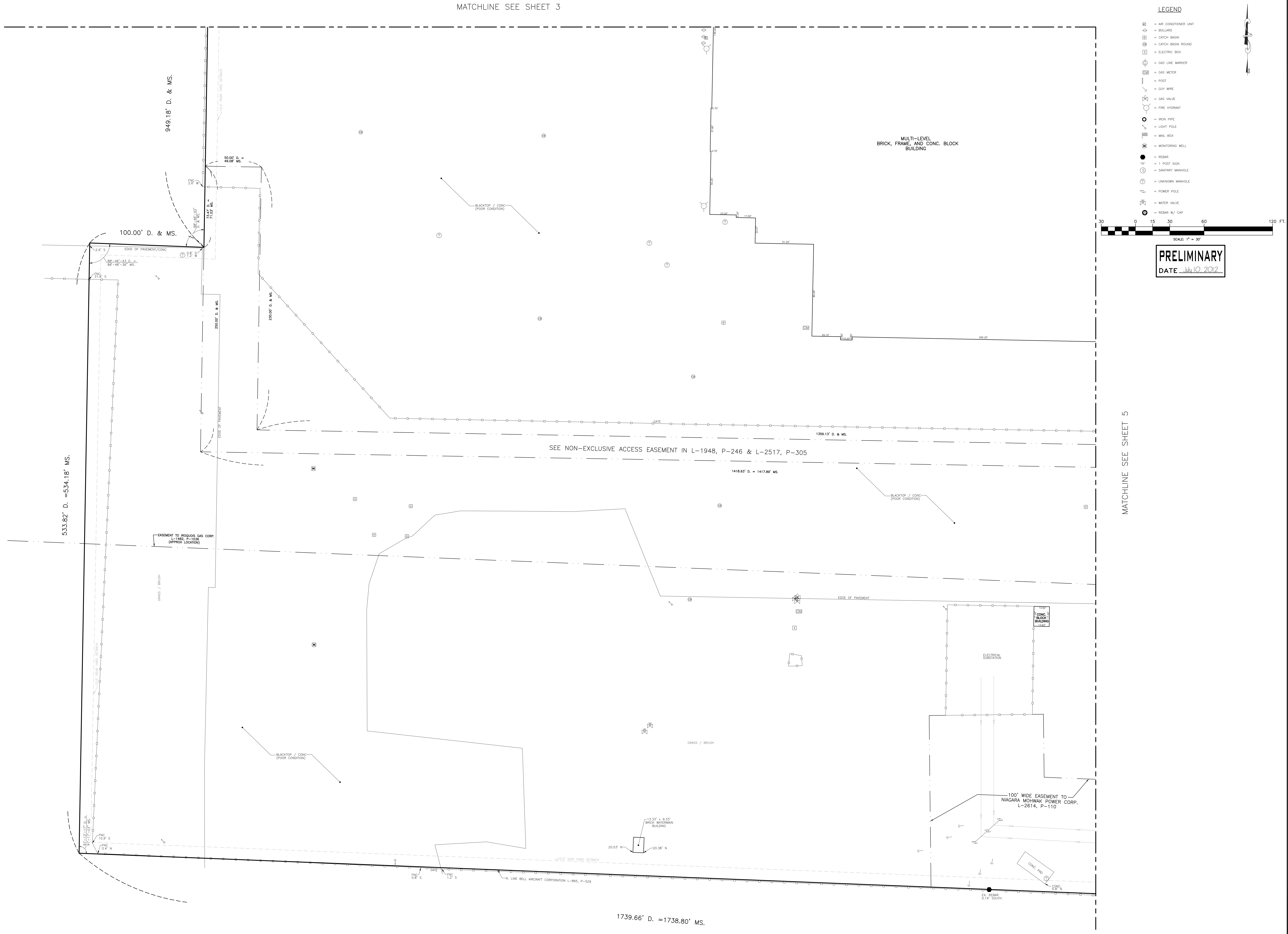

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DATE	BY	DESCRIPTION	REV

DATE	BY	DESCRIPTION	REV

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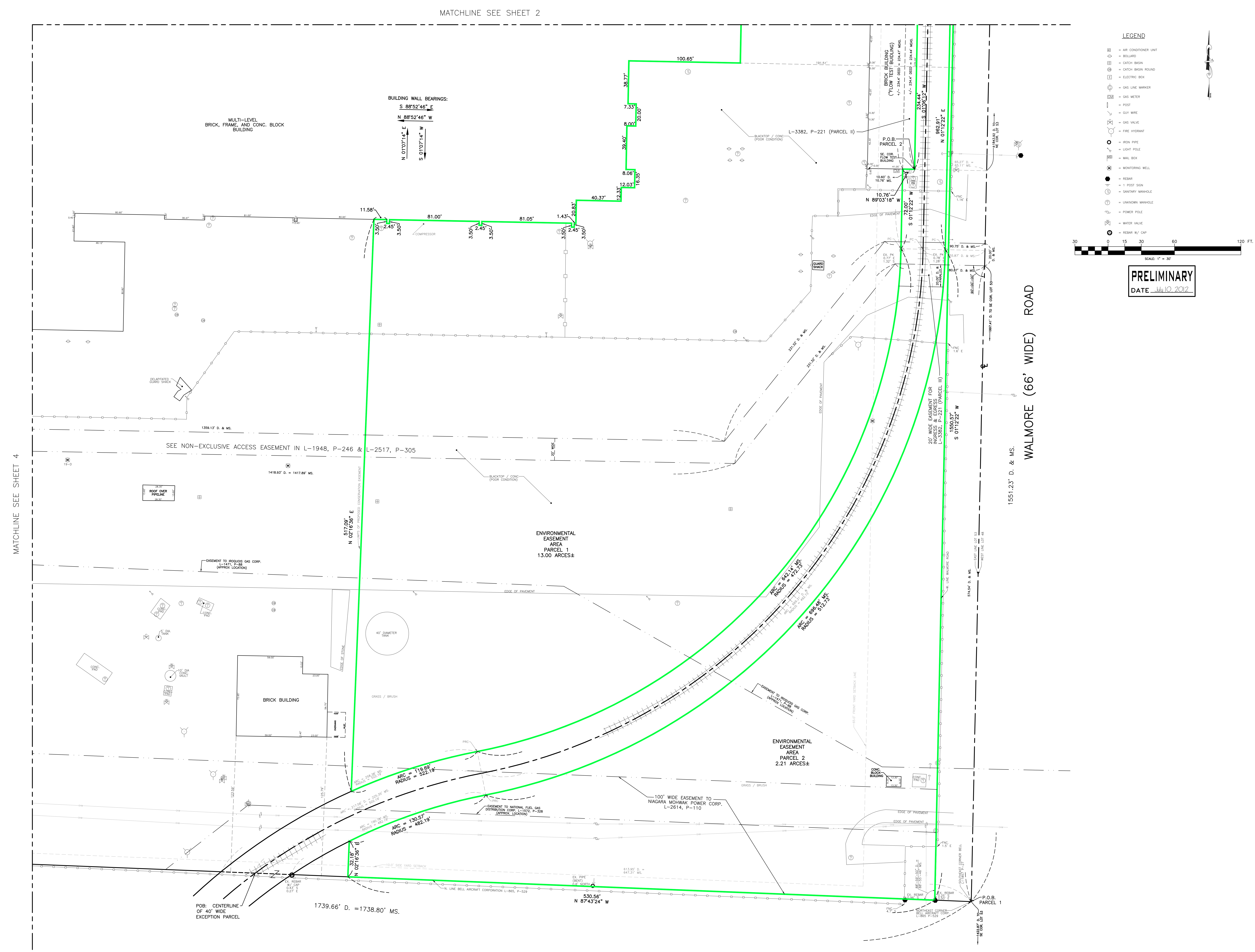

PRELIMINARY
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Sheet 5 of 6

DATE	BY	DESCRIPTION	REV

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APPENDIX B
RESTRICTIVE COVENANT

NIAGARA COUNTY – STATE OF NEW YORK
WAYNE F. JAGOW – NIAGARA COUNTY CLERK
P.O. BOX 461, LOCKPORT, NEW YORK 14095-0461

RECEIVED
MAY 27 2014
DEVAPRASAD PLLC

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

Recording:

Cover Page	8.00
Recording Fee	152.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
Total:	180.00

**** NOTICE: THIS IS NOT A BILL ****

INSTRUMENT #: 2014-08069

Receipt#: 2014199409
Clerk: BH
Rec Date: 05/22/2014 12:24:07 PM
Doc Grp: DEED
Descrip: RESTRICTED COVENANTS
Num Pgs: 50

Party1: PATRIOT WHEATFIELD ASSOCIATES LP
PATRIOT WHEATFIELD ASSOCIATES II LP
Party2: PATRIOT WHEATFIELD ASSOCIATES LP
PATRIOT WHEATFIELD ASSOCIATES II LP
Town: WHEATFIELD

ORIGINAL FILED
MAY 22 2014
WAYNE F. JAGOW
NIAGARA COUNTY CLERK

Record and Return To:

DEVAPRASAD PLLC
119 WASHINGTON AVE
ALBANY NY 12210

WARNING***
** Information may change during the verification process and may not be reflected on this page.

Wayne F. Jagow
Niagara County Clerk

R+R:

DEVAPRASAD PLLC
119 WASHINGTON AVENUE
ALBANY, NEW YORK 12210

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the 27th day May of 2014, by Patriot Wheatfield Associates, LP and Patriot Wheatfield Associates II, LP, limited partnerships organized and existing under the laws of the State of New York and having an office for the transaction of business at 1200 Liberty Ridge Drive, Suite 115, Wayne, Pennsylvania 19087

WHEREAS, the Ekonol Polyester Resins site located in the Town of Wheatfield, County of Niagara and State of New York is the subject of a Voluntary Cleanup Agreement executed by BP America Inc. (hereinafter the "Agreement") as part of the New York State Department of Environmental Conservation's (hereinafter "the Department") Voluntary Cleanup Program, a copy of which is attached hereto as Exhibit A; and

WHEREAS, the Ekonol Polyester Resins site is the real property known as and located at 6600 Walmore Road in the Town of Wheatfield, County of Niagara, State of New York; being the lands conveyed by Saint Gobain Abrasives Inc. to Patriot Wheatfield Associates LP by deed dated September 20, 2006 and recorded in the Niagara County Clerk's Office in Book 3382 of Deeds at Page 221; also being the buildings and improvements conveyed by Patriot Wheatfield Associates LP to Patriot Wheatfield Associates II, LP by deed dated June 28, 2007 and recorded in the Niagara County Clerk's Office in Book 3408 of Deeds at Page 938 (hereinafter the Property"). The Property is administratively identified by tax parcel number 294000-146-000-0001-009-002 and is more particularly described in Appendix "A" attached to this Declaration of Covenants and Restrictions (hereinafter "Declaration") and by reference made a part hereof; and

WHEREAS, the Department approved a remedy to eliminate or mitigate all significant threats to the environment presented by the contamination at the Property and such remedy requires that a portion of the Property be subject to particular restrictive covenants and restrictions (hereinafter "the Remedy"); and

WHEREAS, it is the intention of the parties to impose the terms of this Declaration on the portion of the Property depicted within the Environmental Easement Areas shown on a map attached to this Declaration as Appendix "B" and by reference made a part hereof (hereinafter "Environmental Easement"). The Environmental Easement is more particularly described in Appendix "C" attached to this Declaration and by reference made a part hereof.

NOW, THEREFORE, Patriot Wheatfield Associates, LP and Patriot Wheatfield Associates II, LP, for themselves and their successors and/or assigns, covenant that:

1. There shall be no construction, use or occupancy of the Environmental Easement that results in the disturbance or excavation of the soils of the Environmental Easement which threatens the integrity of the engineering controls or which result in unacceptable human exposure to contaminated soils within the Environmental Easement absent written approval by the Department If the Department shall no longer exist, written approval for construction, use or occupancy of the Environmental Easement shall be obtained from any New York State (hereinafter "State") agency or agencies subsequently created to protect the environment of the State and/or the health of the State's citizens (hereinafter referred to as "Relevant Agency").

ORIGINAL FILED
MAY 22 2014
WAYNE F. JAGOW
NIAGARA COUNTY CLERK

a. Following Department or Relevant Agency approval for construction, use or occupancy within the Environmental Easement, all work shall comply with the terms of the Department approved Site Management Plan (hereinafter "SMP"), including, but not limited to, the following requirements:

   i. Any soils excavated from the Environmental Easement shall be observed for staining of soils. During any excavation of the Environmental Easement, the presence of water and utilities should be noted. These observations shall be recorded by the party engaged in the excavation of soils, whether it is the owner of the Environmental Easement and/or any party actively remediating the soils or groundwater within the Environmental Easement (hereinafter "Remediating Party")

   ii. Soils that exhibit obvious visual or olfactory signs or impacts or have sustained PID readings above 10ppm shall not be used for backfill of the excavation and should be staged for proper disposal. Staged soils to be characterized for disposal will be placed on poly plastic and covered with plastic, or contained in a roll-off container or soil drums.

   iii. Prior to any construction of an enclosed structure located within the Environmental Easement, the party engaged in the construction activities or the owner of the Environmental Easement must (1) perform a soil vapor intrusion (SVI) evaluation to determine whether mitigation measure are necessary to eliminate potential exposure to vapors in the proposed structure(s); or (2) include a SVI mitigation system as an element of the building foundation.

   iv. Prior to conducting a SVI evaluation or installing a SVI mitigation system, a work plan must be submitted to the Department or Relevant Agency and the State Department of Health.

2. Within the Environmental Easement, an asphalt cap has been installed over the bioreactor in conjunction with the Remedy as described in more detail in the SMP. The owner of the Environmental Easement shall not remove and shall properly maintain the asphalt cap until such time that the removal of the asphalt caps is approved by the Department or the Relevant Agency. The location of the asphalt caps is depicted as the "Area of Engineering Control" in Appendix B. This area is also more particularly described in Appendix "D" of the Declaration which by reference is made a part hereof.

3. Absent a written waiver from the Department or Relevant Agency, the owner of the Environmental Easement shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of the engineering controls required for the remediation of the Environmental Easement (hereinafter "the

Remedy") The engineering controls are described in more detail in the in the SMP.

4. The owner of the Environmental Easement and/or Remediating Party shall continue in full force and effect any institutional and engineering controls, including the OM&M Work, required under the Agreement and maintain such controls unless the owner or Remediating Party first obtains permission to discontinue such controls from the Department or Relevant Agency, subject to the modifications as approved by the Department or Relevant Agency.

5. Absent a written waiver from the Department or the Relevant Agency, the Environmental Easement shall only be used for commercial or industrial use purposes.

6. Absent a written waiver from the Department or Relevant Agency, the Owner of the Environmental Easement shall prohibit the use of the groundwater underlying the Environmental Easement without treatment rendering it safe for drinking water or for industrial purposes, as appropriate.

7. The owner of the Environmental Easement shall provide a periodic certification, prepared and submitted by a professional engineer or environmental professional acceptable to the Department or Relevant Agency, which will certify that the institutional and engineering controls required for the Remedy comply with the covenants of this Declaration

8. This Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Environmental Easement, and shall provide that the owner and its successors and assigns consent to enforcement by the Department or Relevant Agency of the prohibitions and restrictions that the Voluntary Cleanup Agreement requires to be recorded, and hereby covenants not to contest the authority of the Department or Relevant Agency to seek enforcement.

9. Any deed or conveyance of the Environmental Easement shall recite, unless the Department or Relevant Agency has consented in writing to the termination of such covenants and restrictions that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned have executed this instrument the day written below.

DATED:

MARCH 27, 2014

Patriot Wheatfield Associates, LP
BY: PATRIOT WHEATFIELD, INC.
By:
Name: ALAN S. WERNER
Title: VICE PRESIDENT

DATED:

Patriot Wheatfield Associates II, LP

By: ____________________
Name: ____________________
Title: ____________________

STATE OF PA)
)ss.:
COUNTY OF CHESTER)

On the 27th day of MARCH, ~~2013,~~ 2014 before me, the undersigned, a notary public in and for said state, personally appeared ALAN S WERNER personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity, and that by his/her/their signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual(s) acted, executed the instrument.

____
Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Jennifer Coyle, Notary Public
Tredyffrin Twp., Chester County
My Commission Expires Sept. 1, 2015
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

IN WITNESS WHEREOF, the undersigned have executed this instrument the day written below.

DATED:

Patriot Wheatfield Associates LP

By: ____________________
Name: ____________________
Title: ____________________

DATED:

MARCH 27, 2014

Patriot Wheatfield Associates II, LP
BY: PATRIOT WHEATFIELD II, INC.
By:
Name: ALAN S. WERNER
Title: VICE PRESIDENT

STATE OF PA)
)ss.:
COUNTY OF CHESTER)

On the 27th day of MARCH, ~~2013~~ 2014, before me, the undersigned, a notary public in and for said state, personally appeared ALAN S WERNER personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity, and that by his/her/their signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Jennifer Coyle, Notary Public
Tredyffrin Twp., Chester County
My Commission Expires Sept. 1, 2015
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

CONSENT

U.S. Bank National Association, successor to Bank of America, N.A. (successor by merger to LaSalle Bank National Association), as Trustee for J.P.Morgan Chase Commercial Mortgage Securities Corp. J.P.Morgan Chase Commercial Mortgage Securities Trust 2008-C2 ("Mortgagee"), successor in interest to Wells Fargo Bank, National Association, is the successor mortgagee under that certain Mortgage, Assignment of Leases and Rents, Security Agreement and Fixture Filing dated September 20, 2006, and recorded on December 5, 2006, in the Office of the Niagara County Clerk, as Document Number 2008155, Mortgage Book 5232, Page 655, as assigned to CIBC Inc., a Delaware corporation, by that certain Mortgage dated as of July 19, 2007 (as assigned, the "Security Instrument"), and is the holder of that certain Promissory Note made by Patriot Wheatfield Associates, L.P., a New York limited partnership, whose obligations were assumed by Patriot Wheatfield Associates II, L.P., a New York limited partnership ("Borrower"), which is secured by the Security Instrument, and as such mortgagee and holder, joins in the execution of the annexed Declaration of Covenants and Restrictions (the "Declaration") for the sole purpose of consenting to, and subordinating the lien of the Security Instrument to, the Declaration and all covenants, restrictions, conditions and easements contained in the Declaration upon Borrower's property. Notwithstanding the immediately prior sentence, nothing contained in this Consent shall be deemed to subordinate the Security Instrument to any financial obligation set forth in the Declaration nor shall anything in this Consent be deemed to obligate Mortgagee with respect to any financial obligation or payment for any lien that may arise from the Declaration, and the Security Instrument shall remain prior and superior to any such liens or covenants created by the Declaration and any and all financial obligations set forth or created therein.

Except as expressly stated herein, nothing contained herein shall be deemed to modify or amend the terms of the Security Instrument, and the Security Instrument shall remain in full force and effect without change. The Declaration shall not be amended without the prior written consent of Mortgagee

Dated: April 14th, 2014.

MORTGAGEE:

U.S. BANK NATIONAL ASSOCIATION, successor to Bank of America, N.A. (successor by merger to LaSalle Bank National Association), as Trustee for J.P Morgan Chase Commercial Mortgage Securities Corp. J.P.Morgan Chase Commercial Mortgage Securities Trust 2008-C2

By: Wells Fargo Bank, N.A., as Master Servicer No. 2

By:

Name: **Brent Lloyd**

Title: **Assistant Vice President**

STATE OF CALIFORNIA)
) §
COUNTY OF ALAMEDA)

On the 14th day of April, 2014, before me, the undersigned, personally appeared BRENT LLOYD, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that [✓ he]/she executed the same in [✓ his]/~~her~~ capacity, and that by [✓ his]/~~her~~ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument

[SEAL]

NOREEN SUTTERFIELD
Commission # 2000434
Notary Public - California
Alameda County
My Comm. Expires Jan 5, 2017

Notary Public

Exhibit A

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of the Implementation of a **Voluntary Cleanup Agreement**

for: Ekonol Polyester Resins by: BP America, Inc., "Volunteer"
Site #: V00653-9   Index #: B9-0636-03-05

WHEREAS, the Department is responsible for the enforcement of the ECL and the NL and such laws provide the Department authority to enter into this Agreement;

WHEREAS, the Department has established a Voluntary Cleanup Program to address the environmental, legal, and financial barriers that hinder the redevelopment and reuse of contaminated properties;

WHEREAS, Volunteer represents, and the Department relied upon such representations in entering into this Agreement, that Volunteer's involvement with the Site is limited to the following: Volunteer is a former owner of the Site;

WHEREAS, the parties are entering into this Agreement in order to set forth a process through which the Department will approve and the Volunteer will implement activities designed to address in whole or in part environmental contamination at the Site; and

WHEREAS, the Department has determined that it is in the public interest to enter into this Agreement as a means to address environmental issues at the Site with private funds while ensuring the protection of human health and the environment;

NOW, THEREFORE, IN CONSIDERATION OF AND IN EXCHANGE FOR THE MUTUAL COVENANTS AND PROMISES, THE PARTIES AGREE TO THE FOLLOWING:

I. Site Specific Definitions

For purposes of this Agreement, the terms set forth in the Glossary attached to, and made a part of, this Agreement shall have the meanings ascribed to them in that Glossary. In addition, for purposes of this Agreement, the following terms shall have the following meanings:

A. "Contemplated Use": restricted commercial use excluding day care, child care and medical care uses.

B "Existing Contamination": chlorinated volatile organic compounds, semi-volatile organic compounds and metals as described in the "Site Characterization Report/Ekonol Polyester Resins Facility/ Wheatfield, New York" prepared by Parsons and dated February 2001 and "Phase II Site Characterization at Ekonol Polyester Resins Wheatfield, New York" prepared by Parsons and dated March 2003. The term also includes contamination identified during the implementation of this Agreement, the nature and extent of which were unknown or insufficiently characterized as of the effective date of this Agreement, but which shall have been fully characterized and addressed to the Department's satisfaction

C. "Site": the eastern portion of that parcel of real property located on 6660 Walmore Road in the Town of Wheatfield, County of Niagara, New York bearing Tax Map Number

146.00-1-9.2 as depicted on Exhibit "A" of this Agreement. Exhibit "A" is a map of the Site showing its general location.

D. "Volunteer": BP America, Inc., a corporation organized and existing under the laws of the State of Delaware and authorized to do business in the State of New York and having an office for the transaction of business at 4101 Winfield Road, Warrenville, IL 60555.

II. Development, Performance and Reporting of Work Plans

A. Work Plan Labels

The work plans ("Work Plan" or "Work Plans") under this Agreement shall be captioned as follows:

1. "Investigation Work Plan" if the Work Plan provides for the investigation of the nature and extent of contamination at the Site;

2. "IRM Work Plan" if the Work Plan provides for an interim remedial measure;

3. "Remedial Action Work Plan" if the Work Plan provides for the Site's remediation to cleanup levels sufficient to allow for the Contemplated Use of the Site; or

4. "OM&M Work Plan" if the Work Plan provides for post-remedial construction operation, maintenance, and/or monitoring.

B. Submission/Implementation of Work Plans

1. The first proposed Work Plan to be submitted under this Agreement shall be submitted within forty (40) Days after the effective date of this Agreement. Thereafter, the Volunteer can submit such other and additional work plans it deems appropriate.

2. A proposed Work Plan shall be submitted for the Department's review and approval and shall include, at a minimum, a chronological description of the anticipated activities, a schedule for performance of those activities, and sufficient detail to allow the Department to evaluate that Work Plan. A Professional Engineer must prepare, sign, and seal all Work Plans other than an Investigation Work Plan. Upon the Department's written approval of a Work Plan, such Department-approved Work Plan shall be incorporated into and become an enforceable part of this Agreement and shall be implemented in accordance with the schedule contained therein. If the Department disapproves a Work Plan, the reasons for such disapproval shall be provided in writing. In the event the Department disapproves a Work Plan, within twenty (20) Days after receiving written notice of such disapproval, Volunteer shall elect in writing to (i) modify or expand it; (ii) complete any other Department-approved Work Plan(s); (iii) invoke dispute resolution pursuant to Paragraph XIII; or (iv) terminate this Agreement pursuant to Subparagraph XII.A.

3. During all field activities, Volunteer shall have on-Site a representative who is qualified to supervise the activities undertaken. Such representative may be an employee or a consultant retained by Volunteer to perform such supervision.

C. Revisions to Work Plans

If revisions to a Work Plan are required to satisfy the objectives of such Work Plan, the parties will negotiate revisions which shall be attached to and incorporated into the relevant Work Plan and which shall be enforceable under this Agreement If the parties cannot agree upon revisions to the relevant Work Plan, then unless the Volunteer invokes dispute resolution pursuant to Paragraph XIII, either party may terminate this Agreement pursuant to Subparagraph XII.A.

D. Submission of Final Reports

1. In accordance with the schedule contained in a Work Plan, Volunteer shall submit a final report which includes the caption of that Work Plan on the cover page. The final report pertaining to that Work Plan's implementation shall include but not be limited to: all data generated relative to the Site and all other information obtained as part of the implementation of the subject Work Plan; all of the assessments and evaluations required by the subject Work Plan; a statement of any additional data that must be collected; and "as-built" drawings, to the extent necessary, showing all changes made during construction. Additionally, the final report for an Investigation Work Plan shall contain a certification by the person with primary responsibility for the day to day performance of the activities under this Agreement that those activities were performed in full accordance with the Investigation Work Plan, and all other Work Plan final reports must contain such certification made by a Professional Engineer with primary responsibility for the day to day performance of the activities under this Agreement that all such activities were performed in full accordance with the Department approved Work Plan.

2. An OM&M Work Plan, if necessary, shall be submitted in accordance with the schedule set forth in the IRM Work Plan or Remedial Action Work Plan.

E. Review of Submittals other than Work Plans

1. The Department shall timely notify Volunteer in writing of its approval or disapproval of each submittal other than a Work Plan. All Department-approved submittals shall be incorporated into and become an enforceable part of this Agreement.

2 If the Department disapproves a submittal covered by this Subparagraph, it shall specify the reasons for its disapproval and may request Volunteer to modify or expand the submittal. Within twenty (20) Days after receiving written notice that Volunteer's submittal has been disapproved, Volunteer shall elect in writing to either (i) modify or expand it; (ii) complete any other Department-approved Work Plan(s); (iii) invoke dispute resolution pursuant to Paragraph XIII; or (iv) terminate this Agreement pursuant to Subparagraph XII.A. If Volunteer submits a revised submittal and it is disapproved, the Department and Volunteer may pursue whatever remedies may be available under this Agreement or under law.

3. Within sixty (60) Days of the Department's approval of a final report, Volunteer shall submit such additional Work Plans as it proposes to implement. Failure to submit any additional Work Plans within such period shall, unless other Work Plans are under review by the Department or being implemented by Volunteer, result in the termination of this Agreement pursuant to Subparagraph XII B.

4. All approved final reports shall be submitted to the Department in an electronic format acceptable to the Department within thirty (30) Days of approval of such final

report. If any document cannot be converted into electronic format, Volunteer shall so advise the Department and, if the Department concurs, submit such document in an alternative format acceptable to the Department.

F. Department's Determination of Need for Remediation

The Department will determine upon its approval of each final report dealing with the investigation of the Site whether remediation, or additional remediation as the case may be, is needed to allow the Site to be used for the Contemplated Use.

1. The Department shall timely notify Volunteer if it determines that remediation, or additional remediation, is not needed to allow the Site to be used for the Contemplated Use. If the Department determines that additional remediation is not needed and such determination is based upon use restrictions, Volunteer shall cause to be filed a Declaration of Covenants and Restrictions in accordance with Paragraph X within sixty (60) Days of receipt of the Department's determination. Upon receipt of a copy of such instrument, the Department will provide Volunteer with the Release described in Subparagraph II.H.

2. If the Department determines that remediation, or additional remediation, is needed to allow the Site to be used for the Contemplated Use, Volunteer may elect to submit for review and approval a proposed Work Plan (or a revision to an existing Remedial Action Work Plan for the Site) which addresses the remediation of Existing Contamination. Such proposed Work Plan shall include, among other requirements, an evaluation of the proposed remedy considering the factors set forth in 6 NYCRR 375-1.10(c)(1) through (c)(6), excluding consideration of cost-effectiveness. At a minimum, the remedial activities contemplated by the proposed Work Plan must eliminate or mitigate all significant threats to the public health and/or the environment and must result in the Site being protective of public health and the environment for the Contemplated Use. The Department will notice a proposed Work Plan addressing the Site's remediation for public comment in accordance with Subparagraph II.G of this Agreement. If Volunteer elects not to develop a Work Plan under this Subparagraph or either party concludes that a mutually acceptable Work Plan under this Subparagraph cannot be negotiated, then this Agreement shall terminate in accordance with Subparagraph XII.A.

G. Notice of Proposed Work Plan for the Site's Remediation

Whenever a Work Plan for the Site's remediation (other than an IRM Work Plan) is proposed, the Department will timely publish a notice in the Environmental Notice Bulletin to inform the public of the opportunity to submit comments on the proposed Work Plan within thirty (30) Days after the date of the issue in which the notice appears. The Department shall timely mail an equivalent notice to the County of Niagara and Town of Wheatfield. The Department shall timely notify Volunteer following the close of the public comment period whether the proposed Work Plan needs to be revised. If the Department determines that revisions are necessary for Site conditions to be protective of the public health or the environment based upon the Contemplated Use, Volunteer agrees to negotiate revisions to the proposed Work Plan in accordance with Paragraph II.C. If either party concludes that such revisions cannot be negotiated, then this Agreement shall terminate in accordance with Paragraph XII. If the Department determines that no revisions are required, then the Work Plan shall be attached hereto as Exhibit "B."

H. Release and Covenant Not to Sue

Upon the Department's determination that (i) Volunteer is in compliance with the Agreement; (ii) no requirements other than those remedial actions, exclusive of OM&M activities, already conducted at the Site, if any, are necessary to assure that Site conditions are protective of the public health and the environment based upon the Contemplated Use; and (iii) Volunteer has complied, if required, with Paragraph X, the Department shall timely provide Volunteer with the Release and Covenant Not to Sue attached hereto as Exhibit "C," subject to the terms and conditions stated therein.

I. Submission of Annual Reports, if required

In the event that the remedy for the Site, if any, or any Work Plan for the Site requires operation, maintenance, and monitoring (OM&M), including reliance upon institutional or engineering controls, Volunteer shall cause the filing of an annual report by the 1st Day of the month following the anniversary of the start of the OM&M. Volunteer shall file such annual report until the Department determines that the Site can be closed out and so notifies Volunteer in writing. Such annual report shall be signed by a Professional Engineer and shall contain a certification that any institutional and engineering controls put in place pursuant to this Agreement are still in place, have not been materially altered, and are still effective in achieving their objectives. Volunteer shall notify the Department within twenty-four (24) hours of discovery of any upset, interruption, or termination of one or more controls without the prior approval of the Department. Further, Volunteer shall take all actions required by the Department to maintain conditions at the Site that achieve the objectives of the remedy and/or the Work Plan and are protective of public health and the environment. An explanation of such upset, interruption, or termination of one or more controls and the steps taken in response shall be included in the foregoing notice and in the annual report required by this Subparagraph as well as in any progress reports required by Paragraph III. Volunteer can petition the Department for a determination that the institutional and/or engineering controls may be terminated. Such petition must be supported by a Professional Engineer stating that such controls are no longer necessary for the protection of public health and the environment. The Department shall not unreasonably withhold its approval of such petition.

III. Progress Reports

Volunteer shall submit a written progress report of its actions under this Agreement to the parties identified in Subparagraph XI.A.1 by the 10th Day of each month commencing with the month subsequent to the approval of the first Work Plan and ending with the Termination Date, unless a different frequency is set forth in a Work Plan. Such reports shall, at a minimum, include: all actions relative to the Site during the previous reporting period and those anticipated for the next reporting period; all approved activity modifications (changes of work scope and/or schedule); all results of sampling and tests and all other data received or generated by or on behalf of Volunteer in connection with this Site, whether under this Agreement or otherwise, in the previous reporting period, including quality assurance/quality control information, information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule, efforts made to mitigate such delays, and information regarding activities undertaken in support of the Citizen Participation Plan during the previous reporting period and those anticipated for the next reporting period.

IV. Enforcement

This Agreement shall be enforceable as a contractual agreement under the laws of the State of New York. Volunteer shall not suffer any penalty or be subject to any proceeding or action if it cannot comply with any requirement of this Agreement as a result of a Force Majeure Event provided it notifies the Department in writing within ten (10) Working Days of when it obtains knowledge of any such event. Volunteer shall include in such notice the measures taken and to be taken to prevent or minimize any delays and shall request an appropriate extension or modification of this Agreement. Volunteer shall have the burden of proving by a preponderance of the evidence that an event qualifies as a Force Majeure Event pursuant to this Paragraph.

V. Entry upon Site

A. Volunteer hereby consents, upon reasonable notice under the circumstances presented, to entry upon the Site or areas in the vicinity of the Site which may be under the control of Volunteer, by any duly designated officer or employee of the Department or any State agency having jurisdiction with respect to the matters addressed in a Department-approved Work Plan, and by any agent, consultant, contractor, or other person so authorized by the Commissioner, all of whom shall abide by the health and safety rules in effect for the Site, for (i) inspecting, sampling, and copying records related to the contamination at the Site; (ii) implementing the activities under this Agreement; and (iii) testing and any other activities necessary to ensure Volunteer's compliance with this Agreement. Upon request, Volunteer shall (i) provide the Department with suitable office space at the Site, including access to a telephone, to the extent available; and (ii) permit the Department full access to all non-privileged records relating to matters addressed by this Agreement. Raw data is not considered privileged and that portion of any privileged document containing raw data must be provided to the Department.

B. The Department shall have the right to take its own samples and scientific measurements and the Department and Volunteer shall have the right to obtain samples, duplicate samples, or both, of all substances and materials sampled. The Department shall make the results of all sampling and scientific measurements taken under this Subparagraph available to Volunteer.

VI. Payment of State Costs

A. Within forty-five (45) Days after receipt of an itemized invoice from the Department, Volunteer shall pay to the Department a sum of money which shall represent reimbursement for State Costs for work performed at or in connection with the Site prior to the effective date of this Agreement, as well as for negotiating this Agreement, and all costs associated with this Agreement, through and including the Termination Date.

B. Personal service costs shall be documented by reports of Direct Personal Service, which shall identify the employee name, title, biweekly salary, and time spent (in hours) on the project during the billing period, as identified by an assigned time and activity code. Approved agency fringe benefit and indirect cost rates shall be applied. Non-personal service costs shall be summarized by category of expense (*e.g.*, supplies, materials, travel, contractual) and shall be documented by expenditure reports. The Department shall not be required to provide any other documentation of costs, provided however, that the Department's records shall be available consistent with, and in accordance with, Article 6 of the Public Officers Law.

C. Such invoice shall be sent to Volunteer at the following address:

William B. Barber, CPG
Group Environmental Management Co.
4850 East 49th Street, MBC3-147
Cuyahoga Heights, Ohio 44125

D. Each such payment shall be made payable to the Department of Environmental Conservation and shall be sent to:

Bureau of Program Management
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway, Albany, NY 12233-7012.

E. Each party shall provide written notification to the other within ninety (90) Days of any change in the foregoing addresses.

F. Volunteer may contest, in writing, invoiced costs under Subparagraph VI.A if it believes (i) the cost documentation contains clerical, mathematical, or accounting errors; (ii) the costs are not related to the State's activities reimbursable under this Agreement; or (iii) the Department is not otherwise legally entitled to such costs. If Volunteer objects to an invoiced cost, Volunteer shall pay all costs not objected to within the time frame set forth in Subparagraph VI.A and shall, within thirty (30) Days of receipt of an invoice, identify in writing all costs objected to and identify the basis of the objection. This objection shall be filed with the BPM Director. The BPM Director or the BPM Director's designee shall have the authority to relieve Volunteer of the obligation to pay invalid costs. Within forty-five (45) Days of the Department's determination of the objection, Volunteer shall pay to the Department the amount which the BPM Director or the BPM Director's designee determines Volunteer is obligated to pay or commence an action or proceeding seeking appropriate judicial relief.

G. In the event any instrument for the payment of any money due under this Agreement fails of collection, such failure of collection shall constitute a violation of this Agreement, provided (i) the Department gives Volunteer written notice of such failure of collection, and (ii) the Department does not receive from Volunteer a certified check or bank check within fourteen (14) Days after the date of the Department's written notification.

VII Reservation of Rights

A. 1. Except as provided in the Release and Covenant Not to Sue (Exhibit "C") after its issuance and except as provided in Subparagraph VII.A.2, nothing contained in this Agreement shall be construed as barring, diminishing, adjudicating, or in any way affecting any of the Department's rights or authorities, including, but not limited to, the right to recover natural resource damages, the right to take any investigatory or remedial action deemed necessary, and the right to exercise summary abatement powers with respect to any person, including Volunteer.

2. Except for the Department's right to take any investigatory or remedial action deemed necessary as a result of a significant threat resulting from the Existing Contamination or to exercise summary abatement powers, the Department shall not take any

enforcement action under ECL Article 27, Title 13, under CERCLA, under the NL, or under comparable statutory or common law theories of remedial liability with respect to the Existing Contamination, to the extent that such contamination is being addressed under the Agreement, against Volunteer or Volunteer's grantees, successors, or assigns during the implementation of this Agreement, provided such party is in compliance with the terms and provisions of this Agreement, including, without limitation, the requirements of all Work Plans and amendments thereto.

B. Except as otherwise provided in this Agreement, Volunteer specifically reserves all rights and defenses under applicable law to contest, defend against, dispute, or disprove any action, proceeding, allegation, assertion, determination, or order of the Department, including any assertion of remedial liability by the Department against Volunteer, and further reserves all rights including the rights to notice, to be heard, to appeal, and to any other due process respecting any action or proceeding by the Department, including the enforcement of this Agreement. The existence of this Agreement or Volunteer's compliance with it shall not be construed as an admission of any liability, fault, wrongdoing, or violation of law by Volunteer, and shall not give rise to any presumption of law or finding of fact which shall inure to the benefit of any third party.

C. Except as provided in Subparagraph XIV.O, Volunteer reserves such rights as it may have to seek and obtain contribution, indemnification, and/or any other form of recovery from its insurers and from other potentially responsible parties or their insurers, for past or future response and/or cleanup costs or such other costs or damages arising from contamination at the Site as provided under applicable law.

VIII. Indemnification

Volunteer shall indemnify and hold the Department, the State of New York, and their representatives and employees harmless for all claims, suits, actions, damages, and costs of every name and description arising out of or resulting from the fulfillment or attempted fulfillment of this Agreement by Volunteer prior to the Termination Date except for liability arising from (i) vehicular accidents occurring during travel to or from the Site; or (ii) from willful, wanton, or malicious acts or omissions, or acts or omissions constituting gross negligence or criminal behavior by the Department, the State of New York, and/or their representatives and employees during the course of any activities conducted pursuant to this Agreement. The Department shall provide Volunteer with written notice no less than thirty (30) Days prior to commencing a lawsuit seeking indemnification pursuant to this Paragraph.

IX. Public Notice

A. Within thirty (30) Days after the effective date of this Agreement, Volunteer shall cause to be filed a Department-approved Notice of Agreement, which Notice shall be substantially similar to the Notice of Agreement attached to this Agreement as Exhibit "D," with the County Clerk in the county in which the Site is located to give all parties who may acquire any interest in the Site notice of this Agreement. Within thirty (30) Days of such filing (or such longer period of time as may be required to obtain a certified copy provided Volunteer advises the Department of the status of its efforts to obtain same within thirty (30) Days), Volunteer shall provide the Department with a copy of such instrument certified by such County Clerk to be a true and faithful copy. Volunteer may terminate such Notice on or after the Termination Date of this Agreement.

B. If Volunteer proposes to convey the whole or any part of Volunteer's ownership interest in the Site, or becomes aware of such conveyance, Volunteer shall, not fewer than forty-five (45) Days before the date of conveyance or within forty-five (45) Days after becoming aware of such conveyance, notify the Department in writing of the identity of the transferee and of the nature and proposed date of the conveyance, and shall notify the transferee in writing, with a copy to the Department, of the applicability of this Agreement. However, such obligation shall not extend to the granting of any rights under any mortgage, deed, trust, assignment, judgment, lien, pledge, security agreement, lease, or any other right accruing to a person not affiliated with Volunteer to secure the repayment of money or the performance of a duty or obligation.

X. Declaration of Covenants and Restrictions

A. Within thirty (30) Days after the Department's approval of a Work Plan which relies upon one or more institutional controls, or within thirty (30) Days after the Department's determination pursuant to Subparagraph II.F.1 that additional remediation is not needed based upon use restrictions, Volunteer shall submit to the Department for approval a Declaration of Covenants and Restrictions to run with the land which provides for covenants and restrictions consistent with the Work Plan. The submittal shall be substantially similar to Exhibit "E." Volunteer shall cause such instrument to be recorded with the County Clerk in the county in which the Site is located within thirty (30) Days after the Department's approval of such instrument. Volunteer shall provide the Department with a copy of such instrument certified by the County Clerk to be a true and faithful copy within thirty (30) Days of such recording (or such longer period of time as may be required to obtain a certified copy provided Volunteer advises the Department of the status of its efforts to obtain same within such 30 Day period).

B. Volunteer or the owner of the Site may petition the Department to modify or terminate the Declaration of Covenants and Restrictions filed pursuant to this Paragraph at such time as it can certify that the Site is protective of human health and the environment for residential uses without reliance upon the restrictions set forth in such instrument. Such certification shall be made by a Professional Engineer. The Department will not unreasonably withhold its consent.

XI. Communications

A. All written communications required by this Agreement shall be transmitted by United States Postal Service, by private courier service, or hand delivered.

1. Communication from Volunteer shall be sent to:

Daniel King, P.E.
Division of Environmental Remediation
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

Note: four copies (one unbound) of work plans are required to be sent.

Gary Litwin
Bureau of Environmental Exposure Investigation
New York State Department of Health
Flanigan Square
547 River Street
Troy, New York 12180-2216

Note: two copies of work plans are required to be sent, and

James Charles, Esq.
Division of Environmental Enforcement
New York State Department of Environmental
Conservation
270 Michigan Ave.
Buffalo, New York 14203-2999

2. Communication from the Department to Volunteer shall be sent to:

William B. Barber, CPG
Group Environmental Management Co.
4850 East 49th Street, MBC3-147
Cuyahoga Heights, Ohio 44125

B. The Department and Volunteer reserve the right to designate additional or different addressees for communication on written notice to the other.

C. Each party shall notify the other within ninety (90) Days after any change in the addresses listed in this Paragraph XI or in Paragraph VI.

XII. Termination of Agreement

A. 1. Volunteer may elect in writing to terminate this Agreement without cause while the Department may only elect to terminate this Agreement for cause, which shall be established so long as the Department's stated reason is not arbitrary and capricious. The Department shall include in its notice of termination the basis for its election to terminate this Agreement.

2. In the event of either party's election to terminate this Agreement, this Agreement shall terminate effective the 5th Day after the non-terminating party's receipt of the written notification terminating this Agreement, except that such termination shall not affect the provisions contained in Paragraphs IV, VI and VIII and in Subparagraph XIV.O, nor Volunteer's obligation to ensure that it does not leave the Site in a condition, from the perspective of human health and environmental protection, worse than that which prevailed before any activities were commenced under this Agreement, which provisions and obligation shall survive the termination of this Agreement.

B. Notwithstanding Subparagraph XII.A, this Agreement shall terminate without notice in the event that Volunteer fails to submit additional Work Plans in accordance with Subparagraph II.E, unless other Work Plans are under review by the Department or being implemented by Volunteer.

XIII. Dispute Resolution

A If Volunteer disagrees with the Department's notice of disapproval of a submittal or a proposed Work Plan, disapproval of a final report, nullification of this Agreement pursuant to Subparagraph XIV.A.2, or rejection of Volunteer's assertion of a Force Majeure Event, Volunteer may, within thirty (30) Days of receipt of such notice, request in writing informal negotiations with the Department in an effort to resolve the dispute. A copy of such request shall be sent by Volunteer to the appropriate Remedial Bureau Chief in the Department's Central Office. The Department and Volunteer shall consult together in good faith and exercise best efforts to resolve any differences or disputes without resort to the procedures described in Subparagraph XIII.B. The period for informal negotiations shall not exceed thirty (30) Days from Volunteer's request for informal negotiations. If the parties cannot resolve a dispute by informal negotiations during this period, the Department's position shall be considered binding unless Volunteer notifies the Department in writing within thirty (30) Days after the conclusion of the thirty (30) Day period for informal negotiations that it invokes the dispute resolution provisions provided under Subparagraph XIII.B.

B 1. Volunteer shall file with the OH&M a request for formal dispute resolution and a written statement of the issues in dispute, the relevant facts upon which the dispute is based, factual data, analysis, or opinion supporting its position, and all supporting documentation upon which Volunteer relies (hereinafter called the "Statement of Position"). A copy of such request and written statement shall be provided contemporaneously to the Director and to the parties listed under Subparagraph XI.A.1.

2. The Department shall serve its Statement of Position no later than twenty (20) Days after receipt of Volunteer's Statement of Position

3. Volunteer shall have the burden of proving by substantial evidence that the Department's position does not have a rational basis and should not prevail. The OH&M can conduct meetings, in person or via telephone conferences, and request additional information from either party if such activities will facilitate a resolution of the issues.

4 The OH&M shall prepare and submit a report and recommendation to the Director. The Director shall issue a final decision resolving the dispute in a timely manner. The final decision shall constitute a final agency action and Volunteer shall have the right to seek judicial review of the decision pursuant to Article 78 of the CPLR provided that Volunteer notifies the Department within thirty (30) Days after receipt of a copy of the final decision of its intent to commence an Article 78 proceeding and commences such proceeding within sixty (60) Days after receipt of a copy of the Director's final decision. Volunteer shall be in violation of this Agreement if it fails to comply with the final decision resolving this dispute within forty-five (45) Days after the date of such final decision, or such other time period as may be provided in the final decision, unless it seeks judicial review of such decision within the forty-five (45) Day period provided. In the event that Volunteer seeks judicial review, Volunteer shall be in violation of this Agreement if it fails to comply with the final Court Order or settlement within thirty (30) Days after the effective date of such Order or settlement, unless otherwise directed by the Court. For purposes of this Subparagraph, a Court Order or settlement shall not be final until the time to perfect an appeal of same has expired

5. The invocation of dispute resolution shall not extend, postpone, or modify Volunteer's obligations under this Agreement with respect to any item not in dispute unless or until the Department agrees or a Court determines otherwise. The invocation of the procedures set forth in this Paragraph XIII shall constitute a waiver of any and all other administrative remedies which may otherwise be available to Volunteer regarding the issue in dispute.

6. The Department shall keep an administrative record of any proceedings under this Paragraph XIII which shall be available consistent with Article 6 of the Public Officers Law.

7. Nothing in this Paragraph XIII shall be construed as an agreement by the parties to resolve disputes through administrative proceedings pursuant to the State Administrative Procedure Act, the ECL, or 6 NYCRR Part 622 or Section 375-2.1.

XIV. Miscellaneous

A. 1. Volunteer hereby certifies that all information known to Volunteer and all information in the possession or control of Volunteer and its agents which relates in any way to the contamination existing at the Site on the effective date of this Agreement, and to any past or potential future release of hazardous substances, pollutants, or contaminants at or from the Site, and to its application for this Agreement, has been fully and accurately disclosed to the Department in conjunction with the Volunteer's application for the Voluntary Cleanup Program.

2. If the information provided and certifications made by Volunteer are not materially accurate and complete, this Agreement, except with respect to the provisions of Paragraphs IV, VI and VIII and Subparagraph XIV.O, at the sole discretion of the Department, shall be null and void *ab initio* fifteen (15) Days after the Department's notification of such inaccuracy or incompleteness or fifteen (15) Days after issuance of a final decision resolving a dispute pursuant to Paragraph XIII, whichever is later, and the Department shall reserve all rights that it may have, unless, however, Volunteer submits information within that fifteen (15) Day time period indicating that the information provided and the certifications made were materially accurate and complete.

B. Volunteer shall allow the Department to attend, and shall notify the Department at least seven (7) Working Days in advance of, any field activities to be conducted pursuant to this Agreement, as well as any pre-bid meetings, job progress meetings, substantial completion meeting and inspection, and final inspection and meeting; nothing in this Agreement shall be construed to require Volunteer to allow the Department to attend portions of meetings where privileged matters are discussed.

C. Volunteer shall use "best efforts" to obtain all Site access, permits, easements, rights-of-way, rights-of-entry, approvals, institutional controls, or authorizations necessary to perform Volunteer's obligations under this Agreement, except that the Department may exempt Volunteer from the requirement to obtain any permit issued by the Department for any activity that is conducted on the Site and that the Department determines satisfies all substantive technical requirements applicable to like activity conducted pursuant to a permit. If, despite Volunteer's best efforts, any access, permits, easements, rights-of-way, rights-of-entry, approvals, institutional controls, or authorizations required to perform this Agreement are not obtained within forty-five (45) Days after the effective date of this Agreement or within forty-five (45) Days after the date the Department notifies Volunteer in writing that additional access beyond that previously secured is necessary, Volunteer shall promptly notify the Department, and shall include in that notification a summary of the steps Volunteer has taken to obtain access. The Department may, as it deems appropriate and within its authority, assist Volunteer in obtaining access. If an interest in property is needed to implement an institutional control required by a Work Plan and such interest cannot be obtained, the Department may require Volunteer to modify the Work Plan pursuant to Subparagraph II.C of this Agreement to reflect changes necessitated by the lack of access and/or approvals.

D Volunteer shall not be considered an operator of the Site solely by virtue of having executed and/or implemented this Agreement.

E. Volunteer shall provide a copy of this Agreement to each contractor hired to perform work required by this Agreement and shall condition all contracts entered into to carry out the obligations identified in this Agreement upon performance in conformity with the terms of this Agreement. Volunteer or its contractor(s) shall provide written notice of this Agreement to all subcontractors hired to perform any portion of the work required by this Agreement. Volunteer shall nonetheless be responsible for ensuring that Volunteer's contractors and subcontractors perform the work in satisfaction of the requirements of this Agreement.

F. The paragraph headings set forth in this Agreement are included for convenience of reference only and shall be disregarded in the construction and interpretation of any provisions of this Agreement.

G 1. The terms of this Agreement shall constitute the complete and entire agreement between the Department and Volunteer concerning the implementation of the activities required by this Agreement. No term, condition, understanding, or agreement purporting to modify or vary any term of this Agreement shall be binding unless made in writing and subscribed by the party to be bound. No informal advice, guidance, suggestion, or comment by the Department shall be construed as relieving Volunteer of Volunteer's obligation to obtain such formal approvals as may be required by this Agreement. In the event of a conflict between the terms of this Agreement and any Work Plan submitted pursuant to this Agreement, the terms of this Agreement shall control over the terms of the Work Plan(s) attached as Exhibit "B." Volunteer consents to and agrees not to contest the authority and jurisdiction of the Department to enter into or enforce this Agreement.

2. i. Except as set forth herein, if Volunteer desires that any provision of this Agreement be changed, other than a provision of a Work Plan or a time frame, Volunteer shall make timely written application to the Commissioner with copies to the parties listed in Subparagraph XI A 1. The Commissioner or the Commissioner's designee shall timely respond.

ii. Changes to the Work Plan shall be accomplished as set forth in Subparagraph II C of this Agreement.

iii. Changes to a time frame set forth in this Agreement shall be accomplished by a written request to the Department's project attorney and project manager, which request shall be timely responded to in writing. The Department's decision relative to a request for a time frame change shall be subject to dispute resolution pursuant to Paragraph XIII.

H. 1. If there are multiple parties signing this Agreement, the term "Volunteer" shall be read in the plural where required to give meaning to this Agreement. Further, the obligations of Volunteers under this Agreement are joint and several and the insolvency of or failure by any Volunteer to implement any obligations under this Agreement shall not affect the obligations of the remaining Volunteer(s) to carry out the obligations under this Agreement.

2. If Volunteer is a partnership, the obligations of all general partners, including limited partners who act as general partners, to finance and perform obligations under this Agreement and to pay amounts owed to the Department under this Order are joint and several. In the event of the insolvency or other failure of any one or more of the general partners to implement the requirements of this Agreement, the remaining general partners shall complete all such requirements.

3 Notwithstanding the foregoing Subparagraphs XIV.H.1 and 2, if multiple parties sign this Agreement as Volunteers but not all of the signing parties elect, pursuant to Subparagraph II.F.2, to implement a Work Plan, then all Volunteers are jointly and severally liable for each and every obligation under this Agreement through the completion of activities in such Work Plan that all such parties consented to; thereafter, only those Volunteers electing to perform additional work shall be jointly and severally liable under this Agreement for the obligations and activities under such additional Work Plan(s). The parties electing not to implement the additional Work Plan(s) shall have no obligations under this Agreement relative to the activities set forth in such Work Plan(s). Further, only those Volunteers electing to implement such additional Work Plan(s) shall be eligible to receive the release and covenant not to sue as provided under Subparagraph II.H.

I. Except as provided in Subparagraph XIV.O, and to the extent authorized under 42 U.S.C. Section 9613, New York General Obligations Law Section 15-108, and any other applicable law, Volunteer shall be deemed to have resolved its liability to the State for purposes of contribution protection provided by CERCLA Section 113(f)(2) for "matters addressed" pursuant to and in accordance with this Agreement. "Matters addressed" in this Agreement shall mean all response actions taken to implement this Agreement for the Site and all response costs incurred and to be incurred by any person or party in connection with the work performed under this Agreement, which costs have been paid by Volunteer, including reimbursement of State Costs pursuant to this Agreement. Furthermore, to the extent authorized under 42 U.S.C. Section 9613(f)(3)(B), by entering into this administrative settlement of liability, if any, for some or all of the response action and/or for some or all of the costs of such action, Volunteer is entitled to seek contribution from any person except those who are entitled to contribution protection under 42 U.S.C. Section 9613(f)(2)

J. Volunteer, Volunteer's grantees, lessees, sublessees, successors, and assigns shall be bound by this Agreement. Any change in ownership of Volunteer including, but not limited to, any transfer of assets or real or personal property, shall in no way alter Volunteer's responsibilities under this Agreement.

K. All activities undertaken by Volunteer pursuant to this Agreement shall be performed in accordance with the requirements of all applicable Federal and State laws, regulations, and guidance documents.

L. Unless otherwise expressly provided herein, terms used in this Agreement which are defined in ECL Article 27, Title 13 or in regulations promulgated under such statute shall have the meaning assigned to them under said statute or regulations. Whenever terms listed in the Glossary attached hereto are used in this Agreement or in the attached Exhibits, the definitions set forth in the Glossary shall apply. In the event of a conflict, the definition set forth in the Glossary shall control.

M. Volunteer's obligations under this Agreement represent payment for or reimbursement of response costs, and shall not be deemed to constitute any type of fine or penalty.

N. This Agreement may be executed for the convenience of the parties hereto, individually or in combination, in one or more counterparts, each of which shall be deemed to have the status of an executed original and all of which shall together constitute one and the same.

O. Volunteer and Volunteer's employees, servants, agents, lessees, sublessees, grantees, successors, and assigns hereby waive any right to pursue reimbursement of monies expended by Volunteer prior to the Termination Date as against the State or the Spill Fund, and agree to indemnify and hold harmless the Spill Fund from any and all legal or equitable claims, suits, causes of action, or demands whatsoever with respect to the Site that any of same has or may have as a result of Volunteer's entering into or fulfilling the terms of this Agreement with respect to the Site.

P. The effective date of this Agreement is the 10th Day after the date it is signed by the Commissioner or the Commissioner's designee.

DATED: SEP 1 0 2003

ERIN M. CROTTY, COMMISSIONER
NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

By:

Dale A. Desnoyers, Director
Division of Environmental Remediation

CONSENT BY VOLUNTEER

Volunteer hereby consents to the issuing and entering of this Agreement, waives Volunteer's right to a hearing herein as provided by law, and agrees to be bound by this Agreement.

BP America, Inc.

By: Richard M. Frankoski

Title: Manager, Environmental Properties

Date: June 27, 2003

STATE OF ~~NEW YORK~~ OHIO)
) ss:
COUNTY OF CUYAHOGA)

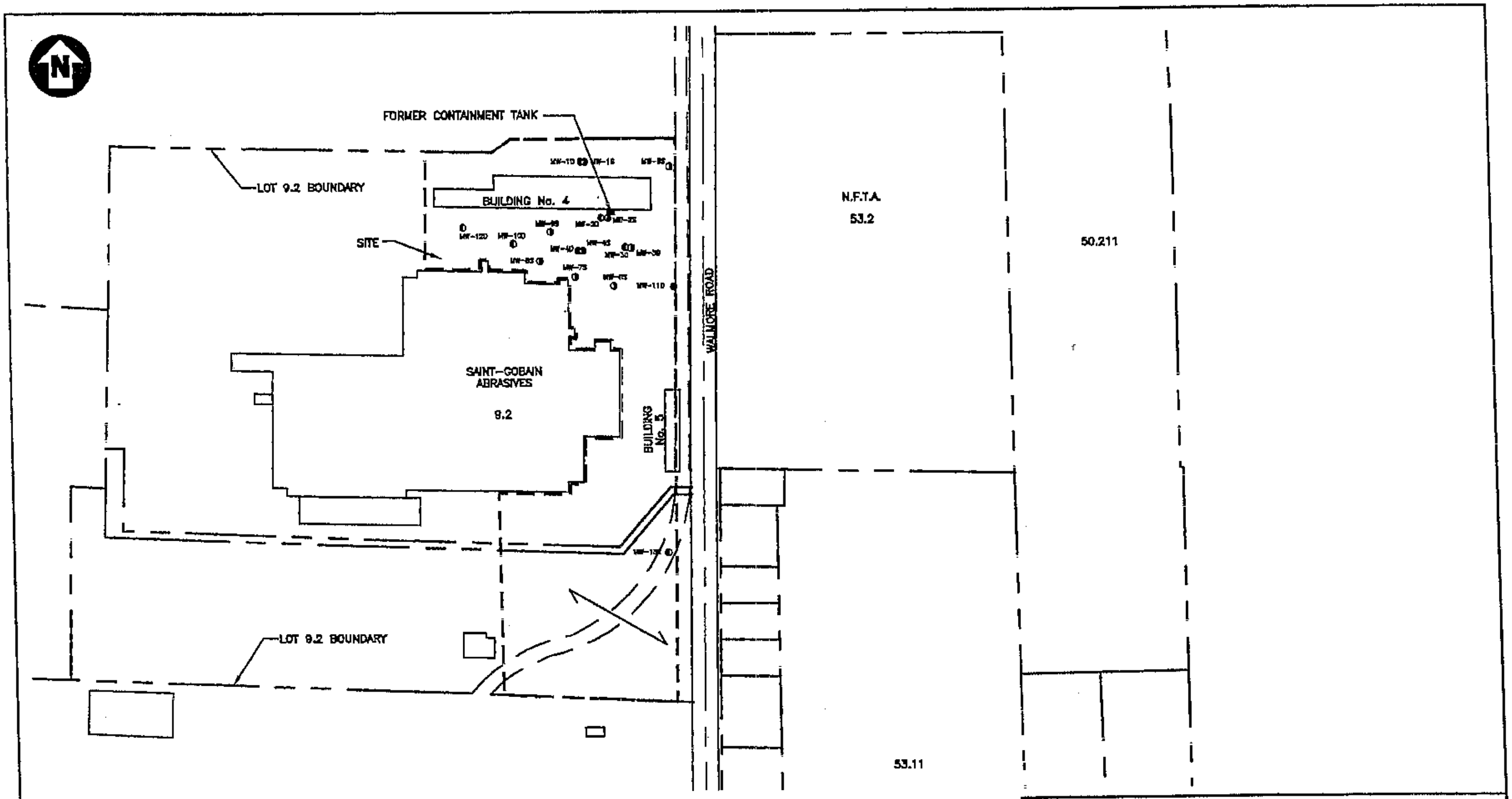
On the 27th day of June, in the year 2003, before me, the undersigned, personally appeared Richard M. Frankoski, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Diane Luptak
Signature and Office of individual taking acknowledgment

DIANE LUPTAK, Notary Public
State of Ohio, Cuyahoga County
My Commission Expires Oct. 29, 2007

EXHIBIT "A"

Map of Site



NOTES:

1. SOURCE TAX MAP 146.0D, TOWN OF WHEATFIELD, NIAGARA COUNTY, NY, MARCH 1, 2002.
2. BUILDING AND BORING LOCATIONS ARE OVERLAID ON TAX MAP AND ARE APPROXIMATE.

400 200 0 400 800

SCALE: 1"=400'

LEGEND:

◐ MW-1D	EXISTING BEDROCK MONITORING WELL
◑ MW-1S	EXISTING OVERBUROEN MONITORING WELL
▬ ▬ ▬ ▬	SITE BOUNOARY
—— — — ——	PROPERTY LINE
— — — —	RIGHT-OF-WAY

EXHIBIT A

EKONOL POLYESTER
RESINS FACILITY
WHEATFIELD, NEW YORK

GENERAL SITE PLAN

PARSONS
180 LAWRENCE BELL DRIVE, SUITE 104, WILLIAMSVILLE, N.Y. 14221, PHONE: 716-633-7074

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No XREFs

EXHIBIT "B"

Department-Approved Work Plan(s)

EXHIBIT "C"

Release and Covenant Not to Sue

Unless otherwise specified in this letter, all terms used in this letter shall have the meaning assigned to them under the terms of the Voluntary Cleanup Agreement entered into between the New York State Department of Environmental Conservation (the "Department") and BP America, Inc. ("Volunteer"), Index No B9-0636-03-05 (the "Agreement").

The Department is pleased to report that the Department is satisfied that the Agreement's Work Plan(s) relative to the Site, located at 6660 Walmore Road in the Town of Wheatfield, County of Niagara, New York and consisting of the eastern portion of the parcel having Niagara County Tax Map Identifier number 146.00-1-9.2 has been successfully implemented.

The Department therefore, hereby releases and covenants not to sue, and shall forbear from bringing any action, proceeding, or suit pursuant to the Environmental Conservation Law, the NL or the State Finance Law, and from referring to the Attorney General any claim for recovery of costs incurred by the Department, against Volunteer and Volunteer's lessees and sublessees, grantees, successors, and assigns, and their respective secured creditors, for the further investigation and remediation of the Site, based upon the release or threatened release of Covered Contamination, provided that (a) timely payments of the amounts specified in Paragraph VI of the Agreement continue to be or have been made to the Department, (b) appropriate deed restrictions remain recorded in accordance with Paragraph X of the Agreement, and (c) Volunteer and/or its lessees, sublessees, successors, or assigns promptly commence and diligently pursue to completion the Work Plan providing for OM&M, if any. Nonetheless, the Department hereby reserves all of its respective rights concerning, and such release and covenant not to sue shall not extend to natural resource damages or to any further investigation or remedial action the Department deems necessary:

- due to migration off-Site of contaminants resulting in impacts that are not inconsequential to environmental resources, to human health, or to other biota and to off-Site migration of petroleum;
- due to environmental conditions or information related to the Site which were unknown at the time this Release and Covenant Not to Sue was issued and which indicate that the Contemplated Use cannot be implemented with sufficient protection of human health and the environment;
- due to Volunteer's failure to implement the Agreement to the Department's satisfaction; or
- due to fraud committed by Volunteer in entering into or implementing this Agreement.

Additionally, the Department hereby reserves all of its rights concerning, and any such release and covenant not to sue shall not extend to Volunteer nor to any of Volunteer's lessees, sublessees, successors, or assigns who cause or allow a release or threat of release at the Site of any hazardous substance (as that term is defined at 42 USC 9601[14]) or petroleum (as that term is defined in Navigation Law § 172[15]), other than Covered Contamination; or cause or allow the use of the Site to change from the Contemplated Use to one requiring a lower level of residual contamination before that use can be implemented with sufficient protection of human health and the environment; nor to any of Volunteer's lessees, sublessees, successors, or assigns who are otherwise responsible under law for the remediation of the Existing Contamination independent of any obligation that party may have respecting same resulting solely from the Agreement's execution.

Notwithstanding the above, however, with respect to any claim or cause of action asserted by the Department, the one seeking the benefit of this release and covenant not to sue shall bear the burden of proving that the claim or cause of action, or any part thereof, is attributable solely to Covered Contamination.

Notwithstanding any other provision in this release, covenant not to sue, and forbearance:

- if with respect to the Site there exists or may exist a claim of any kind or nature on the part of the New York State Environmental Protection and Spill Compensation Fund against any party, nothing in this letter shall be construed or deemed to preclude the State of New York from recovering such claim;

- except as provided in this letter and the Agreement, nothing contained in this letter or the Agreement shall be construed as barring, diminishing, adjudicating, or in any way affecting any of the Department's rights (including, but not limited to, the right to recover natural resources damages) with respect to any party, including Volunteer;

- nothing contained in this letter shall prejudice any rights of the Department to take any investigatory or remedial action it deems necessary if Volunteer fails to comply with the Agreement or if contamination other than Existing Contamination is encountered at the Site;

- nothing contained in this letter shall be construed to prohibit the Commissioner or his duly authorized representative from exercising any summary abatement powers; and

- nothing contained in this letter shall be construed to affect the Department's right to terminate the Agreement under the terms of the Agreement at any time during its implementation if Volunteer fails to comply substantially with the Agreement's terms and conditions.

In conclusion, the Department is pleased to be part of this effort to return the Site to productive use of benefit to the entire community.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

By: ______________________________

Date: ______________________________

Appendix "A"

(to Exhibit "C")

Map of the Site

Exhibit "D"

NOTICE OF AGREEMENT

This Notice is made as of the _____ day of ________, 2003 by BP America, Inc regarding the eastern portion of that parcel of real property located at 6660 Walmore Road in the Town of Wheatfield, County of Niagara, New York bearing Tax Map Number 146.00-1-9 2. (the "Property"); and

WHEREAS, BP America, Inc. ("Volunteer"), entered into an agreement with the Department of Environmental Conservation, Index #B9-0636-03-05 (the "Agreement"), concerning contamination which is or may be present on the Property, which Agreement was executed on behalf of the Department on _______________; and

WHEREAS, in return for the remediation of the Property pursuant to the Agreement to the satisfaction of the Department, the Department will provide Volunteer and its lessees and sublessees, grantees, successors, and assigns, including their respective secured creditors, with a release, covenant not to sue, and forbearance from bringing any action, proceeding, or suit related to the Site's further investigation or remediation, subject to certain reservations set forth in the Agreement; and

WHEREAS, pursuant to the Agreement, Volunteer agreed to cause the filing of a notice of the Agreement with the Niagara County Clerk in accordance with Paragraph IX of the Agreement to give all parties who may acquire any interest in the Property notice of the Agreement.

NOW, THEREFORE, Volunteer, for itself and for its successors and assigns, declares that:

1. This Notice of Agreement is hereby given to all parties who may acquire any interest in the Property; and

2. This Notice shall terminate upon the filing of a Notice of Termination of this Agreement after having first received approval to do so from the New York State Department of Environmental Conservation or having terminated the Agreement pursuant to its Paragraph XII.

IN WITNESS WHEREOF, Volunteer has executed this Notice of Agreement by its duly authorized representative.

Dated: By: ______________________

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the _______ day of _________, in the year 2003 before me, the undersigned, personally appeared ________________, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

____
Signature and Office of individual
taking acknowledgment

Appendix "A"

(to Exhibit "D")

Map of the Property

Exhibit "E"

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the __ day of __________ 200__, by__________ a corporation organized and existing under the laws of the State of __________ and having an office for the transaction of business at______________.

WHEREAS, Ekonol Polyester Resins is the subject of a Voluntary Agreement executed by BP America, Inc. as part of the New York State Department of Environmental Conservation's (the "Department's) Voluntary Cleanup Program, namely the eastern portion of a parcel of real property located on 6600 Walmore Road in the Town of Wheatfield, County of Niagara , State of New York, which is part of lands conveyed by______________ to ______________ by deed dated________ and recorded in the Niagara County Clerk's Office on__________ in Book ____ of Deeds at Page ____ and being more particularly described in Appendix "A," attached to this declaration and made a part hereof, and hereinafter referred to as "the Property"; and

WHEREAS, the Department approved a remedy to eliminate or mitigate all significant threats to the environment presented by the contamination disposed at the Property and such remedy requires that the Property be subject to restrictive covenants.

NOW, THEREFORE,______________, for itself and its successors and/or assigns, covenants that:

First, the Property subject to this Declaration of Covenants and Restrictions is described in Appendix "A" and is shown on a map attached to this declaration as Appendix "B" and made a part hereof.

Second, unless prior written approval by the Department or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency," is first obtained, there shall be no construction, use or occupancy of the Property that results in the disturbance or excavation of the Property, which threatens the integrity of the soil cap, or which results in unacceptable human exposure to contaminated soils.

Third, the owner of the Property shall maintain the cap covering the Property by maintaining its grass cover or, after obtaining the written approval of the Relevant Agency, by capping the Property with another material.

Fourth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for restricted commercial use excluding day care, child care and medical care uses without the express written waiver of such prohibition by the Relevant Agency

Fifth, the owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment rendering it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission to do so from the Relevant Agency.

Sixth, the owner of the Property shall continue in full force and effect any institutional and engineering controls required under the Agreement and maintain such controls unless the owner first obtains permission to discontinue such controls from the Relevant Agency.

Seventh, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property, and shall provide that the owner and its successors and assigns consent to enforcement by the Relevant Agency of the prohibitions and restrictions that Paragraph X of the Agreement require to be recorded, and hereby covenant not to contest the authority of the Relevant Agency to seek enforcement.

Eighth, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

[acknowledgment]

Glossary of Terms

The following terms shall have the following meanings:

"BPM Director": the Director of the Bureau of Program Management within the Division of Environmental Remediation.

"CERCLA": the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq.

"Covered Contamination": the concentrations of Existing Contamination remaining on the Site on the date that the Department issues the Release set forth in Exhibit "C."

"CPLR": the Civil Practice Law and Rules, as amended.

"Day": a calendar day unless expressly stated to be a working day. "Working Day" shall mean a day other than a Saturday, Sunday or State holiday. In computing any period of time under this Agreement, where the last day would fall on a Saturday, Sunday or State holiday, the period shall run until the close of business of the next Working Day.

"Department": the New York State Department of Environmental Conservation.

"Director": the Division Director, Division of Environmental Remediation.

"ECL": the Environmental Conservation Law, Chapter 43-B of the Consolidated Laws of New York, as amended.

"Force Majeure Event": an event which is brought on as a result of fire, lightning, earthquake, flood, adverse weather conditions, strike, shortages of labor and materials, war, riot, obstruction or interference by adjoining landowners, or any other fact or circumstance beyond Volunteer's reasonable control.

"Interim Remedial Measure" or "IRM": an interim remedial measure which is a discrete set of activities, including removal activities, to address both emergency and non-emergency Site conditions, which can be undertaken without extensive investigation or evaluation, to prevent, mitigate, or remedy environmental damage or the consequences of environmental damage attributable to a Site.

"NL": the Navigation Law, as amended.

"OH&M": the Office of Hearings and Mediation Services.

"OM&M": post-construction operation, maintenance, and monitoring; the last phase of a remedial program, which continues until the remedial action objectives for the Site are met

"Professional Engineer": an individual registered as a professional engineer in accordance with Article 145 of the New York State Education Law. If such individual is a member of a firm, that firm must be authorized to offer professional engineering services in the State of New York in accordance with Article 145 of the New York State Education Law

"Spill Fund": the New York State Environmental Protection and Spill Compensation Fund as established by Article 12, Part 3 of the NL.

"State Costs": all the State's response expenses related to the Site, including, but not limited to, direct labor, fringe benefits, indirect costs, travel, analytical costs, and contractor costs incurred by the State of New York for negotiating, implementing, overseeing, and administering this Agreement, and any other response costs as defined under CERCLA. Approved agency fringe benefit and indirect cost rates will be applied.

"Termination Date": the date upon which (i) the Release (Exhibit "C") is issued or the Department approves the final report relative to the OM&M at the Site, whichever is later; or (ii) the Agreement terminates pursuant to Paragraph XII or is nullified pursuant to Subparagraph XIV.A.2.

"Trustee": the Trustee of New York State's natural resources.

"USEPA": the United States Environmental Protection Agency.

"Work Plan": a Department-approved work plan, as may be modified, pertaining to the Site, that Volunteer shall implement and that is attached to this Agreement.

APPENDIX A

PARCEL I

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Wheatfield, County of Niagara, State of New York, and being part of Lot Number 53, Township 13 Range 8 of the Holland Land Company's Survey (so-called), bounded and described as follows:

BEGINNING AT A POINT on the centerline of Walmore Road, said centerline being the east line of Lot Number 53 and said point also being the northeast corner of land conveyed to Bell Aircraft Corporation by deed recorded April 15, 1947 in Liber 865 of Deeds at Page 529 and which point of beginning is 1422.87 feet north from the intersection of the centerline of Walmore Road with the south line of Lot Number 53, as measured along said centerline:

RUNNING THENCE: Westerly, along the north line of land deeded to Bell Aircraft Corporation as aforesaid and at an interior angle of 88°-59'-50", 1739.66 feet;

RUNNING THENCE: Northerly, at an interior angle of 91°-13'-17", 533.82 feet;

RUNNING THENCE: Easterly, at an interior angle of 88°-46'-43", 100 feet:

RUNNING THENCE: Northerly, at an exterior angle of 88°-46'-43", 949.18 feet;

RUNNING THENCE: Easterly, at an interior angle of 89°-54'-53", 1055.18 feet;

RUNNING THENCE: Northeasterly, along a line which deflects toward the North 31°-49' from the previous course 66.39 feet;

RUNNING THENCE: Easterly, along a line which deflects 31°-49' toward the south from the preceding course 533.01 feet to a point in the centerline of Walmore Road, which point is distant, 952.81 feet south from the northeast corner of Lot Number 53, being measured along the said centerline.

RUNNING THENCE: Southerly, along the centerline of Walmore Road, 1551.23 feet to the POINT OR PLACE OF BEGINNING

EXCEPTING THEREFROM all that tract or parcel of land, situate in the Town of Wheatfield, County of Niagara and State of New York, being part of Lot Numbers 53 and 54, Township 13, Range 8 of the Holland Land Company's Survey, bounded and described as follows: A strip of land 40 feet in width, measured at right angles to a centerline more particularly bounded and described as follows:

BEGINNING AT A POINT in the north line of the land described in Parcel II in the deed to Bell Aircraft Corporation recorded in Liber 865 of Deeds at Page 529 being the north line of land formerly owned by Charles C. Thomson and Maurice Thompson which point is 613.95 feet west from the centerline of Walmore Road, being also the east line of Lot Number 53 measured along said line;

RUNNING THENCE: Northeasterly, on a line which line is on a curve drawn to the right with a radius of 502.19 feet, the tangent of which curve makes an angle of 39°-25'-17" measured in the northeast quadrant at the intersection of said line with the north line of said former Thomson land;

RUNNING THENCE: Along said curve 217.56 feet, arc measurement to a point of reverse curve;

RUNNING THENCE: Along a curve having a radius of 492.73 feet deflecting to the left a distance of 669.31 feet arc measurement to a point of curve is 55.87 feet west of the centerline of Walmore Road measured at right angles thereto;

RUNNING THENCE: Northerly along a line drawn parallel with the centerline of Walmore Road and 55.87 feet west therefrom measured at right angles thereto to the north line of land conveyed to The Carborundum Company by deed recorded in Liber 897 of Deeds at Page 12:

ALSO excepting therefrom that portion conveyed to the County of Niagara by deed recorded in Liber 1303 of Deeds at Page 425 affecting Walmore Road.

Parcel II

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Wheatfield, County of Niagara, State of New York, and being part of Lot Number 53, Township 13, Range 8 of the Holland Land Company's Survey (so-called). bounded and described as follows:

BEGINNING on a line drawn at right angles to the centerline of Walmore Road, being the east line of Lot Number 53, from a point in said centerline of the Walmore Road which is 1843.92 feet more or less south of the north line of sad Lot Number 53 measured along said centerline of Walmore Road at a distance of 65.27 feet west from the centerline of Walmore Road, said point being the southeast corner of the so called Flow Test Building;

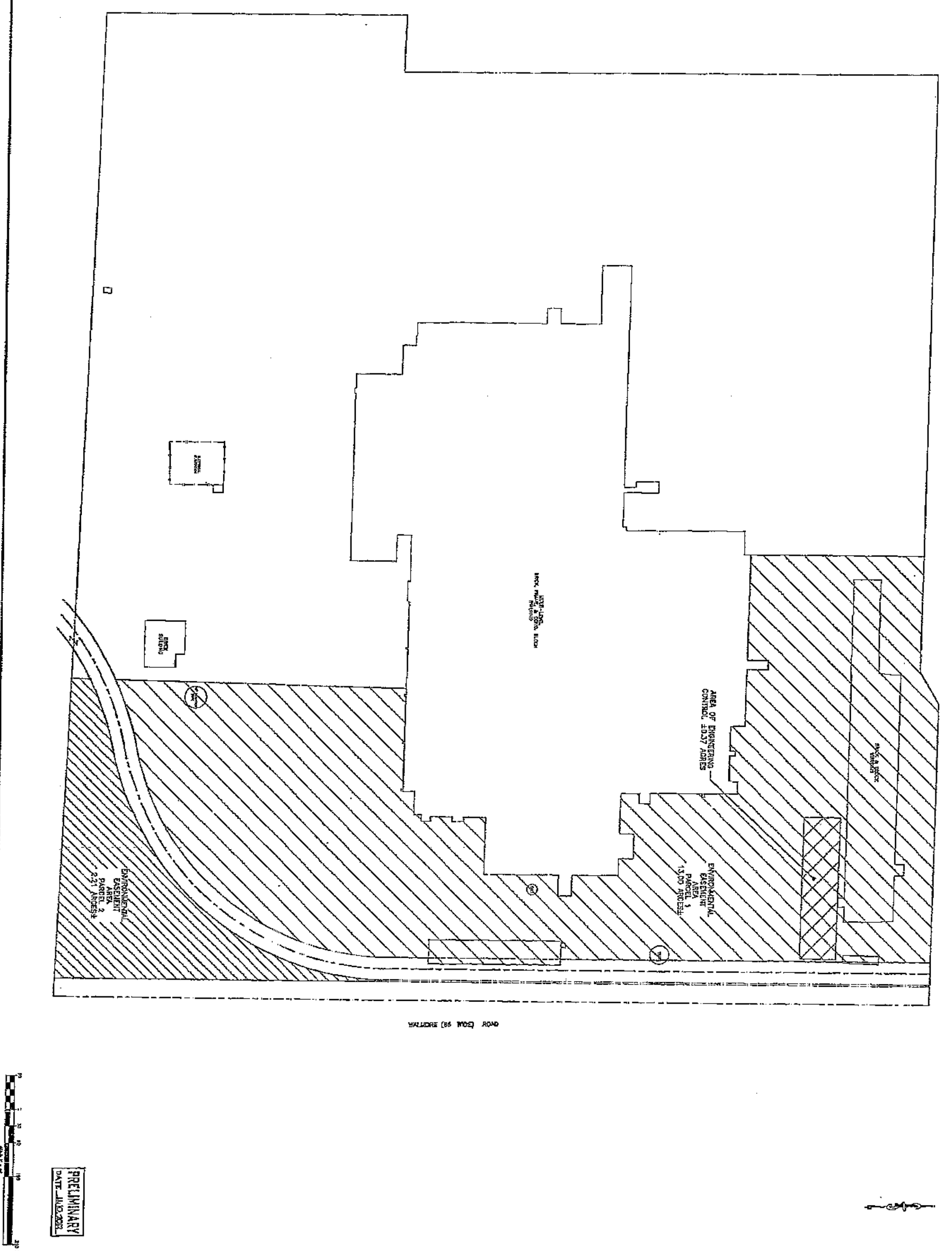
RUNNING THENCE Northerly, 234 4 feet more or less to a line drawn at right angles to the Walmore Road from a point in the centerline of Walmore Road which is 1609.52 feet more or less south from the north line of Lot Number 53 at a point 65.87 feet west from the centerline of Walmore Road being the northeasterly corner of said Flow Test Building;

RUNNING THENCE: Westerly, along the north line of said Flow Test Building 10 feet to the west line of the strip described in the first exception to Parcel 1;

RUNNING THENCE: Southerly, along the west line of said strip 234.4 feet more or less to the south line of said Flow Test Building at a point therein which is 10.6 feet west from the point of beginning;

RUNNING THENCE: easterly, along the south line of said flow test building 10.6 feet to the POINT OR PLACE OF BEGINNING.

APPENDIX B



PRELIMINARY
DATE JUL 10, 2012

58867
Sheet 1 of 1

TOWN OF WHEATFIELD
NIAGARA COUNTY
NEW YORK STATE

EKONOL PLANT DEC BOUNDARY SURVEY
6600 WALMORE ROAD
TOWN OF WHEATFIELD

TVGA CONSULTANTS
ENGINEERING * LAND SURVEY
MAPPING * ENVIRONMENTAL

Field Date: JUNE 8, 2012
Office Date: JUNE 15, 2012

APPENDIX C

PROPOSED DEC Environmental EASEMENT (PARCEL 1)

ALL THAT TRACT OR OR PARCEL OF LAND SITUATE IN THE TOWN OF WHEATFIELD, COUNTY OF NIAGARA AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 53, TOWNSHIP 13, RANGE 8 OF THE HOLLAND LAND COMPANY'S SURVEY, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE NORTH LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 987, PAGE 12 WHERE IT INTERSECTS WITH THE WESTERLY LINE OF A FORTY FOOT WIDE EXCEPTION FOR A RAILROAD; THENCE S 01°-12'-22" W ALONG SAID WESTERLY LINE OF EXCEPTION A DISTANCE OF 656.39 FEET TO A POINT IN THE NORTH FACE OF THE "FLOW TEST BUILDING; THENCE S 88°53'-58" E ALONG SAID NORTH BUILDING FACE A DISTANCE OF 10.34 FEET TO THE NORTHEAST CORNER OF SAID "FLOW TEST BUILDING"; THENCE S 01°-06'-12" W ALONG THE EASTERLY FACE OF SAID "FLOW TEST BUILDING" A DISTANCE OF 234.44 FEET TO THE SOUTHEASTERLY CORNER OF SAID "FLOW TEST BUILDING"; THENCE N 89°-03'-18" W ALONG THE SOUTHERLY FACE OF SAID "FLOW TEST BUILDING" A DISTANCE OF 10.76 FEET TO A POINT OF INTERSECTION OF THE SOUTHERLY LINE OF SAID "FLOW TEST BUILDING WITH THE WESTERLY LINE OF SAID 40 FOOT WIDE EXCEPTION PARCEL; THENCE S 01°-12'-22" W ALONG SAID WESTERLY LINE OF 40 FOOT WIDE EXCEPTION PARCEL A DISTANCE OF 72.00 FEET TO A POINT OF CURVATURE TO THE RIGHT; THENCE ALONG SAID CURVE TO THE RIGHT 642.14 FEET, SAID CURVE HAVING A CHORD BEARING OF S 40°-07'-09" W, AND A RADIUS OF 472.73 FEET TO A POINT OF CURVATURE TO THE LEFT; THENCE ALONG SAID CURVE TO THE LEFT 119.69 FEET, SAID CURVE HAVING A CHORD BEARING OF S 72°-28'-23" W, AND A RADIUS OF 522.18 FEET TO A POINT; THENCE N 02°-16'-36" E A DISTANCE OF 517.09 FEET TO A POINT IN THE SOUTHERLY FACE OF A MULTI-LEVEL BRICK, FRAME, AND CONCRETE BLOCK BUILDING; THENCE ALONG SAID BUILDING FACE THE FOLLOWING 63 COURSES

1) S 88°-52'-46" E A DISTANCE OF 11.58 FEET
2) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
3) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
4) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
5) S 88°-52'-46" E A DISTANCE OF 81.00 FEET
6) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
7) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
8) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
9) S 88°-52'-46" E A DISTANCE OF 81.05 FEET
10) S 01°-07'-14" W A DISTANCE OF 3.50 FEET
11) S 88°-52'-46" E A DISTANCE OF 2.45 FEET
12) N 01°-07'-14" E A DISTANCE OF 3.50 FEET
13) S 88°-52'-46" E A DISTANCE OF 1.43 FEET
14) N 01°-07'-14" E A DISTANCE OF 20.83 FEET
15) S 88°-52'-46" E A DISTANCE OF 40.37 FEET
16) N 01°-07'-14" E A DISTANCE OF 12.33 FEET
17) S 88°-52'-46" E A DISTANCE OF 12.03 FEET
18) N 01°-07'-14" E A DISTANCE OF 16.35 FEET
19) N 88°-52'-46" W A DISTANCE OF 8.06 FEET
20) N 01°-07'-14" E A DISTANCE OF 39.40 FEET

21) S 88°-52'-46" E A DISTANCE OF 8.00 FEET
22) N 01°-07'-14" E A DISTANCE OF 20.00 FEET
23) N 88°-52'-46" W A DISTANCE OF 7.33 FEET
24) N 01°-07'-14" E A DISTANCE OF 38.77 FEET
25) S 88°-52'-46" E A DISTANCE OF 100.65 FEET
26) N 01°-07'-14" E A DISTANCE OF 133.15 FEET
27) S 88°-52'-46" E A DISTANCE OF 36.96 FEET
28) N 01°-07'-14" E A DISTANCE OF 24.36 FEET
29) N 88°-52'-46" W A DISTANCE OF 37.00 FEET
30) N 01°-07'-14" E A DISTANCE OF 83.70 FEET
31) N 88°-52'-46" W A DISTANCE OF 26.05 FEET
32) N 01°-07'-14" E A DISTANCE OF 25.00 FEET
33) N 88°-52'-46" W A DISTANCE OF 44.10 FEET
34) S 01°-07'-14" W A DISTANCE OF 25.00 FEET
35) N 88°-52'-46" W A DISTANCE OF 71.35 FEET
36) N 01°-07'-14" E A DISTANCE OF 31.85 FEET
37) S 88°-52'-46" E A DISTANCE OF 17.97 FEET
38) N 01°-07'-14" E A DISTANCE OF 18.55 FEET
39) N 88°-52'-46" W A DISTANCE OF 17.97 FEET
40) N 01°-07'-14" E A DISTANCE OF 17.45 FEET
41) N 88°-52'-46" W A DISTANCE OF 0.35 FEET
42) N 01°-07'-14" E A DISTANCE OF 72.75 FEET
43) S 88°-52'-46" E A DISTANCE OF 6.47 FEET
44) N 01°-07'-14" E A DISTANCE OF 4.83 FEET
45) N 88°-52'-46" W A DISTANCE OF 6.47 FEET
46) N 01°-07'-14" E A DISTANCE OF 57.80 FEET
47) N 88°-52'-46" W A DISTANCE OF 21.30 FEET
48) S 01°-07'-14" W A DISTANCE OF 9.78 FEET
49) N 88°-52'-46" W A DISTANCE OF 1.78 FEET
50) S 01°-07'-14" W A DISTANCE OF 4.95 FEET
51) N 88°-52'-46" W A DISTANCE OF 44.15 FEET
52) N 01°-07'-14" E A DISTANCE OF 8.35 FEET
53) N 88°-52'-46" W A DISTANCE OF 8.73 FEET
54) S 01°-07'-14" W A DISTANCE OF 8.35 FEET
55) N 88°-52'-46" W A DISTANCE OF 43.62 FEET
56) N 01°-07'-14" E A DISTANCE OF 4.57 FEET
57) N 88°-52'-46" W A DISTANCE OF 0.88 FEET
58) N 01°-07'-14" E A DISTANCE OF 20.83 FEET
59) N 88°-52'-46" W A DISTANCE OF 100.07 FEET
60) N 01°-07'-14" E A DISTANCE OF 37.20 FEET
61) N 88°-52'-46" W A DISTANCE OF 16.00 FEET
62) S 01°-07'-14" W A DISTANCE OF 37.20 FEET
63) N 88°-52'-46" W A DISTANCE OF 186.33 FEET

THENCE N 01°-07'-58" E A DISTANCE OF 309.13 FEET TO A POINT IN THE NORTHERLY LINE OF OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12, THENCE ALONG SAID NORTHERLY LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12 THE FOLLOWING 3 COURSES

1) S 88°-52'-02" E A DISTANCE OF 205.30 FEET
2) N 59°-19'-14" E A DISTANCE OF 66.39 FEET
3) S 88°-52'-01" E A DISTANCE OF 457.14 FEET TO THE POINT OR PLACE OF BEGINNING. CONTAINING 13.00 ACRES OF LAND MORE OR LESS

PROPOSED DEC Environmental EASEMENT (PARCEL 2)

ALL THAT TRACT OR OR PARCEL OF LAND SITUATE IN THE TOWN OF WHEATFIELD, COUNTY OF NIAGARA AND STATE OF NEW YORK, BEING PART OF LOT NUMBER 53, TOWNSHIP 13, RANGE 8 OF THE HOLLAND LAND COMPANY'S SURVEY, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT IN THE WESTERLY LINE OF WALMORE ROAD WHERE SAID WESTERLY LINE OF WALMORE ROAD INTERSECTS WITH THE NORTHERLY LINE OF LANDS DESCRIBED IN A DEED FOUND IN LIBER 897, PAGE 12; THENCE S 01°12'-22" W ALONG SAID WESTERLY LINE OF WALMORE ROAD A DISTANCE OF 1550.57 FEET TO IN THE NORTHERLY LINE OF BELL AIRCRAFT CORPORATION AS DESCRIBED IN A DEED FOUND IN LIBER 865, PAGE 529; THENCE N 87°-43'-24" W ALONG SAID NORTH LINE OF BELL AIRCRAFT CORPORATION A DISTANCE OF 530.56 FEET TO A POINT; THENCE N 02°-16'-36" E A DISTANCE OF 32.18 FEET TO A POINT IN OF CUVATURE TO THE RIGHT, SAID POINT ALSO BEING IN THE EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL; THENCE ALONG SAID CURVE TO THE RIGHT AND EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL 130.57 FEET SAID CURVE HAVING A CHORD BEARING OF N 71°-16'-57" E AND A RADIUS OF 482.19 FEET TO A POINT OF CURVATURE TO THE LEFT; THENCE ALONG SAID CURVE TO THE LEFT 696.48 FEET SAID CURVE HAVING A CHORD BEARNG OF N 40°-07'-09" EAST, AND A RADIUS OF 512.73 FEET TO A POINT IN THE EASTERLY LINE OF A 40 FOOT WIDE EXCEPTION PARCEL; THENCE N 01°-12'-22" E ALONG SAID EASTERLY LINE OF SAID 40 FOOT WIDE EXCEPTION PARCEL A DISTANCE OF 962.91 FEET TO A POINT IN THE NORTH LINE OF LANDS DESCRIBED IN A DEED AND FOUND IN LIBER 897 OF DEEDS AT PAGE 12, THENCE S 88°-52'-01" E ALONG SAID NORTH LINE OF LANDS DESCRIBED IN A DEED AND FOUND IN LIBER 897 OF PAGE 12 A DISTANCE OF 2.87 FEET TO THE POINT OR PLACE OF BEGINNING. CONTAINING 2 21 ACRES OF LAND MORE OR LESS.

APPENDIX D

ENGINEERING CONTROL DESCRIPTION

COMMENCING at the intersection of the north line of lands described in Liber 897 Page 12, with the center line of Walmore Road, also known as the east line of Lot 53;

Thence S 01 12' 22" W along the centerline of said Walmore Road a distance of 170.46';

Thence N 88° 52' 01" W, parallel with the north line of said Liber 8897 Page 12, a distance of 80.08' to the point of beginning;

Thence S 01° 12' 22" W parallel with the centerline of said Walmore Road a distance of 64 50';

Thence N 88° 52' 01" W, parallel with the north line of said Liber 8897 Page 12, a distance of 251.23';

Thence N 01° 12' 22" E parallel with the centerline of said Walmore Road a distance of 64.50';

Thence S 88° 52' 01" E, parallel with the north line of said Liber 8897 Page 12, a distance of 251.23' to the point of beginning. Containing 0.31 acres of land, more or less.

Bearings are referenced to the New York State Plane Coordinate System (West Zone) as established on site by GPS observations.

APPENDIX C
SOIL MANAGEMENT PLAN

Soil Management Plan
Ekonol Polyester Resins Site, NYSDEC # V00653-9, Wheatfield, NY
July 2015

Air Monitoring

During the excavation of on-site soils, the air quality will be monitored during excavation in the worker breathing zone by a competent person. Measurements will be collected continuously and documented in 5-minute intervals.

Health hazards and the exposure limits associated with chemicals of concern (COCs) are presented in the attached Table 1. These hazards may be encountered during work activities. Air monitoring will be conducted in the worker's breathing zone using a photoionization detector (PID) during intrusive activities. The PID will be equipped with an 11.7eV lamp. If sustained concentrations in the breathing zone are above the action levels listed below, the excavation foreman will be notified and appropriate action taken.

Chemicals of Concern

Chemical of Concern	***Monitoring Equipment***	***Action Levels (PID reading)***	***PPE/Action Taken***
Chloroethane	*PID*	**<1 ppm**: **1-5 ppm**: **5-50 ppm**: **50 – 200 ppm**: **> 200 ppm**:	Level D/ None. Level D/ Implement engineering controls to suppress vapor levels. Level C (qualitative fit test)/ Take 3 consecutive readings. If confirmed, wear half or full facepiece respirator. Continue engineering controls to suppress vapor levels. Level C (qualitative fit test)/ Take 3 consecutive readings. If confirmed, wear full facepiece respirator. Continue engineering controls to suppress vapor levels. / Stop work activities until engineering controls are implemented to suppress vapor levels.
Trans-1,2-DCE	*PID*		
Cis-1,2-DCE	*PID*		
Ethane	*PID*		
Ethene	*PID*		
Tetrachloroethene	*PID*		
TCE	*PID*		
1,1,1-TCA	*PID*		
1,1-DCA	*PID*		
Methane	*PID*		
Vinyl Chloride	*PID*		
1,1-DCE	*PID*		

Soil Management Plan
Ekonol Polyester Resins Site, NYSDEC # V00653-9, Wheatfield, NY
July 2015

Excavation Observation

A competent person will observe the excavation activity to visually observe the soils as they are removed. This person will record their observations regarding the types of soils encountered, and whether there is any visual or olfactory evidence that the soils may have been impacted by COCs. Observations regarding staining of soils, the presence of water, and encountered utilities will be recorded.

Soils Management

Soils that exhibit sustained PID readings less than 10 PPM and exhibit no visual or olfactory signs of contamination may be used as backfill materials. Soils that are not needed for backfill and without obvious signs of contamination will be left on the property and stockpiled. Any soils that exhibit obvious visual or olfactory signs of contamination or have sustained PID readings above 10 PPM will not be used to backfill the excavation and will be staged for subsequent characterization and appropriate disposal. Staged soils to be characterized for disposal will be placed on plastic and covered with plastic, or contained in a roll-off container or drums.

08/14/00

Table 1

Compound	PEL [a/] / TLV [b/] (ppm) 1	IDLH [c/] (ppm)	Odor Threshold[d/] (ppm)	Ionization Potential[e/] (eV)	Physical Description/Health Effects/Symptoms
Aniline	2 (skin)	100	0.5-70	7.70	Colorless to brown, oily liquid (solid<21o F) with an aromatic, amine-like odor. Irritates eyes. Causes headaches, weakness, dizziness, blue skin, incoordination, shortness of breath on effort, tachycardia, methemoglobinemiamm/, and cirrhosis. In animals, causes tumors of the spleen. Carcinogen.
Naphthalene	10	250	0.3	8.12	Colorless to brown solid (shipped as a molten liquid) with a mothball-like odor. Irritates eyes, skin, and bladder. Causes headaches, confusion, excitement, convulsions, coma, vague discomfort, nausea, vomiting, abdominal pain, profuse sweating, jaundice, hematoma, hemoglobin in the urine, renal shutdown, dermatitis, optic nerve disorders, and corneal and liver damage. Experimental teratogen and questionable carcinogen.
1,2-Dichloroethene (DCE) (cis- and trans-isomers)	200	1,000	0.085-500	9.65	Colorless liquid (usually a mixture of cis- and trans- isomers), with a slightly acrid, chloroform-like odor. Irritates eyes and respiratory system. CNS depressant. Cis- isomer is a mutagen.
Bis(2-Ethylhexyl)Phthalate	5 mg/m^3	5,000 mg/m^3	NA	NA	Colorless to light-colored, oily liquid with slight odor. Irritates eyes and mucous membranes. Also affects respiratory system, CNS, and gastrointestinal tract. In animals, causes liver damage, liver tumors, and teratogenic effects. Carcinogen.
Tetrachloroethene (PCE)	25 [z/]	150	5-50	9.32	Colorless liquid with a mild chloroform odor. Eye, nose, skin and throat irritant. Causes nausea, flushed face and neck, vertigo, dizziness, headaches, hallucinations, in coordination, drowsiness, coma, pulmonary changes, and skin redness. Cumulative liver, kidney, and CNS damage. In animals, causes liver tumors. Mutagen, experimental teratogen, and carcinogen.

Table 1 (continued)

1,2,4-Trichlorobenzene	5 ceiling	NA	NA	9.04	Colorless liquid or crystalline solid (<63°F) with an aromatic odor. Irritates eyes, skin, and mucous membranes. In animals, causes liver and kidney damage and possible teratogenic effects. Experimental teratogen.
Trichloroethene (TCE)	50	1,000	21.4-400	9.45	Clear, colorless or blue liquid with chloroform-like odor. Irritates skin and eyes. Causes fatigue, giddiness, headaches, vertigo, visual disturbances, tremors, nausea, vomiting, drowsiness, dermatitis, skin tingling, cardiac arrhythmia, and liver injury. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen, and carcinogen.
1,1,1-Trichloroethane (TCA)	350 / 350	700	20-500	11.00	Colorless liquid with a mild chloroform-like odor. Irritates eyes and skin. Causes headaches, exhaustion, CNS depression, poor equilibrium, dermatitis, liver damage, cardiac arrhythmia, hallucinations or distorted perceptions, motor activity changes, aggression, diarrhea, and nausea or vomiting. Mutagen, experimental teratogen, and questionable carcinogen.
Vinyl Chloride	1 STEL = 5 (29 CFR 1910.1017) [dd/]	NA	260	9.99	Colorless gas (liquid<7°F) with a pleasant odor at high concentrations. Severe irritant to skin, eyes, and mucous membranes. Causes weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or blue skin on the extremities, liver cancer, and frostbite (liquid). Also attacks lymphatic system. Mutagen, experimental teratogen, and carcinogen.

1: PEL and TLV value are the same

2: Operations will cease when action level is reached.

d/ When a range is given, use the highest concentration. in the *NIOSH Pocket Guide to Chemical Hazards*, June 1997.

h/ NA = Not available.

dd/ Refer to expanded rules for this compound.

z/ NIOSH recommends reducing exposure to the lowest feasible concentration, and limiting the number of workers exposed.

APPENDIX D
SSD O&M PLAN

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York 14202 • (716) 541-0730 • Fax (716) 541-0760 • www.parsons.com

December 5, 2011

Michael J. Hinton P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Ave.
Buffalo, NY 14203-2999

Re: Ekonol Polyester Resins Site #V00653-9
Sub-slab Depressurization System
Operations, Maintenance and Monitoring Plan

Dear Mr. Hinton:

Attached for your review is the Operation, Maintenance, and Monitoring (OM&M) plan for the sub-slab depressurization (SSD) system that was installed within the office area of the building currently occupied by St. Gobain at the Ekonol Site in Wheatfield, New York.

If you have any questions regarding this OM&M plan, feel free to contact William Barber at (216) 271-8038.

Sincerely,

George W. Hermance

George W. Hermance
Project Manager

Attachment

cc: W. Barber, Atlantic Richfield
Mike Kolar, Patriot Equities
G. Brown, RT Environmental
M. Forcucci, NYSDOH

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SUB-SLAB DEPRESSURIZATION SYSTEM OPERATION, MAINTENANCE, AND MANAGEMENT PLAN

Ekonol Polyester Resins, NYSDEC # V00653-9
6600 Walmore Rd.
Town of Wheatfield, Niagara County, New York

Prepared for:

Atlantic Richfield Company

A BP affiliated company

4850 East 49th Street
Cuyahoga Heights, Ohio 44125

Prepared by:

PARSONS
40 LA RIVIERE DR, SUITE 350
BUFFALO, NY 14202

December 2011

SUB-SLAB DEPRESSURIZATION SYSTEM INSTALLATION

A sub-slab depressurization (SSD) system was installed within the office area of the building currently being leased by St. Gobain at the Ekonol Site in Wheatfield, New York. The purpose of the SSD system is to limit the potential for migration of volatile organic compounds (VOCs), primarily tetrachloroethene (PCE) from soil gas into indoor air in the office area of the building.

The SSD system was installed and began operation on November 17, 2010. The system was installed by Mitigation Tech of Brockport, New York, under the direction and oversight of Geosyntec of Guelph, Ontario, Canada. An as-built drawing of the SSD system is provided as Figure 1.

The SSD system consists of one suction point, centrally located within the office area at the St. Gobain building, as shown in Figure 1. A 3-inch diameter hole was drilled through the concrete, and sub-grade materials were excavated to a depth of about six inches below the bottom of the existing concrete floor. A Schedule 40 polyvinyl chloride (PVC) vent-pipe, three inches in diameter, was installed vertically within the sump. The bottom of the suction pipe was installed so that it is flush with the bottom of the concrete slab, and was sealed using polyurethane sealant.

The suction pipe was constructed to run vertically from the floor to the rafters, then horizontally overhead to the outer wall, where it exits the building. At the outer wall, the horizontal pipe connects to an electrically operated RadonAway^{tm} GP-501 fan mounted to the exterior of the building via flexible couplings for vibration suppression. The fan is used to draw vapors from beneath the building slab to the exterior of the building. The fan discharge is connected to a vertical pipe extending to approximately two feet above the roofline. The top of the pipe is fitted with a rain cap to limit water infiltration. The suction point is equipped with a U-tube manometer which indicates the measured vacuum induced at the suction point, and an audible alarm that notifies the facility management in the event that the fan stops operating.

ROUTINE MONITORING AND MAINTENANCE

Routine monitoring and maintenance visits are scheduled once each quarter (every three months). During each visit, inspections will be conducted to verify and document that the system is in good working order. The inspections will include a visual inspection of the system’s interior and exterior components. Also, during each routine visit, operations monitoring will be conducted. This will consist of recording the U-Tube manometer measurement and comparing it to the existing data recorded during the system’s original and/or latest system inspection. Anticipated operating condition of the system is 2 inches of H_2O as read from the U-tube manometer. The data will be used to evaluate whether the system is performing within an acceptable range of operation.

Additionally, a smoke stick will be used to check for the presence of back-drafts, leaky fittings, and flow into any visible cracks in the floor or walls. The smoke stick will be passed near the equipment near where possible leaks could occur. The behavior of the smoke will be observed if the smoke is sucked into or blown away from the equipment a possible leak will be noted and repairs made. The system will be shut down temporarily to confirm that the audible alarm functions as designed.

Items identified during the routine monitoring and maintenance visits pertaining to system design and/or performance will be addressed during the inspection visit if possible, or a follow-up visit will be scheduled. Any needed repairs or system modifications will be documented and the as-built diagram (Figure 1) will be updated as necessary. The attached inspection form will be used during the visit.

NON-ROUTINE ACTIVITIES

The owner/occupant will be provided with instructions and contact information in the event repairs may be required on the system, and for requesting maintenance activities. These instructions include the following:

- Problem with system operation, including an alarm condition, excessive noise or vibration, unexpected shut-down, etc.;
- Major renovations to the building structure; or
- Any system damage.

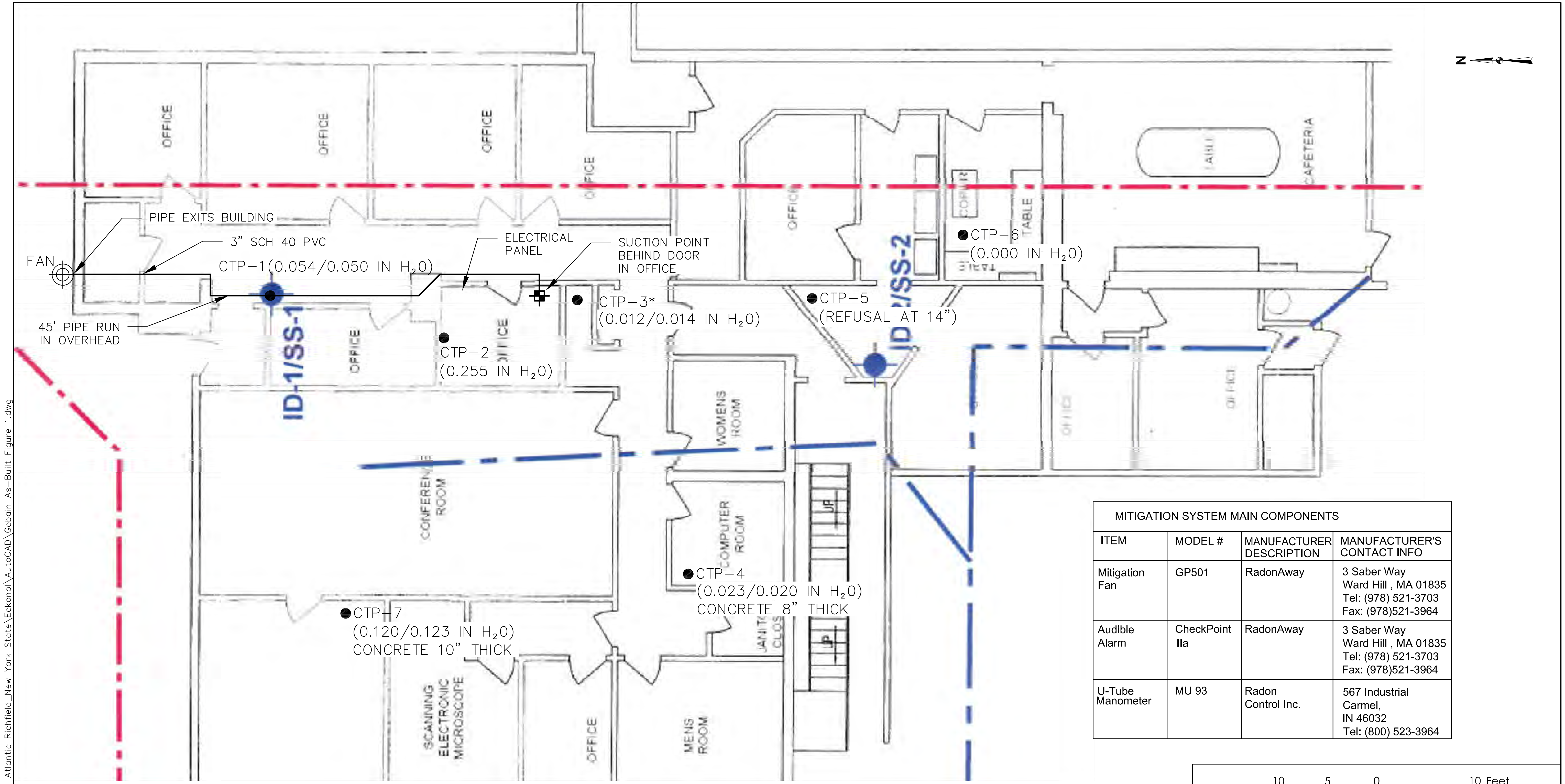
Upon being contacted by an owner/occupant of the site about a suspected problem with the system, a site visit will be scheduled. During on-site visits, the inspector will investigate reported problems, identify the potential causes, and implement the necessary repairs. To the extent practical, repairs will be made during the investigation visit. However, if repairs cannot be executed at that time, a follow-up visit will be scheduled for a later date that is convenient to the owner/occupant. Upon completion of the action, the investigation/repair activities will be documented and the as-built diagram (Figure 1) will be updated as needed.

The table below shows the contact names and information for the owner/occupant to use if system maintenance is required or the systems stops running. .

Name	Contact Information
William Barber BP Project Manager	Office: 216-271-8038 Cell Phone: 216-408-1660
George Hermance Parsons-Buffalo Project Manger	Office: 716-541-0730 Direct: 716-407-4990 Cell Phone: 716-861-7882

SYSTEM SHUTDOWN/DECOMMISSIONING PLAN

After 2 years of operation a sample of the sub slab air will be collected and analyzed for VOCs. If the results are within acceptable levels the system will be shut down and retested in 24 hours. If sample results are still at acceptable levels a plan for decommissioning the system will be submitted to DEC.



MITIGATION SYSTEM MAIN COMPONENTS

ITEM	MODEL #	MANUFACTURER DESCRIPTION	MANUFACTURER'S CONTACT INFO
Mitigation Fan	GP501	RadonAway	3 Saber Way Ward Hill , MA 01835 Tel: (978) 521-3703 Fax: (978)521-3964
Audible Alarm	CheckPoint IIa	RadonAway	3 Saber Way Ward Hill , MA 01835 Tel: (978) 521-3703 Fax: (978)521-3964
U-Tube Manometer	MU 93	Radon Control Inc.	567 Industrial Carmel, IN 46032 Tel: (800) 523-3964

LEGEND:

● ID-1/SS-1	APPROXIMATE LOCATION AND DESIGNATION OF INDOOR AND SUB-SLAB AIR SAMPLES. COLLECTED BY GZA GEOENVIRONMENTAL
— · —	APPROXIMATE LOCATION OF SANITARY SEWER LINE
— · —	APPROXIMATE LOCATION OF STORM SEWER LINE
⌖	SUCTION POINT
●CTP–1	COMMUNICATION TEST POINT. VACUUM MEASURED IN INCHES OF WATER (IN H_2O)
*	COMMUNICATIONS TEST POINT WAS NOT DRILLED COMPLETELY THROUGH SLAB (>14" THICK)

NOTES:

1. BASE MAP ADAPTED FROM A SITE PLAN PROVIDED BY THE CLIENT AND FIELD OBSERVATIONS.
2. THE SIZE AND LOCATIONS OF EXISTING SITE FEATURES SHOULD BE CONSIDERED APPROXIMATE.
3. UTILITY LOCATIONS ADAPTED FROM A COPIED PORTION OF A UTILITY DRAWING PROVIDED BY ST. GOBAIN.
4. APPLIED VACUUM AT EXTRACTION POINT IS 2 IN H_2O.
5. CONCRETE AT EXTRACTION POINT IS 6" THICK.

10 5 0 10 Feet

As-Built Sub-Slab Depressurization System

Saint Gobain Office Area
6600 Walmore Road Facility
Wheatfield, New York

Geosyntec consultants

Figure:
1

Guelph
07-Dec-2010

\\guelph-01\data\PRJ\Projects\TR0318 – Atlantic Richfield_New York State\Eckonol\AutoCAD\Gobain As-Built Figure 1.dwg

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Date: _______________________________________

Checklist Completed By: _________________________

Project Number: ______________________________

Property Location: _____________________________

System Installation Date: _______________________

The purpose of this form is to document the operation and maintenance of the sub-slab depressurization system to provide assurance that the system is functioning as designed or identify and execute any actions required to achieve the mitigation of subsurface vapor intrusion of volatile organic compounds to indoor air

1. MITIGATION SYSTEM INSPECTION

Occupant Interview

Any concerns identified by the building occupants?	YES	NO	

Comments / Action Items

Occupant's Initials:

External Piping

Vent pipes securely fastened to building	YES	NO	
Are there any visible openings or breaks in the pipe system	YES	NO	
Is the rain cap present and intact at discharge point	YES	NO	N/A
Inspection of the exhaust point verified that no air intakes have been located nearby	YES	NO	
The sealing/caulking around wall penetrations is intact	YES	NO	

Comments / Action Items

Mitigation Fan

Fan is mounted securely to building (no excessive vibrations during operation)	YES	NO
Fan cover is installed	YES	NO
No visible damage to fan or cover	YES	NO

Comments / Action Items

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Internal Piping

Vertical and horizontal pipe runs are secured, including at all penetration points YES NO

The sealing/caulking is intact around the extraction point or points through the basement floor, crawlspace floor, and/or crawlspace/basement wall interface. YES NO

Vibration dampener installed and intact (pertains to fan mount) YES NO N/A

Mitigation system operation placard present and visible/legible YES NO

Contains description of major components, valid contact number and instructions for occupant inquiries and/or system failure YES NO

Mitigation system maintenance tag present and filled out YES NO

Date of last inspection shown on tag:____________________________

U-tube manometer present and intact at each extraction point YES NO

Comments / Action Items

Electrical

Electrical connections secured YES NO

Junction boxes are closed YES NO

Conduit is supported YES NO

Circuit breakers controlling the mitigation fan and alarm circuits operate and are labeled "Mitigation System" YES NO

Power switch tagged with intact tamper proof seal YES NO

Audible alarm present YES NO

Audible alarm switch in "on" position (light on alarm is green) YES NO

Comments / Action Items

2. OPERATIONAL CHECKS

Fan is operating

Noise and Vibration within normal range YES NO

Alarm sounds when fan is turned off YES NO

U-Tube manometer indicating negative sub slab pressure YES NO

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

Smoke test performed on internal penetrations and pipe joints

Smoke test indicated no leaks YES NO N/A

Smoke test confirms air flow into sump YES NO N/A

Back draft test confirms proper air flow at combustion appliances YES NO N/A

Smoke test indicated no leaks YES NO N/A

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

3. MAINTENANCE

Fan last replaced on (date): ____________________

Fan due to be replaced; ________________

Additional Maintenance Action Items Performed

4. ADDITIONAL ACTION ITEMS/ COMMENTS/COMPLETION DATES

5. CERTIFICATION

I certify that the information on this form is true, accurate and complete (all blanks filled in) to the best of my knowledge and ability, and that I have the appropriate training and experience to perform this monitoring/inspection:

Name: ____________________________ Affiliation: ______________________________

Signature: ______________________________ Date (dd/mm/yy): ______________/_______am/pm

APPENDIX E
SAMPLING AND INSPECTION PLAN

PARSONS
40 La Riviere Drive, Suite 350 • Buffalo, New York 14202 • (716) 541-0730 • Fax (716) 541-0760 • www.parsons.com

Groundwater Sampling Procedures

Groundwater monitoring will be performed on a semi-annual basis (two times per year) to evaluate the performance of the bioreactor and the bedrock injections on groundwater contaminant concentrations. The monitoring wells, performance wells, and injection wells will be sampled in accordance with the sampling matrices provided in Attachments 1 and 2. Well construction completion logs and boring log information for all site monitoring wells, performance wells, and injection wells can be found in Attachment 3. In the spring of each year a total of 57 wells will be sampled. Of the 57 wells sampled, 19 wells will only be sampled during the spring sampling event. The remaining 38 will be sampled in the fall of each year. Groundwater samples will be submitted to a qualified laboratory for analysis of volatile organic compounds (VOCs), total organic carbon (TOC), dissolved gases (methane ethane, and ethene), and dissolved inorganic compounds (iron and potassium). An additional number of parameters including sulfate and sulfide will be included once per year. Quality assurance and quality control samples will also be collected and analyzed per the sampling matrices. Samples for microbial population counts will be collected and submitted for analysis once per year. Results of the monitoring will be included in the semi-annual data summary reports.

A complete round of groundwater levels for all Site wells will be collected prior to the start of groundwater sampling using a water level indicator or oil-water interface probe. Water levels will be documented on the form found in Attachment 4. Between wells a DI water spray on the probe is required to prevent spreading contamination between wells.

Ekonol performance monitoring is conducted using low-flow methods following EPA guidance. The required equipment includes a Geotech peristaltic pump, a Horiba water quality meter with flow through cell, Hach turbidity meters, water level indicator or oil-water interface probe sampling bottles and decontamination supplies. Sampling equipment and meters are routinely calibrated and recorded at the beginning of each work day.

All purge and sampling data are recorded on groundwater sampling forms provided in Attachment 5. The wells are purged until monitored water parameters stabilize (+/- 0.1 pH units, +/- 3 percent conductivity, +/- 3% Temperature, +/- 10 percent DO and +/- 10 mV ORP). Additionally, the turbidity should be less than 50 and the drawdown should be minimal. It is also required that a minimum volume is purged before sampling as well. 2.6 gallons plus the volume of the drawdown should be removed from all wells before sample collection.

Samples are then shipped to Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17601. Microbial samples are shipped to Microbial Insights, 2340 Stock Creek Blvd, Rockford, TN 37853. All samples are shipped on ice in coolers supplied by the laboratories via overnight delivery.

All purge water from the groundwater sampling event is stored onsite in a collection of drums staged in secondary containment inside a 20’ roll-off storage container. At the completion of groundwater sampling, the drums are removed and disposed offsite using a waste disposal subcontractor.

Inspection Procedures

Bioreactor and Monitoring Well Inspection: During the semi-annual groundwater sampling events, the onsite remedial systems will be inspected and recorded on the inspection form found in Attachment 6. The surface conditions above the bioreactor trenches will be inspected for settlement.

Additionally, the at-surface protective casing for all injection and monitoring wells will be inspected for damage, and the need for well maintenance and/or repair will be assessed. This task is generally conducted during the complete round of water levels described above. Well maintenance or repair activity, if needed, will be documented on the form in Attachment 4.

Sub-slab Depressurization System Operations and Maintenance: During the semi-annual sampling event, the sub-slab depressurization system will be inspected. The inspection will be conducted and documented to verify that the system is in good working order and will include a visual inspection of the system's interior and exterior components. Operations monitoring will also be conducted. This will consist of recording the U-Tube manometer measurements, smoke stick testing to check for the presence of back-drafts, leaky fittings, and flow into any visible cracks in the floor or walls. The system will also be shut down temporarily to confirm that the audible alarm functions as designed. This information will be documented on the Sub-slab depressurization system inspection form found in Attachment 7.

Site-Wide Inspection: A site-wide inspection will be conducted at a minimum of once per year, and after all severe weather events at the Ekonol site. The inspection will insure compliance with all Site Engineering and Institutional Controls, note general site conditions and activities, and confirm compliance with permits and schedules. All information will be recorded on the Site-Wide Inspection form in Attachment 8.

ATTACHMENT 1

SEMI-ANNUAL GROUNDWATER SAMPLING MATRIX- SPRING

ATTACHMENT 1
SEMI-ANNUAL GROUNDWATER SAMPLING MATRIX - SPRING
EKONOL POLYESTER RESINS, WHEATFIELD, NEW YORK

Location	Synoptic Water Level Measurement[g]	VOCs[a] (SW8260B)	Methane, Ethane, Ethene (Lab SOP)	Dissolved Inorganics [b/c] (SW6010B)	Total Organic Carbon (SW9060)	Real time Analyses [e]	Sulfate [b] (E300.1)	Sulfide [b] (MS 4500-S2-F)	Microbial Population [d] (Lab SOP)	Mobile Lab Analysis [f]
		Semi Annual	Semi Annual	Semi Annual	Semi Annual	Semi Annual	Annual Only	Annual Only	Annual Only	Annual Only
Overburden Bioreactor Monitoring Wells										
OR-3SM	1	1	1	1	1	1	1	1		1
OR-4SM	1	1	1	1	1	1	1	1		1
OR-5SM	1	1	1	1	1	1	1	1	1	1
OR-6SM	1	1	1	1	1	1	1	1	1	1
OR-9SM	1	1	1	1	1	1	1	1		1
OR-10SM	1	1	1	1	1	1	1	1		1
OR-13SM	1	1	1	1	1	1	1	1	1	1
OR-14SM	1	1	1	1	1	1	1	1	1	1
OR-15SM	1	1	1	1	1	1	1	1		1
OR-18SM	1	1	1	1	1	1	1	1		1
PMW-1S	1	1	1	1	1	1	1	1	1	1
PMW-2S	1	1	1	1	1	1	1	1	1	1
PMW-3S	1	1	1	1	1	1	1	1	1	1
PMW-4S	1	1	1	1	1	1	1	1		1
PMW-5S	1	1	1	1	1	1	1	1		1
PMW-6S	1	1	1	1	1	1	1	1		1
PMW-7S	1	1	1	1	1	1	1	1		1
PMW-9S	1	1	1	1	1	1	1	1	1	1
PMW-11S	1	1	1	1	1	1	1	1		1
Bedrock Injection/Withdrawal Wells										
INJ-7D	1	1	1	1	1	1	1	1	1	1
INJ-8D	1	1	1	1	1	1	1	1		1
INJ-11D	1	1	1	1	1	1	1	1		1
INJ-13D	1	1	1	1	1	1	1	1		1
Bedrock Monitoring Wells										
PMW-9D	1	1	1	1	1	1	1	1		1
PMW-10D	1	1	1	1	1	1	1	1		1
PMW-11D	1	1	1	1	1	1	1	1	1	1
PMW-12D	1	1	1	1	1	1	1	1		1
PMW-15D	1	1	1	1	1	1	1	1	1	1
PMW-16D	1	1	1	1	1	1	1	1		1
PMW-17D	1	1	1	1	1	1	1	1	1	1
Pilot Test Wells										
PMW-1D	1	1	1	1	1	1	1	1		1
PMW-2D	1	1	1	1	1	1	1	1	1	1
PMW-6D	1	1	1	1	1	1	1	1	1	1
RMW-4D	1	1	1	1	1	1	1	1		1
PMW-8D	1	1	1	1	1	1	1	1		
MW-7D	1	1	1	1	1	1	1	1		1
Site Investigation Wells										
MW-1S	1	1	1	1	1	1	1	1		1
MW-2S	1	1	1	1	1	1	1	1	1	1
MW-4S	1	1	1	1	1	1	1	1		1
MW-6S	1	1	1			1				1
MW-10S	1	1	1			1				1
MW-11S	1	1	1			1				1
MW-12S	1	1	1			1				1
RMW-2D	1	1	1	1	1	1	1	1	1	1
RMW-3D	1	1	1	1	1	1	1	1		1
MW-11D	1	1	1			1				1
MW-17D	1	1	1			1				1
MW-20D	1	1	1			1				1
MW-21D	1	1	1			1				1
Investigative Monitoring Wells										
RMW-1D	1	1	1	1	1	1	1	1		
MW-15D	1	1	1	1	1	1	1	1		
MW-16D	1	1	1	1	1	1	1	1		
MW-18D	1	1	1	1	1	1	1	1		
MW-19D	1	1	1	1	1	1	1	1		
MW-13D	1	1	1	1	1	1	1	1		
MW-9S	1	1	1	1	1	1	1	1		
MW-7S	1	1	1	1	1	1	1	1		
Monitoring Subtotal	57	57	57	49	49	57	49	49	16	48
QA/QC										
Duplicates		4	4	4	4		4			
Matrix Spike		4								
Matrix Spike Duplicate		4								
Trip Blanks		15								
TOTAL PER SAMPLING EVENT:		84	61	53	53	57	53	49	16	48

[a] VOCs = volatile organic compounds, including aromatic and chlorinated aliphatic hydrocarbons. If present, an oil sample will also be collected and analyzed for VOCs.

[b] All metal and cation samples must be field-filtered and immediately preserved (Fe, K)

[c] Dissolved inorganic compounds will consist of iron (Fe). Samples will be field filtered.

[d] Analysis of microbial population composition will include concentration measurements of dehalococcoides (DHC) and dehalobacter (DHB) species in cells per milliliter as well as DHC functional genes

[e] Well head analyses include dissolved oxygen, oxidation-reduction potential, pH, temperature, electrical conductivity, and visual appearance.

[f] Mobile lab analyses include carbon dioxide, alkalinity, sulfide, and ferrous iron.

[g] For the baseline monitoring round, all Site Water Levels will be recorded

ATTACHMENT 2

SEMI-ANNUAL GROUNDWATER SAMPLING MATRIX- FALL

ATTACHMENT 2
SEMI-ANNUAL GROUNDWATER SAMPLING MATRIX - FALL
EKONOL POLYESTER RESINS, WHEATFIELD, NEW YORK

Location	Synoptic Water Level Measurement[g]	VOCs[a] (SW8260B)	Methane, Ethane, Ethene (Lab SOP)	Dissolved Inorganics [b/c] (SW6010B)	Total Organic Carbon (SW9060)	Real time Analyses [e]
		Semi Annual	Semi Annual	Semi Annual	Semi Annual	Semi Annual
Overburden Bioreactor Monitoring Wells						
OR-3SM	1	1	1	1	1	1
OR-4SM	1	1	1	1	1	1
OR-5SM	1	1	1	1	1	1
OR-6SM	1	1	1	1	1	1
OR-9SM	1	1	1	1	1	1
OR-10SM	1	1	1	1	1	1
OR-13SM	1	1	1	1	1	1
OR-14SM	1	1	1	1	1	1
OR-15SM	1	1	1	1	1	1
OR-18SM	1	1	1	1	1	1
PMW-1S	1	1	1	1	1	1
PMW-2S	1	1	1	1	1	1
PMW-3S	1	1	1	1	1	1
PMW-4S	1	1	1	1	1	1
PMW-5S	1	1	1	1	1	1
PMW-6S	1	1	1	1	1	1
PMW-7S	1	1	1	1	1	1
PMW-9S	1	1	1	1	1	1
PMW-11S	1	1	1	1	1	1
Bedrock Injection/Withdrawal Wells						
INJ-7D	1	1	1	1	1	1
INJ-8D	1	1	1	1	1	1
INJ-11D	1	1	1	1	1	1
INJ-13D	1	1	1	1	1	1
Bedrock Monitoring Wells						
PMW-9D	1	1	1	1	1	1
PMW-10D	1	1	1	1	1	1
PMW-11D	1	1	1	1	1	1
PMW-12D	1	1	1	1	1	1
PMW-15D	1	1	1	1	1	1
PMW-16D	1	1	1	1	1	1
PMW-17D	1	1	1	1	1	1
Pilot Test Wells						
PMW-1D	1	1	1	1	1	1
PMW-2D	1	1	1	1	1	1
PMW-6D	1	1	1	1	1	1
RMW-4D	1	1	1	1	1	1
PMW-8D	1	1	1	1	1	1
MW-7D	1	1	1	1	1	1
Site Investigation Wells						
MW-1S	1	1	1	1	1	1
MW-2S	1	1	1	1	1	1
MW-4S	1	1	1	1	1	1
MW-6S	1	1	1			1
MW-10S	1	1	1			1
MW-11S	1	1	1			1
MW-12S	1	1	1			1
RMW-2D	1	1	1	1	1	1
RMW-3D	1	1	1	1	1	1
MW-11D	1	1	1			1
MW-17D	1	1	1			1
MW-20D	1	1	1			1
MW-21D	1	1	1			1
Investigative Monitoring Wells						
RMW-1D	1	1	1	1	1	1
MW-15D	1	1	1	1	1	1
MW-16D	1	1	1	1	1	1
MW-18D	1	1	1	1	1	1
MW-19D	1	1	1	1	1	1
MW-13D	1	1	1	1	1	1
MW-9S	1	1	1	1	1	1
MW-7S	1	1	1	1	1	1
Monitoring Subtotal	57	57	57	49	49	57
QA/QC						
Duplicates		4	4	4	4	
Matrix Spike		4				
Matrix Spike Duplicate		4				
Trip Blanks		15				
TOTAL PER SAMPLING EVENT:		84	61	53	53	57

[a] VOCs = volatile organic compounds, including aromatic and chlorinated aliphatic hydrocarbons. If present, an oil sample will also be collected and analyzed for VOCs.

[b] All metal and cation samples must be field-filtered and immediately preserved (Fe, K)

[c] Dissolved inorganic compounds will consist of iron (Fe). Samples will be field filtered.

[d] Analysis of microbial population composition will include concentration measurements of dehalococcoides (DHC) and dehalobacter (DHB) species in cells per milliliter as well as DHC functional genes

[e] Well head analyses include dissolved oxygen, oxidation-reduction potential, pH, temperature, electrical conductivity, and visual appearance.

[f] Mobile lab analyses include carbon dioxide, alkalinity, sulfide, and ferrous iron.

[g] For the baseline monitoring round, all Site Water Levels will be recorded

ATTACHMENT 3

EKONOL WELL COMPLETION LOGS

PARSONS

DRILLING RECORD

BORING NO. MW-1S

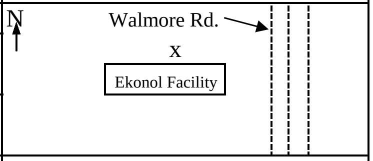
Contractor: SJB Services, Inc.
Driller: Steve Wolkiewicz, Andy Morris
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Sheet of 1
Location: North of Ekonol Facility
Elevation:

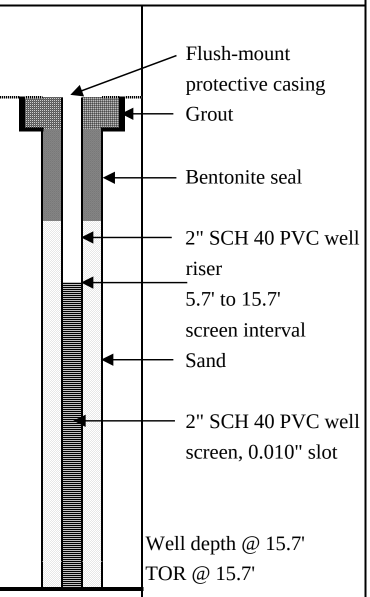
Observations	########		
Depth of Water	~9' bgs		
Top of Boring Elevation			

Weather Sunny 50 F
Date/Time Start 10/22/01 1210
Date/Time Finish 10/22/01 1515



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
0.20		1		1	0-0.5'- concrete slab	
	SS-1	2	1.0	3-7	Stiff, brown, Silty CLAY, some m-Gravel	ML
0.00		3		14-15	Stiff, brown, Silty CLAY, some gray Silt, well sorted pebbles	
	SS-2	4	1.5	16-14	throughout sample.	ML
0.00		5		8-10	Stiff, brown, Silty CLAY, some gray Silt throughout sample.	
	SS-3	6	1.8	14-18		CL
0.00		7		48-35	Very stiff, brown, Silty CLAY, some gray Silt throughout sample,	
	SS-4	8	2.0	31-29	slightly moist at 7.8-8.0'	CL
0.00		9		5-5	Moist, brown, stiff, Silty CLAY, some gray Silt	
	SS-5	10	2.0	5-8		CL
0.00		11		6-7	Moist/wet, stiff, red/brown, Silty CLAY, gray Silty Clay throughout,	
	SS-6	12	1.5	10-9	some well rounded m-Gravel.	ML
0.40		13		2-3	Wet, red/brown, Silty CLAY, some f-Sand throughout, at 13.8'	
	SS-7	14	1.2	4-4	some black staining with m-Gravel.	ML
0.00		15		3-12	Wet, red/brown, Silty CLAY, angular m-Gravel throughout.	
	SS-8	16	1.0	14-50/.2		GC

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION
TOR= TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-2S

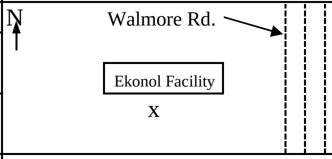
Contractor: SJB Services, Inc.
Driller: Steve Wolkiewicz, Andy Morris
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Sheet of 1
Location: South of Ekonol Facility
Elevation:

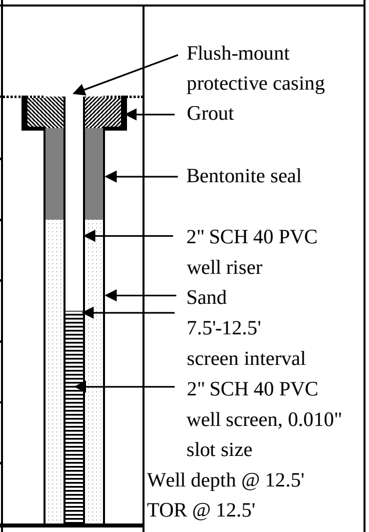
Observations	10/23/2001		
Depth of Water	~10' bgs		
Top of Boring Elevation			

Weather Cloudy 50 F
Date/Time Start 10/23/01 0935
Date/Time Finish 10/23/01 1110



PID Reading	**Sample Code**	**Sample Depth**	**Rec. (ft)**	**SPT**	**FIELD IDENTIFICATION OF MATERIAL**	**UNIFIED SOIL CLASS.**
		0				
21.40		1		3	0-0.5'- concrete slab	
	SS-1	2	0.5	5-6	Stiff, dark gray, Silty CLAY, trace organics	ML
33.00		3		7-12	Stiff, brown, Silty CLAY, some dark staining throughout	
	SS-2	4	0.4	13-12		ML
72.40		5		20-17	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-3	6	1.2	16-18		CL
69.70		7		16-9	Very stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-4	8	1.4	16-17		CL
-		9		19-18	No recovery- rock in spoon cap	
	SS-5	10	-	13-10		
107		11		7-5	Moist/wet, stiff, brown, Silty CLAY, some m-Gravel,	
	SS-6	12	2.0	5-7	black/green staining at 11.7' to 12.0'	CL
133		13		4-50/.1	Moist/wet, brown, Silty CLAY, with plastic odor	
	SS-7	14	1.0			CL

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION
TOR: TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-3S

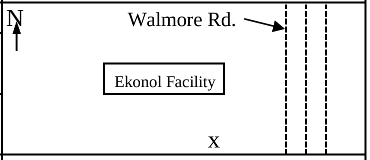
Contractor: SJB Services, Inc.
Driller: Steve Wolkiewicz, Andy Morris
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Sheet of 1
Location: Southeast of Ekonol Facility
Elevation:

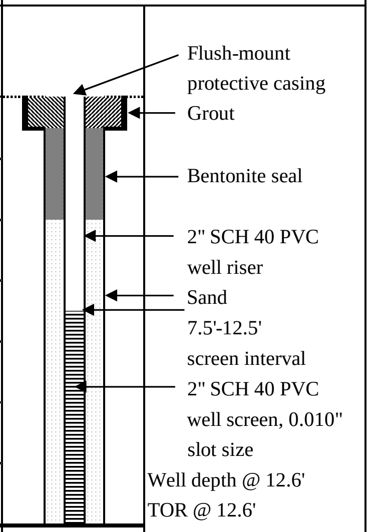
Observations	########		
Depth of Water	~11' bgs		
Top of Boring Elevation			

Weather Cloudy 50 F
Date/Time Start 10/23/01 1445
Date/Time Finish 10/23/01 1600



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
9.40		1		3	0-0.5'- concrete slab	
	SS-1	2	1.0	4-6	Stiff, brown, Silty CLAY	CL
11.60		3		17-20	Stiff, brown, Silty CLAY, some gray Silt throughout,	
	SS-2	4	0.8	18-15	some m-Gravel	ML
10.20		5		3-4	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-3	6	1.5	7-18		CL
7.10		7		25-34	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-4	8	2.0	24-48		CL
11.10		9		4-7	Same description as above	
	SS-5	10	1.5	7-8		CL
6.9		11		9-10	Moist/wet, red/brown, Silty CLAY, some gray Silt throughout,	
	SS-6	12	2.0	8-9	trace of m-Gravel	ML
7.7		13		4-50/.1	Moist/wet, red/brown, Silty CLAY, some gray Silt throughout,	
	SS-7	14	0.5		trace of m-Gravel	CL

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR: TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-4S

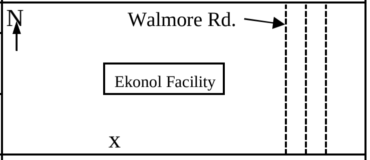
Contractor: SJB Services, Inc.
Driller: Steve Wolkiewicz, Andy Morris
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Sheet of 1
Location: Southwest of Ekonol Facility
Elevation:

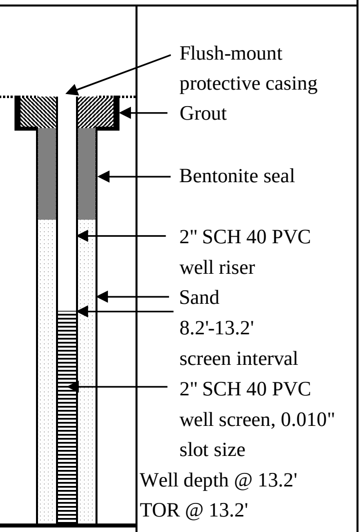
Observations	########		
Depth of Water	~10' bgs		
Top of Boring Elevation			

Weather Rain 60 F
Date/Time Start 10/24/01 1040
Date/Time Finish 10/24/01 1140



PID Reading	**Sample Code**	**Sample Depth**	**Rec. (ft)**	**SPT**	**FIELD IDENTIFICATION OF MATERIAL**	**UNIFIED SOIL CLASS.**
		0				
-		1		-	0-0.9'- concrete slab	
	SS-1	2	-	5-4	Minimal recovery, piece of concrete in spoon cap	
1.70		3		8-10	Stiff, brown, Silty CLAY, some gray Silt throughout,	
	SS-2	4	1.2	14-16	some m-Gravel	ML
0.20		5		4-8	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-3	6	1.4	12-20		CL
3.20		7		18-26	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-4	8	2.0	33-38		CL
1.90		9		4-7	Moist, stiff, red/brown, Silty CLAY	
	SS-5	10	2.0	9-9		CL
2.6		11		7-6	Moist/wet, red/brown, Silty CLAY	
	SS-6	12	2.0	9-8		CL
14.0		13		12-13	Moist/wet, red/brown, Silty CLAY, some gray Silt throughout,	
	SS-7	14	0.5		trace of m-Gravel	ML

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR: TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-5S

Contractor: SJB Services, Inc.
Driller: Matt Matthies, Keith Oliver
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

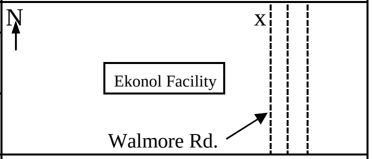
Location: Northeast of Ekonol Facility
Elevation:

Observations	6/10/2002		
Depth of Water	~9.6' bgs		
Top of Boring Elevation			

Weather Sunny 70 F

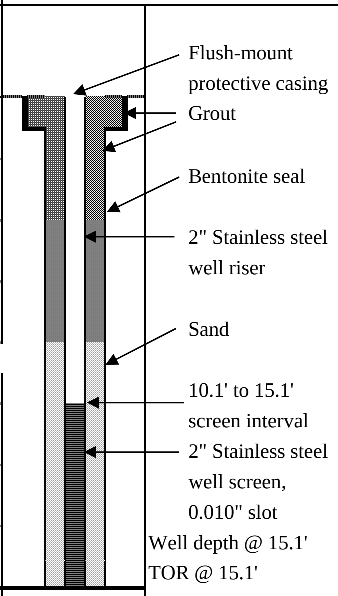
Date/Time Start 6/10/02 1105

Date/Time Finish 6/10/02 1225



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
2.2		1		-	0-1.0'- Concrete slab.	
	SS-1	2	0.5	2-3	Stiff, brown, Silty CLAY, some organic staining	ML
2.3		3		5-7	Stiff, brown/gray, Silty CLAY	
	SS-2	4	1.3	10-20		ML
2.3		5		4-8	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-3	6	1.7	15-21		CL
2.3		7		12-15	Very stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-4	8	2.0	31-37		CL
3.3		9		3-4	Moist, brown, stiff, Silty CLAY, some gray Silt	
	SS-5	10	2.0	5-4		CL
3.2		11		3-2	Moist/wet, stiff, red/brown, Silty CLAY, gray Silt throughout,	
	SS-6	12	2.0	3-3	trace of f-Gravel	ML
3.2		13		3-2	Wet, red/brown, CLAY, trace of f-Gravel	
	SS-7	14	1.8	3-2		ML
2.2		15		29-50/0.3	Wet, red/brown, CLAY, angular pieces of bedrock throughout	
	SS-8	16	0.5	-		ML

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-6S

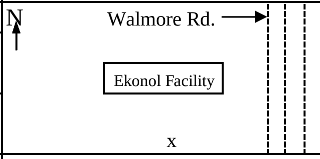
Contractor: SJB Services, Inc.
Driller: Matt Matthies, Keith Oliver
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Location: South of Ekonol Facility
Elevation:

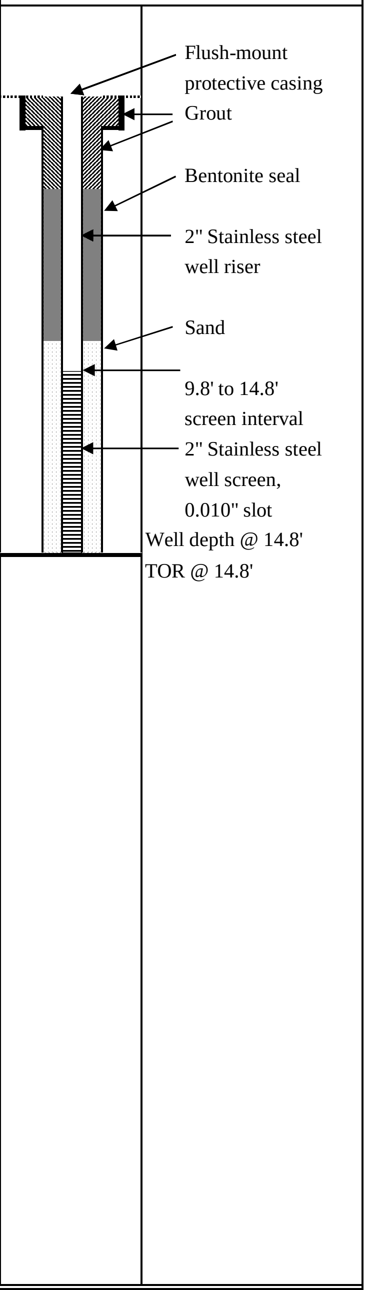
Observations	6/14/2002		
Depth of Water	~11.5' bgs		
Top of Boring Elevation			

Weather Sunny 70 F
Date/Time Start 6/14/02 0925
Date/Time Finish 6/14/02 1115



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
2.3		1		-	0-1.0'- Concrete slab.	
	SS-1	2	0.5	3-5	Stiff, brown, Silty CLAY, some gray Silt	ML
2.1		3		5-4	Stiff, brown/gray, Silty CLAY, some gray Silt	
	SS-2	4	0.9	10-10		ML
2.2		5		5-8	Stiff, brown, Silty CLAY, some gray Silt throughout sample,	
	SS-3	6	1.7	16-21	trace of f-Sand, brown	CL
2.2		7		18-22	Very stiff, brown, Silty CLAY	
	SS-4	8	2.0	22-27		CL
2.0		9		4-5	Very stiff, brown, Silty CLAY	
	SS-5	10	2.0	7-9		CL
2.1		11		4-5	Moist/wet, stiff, red/brown, Silty CLAY	
	SS-6	12	1.9	7-12		ML
2.5		13		12-22	Wet, red/brown, CLAY, trace of f-Gravel	
	SS-7	14	0.8	26-27		ML
2.0		15		10-50/0.3	Wet, red/brown, CLAY, angular pieces of bedrock throughout	
	SS-8	16	0.5	-		ML

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION
TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-7S

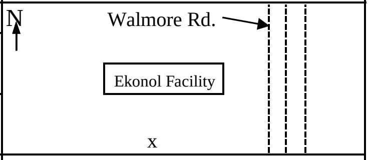
Contractor: SJB Services, Inc.
Driller: Jon Keherer, Keith Oliver
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Location: South of Ekonol Facility
Elevation:

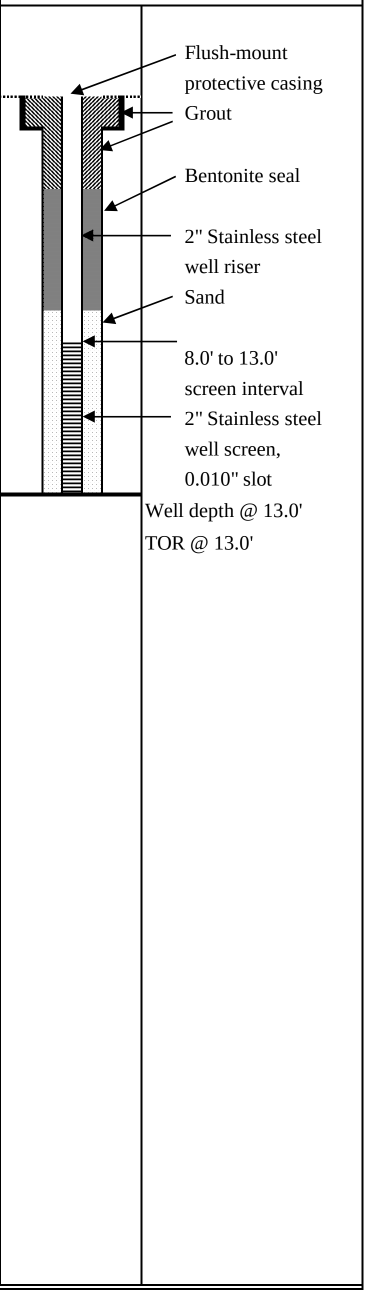
Observations	6/17/2002		
Depth of Water	~10.9' bgs		
Top of Boring Elevation			

Weather: Sunny 60 F
Date/Time Start: 6/17/02 1035
Date/Time Finish: 6/17/02 1145



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
1.6		1		3	0-0.8'- Concrete slab	
	SS-1	2	0.6	6-10	Concrete pieces and Gravel	
1.7		3		3-5	Stiff, black/brown/gray, Silty CLAY, some m-Gravel	
	SS-2	4	0.8	6-8		ML
1.8		5		13-12	Stiff, brown, Silty CLAY, some gray Silt throughout sample,	
	SS-3	6	1.2	11-16	some angular Sand crystals	CL
1.7		7		41-32	Very stiff, brown, CLAY, some gray Silt throughout sample,	
	SS-4	8	1.9	26-39	some Sandy, m-Gravel	CL
1.6		9		15-14	Moist, brown, stiff, Silty CLAY	
	SS-5	10	1.1	11-6		CL
1.7		11		4-5	Moist/wet, stiff, red/brown, Silty CLAY, some f-Gravel	
	SS-6	12	2.0	5-11		ML
1.6		13		8-14	Wet, red/brown, CLAY, angular pieces of bedrock throughout	
	SS-7	14	0.4	25-50/0.0		ML
		15				
		16				

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION
TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-8S

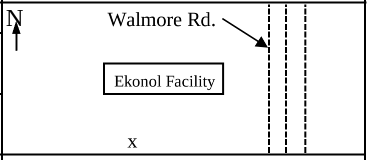
Contractor: SJB Services, Inc.
Driller: Jon Keherer, Keith Oliver
Inspector: Andy Janik/Eric Felter
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Location: Southwest of Ekonol Facility
Elevation:

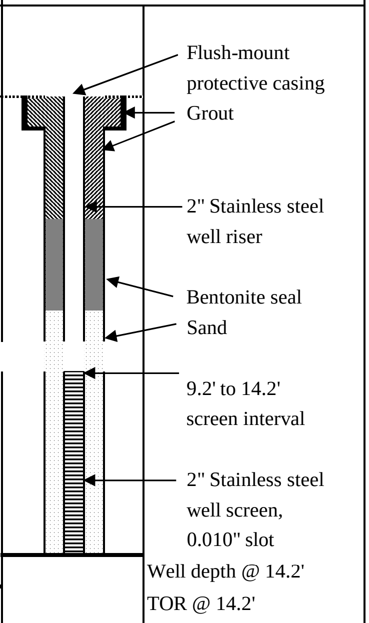
Observations	6/19/2002		
Depth of Water	~11.0' bgs		
Top of Boring Elevation			

Weather Sunny 65 F
Date/Time Start 6/18/02 0845
Date/Time Finish 6/19/02 0940



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
1.4		1		-	0-1.2'- Concrete slab	
	SS-1	2	0.4	5-5	Stiff, brown, Silty CLAY, some concrete bits	ML
1.6		3		5-9	Stiff, brown/gray, Silty CLAY	
	SS-2	4	0.9	10-15		ML
		5		37-20	No Recovery	
	SS-3	6		11-10		
0.2		7		6-8	Very stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-4	8	1.2	38-40		CL
0.5		9		40-11	Moist, brown, stiff, Silty CLAY, some gray Silt , trace f-Gravel	
	SS-5	10	1.2	12-14		CL
0.5		11		10-6	Moist/wet, stiff, red/brown, Silty CLAY, gray Silt throughout,	
	SS-6	12	1.4	4-5	trace of f-Gravel	ML
0.2		13		6-7	Wet, red/brown, CLAY, trace of f-Gravel	
	SS-7	14	1.6	6-7		ML
0.5		15		50/0.2	Wet, red/brown, CLAY, angular pieces of bedrock throughout	
	SS-8	16	0.2	-		ML

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION
TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-9S

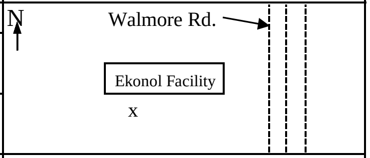
Contractor: SJB Services, Inc.
Driller: Jon Keherer, Keith Oliver
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 737515

Location: Southwest of Ekonol Facility
Elevation:

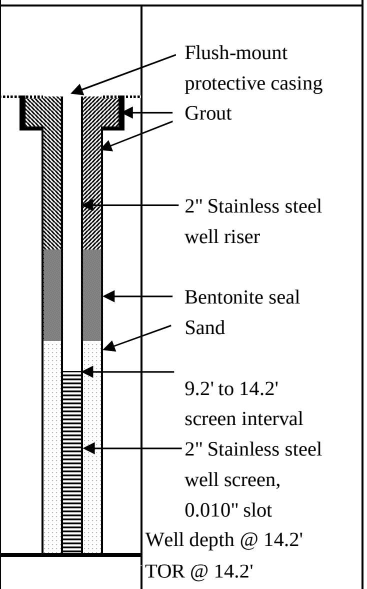
Observations	6/14/2002		
Depth of Water	~9.7' bgs		
Top of Boring Elevation			

Weather Sunny 70 F
Date/Time Start 6/14/02 1345
Date/Time Finish 6/14/02 1505



PID Reading	Sample Code	Sample Depth	Rec. (ft)	SPT	FIELD IDENTIFICATION OF MATERIAL	UNIFIED SOIL CLASS.
		0				
2.1		1		-	0-1.0'- Concrete slab	
	SS-1	2	0.6	4-5	Stiff, black, Silty CLAY, trace organics	ML
2.3		3		6-6	Stiff, brown, Silty CLAY, some gray Silt throughout sample	
	SS-2	4	0.5	8-15		ML
1.9		5		7-7	Stiff, brown, Silty CLAY, some gray Silt throughout sample,	
	SS-3	6	1.3	9-11	trace of f-Sand, brown	CL
2.2		7		17-19	Very stiff, brown, Silty CLAY	
	SS-4	8	1.8	27-32		CL
2.3		9		5-6	Moist, red/brown, stiff, Silty CLAY	
	SS-5	10	2.0	7-8		CL
		11		5-5	No Recovery	
	SS-6	12		4-4		
2.1		13		4-3	Wet, red/brown, CLAY	
	SS-7	14	2.0	2-3		ML
2.2		15		50/0.2	Wet, red/brown, CLAY, angular pieces of bedrock throughout	
	SS-8	16	0.4	-		ML

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION
TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS
DRILLING RECORD

BORING NO. MW-10S

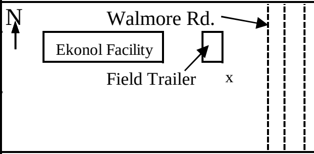
Contractor: SJB Services, Inc.
Driller: Ron Brown, Jason Todkowski
Inspector: Sara Chmura
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 441610

Location: Southeast of Ekonol Facility
Elevation:

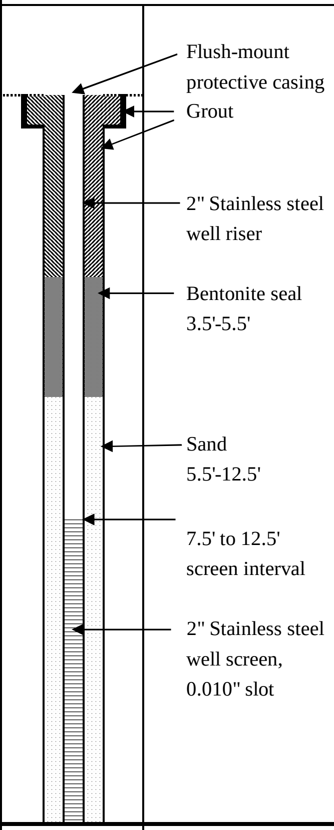
Observations			
Depth of Water	NA		
Top of Boring Elevation			

Weather sun, low 80s, breezy
Date/Time Start 9/07/05 @ 1314
Date/Time Finish 9/09/05 @ 1115



FID Reading	Sample Code	Sample Depth	Rec. %	SPT	FIELD IDENTIFICATION OF MATERIAL
		0			
8.0 ppm			-	-	Hand cleared to 5.0' bgs. Material was 9" of concrete with blue slag then stiff brown clay.
		1			
		2			
		3			
		4			
6.7 ppm	SS-1	5	100.0	WOR	Red/brown, hard mottled clay, no odors, trace calcite mineralization, trace fine brown dry sand, some brown, silt.
				WOR	
		6		WOR	
				WOR	
0.0 ppm	SS-2	7	100.0	WOR	Brown mottled stiff clay, dry. Some mineralization, transitioning to a slightly moist brown silty clay, no odors or staining. Some red/brick colorization at foot.
				WOR	
		8		WOR	
				WOR	
17.3 ppm	SS-3	9	90.0	3	Stiff, brown clay, at 9.5' changes to mottled red/brown silty clay, moist no odors, at 10.5' changes to very moist, silty sand with red clay.
				4	
		10		4	
				3	
15.0 ppm	SS-4	11	100.0	WOR	Moist, soft red/brown silty clay with trace gravel, rock in shoe of spoon. REFUSAL at 12.5' bgs.
				WOR	
		12		WOR	
					End of Boring at 12.5 ft.

WELL CONSTRUCTION DIAGRAM



TOR @ 12.5'

STANDARD PENETRATION
TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

Contractor: SJB Services, Inc.
Driller: Ron Brown, Jason Todkowski
Inspector: Sara Chmura
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

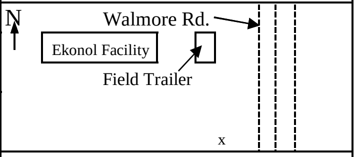
PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 441610

BORING NO. MW-11S

Location: Southeast of Ekonol Facility
Elevation:

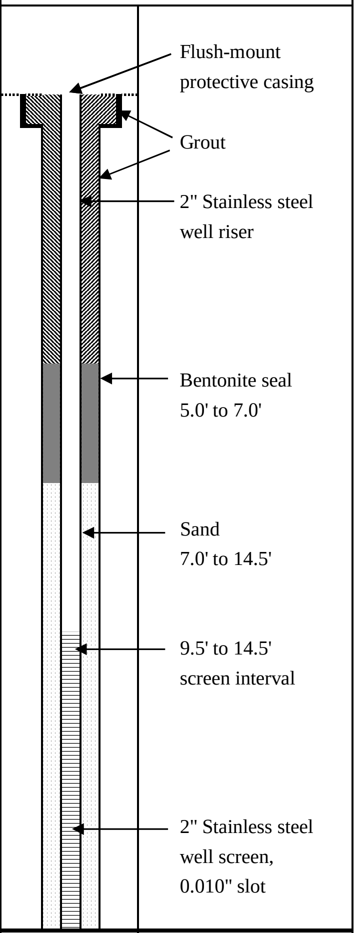
Observations			
Depth of Water			
Top of Boring Elevation			

Weather sun, low 80s, breezy
Date/Time Start 9/07/05 @ 1545
Date/Time Finish 9/08/05 @ 1200



FID Reading	Sample Code	Sample Depth	Rec. %	SPT	FIELD IDENTIFICATION OF MATERIAL
		0			
0.0 ppm			-	-	Hand cleared to 5.0' bgs.
		1			0-8" is asphault
					8"-1' is crushed stone
		2			1'-5' is hard, red clay.
		3			
		4			
16.1 ppm	SS-1	5	100.0	5	wet, mottled red/brown/grey clay, hard, no odors, no staining
				6	no gravel.
		6		6	
				9	
13.5 ppm	SS-2	7	85.0	6	saturated outside, moist inside, mottled red/brown/grey clay, trace
				9	rounded gravel, firm, some mineralization (calcite), no odors
		8		9	no staining.
				12	
13.9 ppm	SS-3	9	90.0	8	saturated, red/brown/grey mottled clay, stiff, grading to a softer
				10	red/brown, moist, mottled clay nearing 11'
		10		6	
				9	
14.4 ppm	SS-4	11	100.0	6	saturated, red/grey mottled clay, grading to a very soft saturated
				6	brown silt with clay, trace sub-rounded gravel, trace fine sand, at 13'
		12		7	dark grey fine silt/clay , rock fragments in shoe.
				9	
15.5 ppm	SS-5	13	100.0	10	moist, brown, soft caly with silt, grey rock fragments in bottom of
				10	spoon, Refusal at 14.5' bgs.
		14		50/0	
					End of Boring at 14.5 ft.
		15			
		16			

WELL CONSTRUCTION DIAGRAM



TOR @ 14.5'

STANDARD PENETRATION

TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY: Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-12S

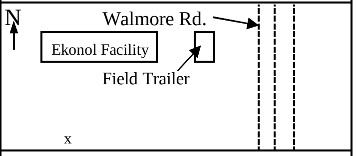
Contractor: SJB Services, Inc.
Driller: Ron Brown, Jason Todkowski
Inspector: Sara Chmura
Rig Type: ACKER AD II, SoilMax
Method: 4.25-inch HSA/SS

PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 441610

Location: South of Ekonol Facility
Elevation:

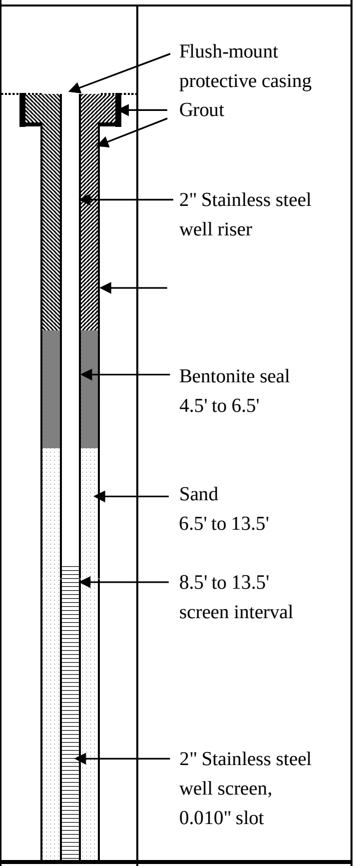
Observations
Depth of Water
Top of Boring Elevation

Weather sun, low 80s, breezy
Date/Time Start 9/09/05 @ 1325
Date/Time Finish 9/09/05 @ 1440



FID Reading	Sample Code	Sample Depth	Rec. %	SPT	FIELD IDENTIFICATION OF MATERIAL
		0			
0.0 ppm			-	-	Hand cleared to 5.0' bgs.
		1			0-8" is concrete
					8" - 5' is hard brown clay.
		2			
		3			
		4			
0.0 ppm	SS-1	5	100.0	4	dry, hard, brown/grey mottled clay, crystalization (calcite) from 6.5' to 7.0', no odors, no staining.
				8	
		6		11	
				14	
0.0 ppm	SS-2	7	100.0	10	dry, hard, brown/grey mottled clay, crystalization (calcite), grading to a softer brown clay with silt.
				16	
		8		16	
				12	
0.0 ppm	SS-3	9	5.0	2	black clay with silt, no odors, poor recovery
				3	
		10		4	
				5	
0.0 ppm	SS-4	11	100.0	3	very wet, brown silty clay, trace fine grained sand, at 12' there pockets of black sediment, no odors, rock fragments in shoe.
				3	
		12		6	
				50/0	
0.0 ppm	SS-5	13	20.0	-	grey rock fragments in shoe, Refusal at 13.5' bgs.
					End of Boring at 13.5 ft
		14			
		15			
		16			

WELL CONSTRUCTION DIAGRAM



TOR @ 13.5'

STANDARD PENETRATION

TOR = TOP OF ROCK
SS = SPLIT SPOON
ST = SHELBY TUBE

SUMMARY:
Top of competent bedrock (TOR) defined as auger and split spoon (SS) refusal.
Collected a small sample for visual reference of 5-7' interval of crystalization.
Collected a small sample for visual reference of 11-13" interval of black pockets.

PARSONS

DRILLING RECORD

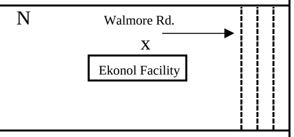
BORING NO. RMW-1D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 550-X, ATV Drill Rig
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

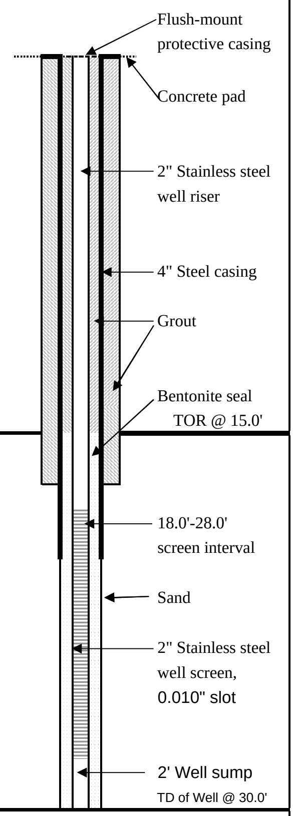
Location: North of Ekonol Facility
Elevation:

Weather Cloudy 40 degrees
Date/Time Start Coring 10/24/03 0755
Date/Time Finish Coring 10/24/03 1005



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			Description of overburden material is consistent with other well locations.
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
		16			
#1	17.0'-20.45'	17	100.0	61.0	Light gray dolostone, spotted mineralization, some stylolitic horizons to fracture (17.0'-17.43')
		18			Light gray dolostone, stylolitic horizons, mineralization, vertical fracture to break (17.43'-18.25')
		19			Light gray dolostone, spotted mineralization, some stylolitic horizons, vertical fracture continues to 19.15'
		20			and becomes mineralized to break, small vugs (18.25'-20.45')
#2	20.45'-25.45'	21	100.0	78	Light gray dolostone, spotted mineralization, some stlylolitic horizons to weathered break (20.45'-21.45')
		22			Light gray dolostone, very borken/rubble zone, water loss (21.5' - 22.5')
		23			
		24			Light gray dolostone, vugs increasingly abundant, fossiliferous corals, spotted mineralization (22.5'-24.0')
		25			Light gray dolostone, fossiliferous coral, porous, vugs (24.0'-25.45')
#3	25.45'-30.35'	26	100.0	87	Light gray dolostone, stylolitic horizons, fossiliferous corals, porous, mineralization to break (25.45'-25.85')
		27			Light gray dolostone, some vugs, some stylolitic horizons (25.85'-27.3')
		28			Light gray dolostone, stylolitic horizons, mineralized vugs (27.3'-28.0')
		29			Dark/black coal seam (28.0'-29.0')
		30			Light gray dolostone, stylolitic horizons, mineralized vugs, oil-like substance, pyrite precipitate(29.0'-30.35')
		31			
		32			
		33			
		34			
		35			
		36			
		37			
		38			
		39			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY:
TOR was determined at HSA auger refusal.
Due to difficulty in drilling, well was not set at total depth of boring.
Replacement well for MW-1D

PARSONS

DRILLING RECORD

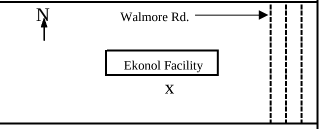
BORING NO. RMW-2D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 550-X, ATV Drill Rig
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

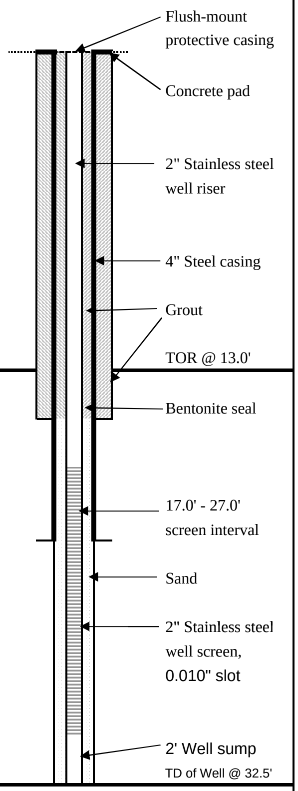
Location: South of Ekonol Facility
Elevation:

Weather Showers 45 degrees
Date/Time Start Coring 10/27/03 0740
Date/Time Finish Coring 10/27/03 0910



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
#1	15.0'-19.5'	15	96.0	100	Light gray dolostone, some spotted mineralization, stylolitic horizons, some small vugs to fracture (15.0'-16.4')
		16			
		17			Light gray dolostone, stylolitic horizons, mineraliziation more abundant towards fracture, large dolostone
		18			crystal concentration, to breack/fracture (16.4'-17.95')
		19			Light gray dolostone, mineralization at top of break, some fractures, few stylolitic horizons (17.95'-18.9')
		20			Light gray dolostone, spotted mineralization to end of run, weathered plane (18.9'-19.5')
#2	19.5'-24.5'	21	100.0	90	Light gray dolostone, very little mineralization, clay seam at 21.9' bgs (19.5'-22.0')
		22			
		23			Light gray dolostone, many stylolitic horizons to fracture, small potted mineralization to gracture (22.0'-23.15')
		24			Light gray dolostone, some larger mineraliztion, some vugs to fracture (23.15'-23.75'
		25			Light gray dolostone, stylolitic horizons to fracture, spotted mineralization to break, lost circulation (23.75'-24.5')
#3	24.5'-29.5'	26	100.0	99	Light gray dolostone, some rust coloration through out, mineralization, many large vugs at 27.9', stylolitic
		27			horizons, some mineralized vugs (24.5'-27.9')
		28			Light gray dolostone, many vugs at top of break, stylolitic horizons, spotted mineraliztion, dolostone
		29			crystals inside vugs (27.9'-28.15')
		30			
		31			
		32			
		33			
		34			
		35			
		36			
		37			
		38			
		39			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY:
TOR was determined at HSA auger refusal.
Due to difficulty in drilling, well was not set at total depth of boring.
Replacement well for MW-2D

PARSONS

DRILLING RECORD

BORING NO. RMW-3D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 75
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

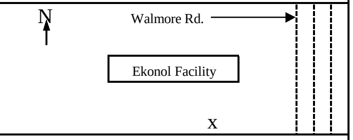
PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

Location: Southeast of Ekonol Facility
Elevation:

Weather Cloudy 40 degrees

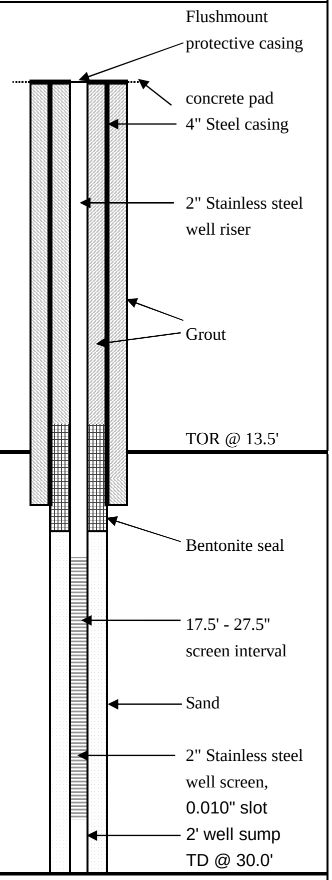
Date/Time Start Coring 10/2403 1040

Date/Time Finish Coring 10/24/03 1145



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
#1	15.5'-19.85'	16	100	100	Light gray dolostone, some mineralization, stylolitic horizons, some clay seems to fracture (15.5'-16.84')
		17			Light gray dolostone, some mineralization, some vugs from fracture to 17.9' bgs, stylolitic horizons to hand break (16.84'-18.9')
		18			
		19			Light gray dolostone, some mineralization, no apparent stylolitic horizons (18.9'-19.85')
#2	19.85'-24.85'	20	100	79	Light gray dolostone, some mineralization, stylolitic horizons at 19.98', trace fossiliferous coral to weathered bedding plane (19.85'-20.92')
		21			
		22			Light gray dolostone, some mineralization, slightly porous to break (20.92'-22.85')
		23			Light gray dolostone, stylolitic horizons, water loss at fracture (22.85'-23.1')
		24			Light gray dolostone, stylolitic horizons, mineral pocket at 24' bgs (23.1'-24.85')
#3	24.85'-29.9'	25	100	100	Light gray dolostone, becomming more porous, mineralization, some vugs, stylolitic horizons (24.85'-25.85')
		26			Light gray dolostone, fossiliferous coral, vugs,some are mineralized with dolostone, stylolitic horizons (25.85'-29.9')
		27			
		28			
		29			
		30			
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY:
TOR was determined at HSA auger refusal.
Replacement well for MW-3D

PARSONS

DRILLING RECORD

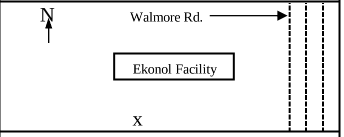
BORING NO. RMW-4D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 550-X, ATV Drill Rig
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

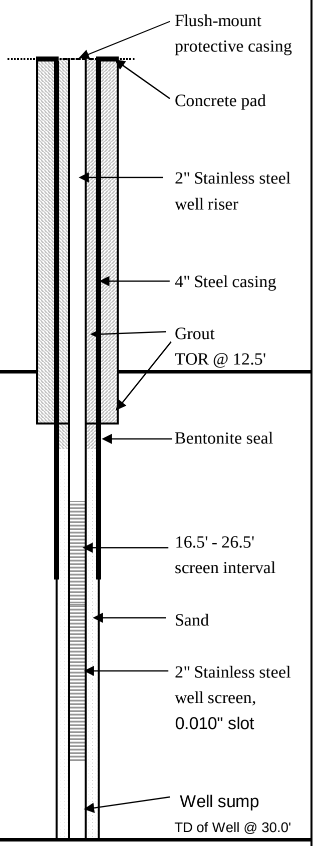
Location: Southwest of Ekonol Facility
Elevation:

Weather Cloudy 40 degrees
Date/Time Start Coring 10/24/03 1245
Date/Time Finish Coring 10/24/03 1450



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
#1	14.8'-19.9'	14	100.0	100.0	Light gray dolostone, porous, some vugs, some mineralization, stylolitic horizons, small veritical fractures that are mineralized to horizontal fracture (14.8'-15.2')
		15			
		16			Light gray dolostone, few mineralized vugs, some stylolitic horizons to fracture (15.2'-15.87')
		17			Light gray dolostone, slightly porous, some mineralization, some stylolitic horizons, some mineralized vugs to hand break (15.87'-18.82')
		18			
		19			Light gray dolostone, some stylolitic horizons, little mineralization to break (18.82'-19.9')
#2	19.9'-24.9'	20	98.0	82.0	Light gray dolostone, few stylolitic horizons, some mineralization to weathered fracture (19.9'-21.9')
		21			
		22			Light gray dolostone, slightly porous, some mineralization to fracture (21.9'-22.4')
		23			Light gray dolostone, many stylolitic horizons, mineralization to fracture (22.4'-23.0')
		24			Light gray dolostone, stylolitic horizons, small mineralized vertical fractures to break (23.0'-24.1')
		25			Light gray dolostone, stylolitic horizons, few vugs, slightly porous to end of run (24.1'-24.9')
#3	24.9'-30.0'	26	100.0	100	Light gray dolostone, many vugs, mineralization, porous, fossiliferous corals to fracture (24.9'-25.9')
		27			Light gray dolostone, very porous, many vugs, fossiliferous coral, mineralized to fracture (25.9'-27.35')
		28			Light gray dolostone, mineralized vugs (dolostone crystals), slightly porous, spotty mineralization to break (28.5'-30.0')
		29			
		30			
		31			
		32			
		33			
		34			
		35			
		36			
		37			
		38			
		39			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.
Replacement well for MW-4d

PARSONS

DRILLING RECORD

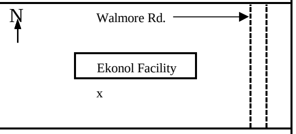
BORING NO. MW-10D

Contractor: SJB Services, Inc.
Driller: Jon Keherer, Mike Kukoleca
Inspector: Andy Janik/Jim Schuetz
Rig Type: ACKER AD II, SoilMax
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

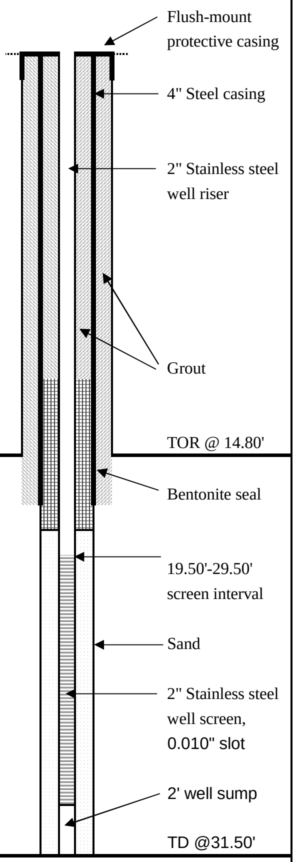
Location: Southwest of Ekonol Facility
Elevation:

Weather Hazy/Humid 85 F
Date/Time Start Coring 7/2/02 0820
Date/Time Finish Coring 7/2/02 1230



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			Description of overburden material is consistent with other well locations.
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
		16			
#1	17.20'-21.00'	17	100.0	100.0	Start of Run #1, grout from installation of 4" steel casing
		18			Massive, light to dark gray dolomite, laminated to fracture on bedding plane (17.20'-18.43')
		19			
		20			
		21			Massive, light to dark gray dolomite, laminated, porous, with stylolitic horizons (18.43'-21.00')
#2	21.00'-26.50'	22	96.0	67.0	Light to dark gray dolomite, laminated, porous, fossiliferous, vugged with mineralization (21.00'-24.00')
		23			
		24			Light to dark gray dolomite, laminated, porous, fossiliferous, vugged with mineralization (21.00'-24.00')
		25			
		26			Light to dark gray dolomite, rubble zone, weathered fractures and stylolitic horizons (24.00'-26.50')
#3	26.50'-31.50'	27	100.0	100.0	Light to dark gray dolomite, finely laminated, to break on mineralized bedding plane (26.50'-26.92')
		28			
		29			Light to dark gray dolomite, laminated to drill break (26.92'-29.00')
		30			Light to dark gray dolomite, laminated to fracture (29.00'-29.40')
		31			Light to dark gray dolomite, laminated to fracture on mineralized bedding plane (29.40'-30.50')
		32			Light to dark gray dolomite, laminated to drill break (30.50'-31.50')
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

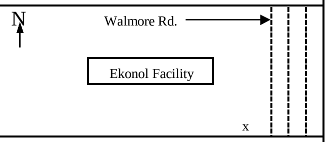
BORING NO. MW-11D

Contractor: SJB Services, Inc.
Driller: Jon Keherer, Mike Kukoleca
Inspector: Andy Janik
Rig Type: ACKER AD II, SoilMax
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

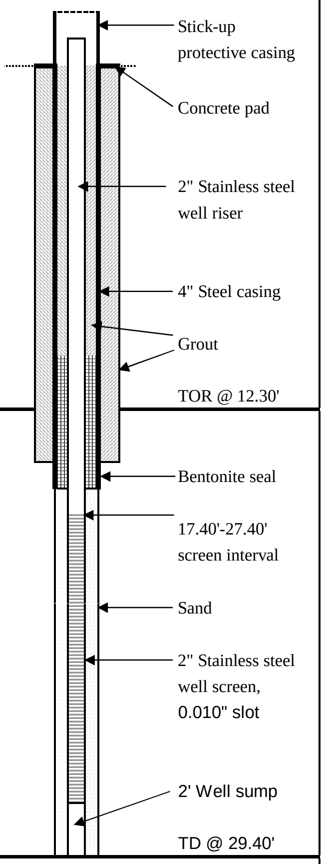
Location: Southeast of Ekonol Facility
Elevation:

Weather Hazy/Humid 85 F
Date/Time Start Coring 7/3/02 0940
Date/Time Finish Coring 7/3/02 1455



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
#1	14.50'-19.30'	14	100.0	50.0	Light to dark gray, dolomite, rubble zone, heavily fractured (14.50'-15.45')
		15			Light to dark gray, dolomite, laminated, some stylolitic horizons (15.45'-16.05')
		16			Light to dark gray, dolomite, rubble zone, heavily fractured (16.05'-17.40')
		17			Light to dark gray, dolomite, to fracture at 18.05' on mineralized bedding plane (17.40'-18.40')
		18			Light to dark gray, dolomite, laminated, some stylolitic horizons to break on bedding plane (18.40'-18.65')
		19			Light to dark gray, dolomite, mineralized bedding planes to drill break (18.65'-19.30')
#2	19.30'-24.50'	20	100.0	87.0	Light to dark gray, dolomite, fracture at 19.55' on bedding plane (19.30'-19.80')
		21			Light to dark gray dolomite, laminated with stylolitic horizons, to fracture on bedding plane (19.80'-22.40')
		22			
		23			
		24			Light to dark gray dolomite, laminated with stylolitic horizons, to drill break (22.40'-24.50')
#3	24.50'-29.80'	25	100.0	94.0	Light to dark gray dolomite, some stylolitic horizons to fracture on bedding plane (24.50'-25.27')
		26			Light to dark gray dolomite, porous, some vugging to weathered fracture (25.27'-25.46')
		27			Light gray dolomite, porous, vuggy, numerous stylolitic horizons to fracture with c-Gravel (25.46'-26.38')
		28			Light gray dolomite, porous, vuggy, with mineralization, some fossiliferous corals (26.38'-29.80')
		29			Hand break at 28.39'
		30			
		31			
		32			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

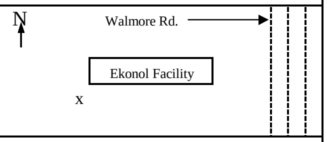
BORING NO. MW-12D

Contractor: SJB Services, Inc.
Driller: Dale Matthies, Matt Matthies
Inspector: Andy Janik
Rig Type: CME 550-X, ATV Drill Rig
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

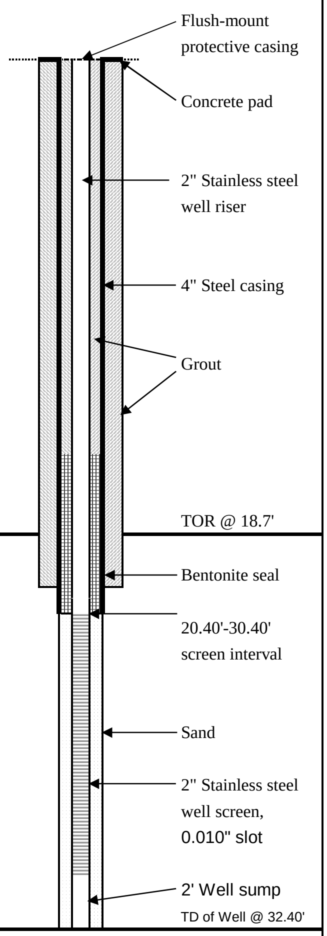
Location: Southwest of Ekonol Facility
Elevation:

Weather Sunny 65 F
Date/Time Start Coring 9/23/02 1005
Date/Time Finish Coring 9/24/02 1540



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			Description of overburden material is consistent with other well locations.
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
		16			
		17			
		18			
#1	19.70'-24.70'	19	78.0	57.0	Light to dark gray dolomite, heavily fractured rubble zone, some pieces of grout (19.70'-20.70')
		20			
		21			Light to dark gray dolomite, porous, some stylolitic horizons, to break on bedding plane (20.70'-21.75')
		22			Light to dark gray dolomite, porous, to break on Sandy (brown), weathered bedding plane (21.75'-22.45')
		23			Light to dark gray dolomite, some brown, fossiliferous corals, porous with stylolitic horizons, to drill break (22.45'-23.55')
		24			
#2	24.70'-29.70'	25	100.0	100.0	Gray dolomite, heavily fractured rubble zone (24.70'-26.40')
		26			Brown, porous, fossiliferous corals in gray, dolomite, to fracture (26.40'-26.80')
		27			Brown, porous, fossiliferous corals in gray, dolomite, to fracture (26.80'-27.65')
		28			Brown, porous, fossiliferous corals in gray, dolomite, becoming laminated in light to dark gray dolomite, slightly vugged, some mineralization, hand break at 28.60' (27.65'-29.68')
		29			
#3	29.70'-35.00'	30	100.0	95.0	Gray, dolomite, heavily fractured, rubble zone (29.70'-30.10')
		31			Gray dolomite, to weathered bedding plane (30.10'-30.70')
		32			Dark gray, dolomite, laminated, vugged with some mineralization, to fracture (30.70'-32.30')
		33			Dark gray, dolomite, laminated, vugged, some mineralization, stylolitic horizons to fracture (32.30'-33.14')
		34			Dark gray, dolomite, laminated, vugged with mineralization and corals, horizontal and vertical stylolitic horizons to vertical fracture (33.14'-34.19') Hand break at 33.59'
		35			
		36			Dark gray/brown, dolomite, some vugging, laminated to vertical fracture/drill break (34.19'-35.00')
		37			
		38			
		39			

WELL CONSTRUCTION DIAGRAM



TD of Boring @ 35.0'

STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY:
TOR was determined at HSA auger refusal.
Due to difficulty in drilling, well was not set at total depth of boring.

PARSONS

DRILLING RECORD

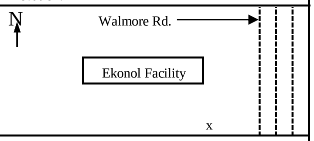
BORING NO. MW-13D

Contractor: SJB Services, Inc.
Driller: Dale Matthies, Matt Matthies
Inspector: Andy Janik
Rig Type: CME 550-X, ATV Drill Rig
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

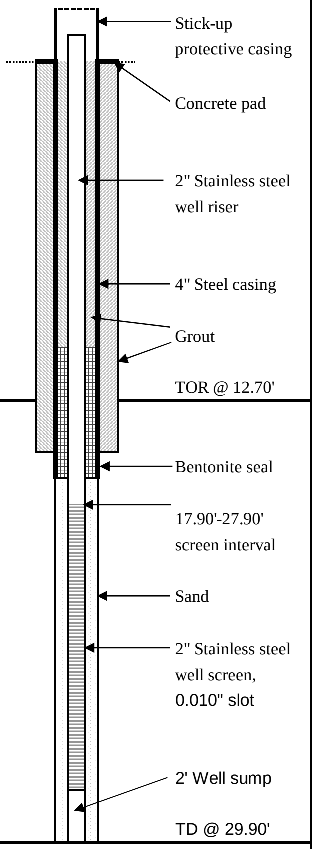
Location: Southeast of Ekonol Facility
Elevation:

Weather Sun 70 F
Date/Time Start Coring 9/25/02 1115
Date/Time Finish Coring 9/25/02 1550



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
#1	14.00'-19.00'	14	100.0	22.0	Light to dark gray, dolomite, porous, numerous breaks on bedding planes and stylolitic horizons, 21 breaks in this core section (14.00'-17.83')
		15			
		16			
		17			
		18			Light to dark gray, dolomite, stylolitic horizons to near vertical fracture with mineralization (17.83'-18.32')
		19			Light to dark gray, dolomite, stylolitic horizons to weathered, vertical fracture (18.32'-19.00')
#2	19.00'-24.00'	20	100.0	68.0	Light to dark gray, dolomite, numerous breaks on bedding planes and stylolitic horizons, 13 breaks in this core section (19.00'-21.85')
		21			
		22			Light to dark gray, dolomite, stylolitic horizons to vertical, weathered fracture (21.85'-22.31')
		23			Light to dark gray, dolomite, stylolitic horizons, large vug and vertical fracture at 23.30', to vertical fracture/drill break (22.31'-24.00')
		24			
#3	24.50'-29.80'	25	90.0	90.0	Light to dark gray, massive, dolomite, some stylolitic horizons to mineralized fracture (24.00'-25.00')
		26			Dark gray, dolomite, massive, to mineralized bedding plane (25.00'-28.55') Hand break at 27.70'
		27			
		28			Dark gray, dolomite, massive, to break on weathered bedding plane (28.55'-29.90')
		29			
		30			
		31			
		32			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

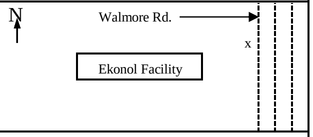
BORING NO. MW-14D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 75
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

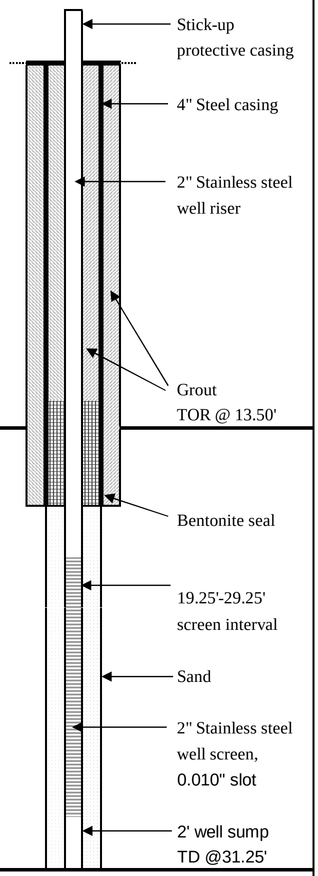
Location: Northeast of Ekonol Facility
Elevation:

Weather Sun 75 F
Date/Time Start Coring 9/11/03 0915
Date/Time Finish Coring 9/11/03 1445



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
		16			
#1	16.00'-21.00'	17	100	100	
		18			Light gray dolomite, some mineralization to fracture on bedding plane (16.00'-17.70')
		19			
		20			
		21			Light gray dolomite, few stylolitic horizons, three hand breaks in section (17.70'-21.0')
#2	21.00'-25.98'	22	100	91	Light gray dolomite, few stylolitic horizons, to fracture (21.0'- 22.85')
		23			Light gray dolomite, weathered, rubble zone (22.85'-23.55')
		24			Light gray dolomite, stylolitic horizons with some mineralization (23.55'-24.42')
		25			Light gray dolomite, porous, some mineralization and fossiliferrous corals to break (24.42'-25.98')
#3	25.98'-31.25'	26	100	100	Light to dark gray dolomite, porous, stylolitic horizons, some vugging throughout section (25.98'-29.35')
		27			
		28			
		29			Light to dark gray dolomite, porous, stylolitic horizons, some vugging, fossiliferous corals to break
		30			(29.35'-31.25')
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

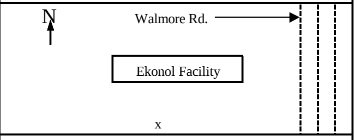
BORING NO. MW-15D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 75
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

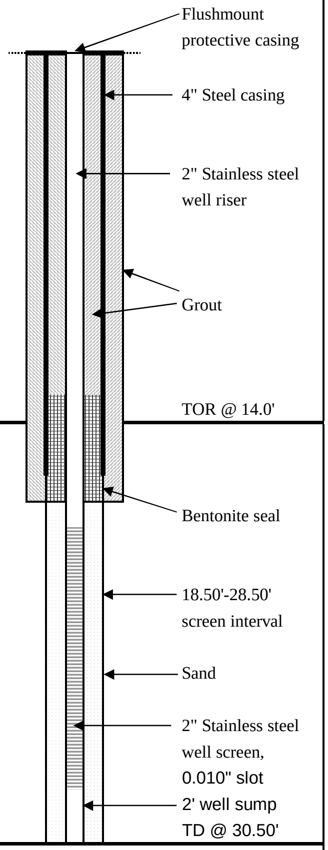
Location: Southwest of Ekonol Facility
Elevation:

Weather Sun/Clouds 70 F
Date/Time Start Coring 9/16/03 0850
Date/Time Finish Coring 9/16/03 1240



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			Description of overburden material is consistent with other well locations.
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
#1	15.50'-20.50'	16	77	10	Light gray dolomite, numerous undulating fractures (16) in section, numerous stylolitic horizons to break at end of run (15.50'-20.50')
		17			
		18			
		19			
		20			
#2	20.50'-25.62'	21	100	76	Light gray dolomite core debris (20.50'-20.80')
		22			Light gray dolomite to fracture (20.80'-21.16'), light gray dolomite to fracture (21.16'-21.59')
		23			Light gray dolomite (21.59'-21.91'), light gray dolomite with vugging and mineralization (21.91'-22.24')
		24			Light gray dolomite, stylolitic horizons, mineralization to fracture (22.24'-24.24')
		25			Light to dark gray dolomite, porous, few stylolitic horizons to break (24.24'-25.62')
#3	25.62'-30.50'	26	100	100	Light to dark gray dolomite, porous, stylolitic horizons, some vugging and mineralization throughout section (25.62'-30.50')
		27			
		28			
		29			
		30			
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

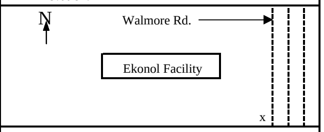
BORING NO. MW-16D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 75
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

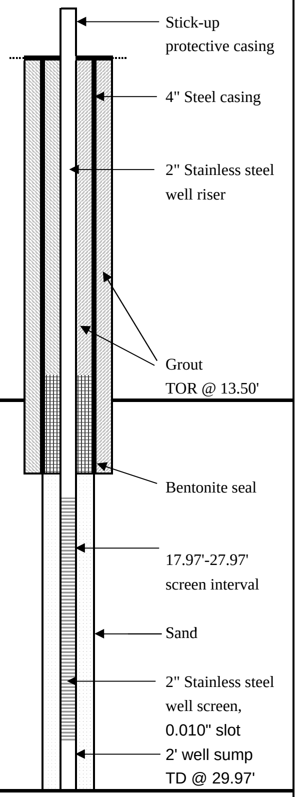
Location: Northeast of Ekonol Facility
Elevation:

Weather Cloudy 75 F
Date/Time Start Coring 9/15/03 0845
Date/Time Finish Coring 9/15/03 1240



HQ Core Run	**Range**	**Depth**	**Rec. (%)**	**RQD (%)**	**FIELD IDENTIFICATION OF MATERIAL**
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
#1	15.50'-20.50'	16	100	9	Light gray dolomite, numerous fractures (23) in section, fractures on weathered bedding planes to gray,
		17			Clay seam (15.50'-19.24')
		18			Gray, Clay seam, with bedrock fragments and core debris(19.24'-19.84')
		19			Light gray dolomite, numerous fractures (5) in sectionfractures are undulating on stylolitic horizons
		20			to break (19.84'-20.50')
#2	20.50'-25.46'	21	100	72	Light gray dolomite, numerous undulating fractures (8) in section on stylolitic horizons (20.50'-22.30')
		22			Gray, Clay seam (22.30'-22.37')
		23			Light gray dolomite, numerous stylolitic horizons, more porous to break (22.37'-23.07')
		24			Light gray dolomite, porous, with mineralization to break (23.07'-25.21'
		25			Light gray dolomite, porous, with mineralization to break (25.21'-25.46'))
#3	25.46'-29.97'	26	100	66	Light gray dolomite, numerous fractures (9), heavy mineralization in fractures, some stylolitic horizons,
		27			to weathered, mineralized break (25.46'-27.92')
		28			Light to dark gray dolomite, porous, several stylolitic horizons, spotty mineralization to break (27.92'-
		29			-29.97')
		30			
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

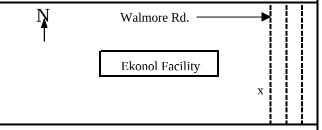
BORING NO. MW-17D

Contractor: SJB Services, Inc.
Driller: Tony Jakubluzak, Carl Dennies
Inspector: Andy Janik
Rig Type: CME 75
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515

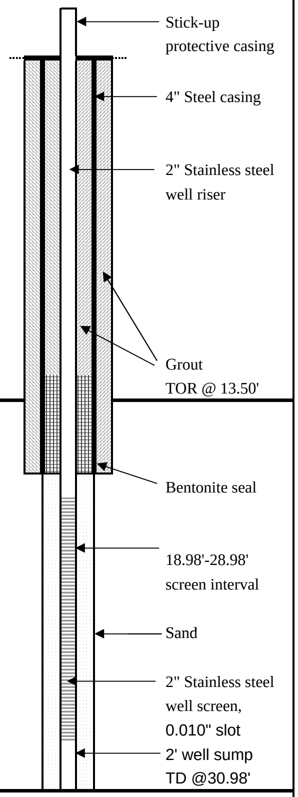
Location: Northeast of Ekonol Facility
Elevation:

Weather Sun 75 F
Date/Time Start Coring 9/12/03 0815
Date/Time Finish Coring 9/12/03 1530



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			Description of overburden material is consistent with other well locations.
		2			
		3			
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			
#1	16.00'-21.22'	16	100	77	Light gray dolomite, few stylolitic horizons (16.00'-16.40'); light gray dolomite, to fracture (16.40'-16.90')
		17			Light gray dolomite, to fracture with rubble (16.40'-16.90')
		18			Light gray dolomite, somewhat porous, slight vugging, with trace mineralization (16.90'-18.35')
		19			Light gray dolomite, porous, vugged with mineralization, to bedding plane fracture (18.35'-19.22')
		20			Light gray dolomite, massive, some stylolitic horizons, to fracture (19.22'-20.32')
		21			Light gray dolomite, porous, to drill break (20.32'-21.22')
#2	21.22'-26.57'	22	100	96	Light gray dolomite, massive with lamination, few stylolitic horizons, to fracture (21.22'-23.48')
		23			Light gray dolomite, massive, several stylolytic horizons, somewhat porous to fracture (23.48'-25.75')
		24			
		25			Light gray dolomite, weathered fracture zone (25.75'-26.57')
#3	26.57'-30.98'	26	100	93	Light gray dolomite, porous, several stylolitic horizons (26.57'-26.70')
		27			Light gray dolomite, fractured (26.70'-27.00')
		28			Light to dark gray dolomite, porous, vugged with mineralization, fossiliferrous corals (27.00'-30.15')
		29			
		30			Light to dark gray dolomite, porous, slightly vugged, mineralization to break (30.15'-30.98')
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

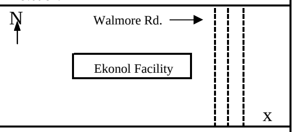
BORING NO. MW-18D

Contractor: SJB Services, Inc.
Driller: Dale and Matthew Mathies
Inspector: Sara Chmura / Jeff Poulsen
Rig Type: ATV Drill Rig CME-55
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515/441237

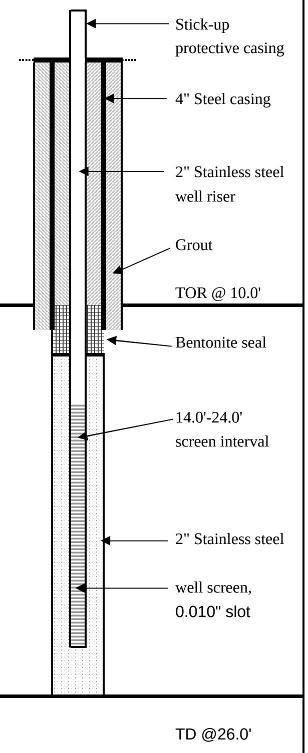
Location: East of Ekonol Facility and Walmore Roa
Elevation:

Weather Sun 75 F
Date/Time Start Coring 05/11/04 1000
Date/Time Finish Coring 05/11/04 1445



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
#1	11.00"-16.00'	11	100	22	
		12			grey dolomite, crystals in fracture, some mineralization
		13			
		14			grey dolomite, porous, some mineralization , vugging through out
		15			
		16			
#2	16.00'-21.00'	17	100	70	very broken zone, grey/dark grey dolomite, vugs through out, some stylliolitic horizons, some
		18			mineralization.
		19			grey to light grey dolomite, some stylliolitic horizons, some mineralization to break/end of run.
		20			
		21			
#3	21.00'-26.00'	22	100	99	grey/light grey dolomite, some stylliolitic horizons, some mineralization
		23			
		24			light grey/grey dolomite, more abundant stylliolitic horizons, vugs through out, mineralization, porou
		25			lost circulation at 25.0' bgs.
		26			
		27			
		28			
		29			
		30			
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS

DRILLING RECORD

BORING NO. MW-19D

Contractor: SJB Services, Inc.
Driller: Dale and Matthew Mathies
Inspector: SMC/JSP
Rig Type: ATV Drill Rig CME-55
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

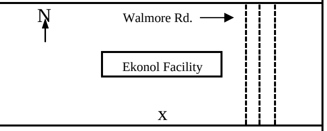
PROJECT NAME Ekonol Facility
PROJECT NUMBER 737515/441237

Location: South of St. Gobain facility in parking
Elevation:

Weather Sun 75 F

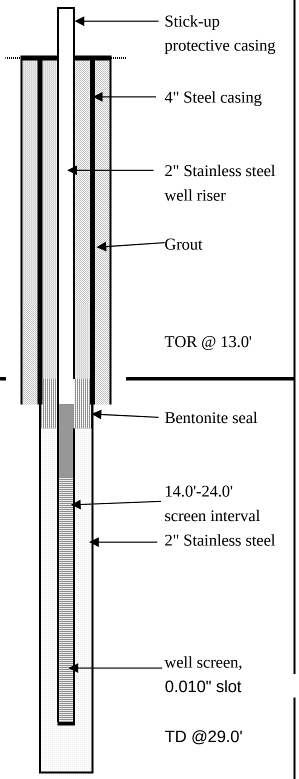
Date/Time Start Coring 05/25/04 1135

Date/Time Finish Coring 05/26/04 1030



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
		15			grey/light grey dolomite, many clay seems/stylliolitic horizons, vertical fracture at 15.2'
# 1	14.0'-19.0'	16	100.0	64.0	
		17			
		18			grey/light grey dolomite, fewer stylliolitic horizons to break.
		19			
		20			grey/light grey dolomite, little mineralization
# 2	19.0'-24.0'	21	90.0	68.0	
		22			grey/light grey dolomite, mineralization, some stylliolitic horizons, dolomite mineral band depostits
		23			little to no vugging, lost circulation at 23.0'
		24			
		25			
#3	24.0'-29.45'	26	92.0	92.0	grey/light grey dolomite, some vugging, few stylliolitic horizons to break
		27			
		28			grey/light grey dolomite, some mineralization to break
		29			grey/light grey dolomite, few stylliolitic horizons to break/end of run.
		30			
		31			
		32			
		33			
		34			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY: TOR was determined at HSA auger refusal.

PARSONS
DRILLING RECORD

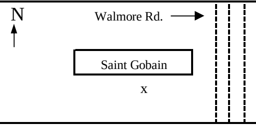
BORING NO. MW-20D

Contractor: SJB Services, Inc.
Driller: Ron Brown, Jason Todkowski
Inspector: Sara M. Chmura
Rig Type: CME 75
Method: 6.25" HSA/5.875" Roller Cone/HQ Coring

PROJECT NAME Ekonol Facility
PROJECT NUMBER 441610

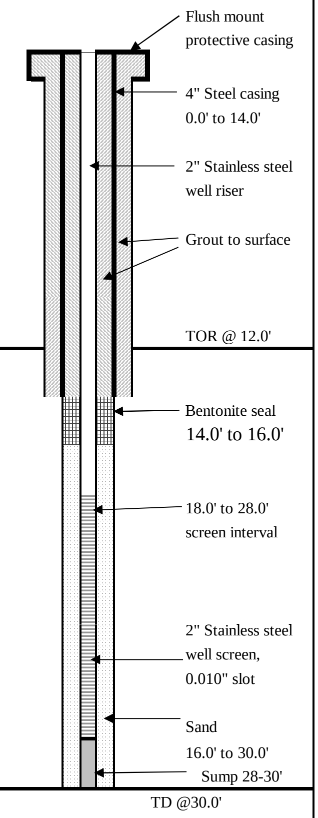
Location: South of St. Gobain facility within fence
Elevation:

Weather overcast, breezy, low 70s
Date/Time Start Coring 9/08/05 @ 1246
Date/Time Finish Coring 9/12/05 @ 1150



HQ Core Run	Range	Depth	Rec. (%)	RQD (%)	FIELD IDENTIFICATION OF MATERIAL
		0			
		1			
		2			
		3			Description of overburden material is consistent with other well locations.
		4			
		5			
		6			
		7			
		8			
		9			
		10			
		11			
		12			
		13			
		14			
# 1	14.0'-20.0'	15	87.5	53.0	Light grey dolomite, many styliolitic horizons, starting to lose some circulation at 20.0'.
		16			
		17			
		18			
		19			
		20			
# 2	20.0'-25.0'	21	96.7	91.4	20' to 21.5' grey/light grey dolomite, fewer styliolitic horizons, slightly porous, some mineralization
		22			
		23			21.5' to 25.0' grey/light grey dolomite, porous, vugs, few/none stylliolitic horizons, mineralization, slightly
		24			fossiliferous.
		25			
#3	25.0'-30.0'	26	96.0	85.0	Massive grey/dark grey dolomite, few to no stylliolitic horizons, some vugging, mineraliztion.
		27			lost circulation at 25.0'
		28			
		29			Porouse with trace fossil coral.
		30			

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY:
TOR was determined at HSA auger refusal.
well is 16.0' into bedrock.

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/19/2011
Date Completed : 5/19/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-1SI

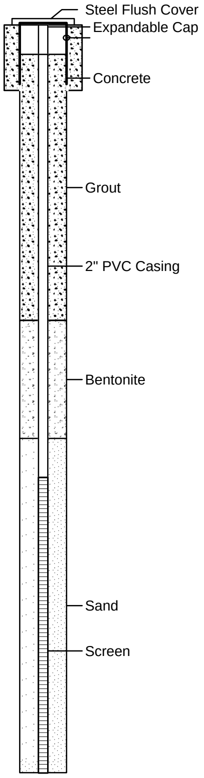
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11							
					0.0		
12							
13		Bedrock at 12' 8"					
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-1SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.020" slot
Diameter : 2"
Placement : 7.66' to 12.66'

SAND PACK
Type : #1 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.66': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/19/2011
Date Completed : 5/19/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-2SI

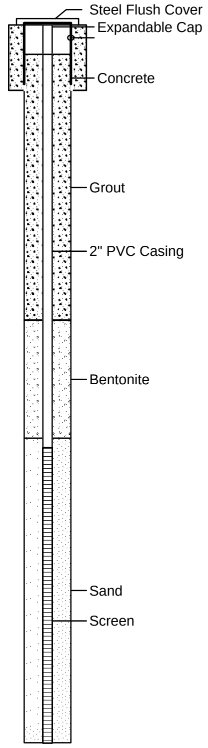
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.	FILL	▨			
4					0.0		Air Knife to 6.5'
8					0.0	N/A	
10					0.0		
					0.0		
12		Bedrock at 12' 2"					

Well: OR-2SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.020" slot
Diameter : 2"
Placement : 7.16' to 12.16'

SAND PACK
Type : #1 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.16': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/19/2011
Date Completed : 5/19/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-3SM

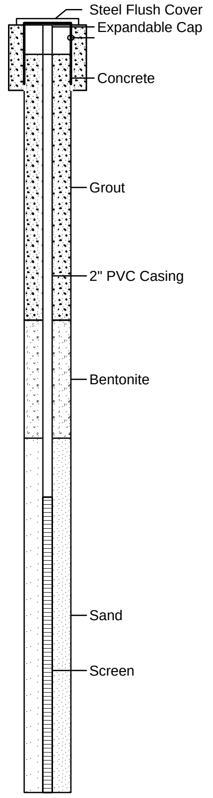
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
7			FILL				
8					0.0	N/A	
9							
10					0.0		
11							
					0.0		
12							
13		Bedrock at 13'.					
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-3SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 8.0' to 13.0'

SAND PACK
Type : #00 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-13.0': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/18/2011
Date Completed	: 5/18/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

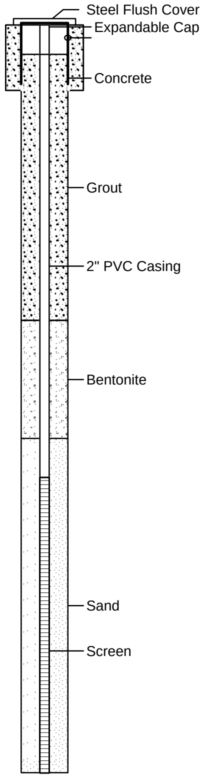
BORING/WELL OR-4SM
(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
7			FILL				
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12							
13		Bedrock at 12' 8"					
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-4SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.010" slot
Diameter	: 2"
Placement	: 7.66' to 12.66'
SAND PACK	
Type	: #00 Sand
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.66': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/18/2011
Date Completed	: 5/18/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL OR-5SM

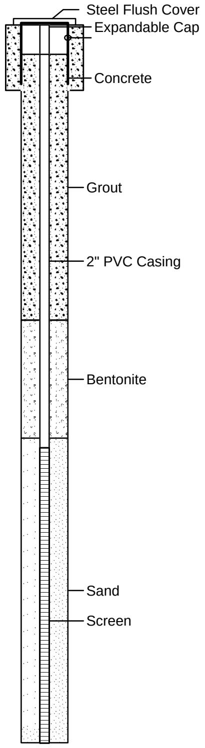
(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12		Bedrock at 12' 2"					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-5SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.010" slot
Diameter	: 2"
Placement	: 7.16' to 12.16'
SAND PACK	
Type	: #00 Sand
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.16': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/18/2011
Date Completed	: 5/18/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL OR-6SM

(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

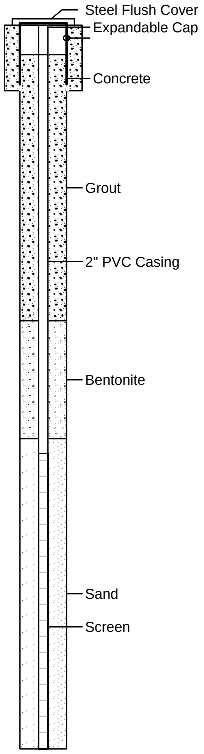
Water Levels

▼ During Drilling: NA

▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
1							
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12							
		Bedrock at 12' 3"					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-6SM
TOC Height:



Monitoring Well
Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.010" slot
Diameter	: 2"
Placement	: 7.25' to 12.25'
SAND PACK	
Type	: #00 Sand
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.25': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/17/2011
Date Completed : 5/17/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-7SI

(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
1							
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12							
		Bedrock at 12' 4"					
13							
14							
15							
16							
17							
18							
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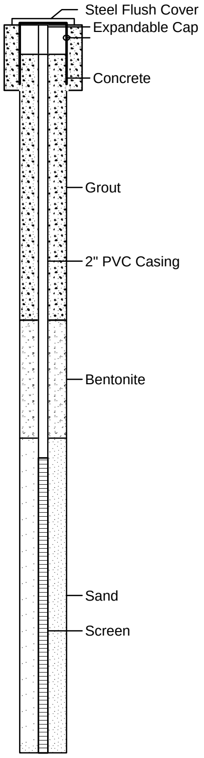
23							
24							
25							
26							

Well: OR-7SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.020" slot
Diameter : 2"
Placement : 7.33' to 12.33'

SAND PACK
Type : #1 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.33': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/17/2011
Date Completed	: 5/17/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL OR-8SI

(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.		▩			
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
7			FILL				
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12							
13		Bedrock at 12' 6"					
14							
15							
16							
17							
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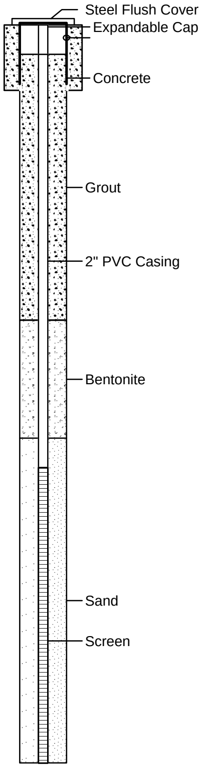
24							
25							
26							

Well: OR-8SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.020" slot
Diameter	: 2"
Placement	: 7.33' to 12.33'
SAND PACK	
Type	: #1 Sand
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.5': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/17/2011
Date Completed	: 5/17/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL OR-9SM

(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

Water Levels

▼ During Drilling: NA

▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.		▨			
1							
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11							
					0.0		
12							
		Bedrock at 12' 2"					
13							
14							
15							
16							
17							
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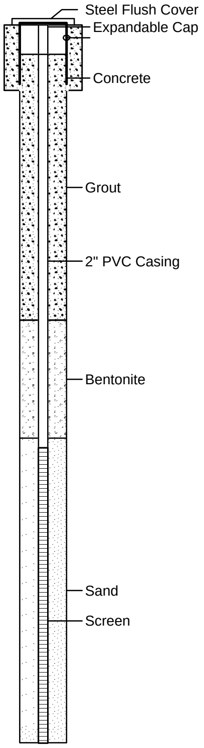
23							
24							
25							
26							

Well: OR-9SM
TOC Height:



Monitoring Well
Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.010" slot
Diameter	: 2"
Placement	: 7.16' to 12.16'
SAND PACK	
Type	: #00 Sand
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.16': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/16/2011
Date Completed : 5/16/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-10SM

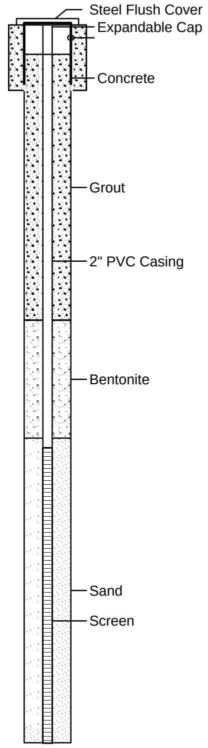
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
4					0.0		Air Knife to 6.5'
6			FILL				
8					0.0	N/A	
10					0.0		
11.5					0.0		
12		Bedrock at 12' 2"					

Well: OR-10SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.020" slot
Diameter : 2"
Placement : 7.16' to 12.16'

SAND PACK
Type : #1 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.16': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/13/2011
Date Completed : 5/13/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-11SI

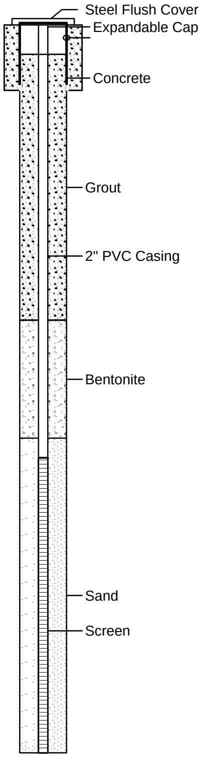
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.		▨			
2				▨			
3				▨			
4				▨	0.0		Air Knife to 6.5'
5				▨			
6			FILL	▨			
7				▨			
8				▨	0.0	N/A	
9				▨			
10				▨	0.0		
11				▨	0.0		
12		Bedrock at 12' 4"					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-11SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.020" slot
Diameter : 2"
Placement : 7.33' to 12.33'

SAND PACK
Type : #1 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.33': 4.25" ID HSA (8" boring diameter)

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/16/2011
Date Completed : 5/16/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-12SI

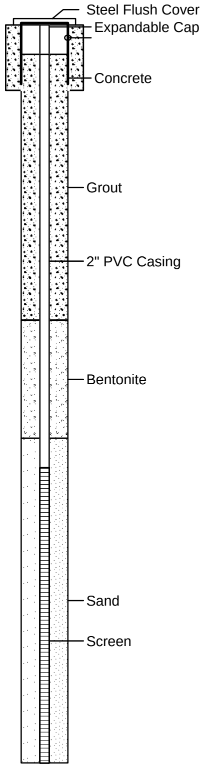
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
During Drilling: NA
Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11							
					0.0		
12							
		Bedrock at 12' 6"					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-12SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.020" slot
Diameter	: 2"
Placement	: 7.5' to 12.5'
SAND PACK	
Type	: #1 Sand
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.5': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/13/2011
Date Completed : 5/13/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-13SM

(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
7			FILL				
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12							
13		Bedrock at 12' 9"					
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-13SM
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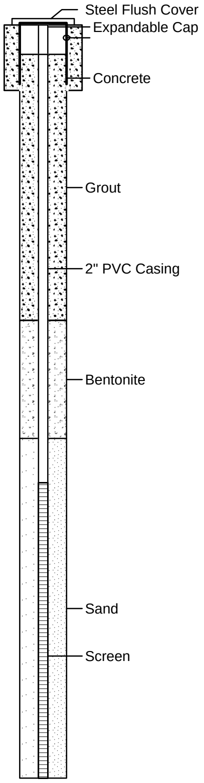


Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.01" slot
Diameter : 2"
Placement : 7.75' to 12.75'

SAND PACK
Type : #00 Sand

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.75': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/13/2011
Date Completed : 5/13/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-14SM

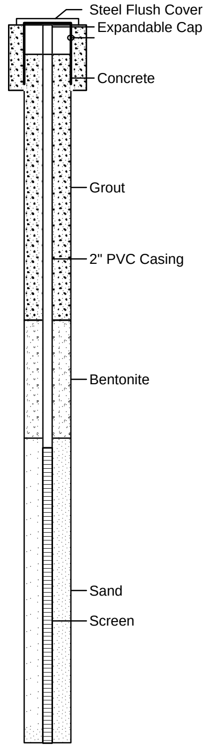
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
1		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.		▨			
2				▨			
3				▨			
4				▨	0.0		Air Knife to 6.5'
5				▨			
6			FILL	▨			
7				▨			
8				▨	0.0	N/A	
9				▨			
10				▨	0.0		
11				▨	0.0		
12		Bedrock at 12' 2"					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-14SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.01" slot
Diameter : 2"
Placement : 7.16' to 12.16'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.16': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/12/2011
Date Completed : 5/12/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-15SM

(Page 1 of 1)

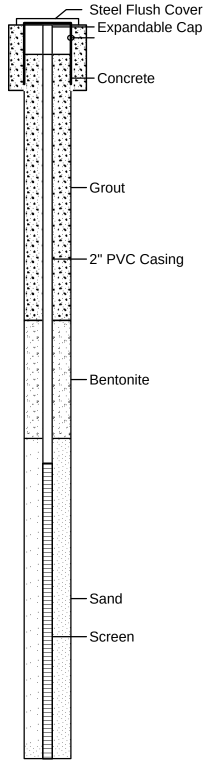
PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain angular gravel and wood fibers/mulch. Strong biological odor. Wet.	FILL				
4					0.0		Air Knife to 6.5'
8					0.0	N/A	
10					0.0		
11					0.0		
12		Bedrock at 12' 5"					

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26

Well: OR-15SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.01" slot
Diameter : 2"
Placement : 7.42' to 12.42'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.42': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company

May 2011

Date Started	: 5/12/2011
Date Completed	: 5/12/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL OR-16SI

(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

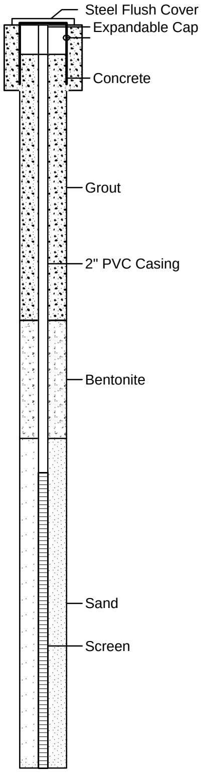
Water Levels

▼ During Drilling: NA

▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain wood fibers, angular gravel, and mulch. Strong biological odor.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			FILL				
7							
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12							
13		Bedrock at 12' 7"					
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-16SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.02" slot
Diameter	: 2"
Placement	: 7.58' to 12.58'
SAND PACK	
Type	: #1 Sand
SEAL	
Material	: Bentonite
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.58': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/12/2011
Date Completed	: 5/12/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL OR-17SI

(Page 1 of 1)

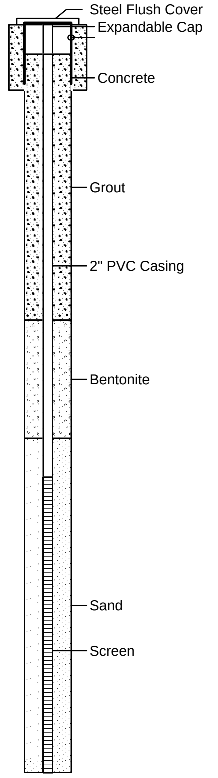
PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain wood fibers, angular gravel, and mulch. Strong biological odor.					
					0.0		Air Knife to 6.5'
			FILL				
8					0.0	N/A	
10					0.0		
					0.0		
		Bedrock at 12' 8"					

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26

Well: OR-17SI
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.02" slot
Diameter	: 2"
Placement	: 7.66' to 12.66'
SAND PACK	
Type	: #1 Sand
SEAL	
Material	: Bentonite
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.66': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/12/2011
Date Completed : 5/12/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL OR-18SM

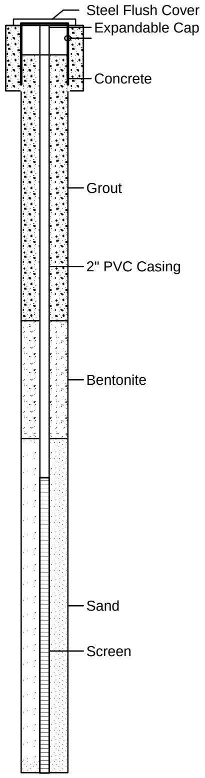
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
		Drill cuttings contain wood fibers, angular gravel, and mulch. Strong biological odor.		▨			
1				▨			
2				▨			
3				▨			
4				▨	0.0		Air Knife to 6.5'
5				▨			
6				▨			
			FILL	▨			
7				▨			
8				▨	0.0	N/A	
9				▨			
10				▨	0.0		
11				▨			
				▨	0.0		
12				▨			
		Bedrock at 12' 8"					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: OR-18SM
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.01" slot
Diameter : 2"
Placement : 7.66' to 12.66'

SAND PACK
Type: : #00 sand

SEAL
Material : Bentonite
GROUT :
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.66': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/25/2011
Date Completed	: 5/27/2011
Drilling Method	: 6.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL INJ-06D

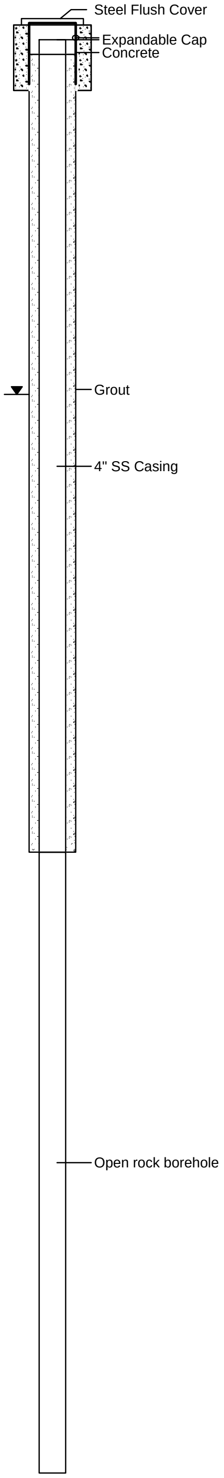
(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Between Bioreactor trenches

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL			
0.5		Drill cuttings contain brown clayey silt with some fine sand. Wet at approximately 6' bgs.				
4				0.0		Air Knife to 6.5'
6			ML			
8				0.0	N/A	N/A
10				0.0		
12		Dolostone Bedrock.		0.0		
14				0.0		
16				0.0		
18			DO	0.0		
20				0.0		
22		Water bearing fracture at approximately 22' bgs.		0.0		
23.5				0.0		
24.5		End of boring at 24' 6".				

Well: INJ-06D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~10.5" O.D.
WELL RISER	
Material	: Stainless steel
Diameter	: 4"
Joints	: None
WELL SCREEN	:
Material	: open bedrock
Diameter	: ~4"
Placement	: 14.0' to 24.5'
SAND PACK	
Type	: None
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

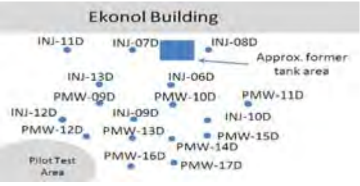
Notes:

Drilling Method
0.0'-6.5': Concrete saw/Air knife
6.5'-12.0': 6.25" ID HSA (10.5" boring diameter)
12.0'-24.5': 4" OD Air hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 to January 2011



Date Started : 12/27/2010
Date Completed : 1/19/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-07D

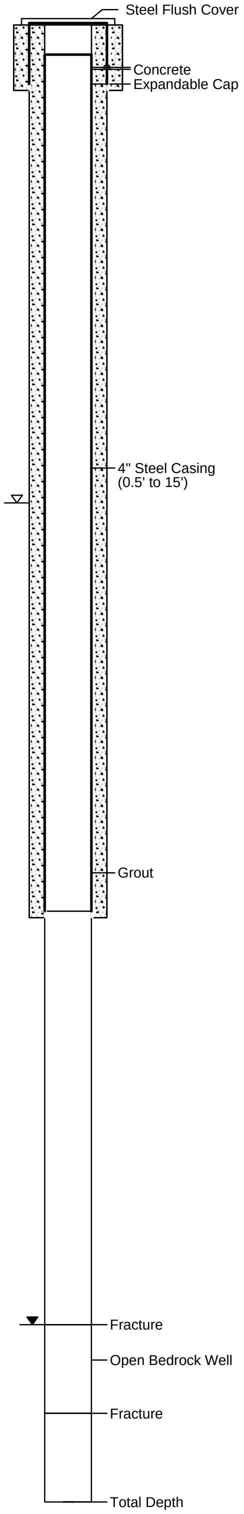
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22'
▽ Static (1/19/11): 8.09'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0–1		2" asphalt, 8" concrete	AR	▨			
1–13		Moist, stiff, brown and gray CLAY. 4.25" ID HSA to 13' (borehole =8.25") (Rock socket drilled w/ 6" ID rock hammer)	CL	🟥			
13–25		Bedrock (Dolomite) 4" ID steel casing set at 15'. (Bedrock drilled w/4" OD rock hammer) Fracture at 22', cuttings become wet. Fracture at 23.5'.	Dolo	▦			
25		End of boring at 25'.					

Well: INJ-07D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT : Soil casing
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

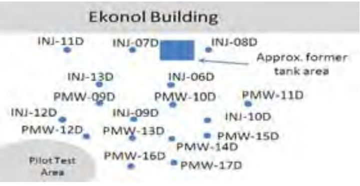
Notes:

Drilling Method
0-6.5': Concrete saw/Air Knife
6.5-13': 4.25" ID HSA (8" boring diameter)
13-15': 6" OD Rock Hammer
15-25': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started : 12/21/2010
Date Completed : 1/19/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-08D

(Page 1 of 1)

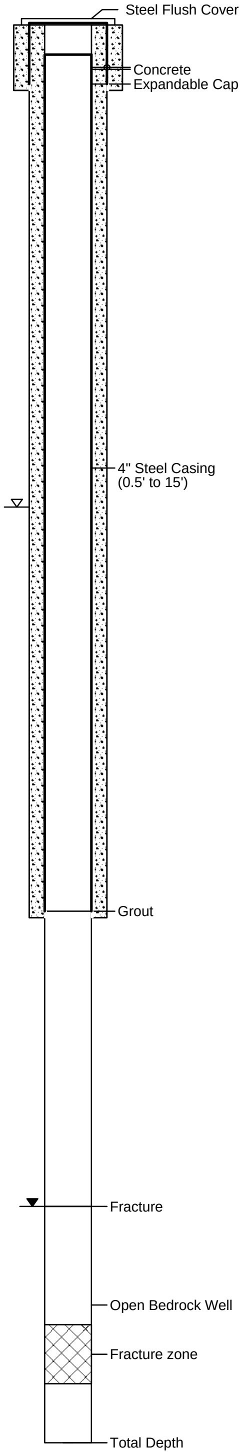
PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 20'
▽ Static (1/19/11): 8.16'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0–1		8" concrete	AR	▨			
1–12		Moist, stiff, brown with some gray CLAY. 4.25" ID HSA to 12' (6" rock hammer to 15')	CL	🟥			
12–24		Bedrock (Dolomite) 4" ID steel casing set at 15'. (Bedrock drilled w/4" OD rock hammer) 15: Light gray dolomite dril cuttings. 20: Cuttings become wet. 22: Fractures indicated by increased water and increased drill speed.	Dolo	▦			

End of boring at 24'.

Well: INJ-08D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT
Material : Soil casing
: Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

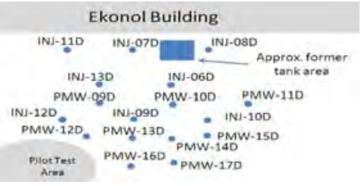
Notes:

Drilling Method:
0-6.5': Concrete saw/Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" OD Rock Hammer
15-24': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started	: 12/22/2010
Date Completed	: 1/18/2011
Drilling Method	: 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method	: NA
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL INJ-09D

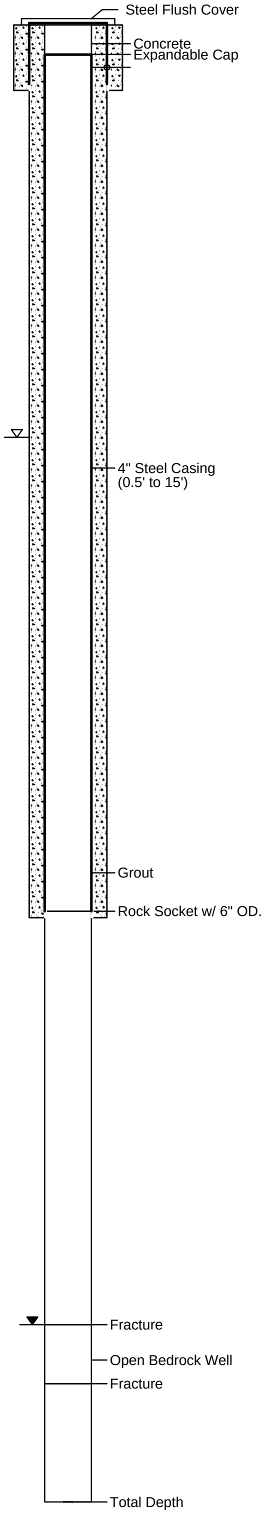
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22'
▽ Static (1/18/11): 6.98'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown and gray CLAY. 4.25" ID HSA to 12' (6" rock hammer to 15')	CL				
12		Bedrock (Dolomite)	Dolo				
15		Casing Socket at 15' 4" ID steel casing set at 15'. (Rock socket drilled w/6" OD rock hammer) (Bedrock drilled w/4" OD rock hammer)					
17		Light gray dolomite drill cuttings.					
22		Fractures at 22' (<1") and 23'. Cuttings become wet.					
25		End of boring at 25'.					

Well: INJ-09D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	: No screen, open borehole
SAND PACK	: none
SEAL	
GROUT	: Soil casing
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

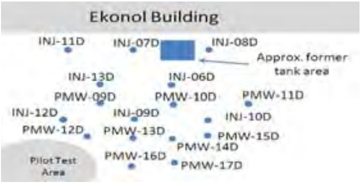
Notes:

Drilling Method:
0-6.5': Concrete saw/Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" Rock Hammer
15-25': 4" Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started : 12/22/2010
Date Completed : 1/18/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-10D

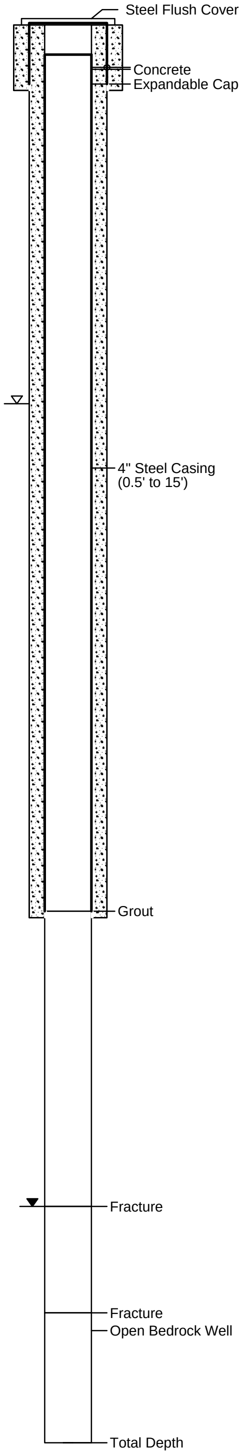
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22
▽ Static (1/18/11): 6.41'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown and gray CLAY. 4.25" ID HSA to 12' (6" rock hammer to 15')	CL				
6		Moist to wet, gray and red-brown varied, stiff clay.					
7						0%	1-1-2-2
9						90%	2-3-5-7
10		Wet, soft, reddish-brown, silt and sand (coarse), trace gravel (coarse, dolomite).	SP			33%	5-8-8-23
12		Bedrock (Dolomite) (Rock socket drilled w/6" OD rock hammer)	Dolo				
15		4" ID steel casing set at 15'. (Bedrock drilled w/4" OD rock hammer)					
17		Light gray dolomite drill cuttings.					
20		Cuttings become wet, fracture at ~ 20'.					
22		Fracture at 21.8' (~1").					
24		End of boring at 24'.					

Well: INJ-10D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT : Soil casing
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

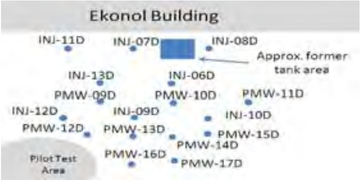
Notes:

Drilling Method:
0-6.5': Concrete saw/Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" Rock Hammer
15-25': 4" Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started : 12/27/2010
Date Completed : 1/19/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-11D

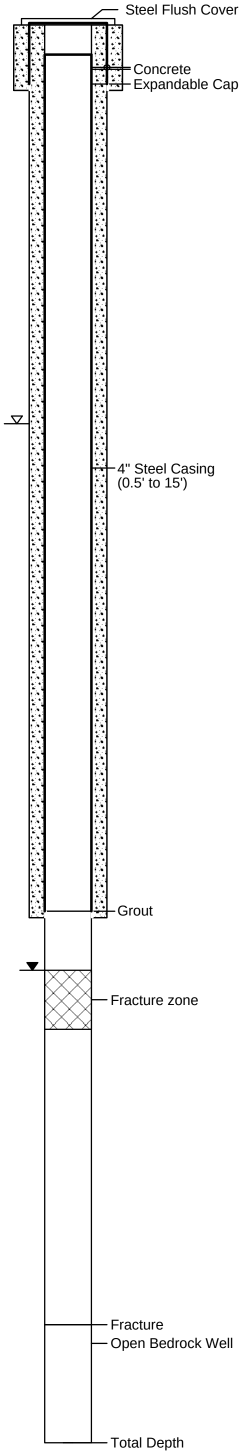
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 16'
▽ Static (1/19/11): 6.75'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown silt and clay.	CL				
2.5		Moist, stiff, brown and gray clay.					
13		Bedrock (Dolomite)	Dolo				
15		4" ID steel casing set at 15.2'.					
16		Wet, light gray dolomite drill cuttings. Soft drilling indicates fractures in 16' to 17' zone.					
22		Fracture at 22'.					
24		End of boring at 24'.					

Well: INJ-11D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT : Soil casing
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

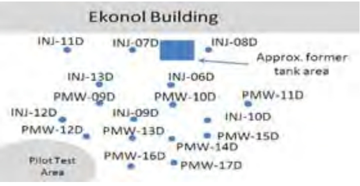
Notes:

Drilling Method
0-6.5': Concrete saw/Air Knife
6.5-13': 4.25" ID HSA (8" boring diameter)
13-15': 6" OD Rock Hammer
15-24': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started : 12/22/2010
Date Completed : 1/18/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-12D

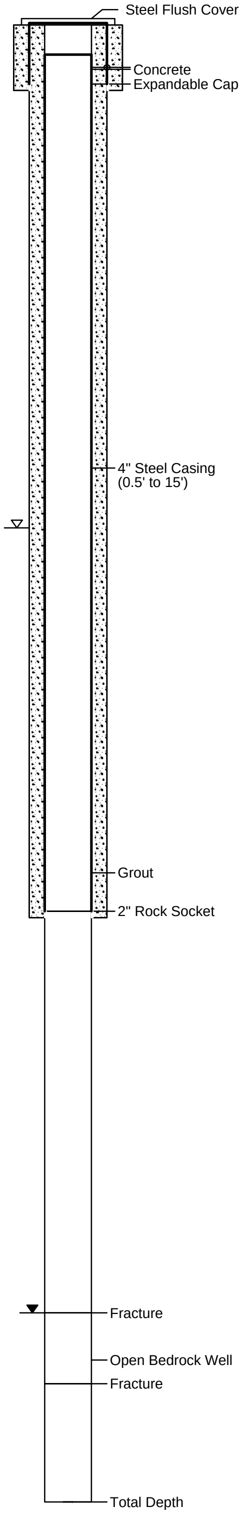
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 21.8'
▽ Static (1/18/11): 8.51'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 12' 6" Rock hammer to 15' Augured to bedrock	CL				
12		Bedrock (Dolomite) 4" ID steel casing set at 15'. 4" Rock hammer to 25'. Fracture at 21.8'. Cuttings become wet. Fractures at 23'.	Dolo				
25		End of boring at 25'.					
26							

Well: INJ-12D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT : Soil casing
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

Notes:

Drilling Method
0-6.5': Concrete saw/Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" OD Rock Hammer
15-25': 4" OD Rock Hammer

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/24/2011
Date Completed	: 5/26/2011
Drilling Method	: 6.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL INJ-13D

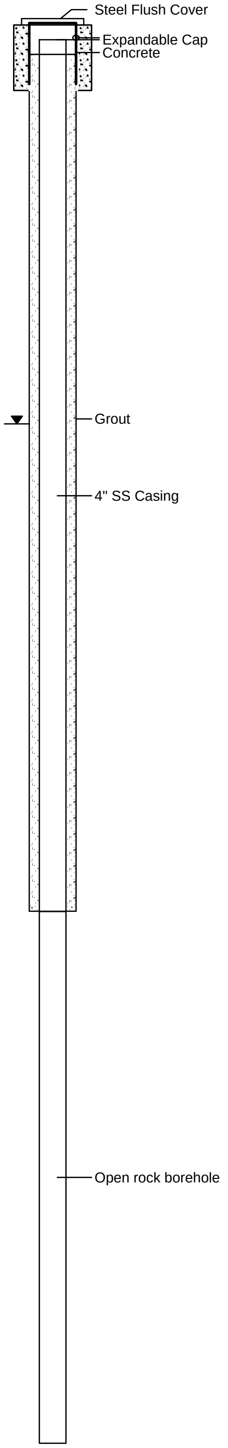
(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: West of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
0.5		Drill cuttings contain brown clay and silt. Wet at approximately 7' bgs.	ML	▥			
4					0.0		Air Knife to 6.5'
8					0.0	N/A	N/A
10					0.0		
12					0.0		
13		Dolostone Bedrock.	DO	▨			
14					0.0		
16					0.0		
18					0.0		
20					0.0		
22		Water bearing fracture at approximately 22' bgs.			0.0		
23.5					0.0		
24		End of boring at 24'.					

Well: INJ-13D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~10.5" O.D.
WELL RISER	
Material	: Stainless steel
Diameter	: 4"
Joints	: None
WELL SCREEN	:
Material	: open bedrock
Diameter	: ~4"
Placement	: 15.0' to 24.0'
SAND PACK	
Type	: None
SEAL	
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

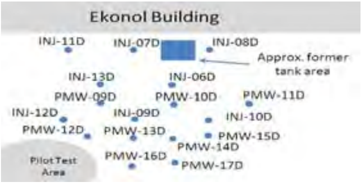
Drilling Method
0.0'-6.5': Concrete saw/Air knife
6.5'-13.0': 6.25" ID HSA (10.5" boring diameter)
13.0'-24.0': 4" OD Air hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company

December 2010 and January 2011



Date Started : 12/21/2010
Date Completed : 1/18/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-12D

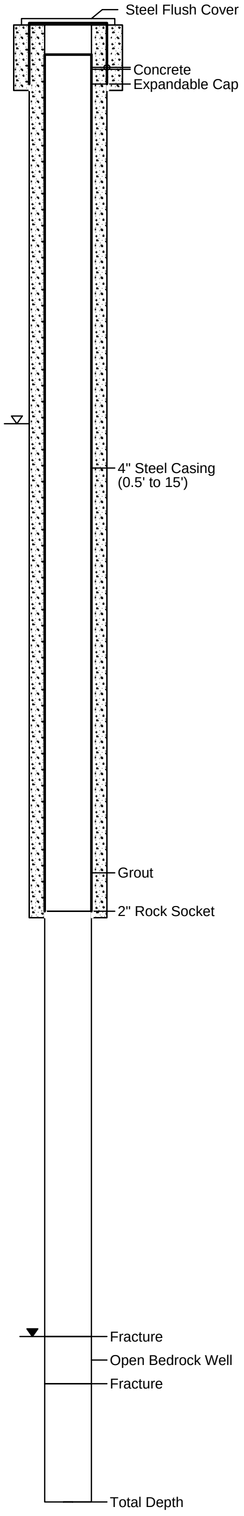
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22.2'
▽ Static (1/18/11): 6.75'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR	▨			
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 13' 6" Rock hammer to 15'	CL	🟥			
13		Bedrock (Dolomite)	Dolo	▦			
15		2" Rock Socket 4" ID steel casing set at 15.2'. 4" Rock hammer to 25'.		▦			
22.2		Fracture at 22.2'.		▦			
23		Fracture at 23'. Water in cuttings.		▦			
25		End of boring at 25'.					

Well: PMW-12D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT
Material : Soil casing : Cement-Bentonite

WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

Notes:

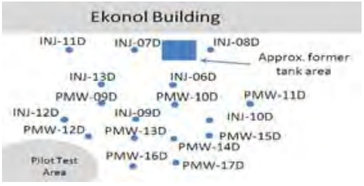
Drilling Method
0-6.5': Concrete saw/Air Knife
6.5-13': 4.25" ID HSA (8" boring diameter)
13-15': 6" OD Rock Hammer
15-25': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company

December 2010 and January 2011



Date Started : 12/21/2010
Date Completed : 1/18/2011
Drilling Method : 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method : NA
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

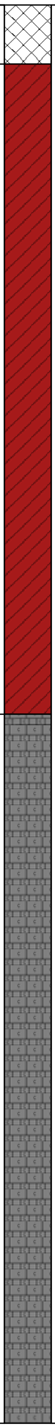
BORING/WELL PMW-13D

(Page 1 of 1)

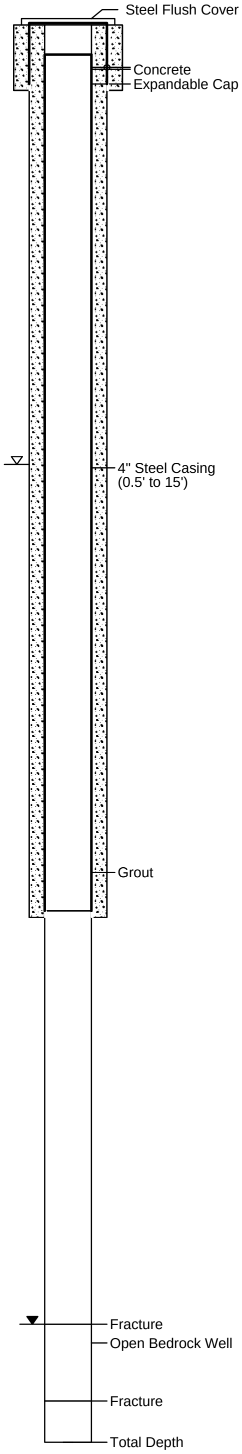
PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22'
▽ Static (1/18/11): 7.44

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 12' 6" Rock hammer to 15'	CL				
6.5		Augured (6.25" ID) to bedrock					
12		Bedrock (Dolomite)	Dolo				
15		4" ID steel casing set at 15'. 4" Rock hammer to 24'.					
22		Fracture at 22'.					
23		Fracture at 23'.					
24		End of boring at 24'.					



Well: PMW-13D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT
Material : Soil casing
: Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

Notes:

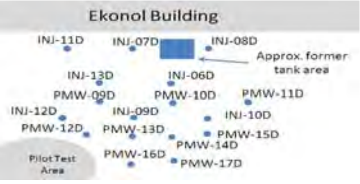
Drilling Method:
0-6.5': Concrete saw/Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" OD Rock Hammer
15'-24': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company

December 2010 and January 2011



Date Started	: 12/21/2010
Date Completed	: 1/18/2011
Drilling Method	: 4.25" HSA, 6" '& 4" Rock Hammer
Sampling Method	: NA
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-14D

(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Source area remediation wellfield south of Ekonol building

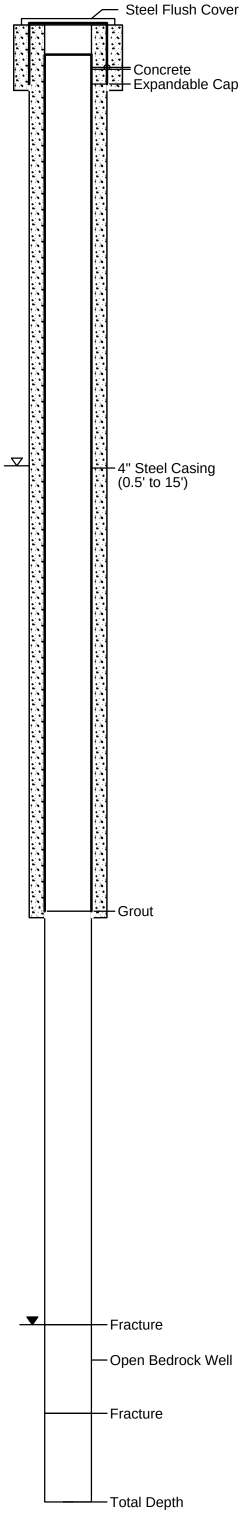
Water Levels

▼ During Drilling: 22'

▽ Static (1/18/11): 7.46'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR	▨			
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 12' 6" Rock hammer to 15'		🟥			
6.5		Augured (6.25" ID) to bedrock	CL				
12		Bedrock (Dolomite)		▦			
15		4" ID steel casing set at 15'. 4" Rock hammer to 24'.					
18.5			Dolo				
22		Fracture at 22'. Cuttings become wet.					
23.5		Fracture at 23.5'.					
25		End of boring at 25'.					
26							

Well: PMW-14D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	: No screen, open borehole
SAND PACK	: none
SEAL	
GROUT	: Soil casing
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

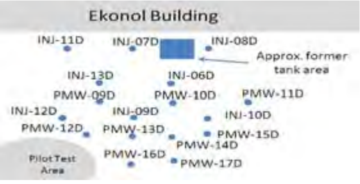
Notes:

Drilling Method:
0-6.5': Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" OD Rock Hammer
15-25': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started	: 12/21/2010
Date Completed	: 1/19/2011
Drilling Method	: 4.25" HSA, 6" Rock Hammer
Sampling Method	: 96 mm HQ Core Barrel
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-15D

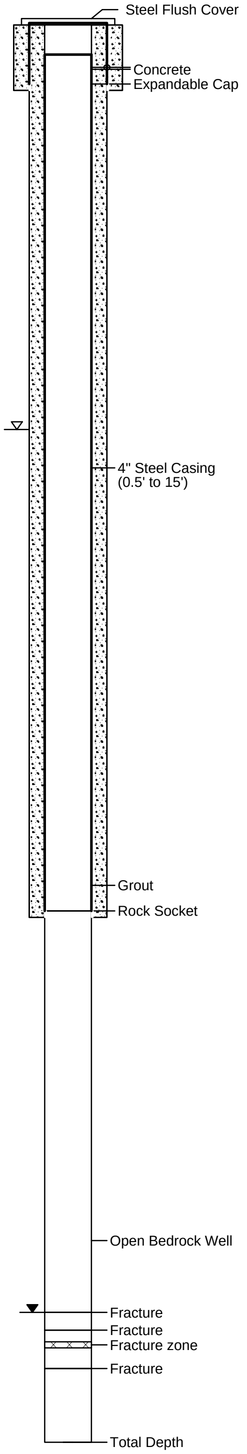
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 21.8'
▽ Static (1/19/11): 6.85'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 11.5' 6" Rock hammer to 15' Augured (6.25" ID) to bedrock	CL				
		Bedrock (Dolomite)	Dolo				
15		Rock Socket at 15'. 4" ID steel casing set at 15'. 4" HQ Core 15' to 24'. Light gray dolomite					
22		Fracture at 21.8' Fracture at 22.1', 22.3-22.4', and 22.75'					
24		End of boring at 24'.					

Well: PMW-15D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	: No screen, open borehole
SAND PACK	: none
SEAL	
GROUT	: Soil casing
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

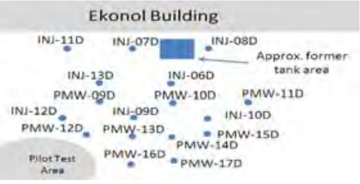
Notes:

Drilling Method:
0-6.5': Concrete saw/Air Knife
6.5-11.5': 4.25" ID HSA (8" boring diameter)
11.5-15': 6" OD Rock Hammer
15-24': HQ core

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started	: 12/21/2010
Date Completed	: 1/17/2011
Drilling Method	: 4.25" HSA, 6" & 4" Rock Hammer
Sampling Method	: NA
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: DC Burkert
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-16D

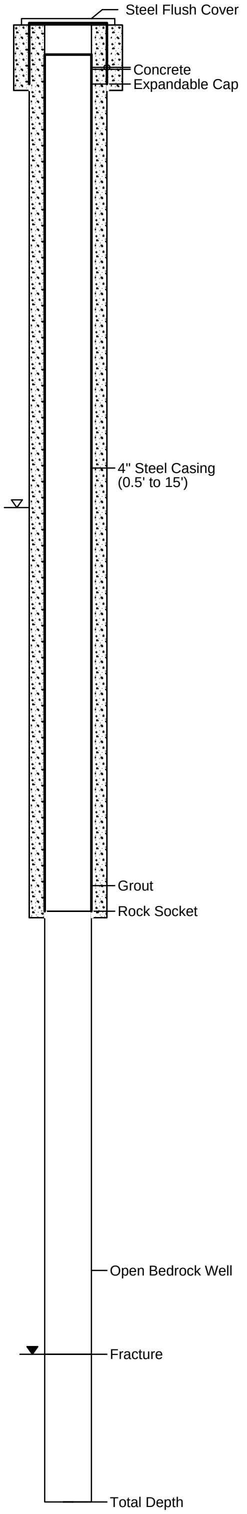
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22.5'
▽ Static (1/17/11): 8.17'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR	▨			
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 12' 6" Rock hammer to 15' Augured to bedrock	CL	🟥			
12		Bedrock (Dolomite) Rock Socket at 15'. 4" ID steel casing set at 15'. 4" Rock hammer to 25'. Light gray dolomite drill cuttings. Fracture at 22.5'. Cuttings become wet.	Dolo	▦			
25		End of boring at 25'.					
26							

Well: PMW-16D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	: No screen, open borehole
SAND PACK	: none
SEAL	
GROUT	: Soil casing
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:

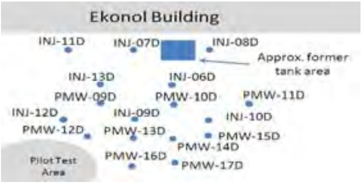
Drilling Method:

0-6.5': Concrete saw/Air Knife
6.5'-12': 4.25" ID HSA (8" boring diameter)
12'-15': 6" OD Rock Hammer
15'-25': 4" OD Rock Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started : 12/21/2010
Date Completed : 1/17/2011
Drilling Method : 4.25" HSA, 6" Rock Hammer
Sampling Method : 96 mm HQ Core Barrel
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-17D

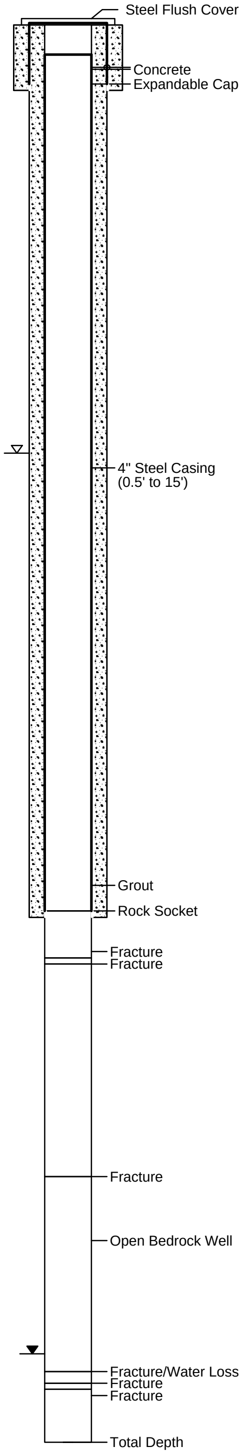
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: 22.5'
▽ Static (1/17/11): 7.25'

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR	☒			
1		Moist, stiff, brown with some gray clay. 4.25" ID HSA to 12' 6" Rock hammer to 15' Augured to bedrock	CL	▨			
12		Bedrock (Dolomite)	Dolo	▦			
15		Rock Socket at 15'. 4" ID steel casing set at 15'. HQ Core. Light gray dolomite. Fractures at 15.8', 15.9'					
		Fracture at 19.5'				100	
		Fracture with water loss at 22.8' Fractures at 23.0' and 23.1					
24		End of boring at 24'.					
25							
26							

Well: PMW-17D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

GROUT : Soil casing
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

Notes:

Drilling Method:
0-6.5': Concrete saw/Air Knife
6.5-12': 4.25" ID HSA (8" boring diameter)
12-15': 6" OD Rock Hammer
15-24': HQ Core

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/31/2011
Date Completed : 5/31/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-1S

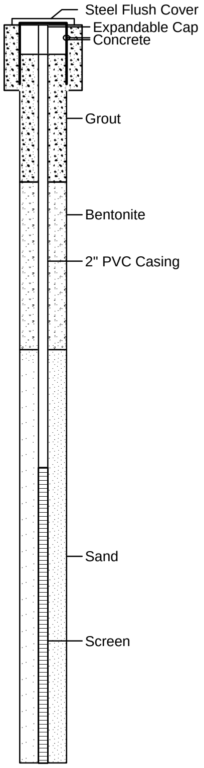
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : North of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML		0.0		Air Knife to 6.5'
7		Brown-gray SILT, some clay, trace fine sand and light brown mottles. Moist.	ML		0.0	100%	3 6 7 7 N/A
11		Brown SILT, trace clay, some fine sand at 12' bgs. Moist. Wet at 12.5' bgs.	ML		0.0	95%	2 2 3
		Bedrock at 12' 6".					

Well: PMW-1S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.5' to 12.5'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.5': 4.25" ID HSA (8" boring diameter)

Shelby tube sample collected from 9'-11' bgs.

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/20/2011
Date Completed : 5/20/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-2S

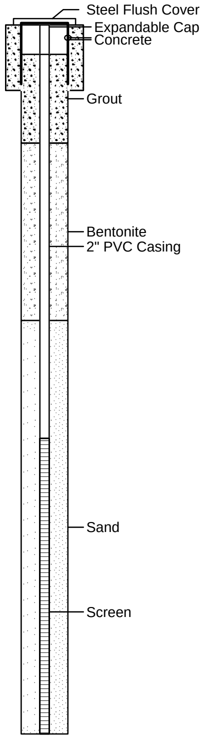
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Between Bioreactor trenches

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML				
1							
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
7							
8					0.0	N/A	
9							
10					0.0		
11							
					0.0		
12		Bedrock at 12'.					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: PMW-2S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.0' to 12.0'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.0': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/23/2011
Date Completed : 5/23/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-3S

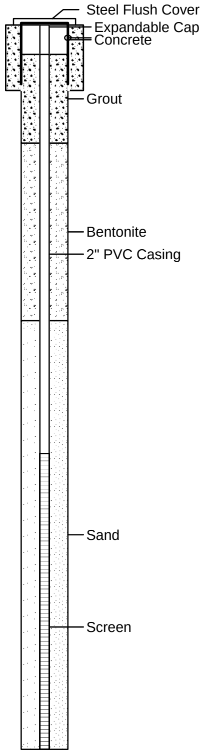
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			ML				
7							
8					0.0	N/A	
9							
10					0.0		
11					0.0		
12		Bedrock at 12' 3".					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: PMW-3S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.25' to 12.25'

SAND PACK
Type : #00 Sand

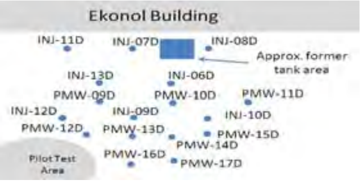
SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.25': 4.25" ID HSA (8" boring diameter)

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
December 2010 and January 2011



Date Started : 12/22/2010
Date Completed : 12/30/2010
Drilling Method : 4.25" HSA
Sampling Method : 2" Split Spoon
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : DC Burkert
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-4S

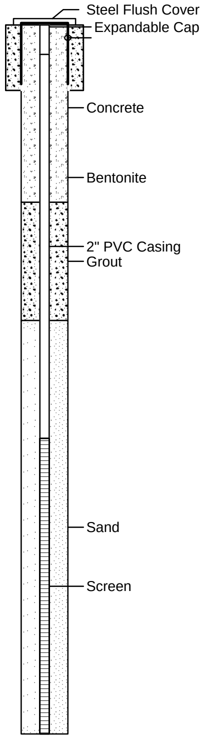
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Source area remediation wellfield south of Ekonol building

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		2" asphalt, 8" concrete	AR				
1		Moist, stiff, brown with some gray CLAY.					
4							Air Knife to 6.5'
5			CL				
7		Moist, brown and gray varied, stiff CLAY.					
8					74.3	90%	2-5-5-5
9		Moist to wet, red-brown, soft, SILT and CLAY.					
10					31.0	55%	5-3-4-5
			ML				
					8.5	20%	5-5.8/50
12		Bedrock at 12'					

Well: PMW-4S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material :
Diameter : 2"
Placement : 7' to 12'

SAND PACK :

SEAL

GROUT :
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/19/2011
Date Completed	: 5/20/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-5S

(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Between Bioreactor trenches

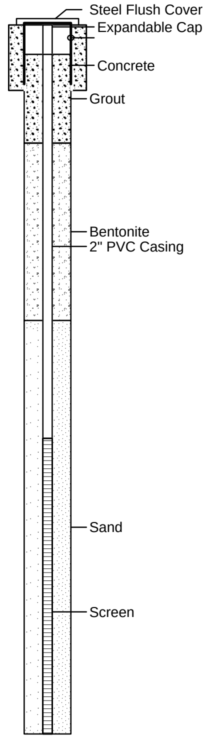
Water Levels

▼ During Drilling: NA

▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL	▤			
0.5		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML	▥			
4					0.0		Air Knife to 6.5'
8					0.0	N/A	
10					0.0		
11.5					0.0		
12		Bedrock at 12'.					

Well: PMW-5S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.010" slot
Diameter	: 2"
Placement	: 7.0' to 12.0'
SAND PACK	
Type	: #00 Sand
SEAL	
Material	: Bentonite
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.0': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/31/2011
Date Completed : 5/31/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-6S

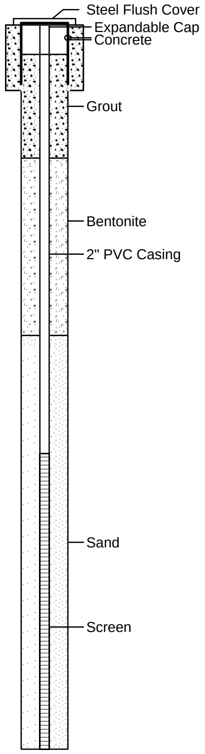
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML		0.0		Air Knife to 6.5'
7		Brown SILT, some-trace fine sand, trace gray silt seams. Dry.	ML		0.0 0.0	65% 55%	4 4 7 9 N/A 7 8 14 16
12		Bedrock at 12' 3".					

Well: PMW-6S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.25' to 12.25'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.25': 4.25" ID HSA (8" boring diameter)

Shelby tube sample collected from 9'-10' bgs.

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/23/2011
Date Completed : 5/23/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-7S

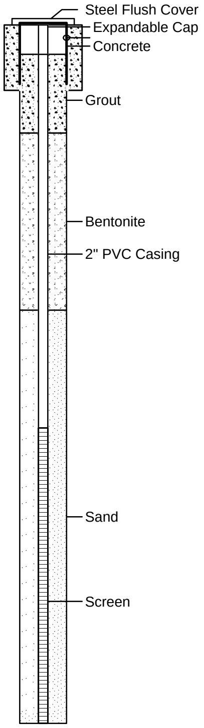
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Between Bioreactor trenches

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML				
2							
3							
4					0.0		Air Knife to 6.5'
5							
6							
7							
8					0.0	N/A	N/A
9							
10					0.0		
11					0.0		
12		Bedrock at 11' 10".					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: PMW-7S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 6.83' to 11.83'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-11.83': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/23/2011
Date Completed : 5/23/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-8S

(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML				
4					0.0		Air Knife to 6.5'
8					0.0	N/A	N/A
10					0.0		
11.5					0.0		
12		Bedrock at 12'.					
13							
14							
15							
16							
17							
18							
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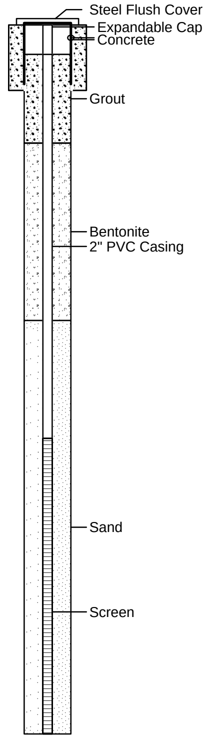
22							
23							
24							
25							
26							

Well: PMW-8S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.0' to 12.0'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.0': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/24/2011
Date Completed : 5/26/2011
Drilling Method : 6.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

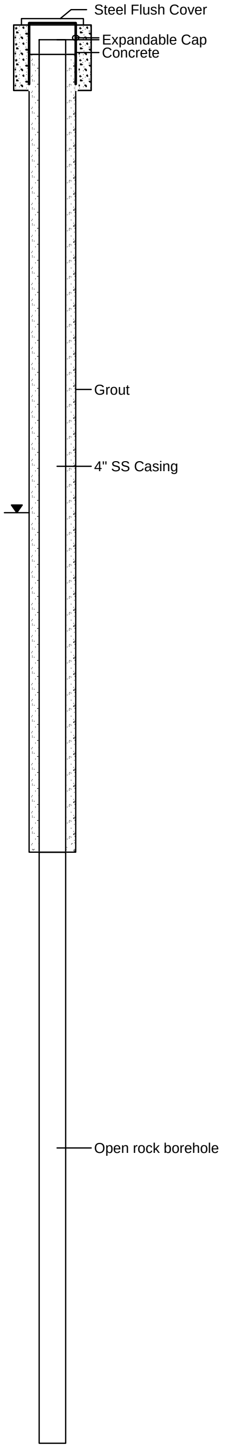
BORING/WELL PMW-9D
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
0.5		Drill cuttings contain brown clay and silt. Wet at approximately 8' bgs.	ML				
4					0.0		Air Knife to 6.5'
8					0.0	N/A	N/A
10					0.0		
12		Dolostone Bedrock.	DO		0.0		
14					0.0		
16					0.0		
18					0.0		
20					0.0		
22		Water bearing fracture at approximately 22' bgs.			0.0		
23.5					0.0		
24		End of boring at 24'.					

Well: PMW-9D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~10.5" O.D.
WELL RISER
Material : Stainless steel
Diameter : 4"
Joints : None
WELL SCREEN :
Material : open bedrock
Diameter : ~4"
Placement : 14.0' to 24.0'

SAND PACK
Type : None

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0.0'-6.5': Concrete saw/Air knife
6.5'-12.0': 6.25" ID HSA (10.5" boring diameter)
12.0'-24.0': 4" OD Air hammer

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/31/2011
Date Completed : 5/31/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-9S

(Page 1 of 1)

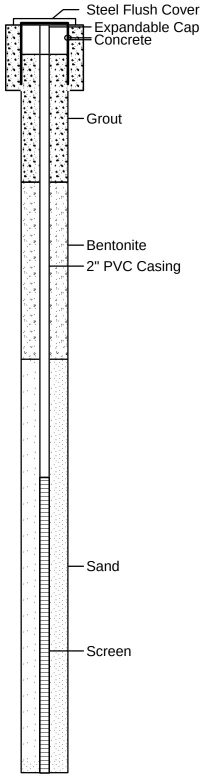
PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : Between Bioreactor trenches

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
		~6" asphalt	FILL	▨			
		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.	ML	■	0.0		Air Knife to 6.5'
		Brown SILT, trace fine sand, woven fabric at 7.2' bgs. Dry.	ML	■	0.0	60%	3 4 6 10 N/A
		Brown SILT, some coarse sand and fine angular gravel (till). Moist.	ML	■	0.0	90%	4 10 15 30
		Bedrock at 12' 8".					

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26

Well: PMW-9S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.66' to 12.66'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.66': 4.25" ID HSA (8" boring diameter)

Shelby tube sample collected from 9'-10' bgs.

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/26/2011
Date Completed	: 6/1/2011
Drilling Method	: 6.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-10D

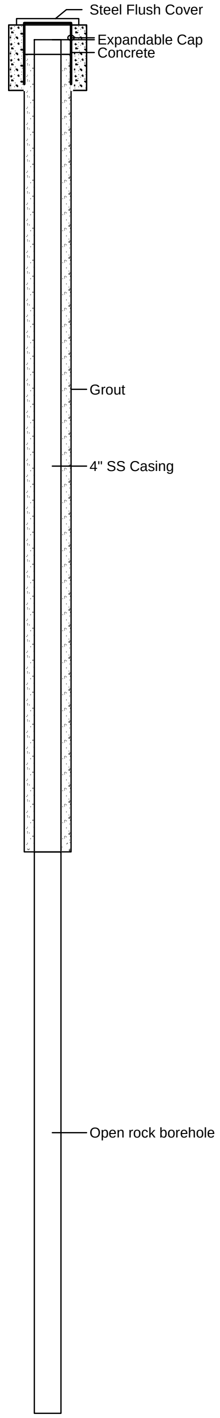
(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clayey silt with some fine sand.	ML				
4					0.0		Air Knife to 6.5'
8					0.0	N/A	N/A
10					0.0		
12		Dolostone Bedrock.	DO		0.0		
14					0.0		
16					0.0		
18					0.0		
20					0.0		
		Water bearing fracture at approximately 21.5' bgs.					
22					0.0		
		End of boring at 23' 6".					

Well: PMW-10D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~10.5" O.D.
WELL RISER	
Material	: Stainless steel
Diameter	: 4"
Joints	: None
WELL SCREEN	:
Material	: open bedrock
Diameter	: ~4"
Placement	: 14.0' to 23.5'
SAND PACK	
Type	: None
SEAL	
Material	: Bentonite
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0.0'-6.5': Concrete saw/Air knife
6.5'-12.0': 6.25" ID HSA (10.5" boring diameter)
12.0'-23.5': 4" OD Air hammer

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
June 2011

Date Started : 6/1/2011
Date Completed : 6/1/2011
Drilling Method : 4.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-10S

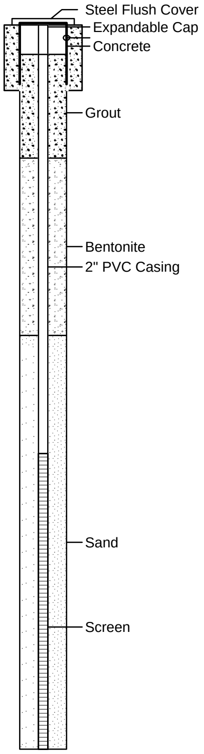
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
1		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.					
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			ML				
7							
8					0.0	N/A	N/A
9							
10					0.0		
11					0.0		
12		Bedrock at 12' 3".					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: PMW-10S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D.
WELL RISER
Material : Schedule 40 PVC
Diameter : 2"
Joints : None
WELL SCREEN :
Material : PVC- 0.010" slot
Diameter : 2"
Placement : 7.25' to 12.25'

SAND PACK
Type : #00 Sand

SEAL
Material : Bentonite
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.25': 4.25" ID HSA (8" boring diameter)

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started : 5/25/2011
Date Completed : 6/1/2011
Drilling Method : 6.25" HSA
Sampling Method : N/A
Drilling Firm : Parratt Wolff
Lead Driller : Jolaan Price
Geologist : Rob Piurek
Project Manager : George Hermance
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-11D

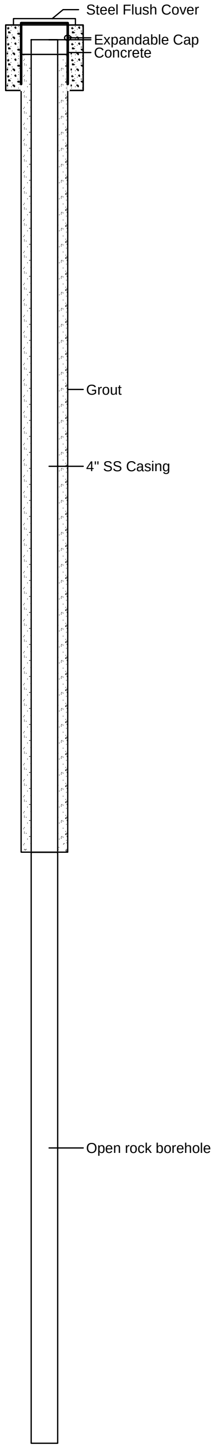
(Page 1 of 1)

PID Model : MiniRae
PID Calibration : 100 ppm Isobutylene
Location : South of Bioreactor trench

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clayey silt with some fine sand.	ML				
4					0.0		Air Knife to 6.5'
8					0.0	N/A	N/A
10					0.0		
12		Dolostone Bedrock.	DO		0.0		
14					0.0		
14.5		Run 1: 14.5' to 19.1'. RQD = 100% Gray Dolostone, vugs from 14.5' to 15.0', some contain calcite deposits. Fracture at 16.0'. One 1/4" vug with calcite deposit at 15.5'. Trace styloltic partings. Competant, hard. No significant water loss.					
17					0.0	100%	
19.1		Run 2: 19.1' to 24.0'. RQD = 84%. Gray Dolostone bedrock, competant, hard. Trace styloltic partings at 19.9', 20.6', 22.3', 22.9', 23.5'. Fractures at 22.2', 22.6', 22.7', 22.9', 23.2', 23.9'. Water loss, no return at 22'.					
21.5					0.0	100%	
22		Water bearing fracture at approximately 22' bgs.					
24		End of boring at 24'.					

Well: PMW-11D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~10.5" O.D.
WELL RISER
Material : Stainless steel
Diameter : 4"
Joints : None
WELL SCREEN :
Material : open bedrock
Diameter : ~4"
Placement : 14.0' to 24.0'

SAND PACK
Type : None

SEAL

GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 12" circular concrete pad

Notes:

Drilling Method
0.0'-6.5': Concrete saw/Air knife
6.5'-12.0': 6.25" ID HSA (10.5" boring diameter)
12.0'-14.0': 4" OD Air hammer
14.0'-24.0': HX core

PARSONS

Ekonol Well Borings
Wheatfield, New York

Atlantic Richfield Company
May 2011

Date Started	: 5/23/2011
Date Completed	: 5/23/2011
Drilling Method	: 4.25" HSA
Sampling Method	: N/A
Drilling Firm	: Parratt Wolff
Lead Driller	: Jolaan Price
Geologist	: Rob Piurek
Project Manager	: George Hermance
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-11S

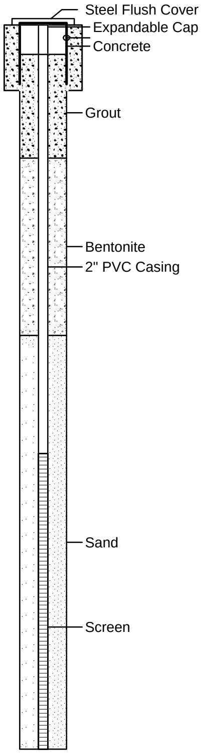
(Page 1 of 1)

PID Model	: MiniRae
PID Calibration	: 100 ppm Isobutylene
Location	: Between Bioreactor trenches

Water Levels
▼ During Drilling: NA
▽ Static: NA

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		~6" asphalt	FILL				
		Drill cuttings contain brown clay and silt. Wet at approximately 5' bgs.					
1							
2							
3							
4					0.0		Air Knife to 6.5'
5							
6			ML				
7							
8					0.0	N/A	N/A
9							
10					0.0		
11					0.0		
12		Bedrock at 12' 3".					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Well: PMW-11S
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D.
WELL RISER	
Material	: Schedule 40 PVC
Diameter	: 2"
Joints	: None
WELL SCREEN	:
Material	: PVC- 0.010" slot
Diameter	: 2"
Placement	: 7.25' to 12.25'
SAND PACK	
Type	: #00 Sand
SEAL	
Material	: Bentonite
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 12" circular concrete pad

Notes:

Drilling Method
0-6.5': Concrete saw/Air knife
6.5-12.25': 4.25" ID HSA (8" boring diameter)

PARSONS

DRILLING RECORD

Contractor: GeoLogic, NY (Northstar Drilling)

BORING NO. MW-7D

Driller: S. Breeds

Inspector: J. Schuetz

Rig Type: CME-55

Method: 6.25 HSA and HQ core

PROJECT NAME BP/Ekonol Facility

PROJECT NUMBER 442257

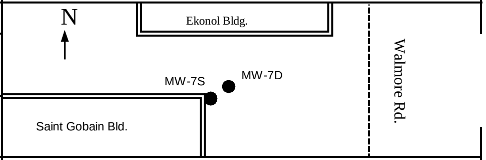
Location: Near MW-7s and RMW-4D

Elevation:

Weather Variable

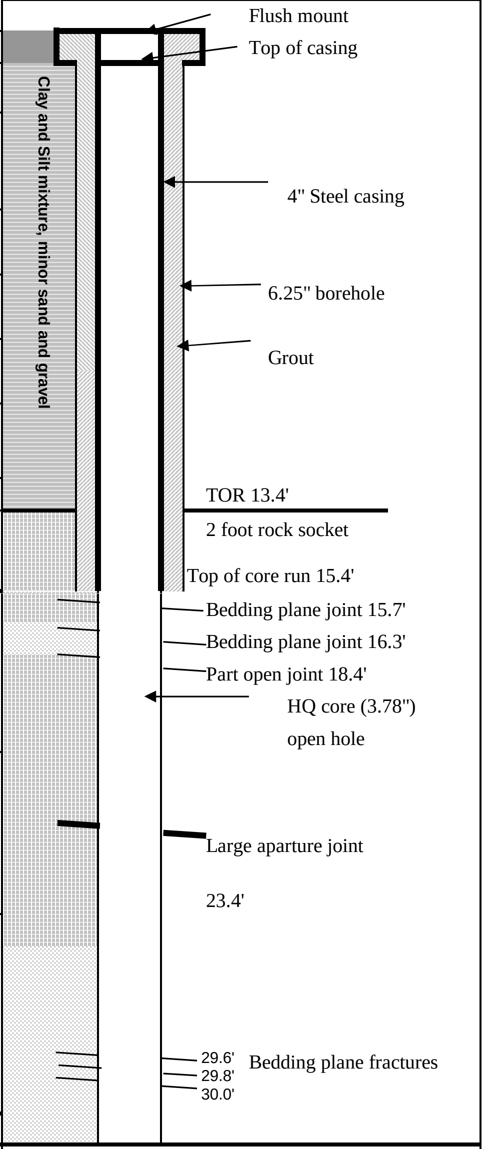
Date/Time Start Boring 9/23/06 1200

Date/Time Finish Coring 10/3/06 14:00



FID Reading	Sample Interval (ft)	Depth ft	Rec. (%)	SPT	FIELD IDENTIFICATION OF MATERIAL
0.0		1			0 - 0.9: Pavement and concrete
		2			0.9 - 1.8: Moist, stiff, brown, red-brown slightly mottled. CLAY and Silt, trace Sand (coarse) CL/OL
		3			1.8 - 2.3: Moist, dark gray, dark green gray, Clay and Silt, organic. OL
0.0		4			2.3 - 5.5: Moist, stiff (very) Brown, red brown green-gray mottled Clay and Silt, trace Gravel (fine to coarse). CL
		5			
0.0	5-7	6	6.5	4/5	Moist, stiff, mottled, brown, red-brown, green-gray CLAY, some Silt. CL
		7		7/7	
0.0	7-9	8	100	14/12	Same as above - CL
		9		14/12	
0.0	9-11	10	100	2/3	Dry-moist, medium stiff, red-brown, brown (mottled) CLAY little Silt, trace Gravel (fine to coarse) laminated. CL
		11		3/4	
0.0	11-13	12	80	9/7	Upper 1 foot: Same as above. Lower 1 foot: wet, stiff, red brown, Clay and Silt, trace Sand (fine to coarse), trace Gravel (fine - coarse). CL
		13		11/12	
0.0	13-15	14	100	50/.4	Moist, hard, red, red-brown, gray Clay and Silt, trace Gravel (coarse). Rock chips
		15			
HQ Core	**Range (ft)**	**Depth (ft)**	**Rec. (%)**	**RQD (%)**	
1	15.4-20.4	16	100	94	Gray, dolomite. joint at 0.3' and 0.9, upper 0.0-1.0' vugged, 1-5mm (crystalized) calcite dolomite vugs. Bedding planes and stylolitic joints at ~ 15 degree. Massive sections, laminated, fine grained, small vugged porosity. Vugged zone 1.8-2.3. Packer test went dry formation will not sustain 0.25 GPM Bedding plane joints are: rough, undulating, tight.
		17			
		18			
		19			
		20			
2	20.4-25.4	21	NS	NS	20.4-25.4': No log due to sampling for treatabiltiy testing. 6" section recovered is: gray dolomite, fine grained, crystaline at drilling breaks, minor stylolitic horizons. Cost circulation at 23.4', Drill rods dropped 0.1', rough drilling. joint at 23.4' looked similar in size as the joint at MW-21D. Large apperature fracturing. Formation sustained 5 GPM during packer testing.
		22			
		23			
		24			
3	25.4-30.4	25	100	78	25.4 - 26.1': Dolomite, very small vugs causing a fine porosity (although it may not contribute to effective porosity), crystalized, some vugs. One larger vug infilled w/ gypsum. 26.1 - 29.3': increasing vugs in size and accurance, dolomite crystals 3-5 mm diameter. 27.01 - 28.4': Dolomite with coral fossils and small vugs. 29.3 - 30.4': massive gray dolomite, 3 natural breaks, tight, slightly undulating, fairly smooth. Formation went dry during packer testing at < 1 GPM.
		26			
		27			
		28			
		29			
		30			
					Total Depth 30.4'

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

SUMMARY:

TOR was determined at HSA auger refusal.

NS: not sampled (or calculated) due to sampling of core for treatabilty testing.

SAA: Same as above

HAS Hollow stem auger

PARSONS

DRILLING RECORD

BORING NO. MW-21D

Contractor: GeoLogic, NY (Northstar Drilling)
Driller: S. Breeds
Inspector: J. Schuetz
Rig Type: CME-55
Method: 6.24 HSA and HQ Core

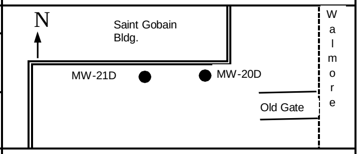
PROJECT NAME BP/Ekonol Facility
PROJECT NUMBER 442257

Location: Southside Saint G.
Elevation:

Weather Variable

Date/Time Start Coring 9/26/06 8:15

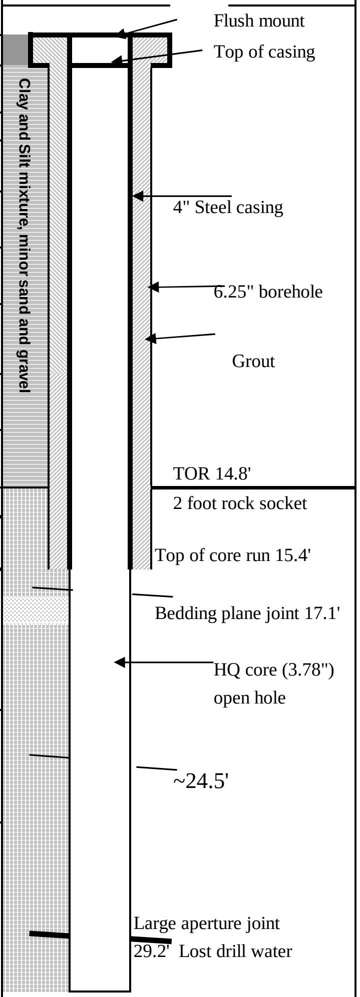
Date/Time Finish Coring 10/3/2006 13:45



FID Reading	Sample Interval (ft)	Depth (ft)	Rec. (%)	SPT	FIELD IDENTIFICATION OF MATERIAL
0.0		1			0.5' concrete
		2			Moist, stiff, brown-gray CLAY and Silt, trace Gravel, trace Sand (coarse) lenses of organics, drop stones.
1.1		3			Moist, stiff, mottled dark gray, green gray, CLAY and Silt, organics, fine roots. OL
1.1		4			2.3 - 5.5': Moist, stiff (very) brown, red brown green-gray mottled Clay and Silt, trace Gravel (fine to coarse). CL
0.0	5-7	5	80%	5/5	Moist, very stiff, mottled brown, gray Clay and Silt, trace Gravel (drop stones). CL
		6		6/7	
0.0	7-9	7	95%	11/8	Moist, same as above. Potential vadose zone clay joints, sand mixed with clay in shoe. ML
		8		8/11	
0.0	9-11	9	100%	5/5	Upper 0.8': Dry, stiff, gray brown, red, Clay and Silt, trace Coarse Sand. ML
		10		6/6	Lower 1.1': Moist, stiff, red brown, Silt, little Sand (fince to coarse), little Clay, trace Gravel. ML
0.0	11-13	11	90%	5/5	Wet, stiff, red brown, Silt, little Sand (fine-coarse), little Clay, trace Gravel. ML
		12		5/7	
0.0	13-15	13	65%	15/14	Moist-wet, very stiff, brown-red, Silt some Gravel (fine-coarse) little Sand (fine-coarse), trace Clay. ML
		14		10/50/.3	
		15			Spoon refusal at 14.8'

HQ Core	Range (ft)	Depth (ft)	Rec. (%)	RQD (%)	
1	16.8-21.8	17	100	41	Lockport dolomite, light gray, gray, fine texture, irregular bedding planes (styololitic-like), discontinities along bedding planes. 10-20% dip to bedding planes, 1.1 ft section of numerous vugs (<1 mm-5mm). Few veritcal joints, infilled, non-continuous. Bedding joints are rough and undulating with surficial mineralization.
		18			
		19			
		20			
		21			
2	21.8-26.8	22	100	NA	All core except 5" sent for treatability testing. Lockport dolomite, light gray, fine texture, massive, fine porosity (<0.5 mm). One tight joint w/ calcite or dolomite crystalization.
		23			
		24			
		25			
3	26.8-31.8	26	100	100	26.8 - 28.8': Lockport dolomite, masive, fine grained fine porosity, no natural breaks. 28.8 - 29.9': dolomite, gray, stylolitic horizons, minor vugs near bottom, nature joint at ~ 29.2, slightly undulating, smooth presumably large apperature. 29.7 - 31.8': dolomite, gray, fine grained, minor bedding planes, vug partially filled and completely filled with dolomite, calcite and gypsum. 5-10 cm to <1 mm in size
		27			
		28			
		29			
		30			
		31			
		32			
					Total depth 31.8'

WELL CONSTRUCTION DIAGRAM



STANDARD PENETRATION

TOR= TOP OF ROCK

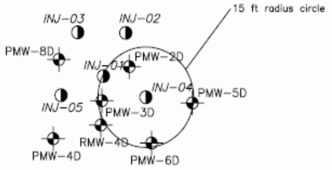
SUMMARY:

TOR was determined at HSA auger refusal.
NS: not sampled (or calculated) due to sampling of core for treatabilty testing.
SAA: Same as above
HAS Hollow stem auger

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/19/2007 15:30
Date Completed : 12/13/07 11:30
Drilling Method : Auger, Core
Sampling Method : Split Spoon, Air Ham., HQ Core
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-01

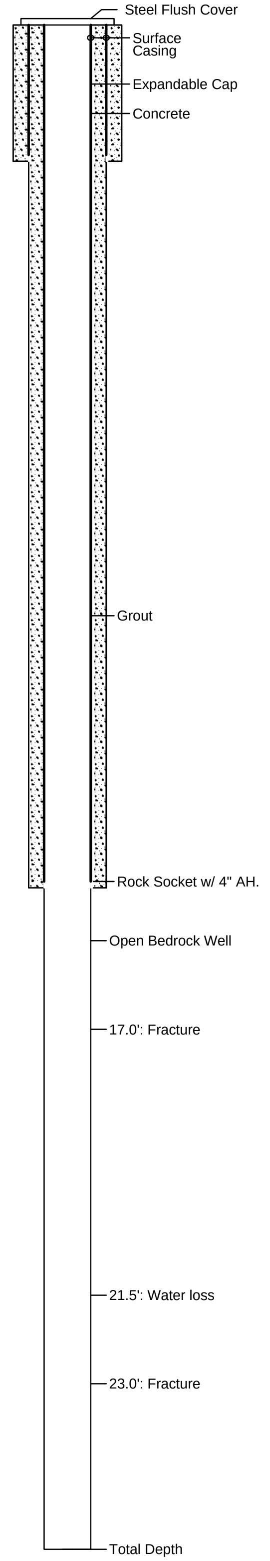
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test area NE of Saint Gobain Building

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0 - 12.5		SANDY CLAY, 0.0' - 5.0'. Hand dug. Moist, hard, red, brown, gray, Clay and Silt, trace Gravel (fine-coarse).	CL	🟥	0.0 0.0 0.0 0.0 0.0	NA NA NA NA 0%	HAND NA NA NA 50/0.1'
12.5 - 14.5		12.5' - 14.5'. 2' Rock Socket. Top of Rock at 12.5'. No recovery at 12.5'.	Dolo	▦	0.0	100%	NA
14.5 - 18.0		14.5' - 18.0'. Dolomite, light-medium gray, frequent styolites, minor pitting, filled vugs. Horizontal fracture at 17.0', may be mechanical.	Dolo	▦	0.0	100%	95%
18.0 - 22.0		18.0' - 22.0'. Solid Dolomite, similar to above, less vugs, less pits. Fracture at 21.5'. Lost water with no return.	Dolo	▦	0.0	100%	95%
22.0 - 25.8		22.0' - 25.8'. Similar to above. Lithology change at 22.5' to a lighter color. Major fracture at 23.0'.	Dolo	▦	0.0	100%	95%

Well: INJ-01
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Stainless Steel
Diameter : 4"
Joints : None
WELL SCREEN : No screen, open borehole

SAND PACK : none

SEAL

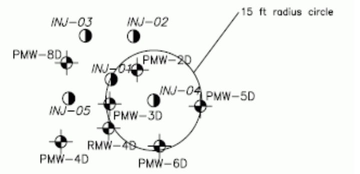
GROUT : Soil casing
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 12.5 ft.

Notes:
AH - Air Hammer
NA - Not Applicable due to technique

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/28/2007 14:00
Date Completed	: 12/11/07 11:30
Drilling Method	: Auger, AH, HQ core
Sampling Method	: Split Spoon, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL INJ-02

(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of : Saint Gobain

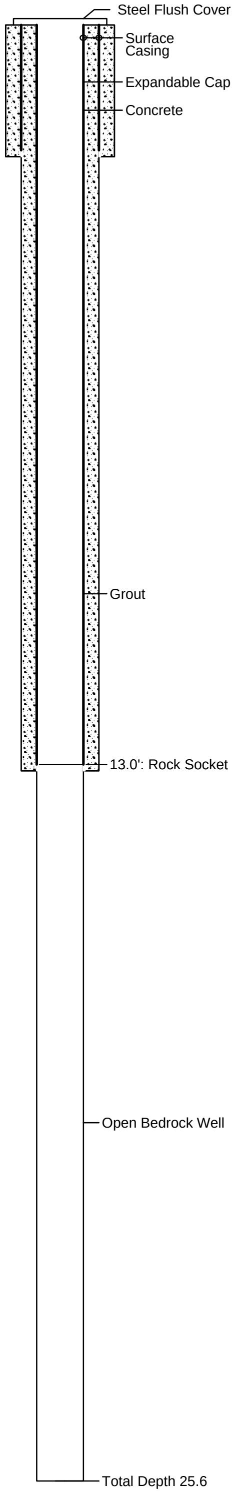
Water Levels

▼ After Completion: ~ 6.0' BTOC

▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Rec %	Blow Count / RQD%
0		0.0' - 5.0'. Hand dug. Similar to nearby wells. Moist, hard, red, brown, gray, CLAY and SILT, trace GRAVEL (f-c).		▨			
1							
2					0.0		HAND
3							
4							
5							
6			CL		0.0		NA
7							
8					0.0	NA	NA
9							
10					0.0	NA	NA
11							
12					0.0	0%	50/0.1'
13		13.0' - 15.0'. 2' Rock Socket. Top of Rock at 13.0'. Soft Rock ~ 1.0' - 1.5' into rock.		▨			
14			Dolo		0.0		NA
15		See INJ-01					
16			Dolo		0.0		NA
17							
18							
19							
20			Dolo		0.0		NA
21							
22							
23							
24			Dolo		0.0		NA
25							
26							
27							

Well: INJ-02
TOC Height:



Monitoring Well Construction Information

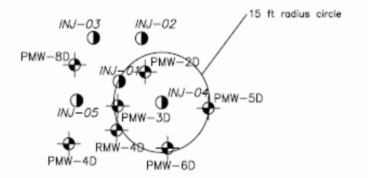
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 4"
Joints	: Threaded
WELL Interval (bgs)	: Open Rock Hole : 13.0-25.6'
GROUT	
Material	: Soils casing : Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 12.5 ft.

AH - Air Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/27/2007
Date Completed : 11/28/2007
Drilling Method : Auger, Air Core
Sampling Method : HQ Core
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-03

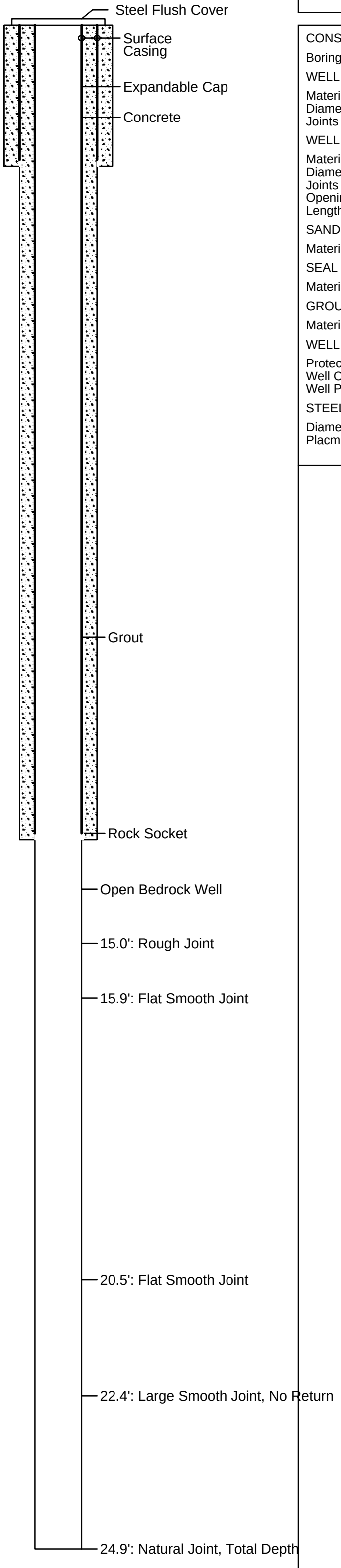
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test area NE of
: Saint Gobain

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0 1 2 3 4 5 6 7 8 9 10		0.0' - 5.0'. Hand dug. Similar to PMW-8D Moist, hard, red, brown, gray, CLAY and SILT, trace GRAVEL (f-c). Top of Rock at 12.5'.	CL	🟥	0.0 0.0 0.0 0.0 0.0	NA NA NA NA 0.0%	HAND NA NA N NA 50/0.1'
11 12		11.0' - 13.2'. Rock Socket. No recovery at 11.0'.	Dolo	▨			
13 14 15 16 17		13.2' - 17.6'. Similar to other borings. ToR ~1.0' higher in the formation /\. Natural 30 degree rough joint at 12.5'. Flat smooth joint at 15.9'.	Dolo	▨	0.0	100%	95%
18 19 20 21 22		17.6' - 22.4'. Similar to above. Horizontal, flat smooth joint at 20.5'. Large smooth joint marker bed at 22.4'. Water loss, no return	Dolo	▨	0.0	100%	95%
23 24 25		22.4' - 24.9'. Similar to above. Natural joint at 24.9	Dolo	▨	0.0	100%	95%

Well: INJ-03
TOC Height:



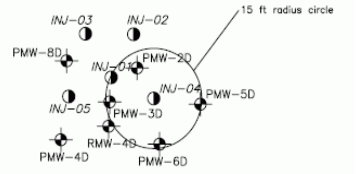
Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Flush mount
Diameter :
Joints :
WELL SCREEN
Material : No screen open rock hole
Diameter :
Joints :
Opening :
Length :
SAND PACK
Material :
SEAL
Material :
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 12.5 ft.

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/27/2007
Date Completed : 11/27/2007
Drilling Method : Auger, Hammer, Core
Sampling Method : HC Core
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL INJ-04

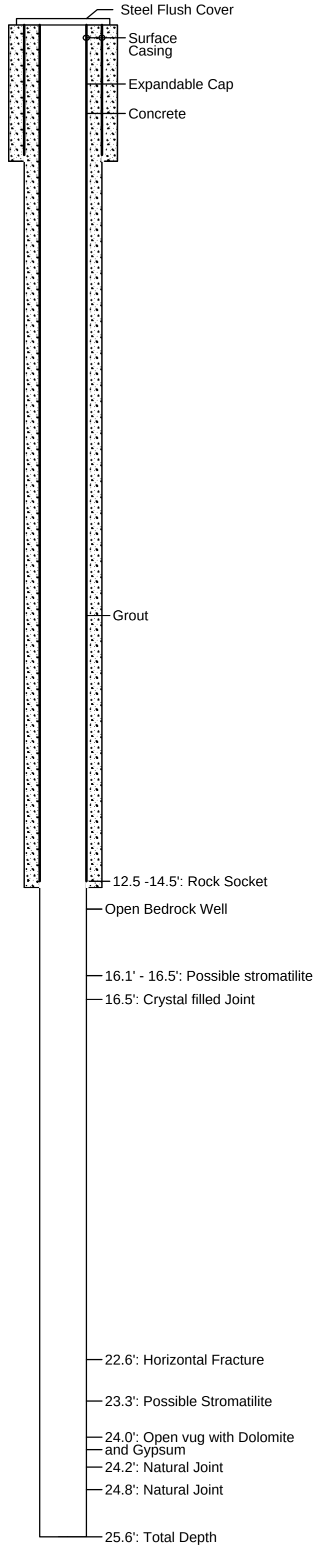
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test area NE of
: Saint Gobain

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0 1 2 3 4 5 6 7 8 9 10 11 12		0.0' - 5.0'. Hand dug. Similar to INJ-01 Moist, hard, red, brown, gray, CLAY and SILT, trace GRAVEL (f-c). Augered to Top of Rock. Top of Rock at 12.5'.	CL	▨	0.0 0.0 0.0 0.0	NA	HAND
13 14		12.5' TOR 12.5' - 14.5'. Rock Socket.	Dolo	▦			
15 16 17 18 19 20		14.5' - 20.3'. Massive, hard, dolomite, light gray, minor coral pitting. Few stylolites. Possibly stromatolite from 16.1' to 16.5'. Crystal filled joints at 16.5'. No breaks, full intact rock core.	Dolo	▦	95	88%	NA
21 22 23 24		20.3' - 24.8'. Massive Dolomite similar to above. Horizontal fracture at 22.6', mostly smooth. Marker bed change at 23.3', possible stromatilite. Open vug with dolomite and gypsom at 24.0'. Drill break with Galena at 24.2'. Tight natural joints at 24.2' and 24.8'.	Dolo	▦	0.0	88%	95%
25		24.8' - 25.6'. Dolomite similar to above, lower 5" has coral fossils and pits.	Dolo	▦	0.0	100%	100%
26							

Well: INJ-04
TOC Height:



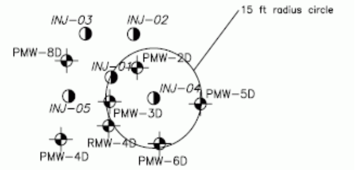
Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Stainless Steel
Diameter : 4"
Joints : Threaded
WELL SCREEN :
Material : No Screen, open rock
Diameter :
Joints :
Opening :
Length :
SAND PACK
Material :
SEAL
Material :
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 12.5 ft.

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)
July 2008



Date Started	: 11/20/2007 10:07
Date Completed	: 12/06/07 11:45
Drilling Method	: Auger, AH, HQ Core
Sampling Method	: SS, HQ Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL INJ-05

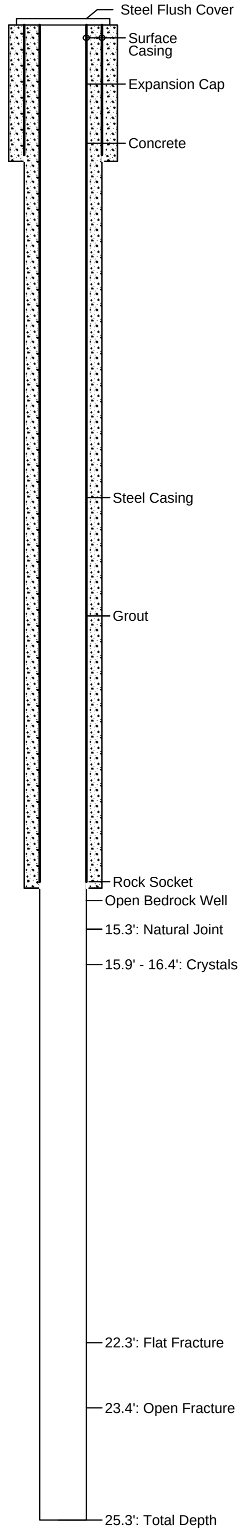
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of : Saint Gobain

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
		0.0' - 5.0'. Hand dug. Moist, hard, red, brown, gray, CLAY and Silt, trace Gravel (fine-coarse).	CL	▨	0.0 0.0 0.0 0.0 0.0	NA NA NA NA 0.0%	HAND NA NA NA 50/0.1'
		12.5' - 14.5'. 2' Rock Socket. Top of Rock at 12.5'. No recovery at 12.5'.	Dolo	▦			
		Run 1: 14.5' - 19.7'. Dolomite, hard massive, very fine grained. Natural tight joint at 15.3'. Crystaline section from ~15.9' - 16.4'. Only one natural fracture.	Dolo	▦	0.0	90%	100%
		Run 2: 19.7' - 24.75'. Dolomite, massive. Flat, <5 degree fracture at 22.3. Large open fracture at 23.4. Undulating moderately tight fracture at 23.7. Tight fracture at 24.6.	Dolo	▦	0.0	96%	89%
		Run 3: 24.75' - 25.3'. Increase in coral pitting and remnant fossils in bottom of section.	Dolo	▦	0.0	99%	100

Well: INJ-05
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D. upper, ~4" lower

WELL SCREEN

Material	: No Screen : Open Rock Well

GROUT

Material	: Cement-Bentonite

WELL HEAD

Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

STEEL CASING

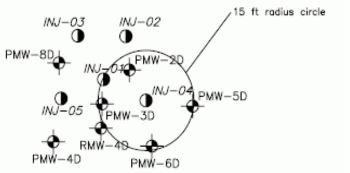
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
AH - Air Hammer
SS - Split Spoon Sample

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/17/2007 16:00
Date Completed	: 12/07/07 10:00
Drilling Method	: Auger, AH, HQ core
Sampling Method	: SS, HQ Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-1D

(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of : Saint Gobain

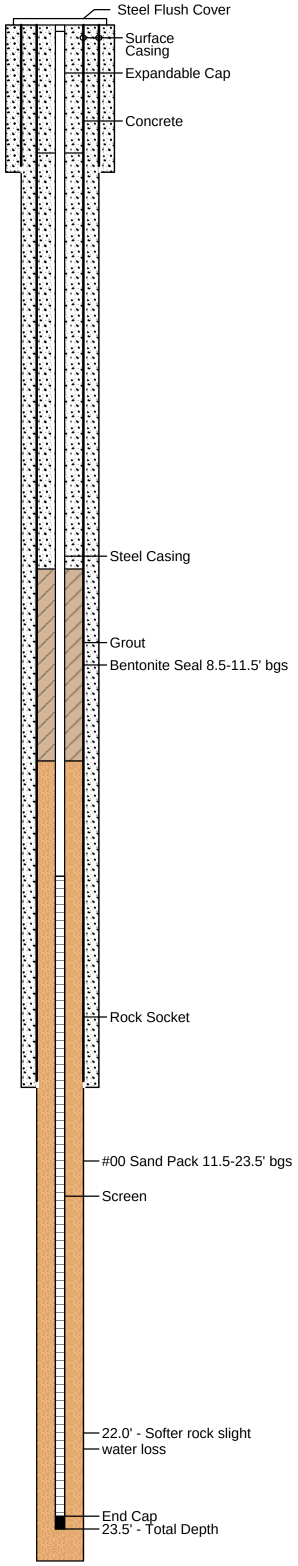
Water Levels

▼ After Completion: ~6' BTOC

▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0		SANDY CLAY, 0.0' - 5.0'. Hand dug. Similar to PMW-6D. Moist, stiff, red brown, Clay, and Silt, trace Sand (fine).	CL	▨	0.0	NA	HAND
5		5.0' - 13.0'. Similar to PMW-6D. Wet, red, brown, CLAY and SILT, trace SAND (fine). Sheen on soils, not PID hits. Top of Rock 14.5'.	CL	▨	0.0 0.0 0.0 0.0 0.0	NA NA NA NA NA	NA NA NA NA NA
		14.5' - 16.5'. Rock Socket. Top of Rock at 14.5'.	Dolo	▨	0.0	NA	NA
		Well drilled with a 6" Tricon Bit. Not cored Started losing water at 22'. Softer rock, but still had water return. Driller changed to clean water, SILT at bottom of hole needs to be washed out. 22.0' - 25.0', lost some water, but did not completely lose return. End 6" roller bit at 25.0' below ground surface. Pumped 70 gallons of water prior to building well, but could not remove all cuttings from the well. ~1.5' of SAND (coarse) in bottom of boring could not be removed, placed well on top of SAND (coarse). Sheen in development water, strong chemical odor. Well Head PID >200ppm, but dissipates quicky.	Dolo	▨	0.0	NA	NA
24							

Well: PMW-3D
TOC Height:



Monitoring Well Construction Information

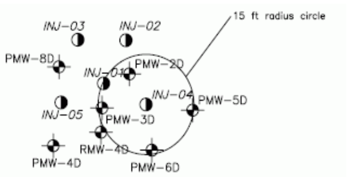
CONSTRUCTION	
Boring Diameter	: ~10" O.D. upper, ~6" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 4-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 6-inch
Placment	: Near surface to 15 ft.

Notes:
AH Air Hammer
HQ Core

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/19/2007
Date Completed	: 12/4/07
Drilling Method	: Auger, AH, HQ-core
Sampling Method	: SS, Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-2D

(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of : Saint Gobain

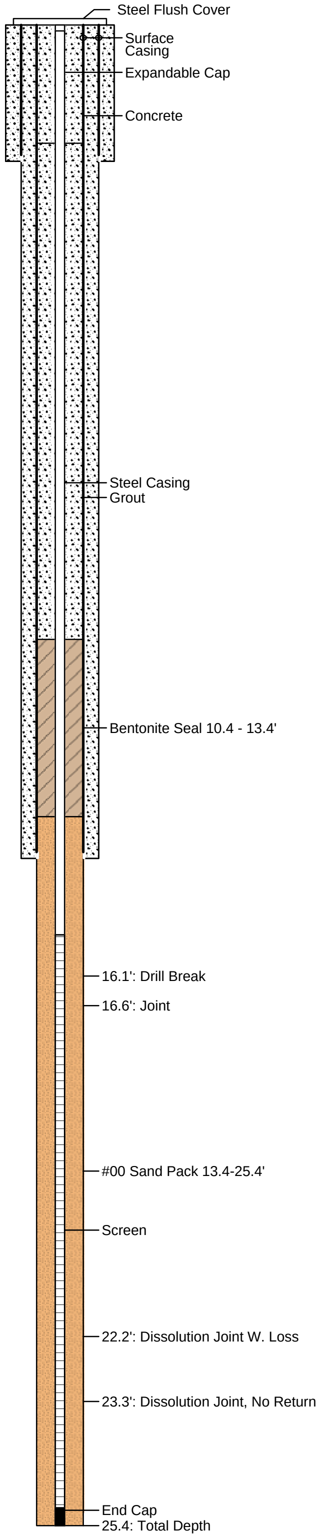
Water Levels

▼ After Completion: ~6' BTOC

▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count \ RQD%
0		0.0' - 5.0'. Hand dug. Similar to PMW-6D. Moist, stiff, red, brown, gray, CLAY and SILT. Top of Rock at 12.5'.	CL				
					0.0	NA	HAND
6					0.0	NA	NA
8					0.0	NA	NA
10					0.0	NA	NA
		TOR - 12.5' bgs 12.5' - 14.5'. Rock Socket.	Dolo				
		Run 1: 14.5' - 19.7'. Dolomite, hard, gray, fine grained. Coral pitted texture, very small (<1 mm). Tight, partial drill break at 16.1'. Joint at 16.6 with calcite and gypsum.	Dolo		0.0	98%	100
		Run 2: 19.7' - 24.8'. Massive with two joints. Large dissolution at 22.2 and 23.3. Water loss at 22.2'. No return at 23.3'. The fractures are bounded in the marker bed (stromatolite) with thin, black, deformed-like seams.	Dolo		0.0	94%	100
		Run 3: 24.8' - 25.4'. Dolomite similar to 14.5' - 19.7'. Slightly darker, gray, brown, more pits.	Dolo		0.0	30%	NA
26							

Well: PMW-2D



Monitoring Well Construction Information

CONSTRUCTION

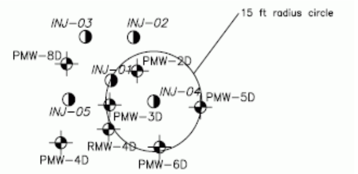
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 14 ft.

Notes:
AH - Air Hammer
SS - 2" Split Spoon
W.Loss - Drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/17/2007
Date Completed	: 12/11/07
Drilling Method	: Auger, AH, Air Hammer
Sampling Method	: SS, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-3D

(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of : Saint Gobain

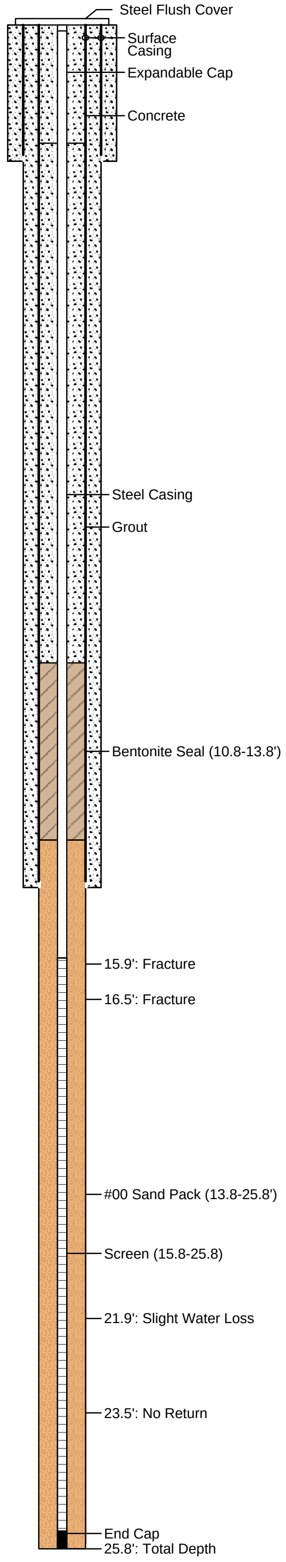
Water Levels

▼ After Completion: ~6' BTOC

▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0		0.0' - 5.0'. Hand dug.	CL	▨	0.0	NA	HAND
5		5.0' - 13.0'. Similar to PMW-6D. Moist, hard, red, brown, gray, CLAY and SILT, trace SAND (c-f). Top of Rock 13.0'.	CL	▨	0.0	NA	NA
13		13.0' - 14.5'. Rock Socket. Top of Rock at 13.0'.	Dolo	▦	0.0	0.0%	50/0.1'
14.5		Run 1: 14.5' - 19.0'. Dolomite, hard, gray, fine grained, saccharoidial. Minor coral pits. Tight, rough fracture at 15.9' and 16.5'.	Dolo	▦	0.0	82%	95%
19		GRAVEL, Poorly Graded, Run 2: 19.0' - 24.0': 19.0' to 21.9' - Massive, dolomite, gray, hard, fine grained. Contiuous core, no breaks. 21.9' to 24.0' - Same as above but with black, undulateing bedding planes (stromatolite). Fractures every 4" - 6".	Dolo	▦	0.0	95	78%
24		Run 3: 24.0' - 25.8'. Dolomite, gray, brown, hard, fine grained. Pitted and vugged with coral remnant texture. One, 6cm, coral fossil at bottom.	Dolo	▦	0.0	72%	100%
26							

Well: PMW-3D
TOC Height:



Monitoring Well Construction Information

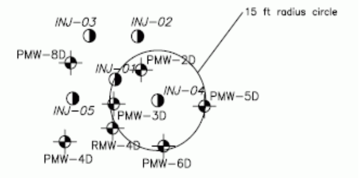
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/21/2007
Date Completed : 11/26/2007 16:00
Drilling Method : Auger, AH, HQ core
Sampling Method : SS, HQ core
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-4D

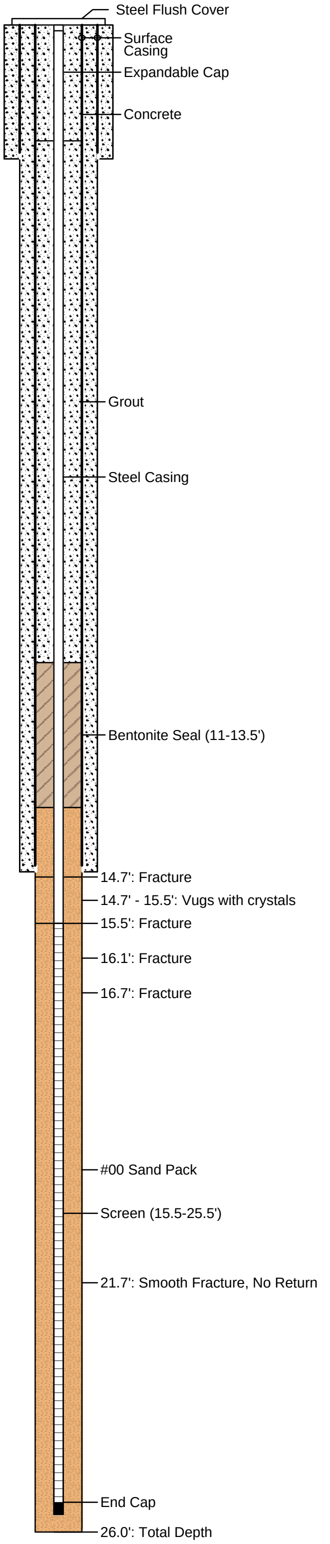
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test Area NE of
: Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
		0.0' - 5.0'. Hand dug. Similar to PMW-3D. Moist, stiff, red, brown, gray mottle, CLAY and SILT, trace SAND (c-f). Top of Rock at 12.5'.	CL		0.0 0.0	NA NA	HAND NA
		12.5' TOR 12.5' - 14.5'. Rock Socket.	Dolo		0.0	NA	NA
		Run 1: 14.5' - 19.7'. Dolomite, hare, fine grained, gray, correlates with other cores. Rough, tight fractures at 14.7', 15.5', 16.1' and 16.7'. Vugs with crystals between 14.7. and 15.5'.	Dolo		0.0	90%	81
		Run 2: 19.7' - 24.9': Massive dolomite, same as above. Smooth fracture at 21.7', water loss with no return. Change to marker bed at 22.5', with irregular undulating black seams to 24.9'.	Dolo		0.0	90%	84
		Run 3: 24.9' - 26.5'. Dolomite same as above with coral pits and vugs in the lower foot of the core.	Dolo		0.0	90%	84

Well: PMW-4D



Monitoring Well
Construction Information

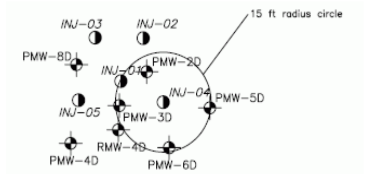
CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Stainless Steel
Diameter : 2"
Joints : Threaded
WELL SCREEN
Material : Stainless Steel
Diameter : 2-Inch
Joints : Threaded
Opening : 0.01-inch slots
Length : 10-feet
SAND PACK
Material : #00 Silica Filter Sand
SEAL
Material : Bentonite Pellets
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 16 ft.

Notes:
CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/27/2008
Date Completed : 12/3/2008
Drilling Method : HQ, Core, Auger, Air, Rotary
Sampling Method : Split Spoon
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-5D

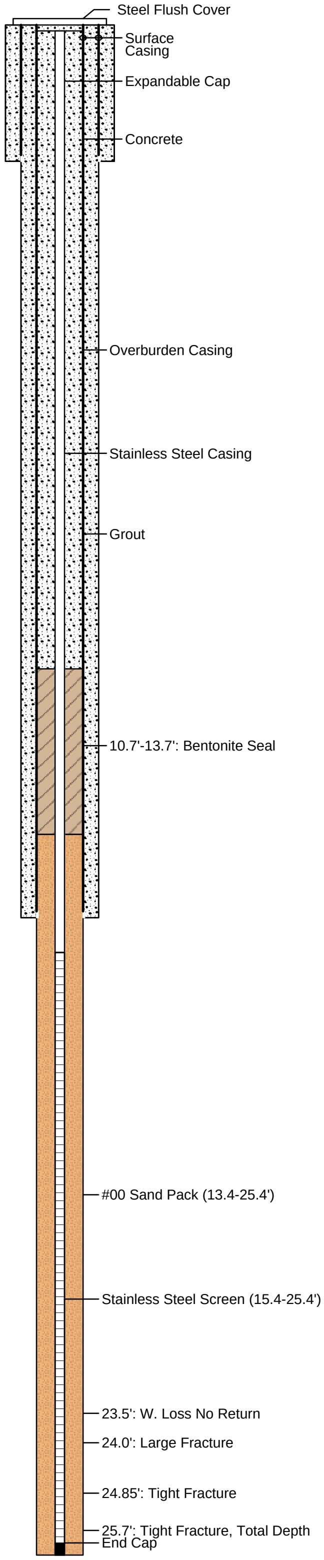
(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test Area NE of
: Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0 - 13		0' - 5.0'. Hand dug. Moist, stiff, red, brown, gray mottle, CLAY and Silt, trace Sand (coarse)	CL	▨	0.0 0.0	NA NA	HAND NA
13 - 15		13.0' - 15'. Rock Socket. Top of Rock at 13.0'.	Dolo	▦			
15 - 19.7		Run 1: 15' - 19.7'. Dolomite, hard, gray, fine grained, saccaroidial. Minor pits. Full, intact, core run.	Dolo	▦	0.0	85%	100
19.7 - 24.85		Run 2: 19.7' - 24.85'. Massive. Dolomite same as above. Thin, undulating seams at 23.4' - 24.55'. Large Fracture at 24.0'. Tight Fracture at 24.85'. Gradual water loss until 23.5', then no return.	Dolo	▦	0.0	100%	84%
24.85 - 25.7		Run 3: 24.85' - 25.7'. Dolomite same as above. Gray, brown, with pits and small vugs. Tight fracture at 25.7'.	Dolo	▦	0.0	100%	78%

Well: PMW-5D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

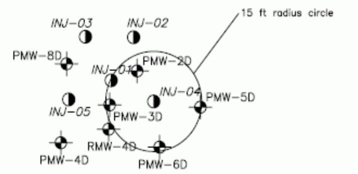
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: SS
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: SS
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/27/2008
Date Completed	: 12/4/07
Drilling Method	: HQ, Core
Sampling Method	: Split Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-6D

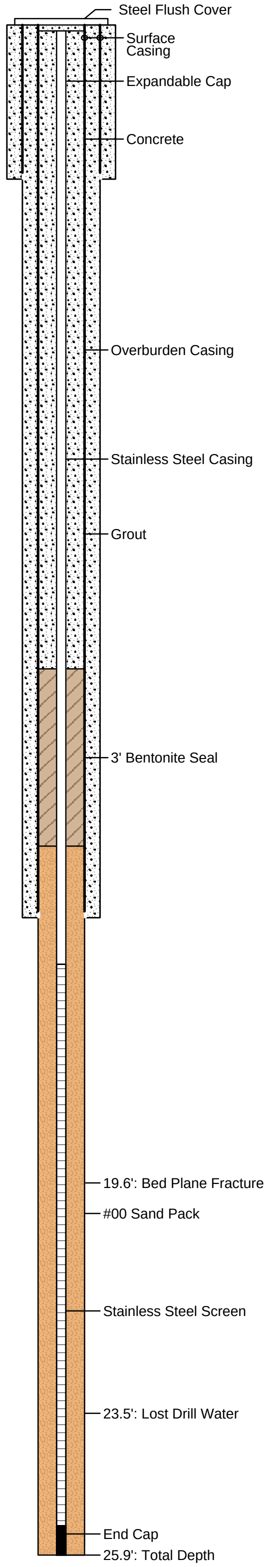
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of : Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count	RQD %
0 1 2 3 4		SAND, Well Graded, 0' - 5.0'. Hand dug. Moist, stiff, red, brown, gray mottle, CLAY and Silt, trace Sand (coarse)	CL		0.0	NA	HAND	
5 6		5.0' - 7.0'. Moist, very stiff, red-brown, and gray. CLAY and Silt. Laminated. Gypsum crystals embedded in CLAY.	CL		0.0	60%	5 8 9 10	
7 8		SAND, Poorly Graded, 7' - 9'. Moist, stiff, red-brown, gray and tan, Clay and Silt, laminated alternating colors.	CL		0.0	100%	4 3 6 7	
9 10		9' - 11'. Same as above.	CL		0.0	100%	15 10 7 9	
11 12		11' - 13'. Wet, stiff, red-brown, SILT, little CLAY, little Sand (fine-coarse), trace Gravel (fine-coarse). Gravel piece in tip. Refusal at 12.5'.	ML		0.0	100%	5 7 9	
13 14		TOR 12.5' 12.5' - 15'. Rock Socket.	Dolo		0.0	100%	50 NA	
15 16 17 18 19		Run 1: 15' - 19.7'. Massive, gray, hard, dolomite, stylotic horizons, fine grained, small pits.	Dolo		0.0	96%	92%	
20 21 22 23 24		Run 2: 19.7' - 24.6'. Dolomite same as above, pitting at bottom, one large natural fracture. Massive dolomite, one large water bearing fracture at 23.7', in irregular bedded marker, may be stromatilite. Gypsum filled vug at 20.0'.	Dolo		0.0	99%	100	
25 26		Run 3: 24.6' - 25.9'. Fine grain dolomite, similar to above marker bed. Bottom 3" has coral pitting.	Dolo		0.0	99%	100	

Well: PMW-6D
TOC Height:



Monitoring Well Construction Information

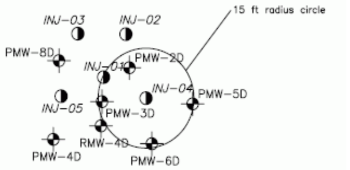
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: SS
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: SS
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/19/2007
Date Completed : 11/30/2007
Drilling Method : Auger, AH, HQ core
Sampling Method : SS, HQ core
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-7D

(Page 1 of 1)

PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test Area NE of
: Saint Gobain

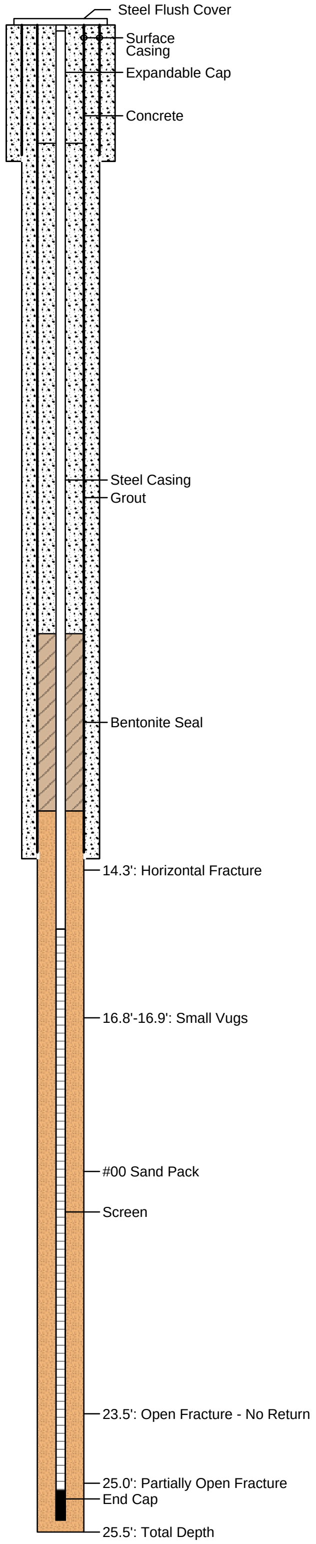
Water Levels

▼ After Completion: ~6' BTOC

▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		0.0' - 5.0'. Hand dug. Moist, stiff, red, brown, gray mottled, Clay and Silt, trace Sand (coarse).	CL	▨	0.0 0.0 0.0 0.0	NA NA NA NA	HAND NA NA NA
12		12.0' - 14.0'. Wet, hard, gray, brown, Silt and Clay, little Sand (fine-coarse), trace Gravel. Top of Rock at 12.2' Rock Socket 12.2' - 14.0'.	Dolo	▦	0.0	50%	50
14		Run 1: 14.0' - 18.9'. Dolomite, hard, gray, fine grained. Small pitted vugs. Fracture at 14.3', horizontal, undulating with sealed vertical fracture below. More vugs at 16.8' - 16.9', one to two styolities.	Dolo	▦	0.0	83%	85%
19		Run 2: 18.9' - 23.0'. Full core, no fractures. Dolomite same as above with few to no coral pits. Two stylolites, saccaroidal. Lighter colored inter bedding and ~6.0" lighter colored band at 21.6" -22.3'.	Dolo	▦	0.0	100%	100%
23		Run 3: 23.0' - 25.3'. Dolomite same as above with few to no pits. Thin black irregular but smooth bedding planes, appear as if deformed (stromatolite). Open fracture at 23.5, water loss with no return. Partially open fracture at ~25.0.	Dolo	▦	0.0	87%	73%
26							

Well: PMW-7D
TOC Height:



Monitoring Well Construction Information

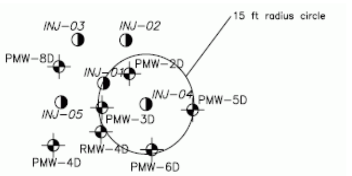
CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Stainless Steel
Diameter : 2"
Joints : Threaded
WELL SCREEN
Material : Stainless Steel
Diameter : 2-Inch
Joints : Threaded
Opening : 0.01-inch slots
Length : 10-feet
SAND PACK
Material : #00 Silica Filter Sand
SEAL
Material : Bentonite Pellets
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 14 ft.

Notes:
Drill rig: CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started : 11/26/2007
Date Completed : 11/27/2007
Drilling Method : Auger, AH, HQ Core
Sampling Method : Split Spoon, HQ core
Drilling Firm : NORTHCOAST DRLG
Lead Driller : Justin Ashcraft
Geologist : Jim Schuetz
Project Manager : Mark Raybuck
Reviewed By : Jim Schuetz
Regulatory Agency : NYSDEC

BORING/WELL PMW-8D

(Page 1 of 1)

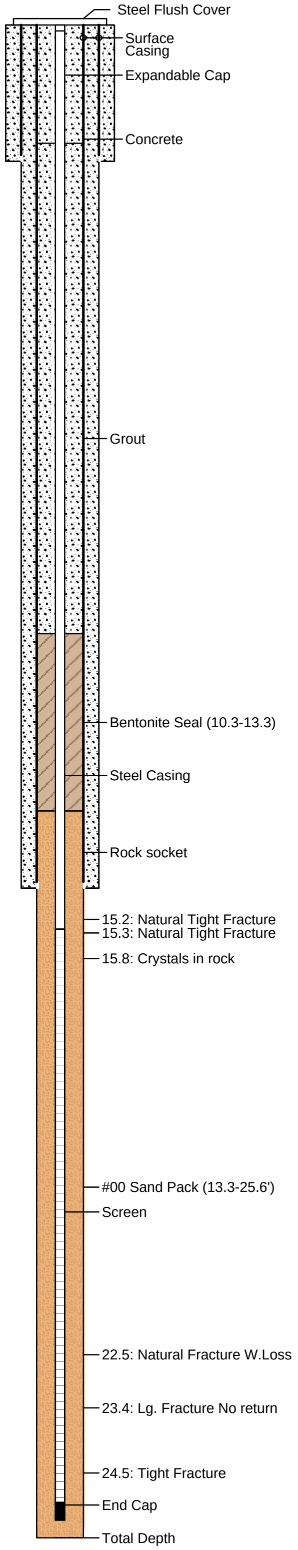
PID Model : MiniRay
PID Calibration : 100 ppm Isobutylene
Location : Pilot Test Area NE of
: Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26

Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
	0.0' - 5.0'. Hand dug. Same as INJ-05. Moist-wet, red-brown, CLAY and SILT, trace Gravel (fine).	CL	▨	0.0 0.0 0.0 0.0	NA NA NA NA	HAND NA NA NA
	12.3' - 14.5'. Rock Socket. Top of Rock at 12.3'	Dolo	▦			
	Run 1: 14.5' - 19.3'. Dolomite, hard, gray. Natural tight fractures at 15.2' and 15.3'. Massive. Crystals imbedded in rock at 15.8', no vugs.	Dolo	▦	0.0	99%	96%
	Run 2: 19.3' - 24.7'. Dolomite same as above. Natural fracture at 22.5', minor water loss. No return at large smooth fracture at 23.4'. Tight fracture at 24.5', fracture occur in same marker bed with irregular black seams (stromatolite).	Dolo	▦	0.0	85%	70%
	Run 3: 24.7' - 25.6'. Massive dolomite, same as above, darker gray with more pits.	Dolo	▦	0.0	100%	100%

Well: PMW-8D
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower
WELL RISER
Material : Stainless Steel
Diameter : 2"
Joints : Threaded
WELL SCREEN
Material : Stainless Steel
Diameter : 2-Inch
Joints : Threaded
Opening : 0.01-inch slots
Length : 10-feet
SAND PACK
Material : #00 Silica Filter Sand
SEAL
Material : Bentonite Pellets
GROUT
Material : Cement-Bentonite
WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

Notes:
Drill rig: CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss
Lg. Large
No return - drill water no longer returning up casing.

ATTACHMENT 4

EKONOL WATER LEVEL / SITE WELL CONDITION FORM

ATTACHMENT 4

EKONOL SITE WATER LEVELS / WELL CONDITION

EKONOL POLYESTER RESINS, WHEATFIELD, NEW YORK

#	Well ID	DTW (ft btoc)	Time	Comments/Well Condition
1	INJ-01			
2	INJ-02			
3	INJ-03			
4	INJ-04			
5	INJ-05			
6	INJ-06D			
7	INJ-07D			
8	INJ-08D			
9	INJ-09D			
10	INJ-10D			
11	INJ-11D			
12	INJ-12D			
13	INJ-13D			
14	MW-1S			
15	MW-2S			
16	MW-3S			
17	MW-4S			
18	MW-5S			
19	MW-6S			
20	MW-7D			
21	MW-7S			
22	MW-8S			
23	MW-9S			
24	MW-10D			
25	MW-10S			
26	MW-11D			
27	MW-11S			
28	MW-12D			
29	MW-12S			
30	MW-13D			
31	MW-14D			
32	MW-15D			
33	MW-16D			
34	MW-17D			
35	MW-18D			
36	MW-19D			
37	MW-20D			
38	MW-21D			
39	OR-1SI			
40	OR-2SI			
41	OR-3SM			
42	OR-4SM			
43	OR-5SM			

ATTACHMENT 4

EKONOL SITE WATER LEVELS / WELL CONDITION

EKONOL POLYESTER RESINS, WHEATFIELD, NEW YORK

#	Well ID	DTW (ft btoc)	Time	Comments/Well Condition
44	OR-6SM			
45	OR-7SI			
46	OR-8SI			
47	OR-9SM			
48	OR-10SM			
49	OR-11SI			
50	OR-12SI			
51	OR-13SM			
52	OR-14SM			
53	OR-15SM			
54	OR-16SI			
55	OR-17SI			
56	OR-18SM			
57	PMW-1D			
58	PMW-1S			
59	PMW-2D			
60	PMW-2S			
61	PMW-3D			
62	PMW-3S			
63	PMW-4D			
64	PMW-4S			
65	PMW-5D			
66	PMW-5S			
67	PMW-6D			
68	PMW-6S			
69	PMW-7D			
70	PMW-7S			
71	PMW-8D			
72	PMW-8S			
73	PMW-9D			
74	PMW-9S			
75	PMW-10S			
76	PMW-10D			
77	PMW-11D			
78	PMW-11S			
79	PMW-12D			
80	PMW-13D			
81	PMW-14D			
82	PMW-15D			
83	PMW-16D			
84	PMW-17D			
85	RMW-1D			
86	RMW-2D			

ATTACHMENT 4

EKONOL SITE WATER LEVELS / WELL CONDITION

EKONOL POLYESTER RESINS, WHEATFIELD, NEW YORK

#	Well ID	DTW (ft btoc)	Time	Comments/Well Condition
87	RMW-3D			
88	RMW-4D			
89	TP-1			
90	TP-2			

ATTACHMENT 5

LOW-FLOW SAMPLING RECORD

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol Facility*

Well ID: ____________

Well Diameter: ____________ Inches

Samplers: ____________________

Monitored Natural Attenuation Sample Set (Y/N)? ____________

Purging Data

WATER VOLUME CALCULATION				
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot				
Casing Volumes (gal/ft.):				
1-inch=0.041	1.5-inch=0.092	2-inch=0.16	3-inch=0.36	
4-inch=0.64	6-inch=1.4	8-inch=2.5	10-inch=4	

Method: ____________________

Date/Time: ____________________

Time	**DTW**	**Pump Rate**	**Vol.**	**pH**	**DO**	**Turbidity**	**Spec. Cond.**	**Temp.**	**TDS**	**ORP**	**Comments**
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	^oC	g/L	mv	

Sampling Data

Method: ____________________

Date/Time: ____________________

Total Volume of Water purged: ________________

Field Parameters

HORRIBA	
pH	
Spec. Cond.(mS/cm)	
Turbidity (NTU)	
DO (mg/L)	
Temp.(^oC)	
ORP (mv)	
TDS (g/L)	

HACH TEST KITS	
Alkalinity (g/g)	
Carbon Dioxide (mg/L)	
Ferrous Iron (mg/L)	
Manganese (mg/L)	
Hydrogen Sulfide (mg/L)	

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL glass vial	HCl	EPA 8260
MEE	2-40mL glass vial	HCl	Lab SOP
Choride / Nitrate / Sulfate	2-40mL glass vial (Field filtered)	None	lab specified
Dissolved Inorganics	1-250mL plastic (Field filtered)	HNO3	SW6010B
Ortho-Phosphate	1-250mL plastic (Field filtered)	None	EPA 365.1
Sulfide	1-250mL glass (Field filtered)	NaOH/Zn Acetate	MS-4500-S2-F
Total Organic Carbon	2-40mL amber glass vial	H3PO4	SW9060
Total Inorganic Carbon	1-120 mL glass amber	None	SW9060
Microbial Census			
Hydrogen, Acetylene			

Comments: ____

____

ATTACHMENT 6

EKONOL SITE PAVEMENT INSPECTION FORM

ATTACHMENT 6
EKONOL SITE PAVEMENT INSPECTION FORM
WHEATFIELD, NEW YORK

Date of Inspection: **Time:**

Inspector(s) Name/Title:

Inspection of	**Condition Present?**		**Action Required?**		**Comments/Location**	**Correction Date**
	Yes	**No**	**Yes**	**No**		
1. Site Pavement						
A. Surface cracks						
B. Pits/divots						
C. Sinking						
2. Well curb boxes						
A. Cracks						
B. Loose						
C. Well caps missing						
D. Settlement						

Site Photo Log:

ATTACHMENT 7

SUB-SLAB DEPRESSURIZATION SYSTEM INSPECTION FORM

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Date: ______________________________________

Checklist Completed By: ________________________

Project Number: _____________________________

Property Location: ____________________________

System Installation Date: ______________________

The purpose of this form is to document the operation and maintenance of the sub-slab depressurization system to provide assurance that the system is functioning as designed or identify and execute any actions required to achieve the mitigation of subsurface vapor intrusion of volatile organic compounds to indoor air

1. MITIGATION SYSTEM INSPECTION

Occupant Interview

Any concerns identified by the building occupants?	YES	NO	

Comments / Action Items

____

____

____

Occupant's Initials: ____________________

External Piping

Vent pipes securely fastened to building	YES	NO	
Are there any visible openings or breaks in the pipe system	YES	NO	
Is the rain cap present and intact at discharge point	YES	NO	N/A
Inspection of the exhaust point verified that no air intakes have been located nearby	YES	NO	
The sealing/caulking around wall penetrations is intact	YES	NO	

Comments / Action Items

____

____

____

Mitigation Fan

Fan is mounted securely to building (no excessive vibrations during operation)	YES	NO
Fan cover is installed	YES	NO
No visible damage to fan or cover	YES	NO

Comments / Action Items

____

____

____

____

____

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Internal Piping

Vertical and horizontal pipe runs are secured, including at all penetration points	YES	NO	
The sealing/caulking is intact around the extraction point or points through the basement floor, crawlspace floor, and/or crawlspace/basement wall interface.	YES	NO	
Vibration dampener installed and intact (pertains to fan mount)	YES	NO	N/A
Mitigation system operation placard present and visible/legible	YES	NO	
Contains description of major components, valid contact number and instructions for occupant inquiries and/or system failure	YES	NO	
Mitigation system maintenance tag present and filled out	YES	NO	

Date of last inspection shown on tag:____________________________

U-tube manometer present and intact at each extraction point	YES	NO	

Comments / Action Items

Electrical

Electrical connections secured	YES	NO
Junction boxes are closed	YES	NO
Conduit is supported	YES	NO
Circuit breakers controlling the mitigation fan and alarm circuits operate and are labeled "Mitigation System"	YES	NO
Power switch tagged with intact tamper proof seal	YES	NO
Audible alarm present	YES	NO
Audible alarm switch in "on" position (light on alarm is green)	YES	NO

Comments / Action Items

2. OPERATIONAL CHECKS

Fan is operating

Noise and Vibration within normal range	YES	NO
Alarm sounds when fan is turned off	YES	NO
U-Tube manometer indicating negative sub slab pressure	YES	NO

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:___________________ Vacuum __________ in H_20

Smoke test performed on internal penetrations and pipe joints

Smoke test indicated no leaks	YES	NO	N/A
Smoke test confirms air flow into sump	YES	NO	N/A
Back draft test confirms proper air flow at combustion appliances	YES	NO	N/A
Smoke test indicated no leaks	YES	NO	N/A

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

3. MAINTENANCE

Fan last replaced on (date): ____________________

Fan due to be replaced; ________________

Additional Maintenance Action Items Performed

4. ADDITIONAL ACTION ITEMS/ COMMENTS/COMPLETION DATES

5. CERTIFICATION

I certify that the information on this form is true, accurate and complete (all blanks filled in) to the best of my knowledge and ability, and that I have the appropriate training and experience to perform this monitoring/inspection:

Name: ___________________________ Affiliation: _____________________________

Signature: ______________________________ Date (dd/mm/yy): ______________/_______am/pm

ATTACHMENT 8

EKONOL SITE INSPECTION FORM

ATTACHMENT 8
EKONOL SITE INSPECTION FORM
WHEATFIELD, NEW YORK

Date of Inspection: **Time:**

Inspector(s) Name/Title:

Inspection of	**Action Required?**		**Comments/Location**	**Correction Date**
	Yes	**No**		
1. Site Institutional Controls				
A. Any site groundwater use?				
B. Any site excavation work?				
C. Any new buildings developed in area?				
D. Any residential buildings on the site?				
2. Site Engineering Controls				
A. Condition and effectiveness of bioreactor asphalt cap?				
3. Site Management Activities				
A. Semi-annual groundwater sampling being completed?				
B. Site Health and Safety inspections being completed?				
4. Site Records				
A. Site records up to date? (ie- field notebook, field forms, etc.)				

Inspection of	**Action Required?**		**Comments/Location**	**Correction Date**
	Yes	**No**		
5. General Site Conditions				
A. Monitoring wells				
B. Fences/Gates				
C. Other Site conditions				
6. Compliance with Operation and Maintenance Plan				
A. Permits up to date?				
B. Schedule maintained?				

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

Quality Assurance Project Plan (QAPP)
For
Ekonol Polyester Resins
Wheatfield, New York
NYSDEC Site # V00653-9

Prepared For:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Hazardous Waste Remediation
625 Broadway, 12th floor
Albany, NY 12233-7012

Prepared By:

PARSONS
40 La Riviere Drive, Suite 350
Buffalo, New York 14202

July 2015

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LIST OF ACRONYMS

ASTM	American Society for Testing and Materials
BFB	4-Bromofluorobenzene
ºC	Degrees Celsius
CAR	Corrective Action Request
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Emergency Response, Compensation, Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm/s	centimeter per second
COC	Chain-of-Custody
CPOI	Chemical Parameter of Interest
CVAA	Cold Vapor Atomic Absorption
cy	cubic yards
DFTPP	decafluorotriphenylphosphine
DOT	Department of Transportation
DQO	Data Quality Objective
DUO	Data Use Objective
DUSR	Data Usability Summary Report
EDD	Electronic Data Deliverable
FAP	Field Activities Plan
FS	Feasibility Study
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detection

LIST OF ACRONYMS
(CONTINUED)

GC/MS	Gas Chromatography/Mass Spectroscopy
HSC	Health and Safety Coordinator
ICP	Inductively Coupled Plasma
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
ICP/AES	Inductively Coupled Plasma/Atomic Emission Spectroscopy
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
LNAPL	Light Non-aqueous Phase Liquid
LPM	Laboratory Project Manager
MD	Matrix Duplicate
mg/kg	milligram per kilogram
mL	milliliter
MS	Matrix Spike
MSB	Matrix Spike Blank
MS/MD	Matrix Spike/Matrix Duplicate
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSD	Matrix Spike Duplicate
NCM	Nonconformance Memo
ng	nanograms
NIOSH	National Institute of Safety and Health
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
OM	Operations Manager
OSHA	Occupational Safety and Health Administration
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
PCB	Polychlorinated Biphenyl

LIST OF ACRONYMS
(CONTINUED)

PE	Performance Evaluation
PID	Photoionization Detector
PRRL	Project Required Quantitation Limit
PT	Performance Testing
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SMU	Sediment Management Unit
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
ug	Micrograms
USEPA	Unites States Environmental Protection Agency
VOC	Volatile Organic Compound

SECTION 1

PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared to support activities and specifies the quality assurance/quality control (QA/QC) procedures for field and laboratory sampling and measurements for the volunteer remedial investigation at Ekonol Polyester Resins, Wheatfield, NY NYSDEC Site # V00653-9. The specific objectives of the QAPP are:

- Foster data quality that is sufficient to meet the investigation objectives and to support the decision-making process
- Provide a standard for control and review of measurement data to confirm that the data are scientifically sound, representative, comparable, defensible, and of known quality.

This QAPP has been prepared in accordance with USEPA guidance (USEPA, 2000a, 2002b).

Project scope and descriptions of the work assignment are provided in the Work Assignment Scoping Documents and Field Activities Plan (FAP).

1.2 SITE BACKGROUND

Atlantic Richfield Company (ARC) is remediating the Ekonol Polyester Resins facility in Wheatfield, New York as a volunteer in the New York State Department of Environmental Conservation (NYSDEC) Voluntary Cleanup Program (VCP). ARC does not currently own the Site. In October 1999, a concrete secondary containment tank at the facility was removed from service and impacts to soil and groundwater were observed. Key chemicals of concern include trichloroethene (TCE), tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-1,2 DCE), phenol, and metals such as lead and zinc.

Following characterization, in February 2006 a Remedial Alternatives Report was submitted to NYSDEC. The preferred remedial strategies are engineering and institutional controls for the soils, a passive bioreactor for the shallow groundwater and *in situ* remediation for deep groundwater. In 2007 through 2009 a bench scale treatability test and a pilot test were conducted to evaluate *in situ* treatment options for bedrock groundwater. Following the pilot test for deep groundwater, NYSDEC approved the remedial approach. ARC began implementing full-scale bioremediation treatment in both shallow and bedrock groundwater in 2011. The passive bioreactor trenches to treat shallow groundwater were installed in April 2011, and vegetable oil substrate injections to treat bedrock groundwater were performed in July 2011 and November 2012. Continued monitoring of shallow overburden and bedrock wells were performed for two years to evaluate performance of the bioremediation treatment.

In addition to the *in situ* bioremediation, ARC has installed a sub-slab depressurization (SSD) system in the office area of the onsite building currently being leased by St. Gobain at the referenced Site. ARC agreed to install the SSD system to limit the potential migration of volatile organic compounds (VOCs), primarily PCE, from sub slab soil gas into indoor air in the office area of the building. ARC installed the SSD system with the expectation that the current owner or tenant would manage operations, maintenance, and additional sub-slab or indoor air testing.

The current remediation strategy for the Site includes supplemental bioremediation injections with continued monitoring for two years. The strategy also calls for institutional controls (maintain fence and paving over the bioreactor area). Continued monitoring is intended to show reduced groundwater concentrations, with improved groundwater quality and minimized potential for migration of chemicals of concern across the property boundary. Overall exit will be obtained through negotiation with NYSDEC, and providing evidence that no further remediation or monitoring is warranted.

SECTION 2

PROJECT ORGANIZATION

2.1 GROUP ENVIRONMENTAL MANAGEMENT CO. PROJECT MANAGER

Michael Teeling
Principal Geologist
Atlantic Richfield Project Manager

2.1.1 Parsons Project Team

Project Manager – George Hermance

Technical Directors – Glenn Ulrich and Mark Raybuck

Field Team Leader – Rob Piurek

Quality Assurance Officer – Maryanne Kosciewicz

2.1.2 Analytical Services

The laboratory identified to provide primary analytical support for this project is Eurofins/Lancaster Laboratories, 2425 New Holland Pike, Lancaster, PA 17601. Laboratory operations will be conducted under the supervision of a laboratory director and a quality assurance manager. A project manager will be assigned to each project. The project manager will be the primary point of contact and will be responsible for coordination and quality of all laboratory activities associated with the project. The laboratory's project manager will manage project sample receipt, analysis scheduling, and data reporting. In case of temporary absence, the laboratory supervisor or alternate project manager will assume the responsibilities of the absent employee or delegate the responsibility to qualified personnel. Sample Management Staff is responsible for receiving, logging, and maintaining internal custody of samples during the sample's residence in the laboratory. In addition, the laboratory will ensure that project analytical requirements are met; monitor project analytical compliance and immediately notify Parsons if conflict or discrepancies arise; initiate and implement appropriate corrective actions; ensure adequate quality review of deliverables prior to release; and participate in coordination meetings.

Biological samples for Micro-Gene analysis of dehalococcoides (DHC) and dehalobacter (DHB) by CENSUS is completed by Microbial Insights, 2340 Stock Creek Blvd, Rockford, TN 87853-3044. All other analyses will be performed by Eurofins/Lancaster Laboratories, Lancaster, PA.

Eurofins/Lancaster Laboratory Director – Duane Luckenbill, Vice President

Eurofins/Lancaster Quality Assurance Manager – Dorothy M. Love

Eurofins/Lancaster Project Manager – Kaitlin Plasterer (717) 656-2300 x1815

Microbial Insights Project Manager – Greg Davis (865) 573-8188

2.2 SPECIAL TRAINING/CERTIFICATION

Management and field personnel must review the requirements of this QAPP to make certain that persons assigned to specific tasks have appropriate credentials and experience. The Field Team Leaders will check that all onsite personnel have read and understood the QAPP.

Field personnel will be required to adhere to the Health and Safety Plan (HASP) and FAP. They must also follow applicable task-specific health and safety plans that project subcontractors develop before they begin investigation activities.

Laboratories will have trained and experienced staff capable of performing the analyses specified in this QAPP. Laboratories will have New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certification for all analyses pertaining to solid and hazardous waste categories. Additionally, the laboratories must be able to demonstrate that they have analyzed performance-evaluation or proficiency-testing samples within 12 months of beginning the analyses.

All personnel independent of the laboratory generating the data who are performing data validation and verification must have experience in data validation, quality assurance oversight, and auditing. The data validator must have a Bachelors degree in chemistry or natural sciences with a minimum of 20 credit hours in chemistry; one year experience in the implementation and application of analytical laboratory methodologies; and one year experience evaluating data packages of all matrices (e.g., soil, water, air, tissue) for compliance and usability with respect to the NYSDEC Analytical Services Protocol (ASP) and the USEPA Region 2 National Functional Guidelines.

SECTION 3

DATA QUALITY OBJECTIVES AND CRITERIA

3.1 INTRODUCTION

A systematic planning process will develop site-specific data quality objective (DQOs). These DQOs will clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential errors. These parameters, in turn, will be the basis for establishing the quality and quantity of data needed to support the utility of the data. This section was prepared in accordance with USEPA Guidance for the Data Quality Objectives Process (USEPA, August 2000). Project DQOs will be developed using the "seven-step" DQO process, consisting of the following steps:

Step 1: State the problem
Step 2: Identify the decision
Step 3: Identify inputs to the decision
Step 4: Define the study boundaries
Step 5: Define the decision rule
Step 6: Specify tolerable limits of decision error
Step 7: Optimize the design

Data quality objectives specify the underlying reason for collecting the data and the data type, quality, quantity, and uses needed to make decision, and they provide the basis for designing data collection activities. DQOs and quality assurance objectives are related data quality planning and evaluation tools for all sampling and analysis tools.

The purpose of this QAPP is to provide a standard for control and review of measurement data to ensure they are scientifically sound, representative, comparable, defensible, and of known quality. The data will be used to evaluate the physical and chemical attributes of samples collected. The project objective for analytical testing is to characterize the physical characteristics and chemical constituents and to provide data to support the decision-making process.

The data produced during sampling activities will be compared with the defined QA objectives and criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) to see that the data reported are representative of actual conditions at the site.

This data assessment activity is an on-going coordinated process with data production and is intended to assure that data produced during the project are acceptable for use in subsequent evaluations. Both statistical and qualitative evaluations will be used to assess the quality of the data. The primary evaluation of the data will be based upon the field quality control samples described in Section 8.1.1 and the laboratory quality control samples described in Section 8.1.2. The "blank" samples (laboratory QC blank samples and field QC blank samples) will be used to evaluate whether or not the laboratory and/or field sample handling represent a possible source of sample contamination. Laboratory duplicate sample results will be used to evaluate analytical precision. Field duplicate sample results will be used to evaluate the overall precision of the sampling and analysis process, as well as sample representativeness and site heterogeneity. Laboratory control samples will be used to evaluate the accuracy of analytical results, as will other analysis-specific criteria, such as surrogate compound recoveries for VOCs. Matrix spike/matrix spike duplicate (MS/MSD) analysis of project samples will be used to evaluate potential sample matrix effects on the analytical results (both of the sample utilized for MS/MSD and of other samples collected from the site). For all sample results, the impact of sample-specific, analysis-specific, and site-specific factors will be evaluated and an assessment will be made as to their impact, if any, on the data. Duplicate sample (field and laboratory QC samples) results will be used to evaluate data precision.

3.1.1 Data Use Objectives

Data use objectives define why analyses are being conducted and how ultimately the data will be used to meet the overall project objectives. For the work assignment activities, these project objectives are stated in the Work Assignment Scoping Documents.

3.2 DATA QUALITY OBJECTIVES (PARCCS PARAMETERS)

3.2.1 Introduction

DQOs are based on the premise that different data uses require different levels of data quality. The term *data quality* refers to a degree of uncertainty with respect to PARCCS data quality indicators. Specific objectives are established to develop sampling protocols and identify applicable documentation, sample handling procedures, and measurement system procedures. These DQOs are established by onsite conditions, objectives of the project, and knowledge of available measurement systems. Overall work assignment DQOs are presented and discussed in detail in this QAPP. A wide range of data quality is achieved through the use of various analytical methods. The following data quality levels are widely accepted as descriptions of the different kinds of data that can be generated for various purposes:

- **Level I, Field screening or analysis using portable instruments (e.g., photoionization detector [PID]):** Results are often not compound-specific but results are available in real time. Depending on the analysis being performed and the instrumentation used, the results may be considered qualitative, semi-quantitative, or quantitative.
- **Level II, Field analysis using more sophisticated portable analytical instruments (e.g., on-site mobile laboratory):** There is a wide range in the quality of data that can be generated depending on the use of suitable calibration standards, reference materials, and sample preparation equipment. Results are available in real-time or typically within hours of sample collection.
- **Level III, All analyses performed in an off-site analytical laboratory using methods other than USEPA-approved analytical methods**: These data generally do not include the level of formal documentation required under Level IV and are not

subject to formal data validation. These data are typically used for engineering studies (e.g., treatability testing), site investigations and remedial design.

- **Level IV, Data generated using USEPA methods and enhanced by a rigorous QA program, supporting documentation, and data validation procedures:** These data are typically used for engineering studies (e.g., treatability testing), risk assessment, site investigations, and remedial design, and may be suitable for litigation/enforcement activities. Results are both qualitative and quantitative.

3.2.2 PARCCS Parameters (Data Quality Indicators)

3.2.2.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), absolute difference (D), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

The objectives for precision for each chemical are based on the capabilities of the approved EPA analytical method with respect to laboratory performance. For this project, field-sampling precision will be determined by analyzing coded (blind) duplicate samples for the same parameters, and then, during data validation, calculating the %RPD for duplicate sample results. The laboratory will determine analytical precision by calculating the %RPD or %D, as applicable to the analytical method being used, e.g., pH will be evaluated using %D.

The laboratory will determine analytical precision by calculating the RPD for the results of the analysis of the laboratory duplicates and matrix spike duplicates. The formula for calculating %RPD is as follows:

$$\%RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

Where,

RPD	=	Relative percent difference
V1, V2	=	Values to be compared
|V1 - V2|	=	Absolute value of the difference between the two values
(V1 + V2)/2	=	Average of the two values

For data evaluation purposes, in instances where both sample concentrations are less than five times (<5x) the RL, duplicate precision will be evaluated using the calculated %D result. In this instance, the applicable precision criterion will be two times the RL (2xRL). If a value is not detected, the %RPD criterion will be considered to be not applicable and the %RPD will not be calculated (i.e. precision will not be quantitatively determined).

3.2.2.2 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987) or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity that is recovered or measured. The recovery of a given analyte depends on the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are less than the quantitation limits are less accurate because they are more affected by such factors as instrument "noise." Higher concentrations will not be as affected by instrument noise or other variables and, thus, will be more accurate.

The objectives for accuracy for each chemical are based on the capabilities of the approved USEPA analytical method with respect to laboratory performance. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), the percent recoveries of matrix spike compounds added to selected samples, and the percent recoveries of spike compounds added to laboratory control samples (LCS), or matrix spike blanks (MSB). An LCS (or MSB) will be analyzed to provide additional information on analytical accuracy. Additionally, initial and continuing calibrations must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a *spike*, added to a sample (matrix spike or laboratory control). The accuracy on a per sample basis will be measured using surrogates for the organics analyses. The %R is calculated as follows:

Matrix Spike Recovery:

$$\%\, Recovery = \frac{SSR - SR}{SA} \times 100$$

Where,

SSR = Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added.

SR = Sample result: the background value; *i.e.,* the concentration of the analyte obtained by analyzing the sample.

SA = Spiked analyte: concentration of the analyte spike added to the sample.

Surrogate and Spike Recovery:

$$\%\,Recovery = \frac{Concentration\ (or\ amount)\ found}{Concentration\ (or\ amount) spiked} \quad x\ 100$$

3.2.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or an environmental condition. Representativeness is a qualitative parameter and is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. An important factor in the selection of sample locations and sampling procedures will be obtaining representative samples.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree technically possible, that the data derived represents the in-place quality of the material sampled. Care will be exercised to see that chemical compounds are not introduced to the sample from sample containers, handling, and analysis. Field blanks, trip blanks, and laboratory method/prep blanks will be analyzed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded (blind) field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis such that the reported results are representative of the sample received. Chain-of-custody procedures will be followed to document the possession of sample containers from the time of container preparation through sample collection and receipt back at the laboratory. Field QC samples will be collected and analyzed to provide information to evaluate sample representativeness. Details of field QC sample collection (rinse blanks, trip blanks, temperature blanks, field duplicates) and chain-of-custody procedures are presented in Section 4.2 and Section 8.1.1.

3.2.2.4 Completeness

Completeness is defined as the percentage of measurements that meet the project's data quality objectives (USEPA, 1987). Completeness is calculated for each method (or analyte) and sample matrix for an assigned group of samples. Completeness for a data set represents the results usable for data interpretation and decision making. The completeness objective for the analytical and field data is 90%. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where,

%C = Percent completeness

V = Number of measurements judged valid (not rejected during data validation)

T = Total number of measurements

Completeness, which is expressed as a percentage, is calculated by subtracting the number of rejected and unreported results from the total planned results and dividing by the total number of results. Results rejected because of out-of-control analytical conditions, severe matrix effects, broken or spilled samples, or samples that could not be analyzed for any other reason, negatively affect completeness and are subtracted from the total number of results to calculate completeness.

3.2.2.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be managed by:

- Using identified standard methods (including laboratory standard operating procedures) for both sampling and analysis phases of this project
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST)
- Requiring that calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable)
- Using standard reporting units and reporting formats including the reporting of QC data
- Performing data validation on the analytical results, including the use of data qualifiers in all cases where appropriate
- Evaluating the sample collection information and analytical QC sample results
- Requiring that the significance of all validation qualifiers be assessed any time an analytical result is used for any purpose.

By taking these steps during the investigation, future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

3.2.2.6 Sensitivity and Quantitation Limits

When selecting an analytical method during the DQO process, the achievable detection limit (MDL) and method reporting limit (RL) must be evaluated to verify that the method will meet the project quantitation limits necessary to support project decision making requirements. This process ensures that the analytical method sensitivity has been considered and that the methods used can produce data that satisfy users' needs while making the most effective use of resources. The concentration of any one target compound that can be detected and/or quantified is a measure of sensitivity for that compound. Sensitivity is instrument-, compound-, method-, and matrix-specific and achieving the required project quantitation limit (RL) and/or method detection limit (MDL) objectives depends on instrument sensitivity and potential matrix effects. With regard to instrument sensitivity, it is important to monitor the instrument performance to ensure consistent instrument performance at the low end of the calibration range. Instrument sensitivity will be monitored through the analysis of method/prep blanks, calibration check samples, and low standard evaluations.

Laboratories generally establish limits that are reported with the analytical results; these results may be called reporting limits, detection limits, quantitation limits, or other terms. These laboratory-specific limits, apply undiluted analyses and must be less than or equal to the project RLs. The RL, also known as the practical quantitation limit (PQL), represents the concentration of an analyte that can be routinely measured in the sampled matrix within stated limits and with confidence in both identification and quantitation. Throughout various documents RL and PQL may be interchanged, but they effectively have the same meaning. The RLs are established based on specific knowledge about the analyte, sample matrix, project specific requirements, and regulatory requirements. The RL is typically established by the laboratory at the level of the lowest calibration standard and is generally in the range of two to ten times the MDL.

The method detection limit (MDL) is defined as "the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero" (40 CFR 136 Appendix B). The MDL is the lowest concentration at which a specific analyte in a matrix can be measured and reported with 99% confidence that the analyte concentration is greater than zero. MDLs are experimentally determined and verified for each target analyte of the methods in the sampling program. The laboratory will determine MDLs for each analyte and matrix type prior to analysis of project samples. In addition, when multiple instruments are employed for the analysis of the same method, each individual instrument will maintain a current MDL study. MDLs are based on the results of seven matrix spikes at the estimated MDL, and are statistically calculated in accordance with the Title 40, Code of Federal Regulations Part 136 (40 CFR 136) Appendix B. The standard deviation of the seven replicates is determined and multiplied by 3.14 (i.e., the 99% confidence interval from the one-sided student t-test). If risk-based project objectives are developed, then where practicable, MDLs must be lower than the risk-based criteria determined for the project.

The MDLs to be used are intended to allow that both nondetected and detected target compound results will be usable to the fullest extent possible for the project. An MDL check sample an (interference-free MS with all method target compounds) must be analyzed following the MDL study to determine if reasonable MDL concentrations have been achieved. The MDL check sample should be at a concentration in the range of two to four times the MDL. If any target compound is not recovered, the MDL study must be repeated. In this case, the repeated MDL should be performed with a higher concentration, based on the analyst's judgment, of the target compounds that failed in the MDL check sample. MDLs must be determined annually at a minimum, and verified by analyzing an MDL check sample on each instrument used for the applicable method.

Laboratory RLs and MDLs for all analyses will meet at a minimum the standards criteria specified in the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) “Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.”

All analytical results will be reported to the MDL. Analytical results below the MDL will be flagged with a *U* at the RL for organics and MDL for metals to indicate the data are non-detect. However, the laboratory will flag analytes detected at a level less than the RL but greater than the MDL (or the laboratory’s determined minimum reportable concentration) with a *J* to denote an estimated concentration.

When results are corrected for dry weight, the reporting limits are then elevated accordingly. To compensate for the low solids, modifications are made either to increase the initial volume extracted/digested or to reduce the final volume of extract/digestate.

For samples that do not meet the project-specified RLs or MDLs, (taking into consideration elevated detection limits due to percent solids or percent moisture and aliquots used for the designated analysis), the laboratory must make available compelling documentation (e.g., screening data) and a justifiable explanation for its inability to meet the specified limits using the project protocols. It must also provide an appropriate, justifiable explanation of the issues and resolution in the analytical report/data package (dilution factor, interference, etc.). Excessive, unnecessary dilutions on any sample for a project are unacceptable. The laboratory will analyze all samples initially undiluted, unless for GC/MS analyses (i.e., SW8260B), a preliminary GC-screen is performed and indicates that GC/MS instrument damage or compromise may occur if the sample is not analyzed initially at dilution. In this instance, the sample will be analyzed at the lowest possible dilution factor. If multiple extractions/ analyses are performed (such as undiluted and diluted analyses), resulting in several data sets for the same sample, the laboratory will report all data and results from each of the multiple analyses in the data package.

Quantitation limits for all definitive data quality level laboratory analytical methods, compounds, and matrices are to be addressed for each work assignment in the Work Assignment Scoping Documents. Individual soil sample RLs and MDLs will be adjusted accordingly based on moisture and aliquots used for analysis.

TABLE 3.1
QUALITY CONTROL LIMITS FOR AQUEOUS SAMPLES

Analytical Parameter	Analytical Method	MS/MSD % Recovery	Duplicate RPD	LCS % Recovery	Surrogate % Recovery
VOCs	SW8260B	Laboratory determined QC limits	≤50	Laboratory determined QC limits	Laboratory determined QC limits
Dissolved Gas VOCs	RSK-175	Laboratory determined QC limits	≤50	Laboratory determined QC limits	Laboratory determined QC limits
Dissolved Metals	SW6010B	Laboratory determined QC limits	≤20	Laboratory determined QC limits	NA
Total Organic Carbon (TOC)	SW9060	Laboratory determined QC limits	≤20	Laboratory determined QC limits	NA
Sulfate	E300.1	Laboratory determined QC limits	≤50	Laboratory determined QC limits	NA
Sulfide	SM 4500-S2-F	Laboratory determined QC limits	≤50	Laboratory determined QC limits	NA
Microbiological Gene Analysis	CENSUS	Laboratory determined QC limits	Laboratory determined QC limits	Laboratory determined QC limits	NA

MS/MSD = Matrix Spike/Matrix Spike Duplicate

LCS = Lab Control Spike Sample

NA = not applicable

SECTION 4

SAMPLING AND DATA ACQUISITION

4.1 SAMPLING METHODS

Any non-disposable sampling equipment used for chemical sampling will be cleaned and decontaminated prior to use to prevent potential cross-contamination between each use. Additionally, this QAPP describes management, handling, and tracking procedures for investigation-derived waste, including solid and liquid materials, and personal protective equipment.

The special precautions described here will be taken to confirm that each sample collected is representative of the conditions at that location and that the sampling and handling procedures neither alter nor contaminate the sample. If failure in the sampling or measurement system occurs, the procedures specified in Section 10.3 of this QAPP will be followed to identify who is responsible for implementing the appropriate corrective action. This section presents sample container preparation procedures, sample preservation procedures, and sample holding times.

For this program, the laboratory will purchase and distribute certified clean sample containers with chemical preservatives. The sample containers used for chemical analysis must be virgin bottleware, I-Chem^{TM} Series 300 (or equivalent). Vendors are required to provide documentation of analysis for each lot of containers, and the documentation will be kept on file at the laboratory. Alternatively, the laboratory may perform testing to certify that the sample containers are not contaminated. Since the containers supplied by the laboratory will be certified clean, the bottles will not be rinsed in the field prior to use.

Laboratory-supplied sample kits (coolers containing field chain-of-custody forms, custody seals, sample containers, preservatives, and packing material) will be prepared by the laboratory's Sample Management Staff and shipped to the Field Team Leader. The type of containers, required sample volumes, preservation techniques, and holding times for specific analyses are presented in Table 4.1.

Samples requiring chemical preservation will be collected in sample containers provided by the analytical laboratory that already contain sufficient quantities of the appropriate preservative(s) to ensure that the sample is kept in accordance with the method requirements. The laboratory must provide an adequate amount of pre-preserved bottles with traceable high-purity preservatives, and additional preservative for use if the added amount is not sufficient, based on request by the Field Team Leader and on an as-needed basis if additional bottleware is needed during the field activities. The field team must verify that the preservative has been added appropriately.

4.2 SAMPLE HANDLING AND CUSTODY

This section presents sample handling and custody procedures for both the field and laboratory. Implementation of proper handling and custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the chain of custody and transfer of samples will be trained as to the purpose and procedures prior to implementation. For transfer of samples within the laboratory, an internal chain of custody will be required.

4.2.1 Sample Handling

Samples to be collected for each work assignment will be specified in the Work Assignment Scoping Documents and FAP. After the samples are collected, they will be split as necessary among preserved containers appropriate to the parameters to be analyzed. Each container will be provided with a sample label that will be filled out at the time of collection. The sampler will print label information, specified below, on each label either before or immediately after collecting the sample with an indelible writing instrument. The label will be protected from water and solvents with clear label packing tape.

The following information, at a minimum, is required on each sample label (note: the location ID and the sample ID as described in the Data Management section below inherently identify some of this information, see below):

- Client
- Project name
- Sampling location
- Sample number
- Date and time of sample collection
- Parameters to be analyzed
- Preservative(s) added, if any
- Initials of the sampler.

Following sample collection, excess soil, water, etc., will be wiped from the outside of the sample containers with a paper towel and the lids will be checked to verify they are tightly closed. Each glass container will be wrapped with bubble wrap to minimize breakage during transport. Bottles containing soil, sediment, and water samples will be placed in separate Ziploc$^{®}$ bags (one bag) and set on ice (ice bath not necessary). Documentation of equipment and methods used in the field for treating the samples will be maintained in the field logbooks, and a chain of custody will be initiated to document transfer of the samples from the field team to the laboratory. In preparation for shipment to the analytical laboratory, the shipment cooler will be packaged as follows:

- Fill a dry shipment cooler with inert cushioning to a depth of 1 inch to prevent bottle breakage.
- Place the bagged samples and the laboratory-provided temperature blank upright in the sample cooler. The temperature blank should be placed in the center (horizontally and vertically) with the samples surrounding.
- Place additional cushioning material around the sample bottles as necessary.
- Place bags of ice in the remaining void space to keep the samples cooled to 4°C.

- Complete the chain-of-custody form (see Section 4.2.2). Place the chain-of-custody form in a polyethylene, sealable bag (such as a 1-gal Ziploc® bag or equivalent) and tape the bag to the interior of the cooler lid. Field personnel retain a copy of the chain-of-custody form; another copy is transmitted to the QAO and the Project Manager specified in the Work Assignment Scoping Documents.
- Prior to sealing for shipment, the list of samples will be checked against the container contents to verify the presence of each sample listed on the chain-of-custody record including the temperature blank.
- Affix a custody seal to the cooler.
- Seal the cooler securely with packing tape, taking care not to cover labels if already present.
- Label the cooler appropriately in accordance with the Department of Transportation (DOT) regulations (49 CFR 171 through 179).
- Ship the samples in accordance with the DOT requirements outlined in 49 CFR 171 through 179. Complete the carrier bill of lading, and retain a copy on file.
- Samples will be delivered to the laboratory by the most expedient means to meet holding times. Whenever practicable, samples will be shipped on the day of collection for delivery to the laboratory the morning of the day after collection. The laboratory will be required to adhere to EPA Region 2 holding times. Laboratory performance requirements for analysis turnaround time will be established using the validated time of sample receipt (VTSR) in accordance with NYSDEC requirements. The field team will carefully coordinate sampling activities with the laboratory to see that holding times are met.

The required holding times must be adhered to for the initial sample preparation/analysis. If subsequent reanalysis or re-extraction becomes necessary because of method requirements or additional requirements stated here, the laboratory will make every effort to perform those re-extractions and/or reanalysis within the primary holding times. Any holding time that is exceeded will be reported immediately to the Project Manager and the QAO by the laboratory QA manager.

4.2.2 Field Sample Custody

The primary objective of sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of samples from the moment of their collection through analysis until their final disposition. A sample (or sample container) will be considered under custody if:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with custody seals placed on the sample cooler so that no one can tamper with it after having been in physical custody
- In a secured area that is restricted to authorized personnel.

The sample custody flowchart is shown in Figure 4.1.

DATA REQUIRED ON CHAIN-OF-CUSTODY*
Project name and client
Signatures of samplers
Sample number, date and time of collection, and grab or composite sample designation
Signatures of individuals involved in sample transfer
If applicable, the air bill or other shipping number
ADDITIONAL ITEMS THAT SHOULD BE INCLUDED:
Sample matrix
Number of sample containers
Analyses to be performed,
Preservative(s)
Name of the analytical laboratory to which the samples are sent
Method of sample shipment
Project number.
*Required by guidance in SW846 Test Methods for Evaluating Solid Waste, Physical and Chemical (USEPA, 1997)

A chain-of-custody record will accompany the samples from the time the samples leave the original sampler’s possession through the sample shipments’ receipt at the laboratory. Triplicate copies of the chain-of-custody record must be completed for each sample set collected. See chart for data requirements.

If samples are split and sent to different laboratories, a copy of the chain-of-custody record is sent with each sample.

The REMARKS space on the chain-of-custody form is used to indicate if the sample is a matrix spike/matrix spike duplicate (MS/MSD) or matrix spike/matrix duplicate (MS/MD), or any other sample information for the laboratory. Since they are not specific to any one-sample point, blanks are indicated on separate rows. Immediately prior to sealing the sample cooler, the sampler will sign the chain-of-custody form and write the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper air bill number on the top of the chain-of-custody form. Mistakes will be crossed out with a single line in ink and initialed by the author.

Sampling personnel will retain one copy of the chain-of-custody form, and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs his or her name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. Field personnel then relinquish the cooler to personnel responsible for shipment, typically an overnight carrier.

The chain-of-custody seal must be broken to open the sample cooler. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Field Team Leader for direction on whether to proceed with the analyses.

Sampling personnel record the information placed on the chain-of-custody record in the field logbook. They also include in the log book a detailed description of the exact locations from which the samples were collected, any pertinent conditions under which the samples were obtained, and the lot number of the containers used.

4.2.3 Laboratory Sample Management

The laboratory has a designated Sample Management Staff responsible for receiving samples in the laboratory, opening the coolers, checking the sample integrity and custody seals, logging samples into the laboratory information management system (LIMS), and controlling the handling and storage of samples while in the laboratory. The laboratory is a secure facility and only authorized laboratory personnel are allowed to handle active samples. The laboratory maintains an SOP for sample management.

4.2.4 Sample Receipt and Logging

Upon receipt at the laboratory, sample-receiving personnel inspect the samples for integrity of the custody seal, check the shipment against the chain-of-custody form, and note any discrepancies. Specifically, the sample-receiving personnel note any damaged or missing sample containers. At this time, the field chain-of-custody record is completed and signed by the Sample Management Staff.

Using the temperature blank in each cooler, the temperature of each incoming sample cooler is measured and recorded during the sample receipt and log-in procedures before samples are placed in laboratory cold storage. Similarly, the laboratory documents that its cold storage facilities are being maintained through daily (at a minimum) documented temperature measurements using a thermometer.

Upon receipt, Sample Management Staff measure and record on the preservation documentation sheet the pH of acid- or base-preserved aqueous samples. Any problems observed during sample receipt must be communicated to the Field Team Leader and/or the QAO verbally and either by fax transmission or email within 24 hr (preferably 3 hr beginning with the normal business day or immediately following for problems noted during second shifts or weekends) after discovery and before samples are released to the laboratory for analysis. Problems may include but are not limited to broken bottles, errors or ambiguities in paper work, insufficient sample volume or weight, inappropriate pH, and elevated temperature.

When the shipment is inspected and the chain-of-custody record agree, the sample receiving personnel enter the sample and analysis information into the LIMS and assign each sample a unique laboratory number. This number is affixed to each sample bottle.

4.2.5 Sample Storage Security

While in the laboratory, the samples and aliquots that require cold storage will be stored and will be maintained in a secured refrigerator unless they are being used for preparation and/or analysis. All of the refrigerators in the laboratory used for storage of samples have restricted access and are numbered. In addition, dedicated refrigerators are designated for extracts and analytical standards. The sample storage areas are in the laboratory, and access is limited to laboratory personnel. Specific requirements for sample storage are described below:

- Samples will be removed from the shipping container and stored in their original containers unless damaged.
- Damaged samples will be disposed in an appropriate manner, and the disposal will be documented or repacked as necessary and appropriate.
- Samples and extracts will be stored in a secure area designed to comply with the storage method(s) defined in the contract.
- The storage area will be kept secure at all times. The sample custodian or designated personnel will monitor access to the storage area.
- Standards or reagents will not be stored with samples or sample extracts.

The following standard operating procedures for laboratory sample security will be implemented to confirm that the laboratory satisfies sample chain-of-custody requirements:

- Samples will be stored in a secure area.
- Access to the laboratory will be through a monitored area. Other outside access doors to the laboratory will be kept locked.
- Visitors must sign a visitor’s log and will be escorted while in the laboratory.
- Refrigerators, freezers, and other sample storage areas will be securely maintained.

Storage blanks will be initiated and analyzed on a weekly basis for each cold storage unit used to hold samples submitted for the analysis of VOCs. Field QC samples must be stored in the same cold storage units as the samples that they are associated with (even if the matrices are different). All soil samples must undergo thorough sample homogenization (stirred within the original sample container) using inert utensils and mixing platforms that will not interfere with the target analytes being requested for analysis with the exception of soil samples submitted for the analysis of VOCs. Samples for VOC determinations will be stored in a secure refrigerator separate from other samples, sample extracts, reagents, and standards.

4.2.6 Retention and Disposal of Samples

The laboratory must retain all excess samples within their original sample bottles for a minimum of 30 days in cold storage (4±2 degrees Celsius) following submission of the validated data to NYSDEC. At that time, the laboratory must contact the Field Team Leader for authorization for responsible disposal or further storage instructions. At the point at which the laboratory is provided authorization to dispose of the samples, the laboratory will be responsible, and will assume all liability for proper characterization and disposal of samples and bottleware in accordance with all local, state, and federal regulations.

FIGURE 4.1
SAMPLE CUSTODY FLOW CHART

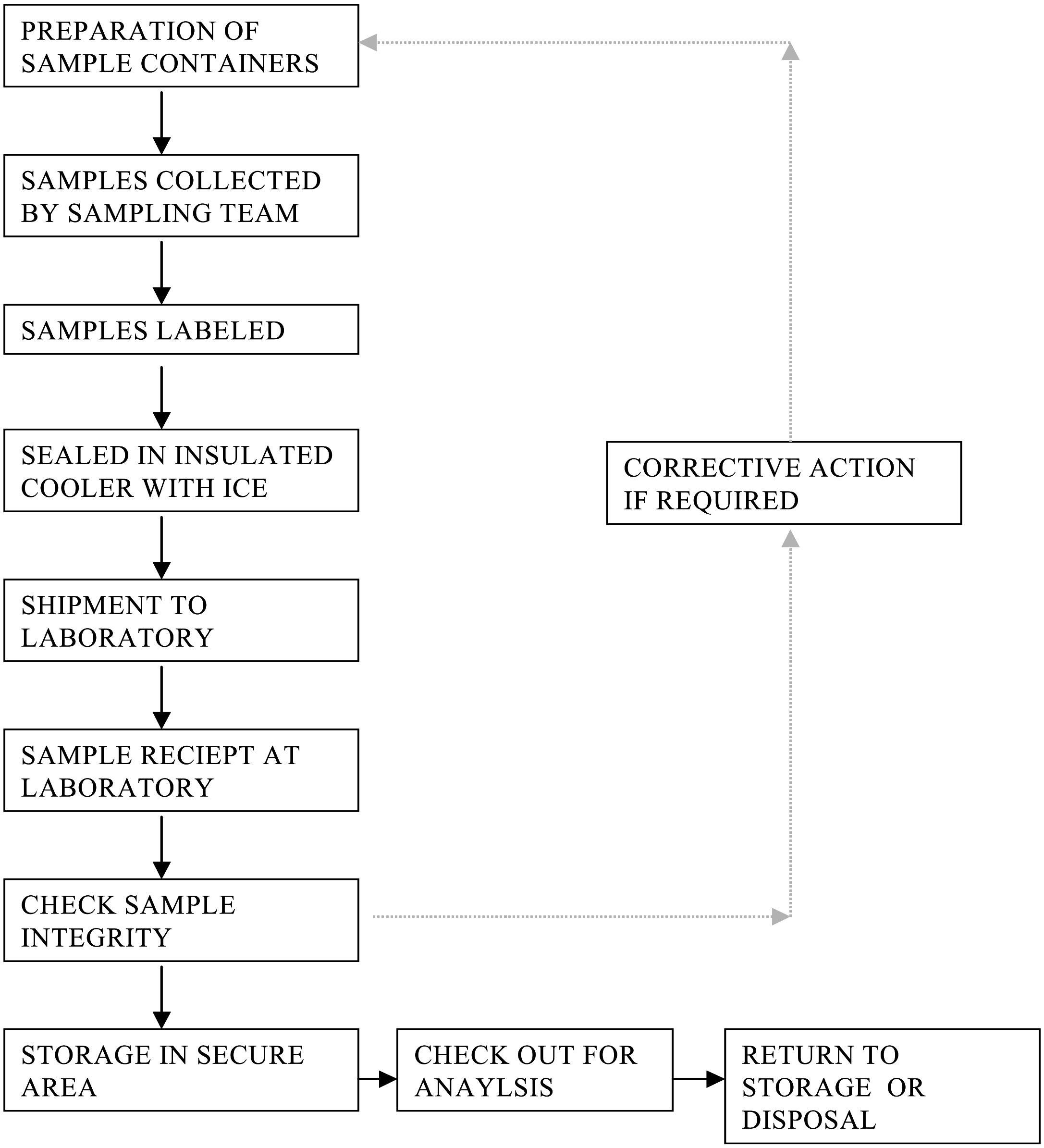
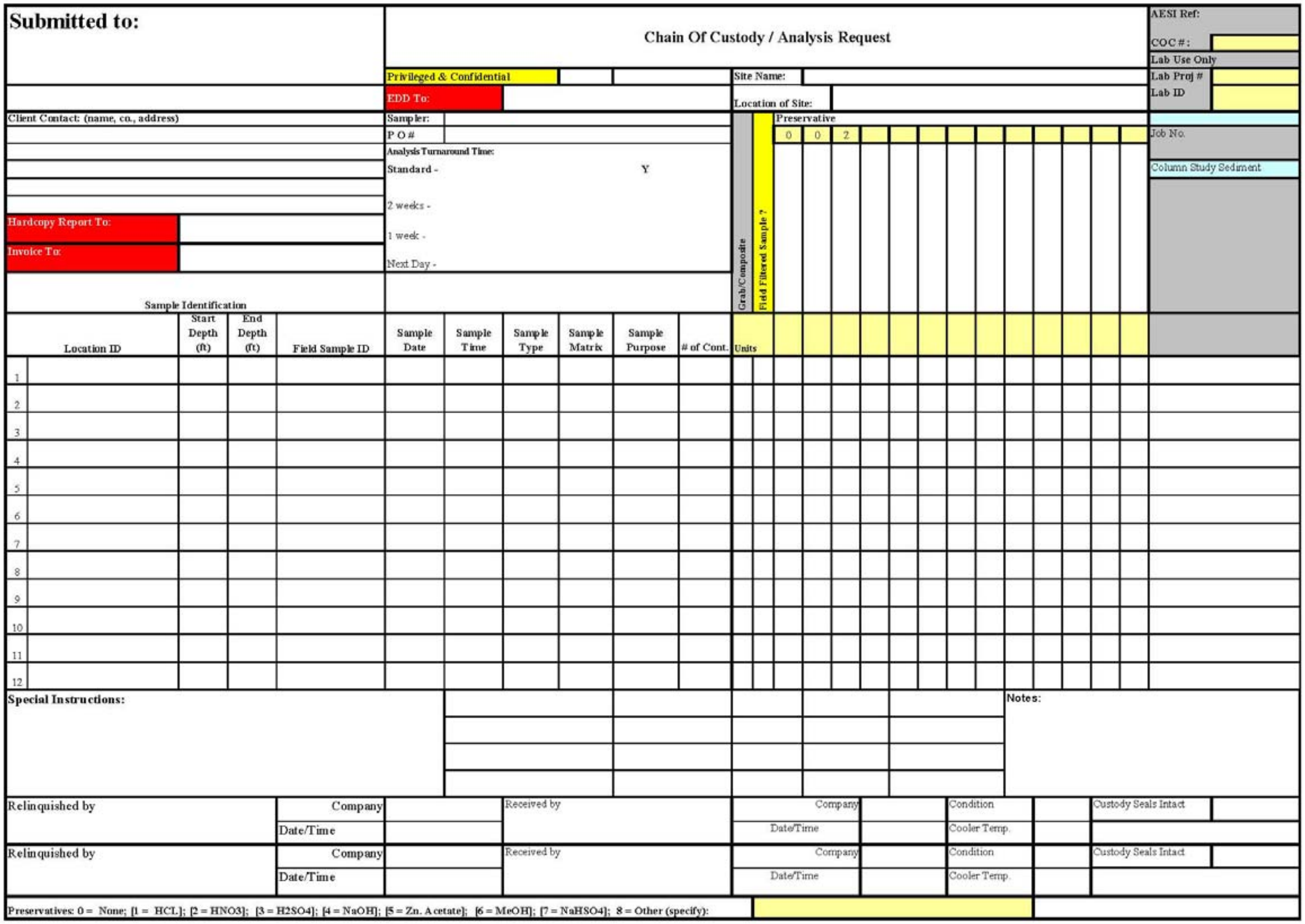


FIGURE 4.2 EXAMPLE CHAIN-OF-CUSTODY RECORD



Submitted to:

Chain Of Custody / Analysis Request

AESI Ref:
COC #:
Lab Use Only
Lab Proj #
Lab ID

Privileged & Confidential
EDD To:
Site Name:
Location of Site:

Client Contact: (name, co., address)
Hardcopy Report To:
Invoice To:

Sampler:
P O #
Analysis Turnaround Time:
Standard - Y
2 weeks -
1 week -
Next Day -

Job No.
Column Study Sediment

Sample Identification

	Location ID	Start Depth (ft)	End Depth (ft)	Field Sample ID	Sample Date	Sample Time	Sample Type	Sample Matrix	Sample Purpose	# of Cont.	Grab/Composite	Field Filtered Sample ?	Preservative													
													0	0	2											
											Units															
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Special Instructions:

Notes:

Relinquished by	Company		Received by	Company		Condition		Custody Seals Intact			
	Date/Time			Date/Time		Cooler Temp.					
Relinquished by	Company		Received by	Company		Condition		Custody Seals Intact			
	Date/Time			Date/Time		Cooler Temp.					

Preservatives: 0 = None; [1 = HCL]; [2 = HNO3]; [3 = H2SO4]; [4 = NaOH]; [5 = Zn. Acetate]; [6 = MeOH]; [7 = NaHSO4]; 8 = Other (specify):

TABLE 4.1
SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

Matrix	Analysis Parameter	Bottle Type	Preservation[1]	Holding Time[2]
Aqueous	VOCs (SW8260B)	3 x 40 mL glass vials w/ PTFE-lined septum caps	Cool to 4ºC HCl to pH < 2 No Headspace	14 days
Aqueous	Dissolved Gases Methane/Ethane/Ethene (Lab SOP RSK-175)	2 x 40 mL glass vials w/PTFE-lined septum caps	Cool to 4ºC HCl to pH < 2 No Headspace	14 days
Aqueous	Sulfate (E300.1)	2 x 40 mL glass vials w PTFE-lined septum caps	Cool to 4ºC No Headspace	28 days
Aqueous	Dissolved Metals (SW6010B) – Fe, K	250 mL plastic bottle with screw cap	Cool to 4ºC HNO_3 to pH<2	6 months
Aqueous	Sulfide (SM 4500-S2-F)	250 mL glass bottle with screw cap	Cool to 4ºC Add Zinc Acetate plus NaOH to pH >9	7 days
Aqueous	Total Organic Carbon (SW9060)	250 mL plastic bottle with screw cap	Cool to 4ºC H_2SO_4 to pH < 2	28 days

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[1] All samples to be preserved in ice after collection and during transport.
[2] Days from date sampled.

TABLE 4.1
SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

Matrix	Analysis Parameter	Bottle Type	Preservation[1]	Holding Time[2]
Aqueous	Microbial Gene Analysis (Lab SOP CENSUS)	Bio-Flo Filters with caps	Cool to 4ºC	24-48 hours

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[1] All samples to be preserved in ice after collection and during transport.

[2] Days from date sampled.

SECTION 5

DATA MANAGEMENT

5.1 INTRODUCTION

The electronic data management systems for each work assignment will be implemented to process the information effectively without loss or alteration. As of April 1, 2011, the New York State Division of Environmental Remediation (DER) has implemented an Environmental Information Management System (EIMS). The EIMS uses the database software application EQuIS$_{TM}$ from EarthSoft® Inc. In an effort to improve the management of environmental data and reduce paper quantities, all laboratory analytical data minus instrument raw data must be submitted in the DEC-approved Electronic Data Deliverable (EDD).

Data providers must download and install the EQuIS Data Processor (EDP) to check their properly formatted EDD as well as the NYSDEC DER Format file. The EDP performs a series of formatting checks on the EDD and identifies any errors in the data file prior to submission. All EDDs are to be error free when submitted. It is important that the most recent version of the EDP and NYSDEC format file are employed since the valid values used by EIMS are periodically updated for the EDP.

5.2 FIELD DATA MANAGEMENT

The Field Team Leader will manage data generated in the field. He or his designee will be responsible for recording and documenting sampling activities in the field logbook, on sampling records (as appropriate), and on chain-of-custody forms (when samples are collected) as described in Section 4.2.2. The records may be photocopied and stored in the project file along with the original.

A sample nomenclature system will be coordinated with the Data Management Team. Each sample name will be unique to include location ID and field sample ID. The Database Manager will add data to EIMS through the input module of the system.

DATA INPUT TO EIMS MAY INCLUDE:

- –Sample planning information (e.g., sample depth)
- –Chain-of-custody data
- –Sediment coring logs
- –Geotechnical data
- –Location and geographic data
- –Field measurements
- –Meteorological data
- –Waste characterization data
- –Groundwater levels
- –Radiodating data
- –Laboratory analytical data

5.3 LABORATORY DATA MANAGEMENT

Laboratory data management involves several important stages that include data transformation, review, verification, and validation, as well as data storage, retrieval, and security. The laboratory will implement a data management system to manage the data from its generation in the laboratory to its final reporting and storage. The data management system will include, but not be limited to, the use of standard record-keeping practices, standard document control systems, and the electronic data management system.

The laboratory data reduction, verification, validation, and reporting procedures and project data management activities, data/information exchange procedures ensure that complete documentation is maintained, transcription and reporting errors are minimized, and data are properly review.

Specific laboratory data management requirements and procedures are discussed in Sections 6 and 9 of this QAPP.

SECTION 6

DOCUMENTS AND RECORDS

6.1 INTRODUCTION

Records will be maintained to document accurately the data generation process during investigation in the field, sample analysis in the lab, and during data validation. Project documentation will be maintained in general accordance with guidelines in the National Enforcement Investigation Center Policies and Procedures (USEPA, 1986). A project file will be maintained that will contain appropriate project documentation; see components in chart. Some of this documentation may be retained electronically in lieu of paper copies. Table 6.1 summarizes the types of project documents and records.

MINIMUM COMPONENTS OF PROJECT FILE

- Project plans and specifications
- Field logbooks and data records
- Photographs, maps, and drawings
- Sample identification documents
- Chain-of-custody records
- Data review notes
- Report notes and calculations
- Progress and technical reports and
- Correspondence and other pertinent information
- Full analytical data deliverables package provided by the lab, including QC documentation and electronic data deliverable

6.2 FIELD RECORDS

Field personnel are responsible for documenting sample handling activities, observations, and data in field sampling records including field logbooks, chain-of-custody records, photographs, and pre-design investigation records. The Field Team Leader is responsible for maintaining these documents. Each record is described below.

6.2.1 Field Logbook

A Field Logbook will be used to document pre-design investigation activities. The field logbook will have consecutively numbered pages, and documentation will be recorded using waterproof ink. Incomplete lines, pages, and changes in the logbook will be lined out with a single line, dated, and initialed. More detailed procedures for documenting investigation activities (such as field sampling records and boring log forms) and type of information to include in the field logbook may be developed.

MINIMUM REQUIREMENT FOR INFORMATION IN FIELD LOG

- Responsible person's name
- Date and time of activity
- Equipment and methods used for field preparation of samples
- Field measurements of samples (*e.g.*, pH, temperature)
- Information coordinating sample handling activities with appropriate field activities and chain-of-custody documentation

Daily calibration activities:

Calibrator's name
Instrument name and model
Date and time of calibration
Standards used and their source
Temperature (if appropriate)
Results of calibration
Corrective actions taken (if any)

6.2.2 Electronic Field Data Management

The field sampling program will have an electronic data management component. The system will be designed to specify the necessary samples taken at any given location and to provide the ability to be updated and amended in the field. This will provide a management system that efficiently tracks the needs of the sampling scope. As the samples are taken, log entries are put in the database, and sample labels are printed. At any given time a chain-of-custody record can be printed as well.

6.2.3 Chain-of-Custody Record

The chain of custody record establishes the documentation necessary to trace sample possession from the date and time of sample collection, through sample shipment, to the date and time of arrival at the laboratory designated to perform analysis. The ability to trace the history of a sample is essential to show that the sample collected was, indeed, the sample analyzed and that the sample was not subjected to biasing influences. Evidence of sample traceability and integrity is provided by chain-of-custody procedures. These procedures are necessary to support the validity of the data and will accompany each shipping container.

A copy of the chain-of-custody record will be detached and kept with the field logbook or placed in the project file; the original record will accompany the shipment.

6.3 LABORATORY RECORDS

Laboratories providing analytical support for this project must maintain records to ensure that all aspects of the analytical processes are adequately documented to ensure legal defensibility of the data.

When a mistake is made, the wrong entry is crossed out with a single line, initialed, and dated by the person making the entry, and the correct information recorded. Obliteration of an incorrect entry or writing over it is not allowed, nor is the use of correction tape or fluid on any laboratory records.

Overwriting or disposal of any electronic media prior to a 5-yr expiration period is strictly prohibited. All electronic and hardcopy data must be stored in an easily accessible climate-controlled environment. The laboratory will exercise “best practices” in terms of frequent, redundant electronic backup procedures on proper long-term storage media to assure that all electronic data representing Atlantic Richfield Company sample analyses will be maintained for the 5-yr storage period. Electronic data must be stored in a secure, limited-access area with redundant copies stored in fireproof vaults and/ or stored off-site of the laboratory facilities.

Sample preparation in the laboratory must be fully documented and include sample preparation conditions (such as digestion temperatures). In addition, documentation must allow complete traceability to all prepared or purchased reagents, acids and solvents, and reference solutions. All spike solutions and calibration standards must be used prior to labeled expiration dates and stored in accordance with manufacturers recommended conditions. Complete and unequivocal documentation must exist to enable traceability of all prepared spike solutions, calibration standards, and prepared reagents back to the reference materials utilized. Organic extracts must be stored in the same type of vials (amber or clear) as the associated standards at the appropriate storage temperatures.

The unit conventions set forth in the figures for reported data will be consistent with standard laboratory procedures. Reporting units used are those commonly used for the analyses performed. Concentrations in soil and sediment samples will be expressed in terms of weight per unit dry weight, with moisture content reported for each sample.

Laboratory records used to document analytical activities in the laboratory will include reagent and titrant preparation records, standard preparation logs, sample preparation logs, bench data sheets, instrument run logs, and strip chart recordings/chromatograms/computer output. Additional records will include calibration records, maintenance records, nonconformance memos, and Corrective Action Request (CAR) forms.

LAB RECORDS SHOULD CONVEY:

- What was done
- When it was done
- Who did it and
- What was found

REQUIREMENTS FOR LAB RECORDKEEPING
- Data entries must be made in indelible water-resistant ink
- Date of each entry and observer must be clear
- Observer uses his or her full name or initials
- Initial and signature log is maintained so the recorder of every entry can be identified
- Information must be recorded in notebook or on other records when the observations are made
- Recording information on loose pieces of paper not allowed

6.3.1 Operational Calibration Records

Operational calibration records will document the calibration of instruments and equipment that are corrected on an operational basis. Such calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibrations are maintained in the following documents:

- Standard preparation information, to trace the standards to the original source solution of neat compound, is maintained in LIMS or laboratory standard preparation logs.
- Instrument logbook provides an ongoing record of the calibration for a specific instrument. The logbook should be indexed in the laboratory operations records and should be maintained at the instrument by the chemist. The chemist must sign and date all entries, and the QM or his designee must review them.
- For Level IV data packages, copies of the raw calibration data will be kept with the analytical sample data so the results can readily be processed and verified as one complete data package. If samples from several projects are processed together, the calibration data is copied and included with each group of data. The laboratory will maintain all calibration, analysis, and corrective action documentation (both hard copy and electronic data) for a minimum of 7 years. The documentation maintained must be sufficient to show all factors used to derive the final (reported) value for each sample. Documentation must include all calculation factors such as dilution factor, sample aliquot size, and dry-weight conversion for solid samples. The individual who performs hand calculations must sign and date them. This documentation must be stored with the raw data. Calculations performed by the data system will be documented and stored as electronic and hard copy data. The instrument printouts will be kept on file, and the electronic data will be stored by the laboratory for a minimum of 7 years

6.3.2 Maintenance Records

Maintenance records will be used to document maintenance activities, service procedures, and schedules. They must be traceable to each analytical instrument, tool, or gauge. The individual responsible for the instrument must review, maintain, and file these records. These records may be audited by the QAO to verify compliance. Logs must be established to record and control maintenance and service procedures and schedules.

6.3.3 Nonconformance Memos

Nonconformance Memos (NCM) may be either a hard copy record or an electronic database record. In either case, review and release of the record must be documented by the initiator, the analytical group leader where appropriate, the laboratory project manager, and the laboratory QA manager. All internal laboratory nonconformance documentation will be communicated to the Field Team Leader by the laboratory project manager verbally and summarized in the report narrative. The NCM will be used to document equipment that fails calibration and will identify any corrective actions taken.

6.3.4 Corrective Action Request (CAR) Forms

The laboratory must use CAR forms to document any incidents requiring corrective action. The CAR form will be issued to the personnel responsible for the affected item or activity. A copy will also be submitted to the laboratory project manager. The individual to whom the CAR is addressed will return the requested response promptly to the QA personnel and will affix his or her signature and date to the corrective action block after stating the cause of the conditions and corrective action to be taken. QA personnel will maintain a log for status of CAR forms to confirm the adequacy of the intended corrective action and to verify its implementation. CARs will be retained in the project record file.

6.3.5 Analytical Data Reports

Analytical data will be reported as an Electronic Data Deliverable (EDD) and as an analytical data package (two copies on CD-Rom and one hard copy). The analytical laboratories are required to submit all data, preliminary and final, in formatted EDDs in accordance with NYSDEC's requirements. The laboratory must meet 100% compliance with these requirements. The Parsons Database Manager will submit written requests dictating the requirements and appropriate files to be supplied by the laboratory. The specifications of the EDD are presented in Section 5.

Analytical data reports will be provided by the laboratory within 28 calendar days following receipt of a complete Sample Delivery Group (SDG) and will include the specifications identified in Attachment 1. An SDG is considered to include all samples received for the same project or site, to a maximum of twenty investigative samples not to exceed 5 consecutive days of sampling. The data package provided by the laboratory will be Level IV, unless an alternative requirement is specified in a laboratory statement of work (SOW) and will contain all information to support the data validation in accordance with the USEPA Region II Standard Operating Procedures (SOP) as described in Section 9. Additionally, the completed copies of the chain-of-custody records, accompanying each sample from the time of initial bottle preparation to completion of analysis, must be attached to the analytical reports.

6.4 DATA VALIDATION AND AUDIT RECORDS

Data validation personnel are responsible for documenting validation procedures and results in the form of a data usability summary report (DUSR). The QAO will be responsible for maintaining this report and the QAO will be responsible for its distribution. Additionally, audit reports will be prepared and distributed by the QAO. A brief description of each record is described below.

6.4.1 Data Usability Summary Reports

The DUSR will be prepared as required by NYSDEC Final DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B, May, 2010. The DUSR will summarize the impacts of using data that do not achieve overall data quality objectives or that do not meet PARCC and sensitivity criteria identified in Section 3.3. Additionally, the report will be used to identify, assess and present issues associated with the overall data.

6.4.2 Audit Reports

Among other QA audit reports, which may be generated during the conduct of activities, a final audit report for this project may be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified

TABLE 6.1
SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS

-	PERSON RESPONSIBLE FOR		
REPORT	**MAINTENANCE**	**DISTRIBUTION**	**STORAGE**
PROJECT FILES AND FIELD SAMPLING RECORDS			
Field Logbook	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Photographs	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Chain-of-Custody	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
Field Sampling Records	Field Team Leader	Project Manager	Job File at Primary Contractor's Location
LABORATORY RECORDS			
Reagent and Titrant Preparation Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Standards Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Sample Preparation Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Bench Data Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Instrument Run Logs	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory

TABLE 6.1
SUMMARY OF FIELD, LABORATORY, AND DATA MANAGEMENT RECORDS (CONT.)

-	PERSON RESPONSIBLE FOR		
REPORT	**MAINTENANCE**	**DISTRIBUTION**	**STORAGE**
Strip Chart Recordings/ Chromatograms/Computer Output	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Analytical Data Reports	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Log-in Sheets	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Maintenance Records	Quality Assurance Manager	Laboratory Project Manager	Instrument Maintenance Logbook at Laboratory
Periodic Calibration Records	Quality Assurance Manager	Laboratory Project Manager	QA Files at Laboratory
Operational Calibration Records	Quality Assurance Manager	Laboratory Project Manager	Job File at Laboratory
Nonconformance Memos	Quality Assurance Manager	Laboratory Project Manager	Maintained in Datbase File at Laboratory
Corrective Action Request Forms	Quality Assurance Manager	Laboratory Project Manager	Client Correspondence Records at Laboratory
DATA VALIDATION AND AUDIT RECORDS			
Data Validation Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location
Audit Reports	Quality Assurance Officer	Quality Assurance Officer	Job File at Primary Contractor's Location

SECTION 7

ANALYTICAL PROCEDURES

7.1 INTRODUCTION

To meet program specific regulatory requirements for chemicals of concern, all methods will be followed as stated, with some specific requirements noted below. Chemical analyses for inorganics, organics, and wet chemistry parameters will be conducted in accordance with the QAPP, the Work Assignment Scoping Documents, NYSDEC ASP, laboratory's SOPs (maintained "on-file" at the laboratory), and with referenced analytical methods including USEPA SW846 Test Methods for Evaluating Solid Waste, Physical, and Chemical (USEPA, 2009), and Methods for Chemical Analysis of Water and Wastes (USEPA, 1983). Where requirements conflict, the technical and QA/QC requirements in this QAPP or the Work Assignment Scoping Documents take precedence.

7.2 STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOPs) are a written step-by-step description of laboratory operating procedures exclusive of analytical methods. Laboratories providing analytical support for this project will be required to document all procedures in SOPs. The SOPs must address the following areas:

- Storage containers and sample preservatives
- Sample receipt and logging
- Sample custody
- Sample handling procedures
- Sample transportation
- Glassware cleaning
- Laboratory security
- QC procedures and criteria
- Equipment calibration and maintenance
- Documentation
- Safety
- Data handling procedures
- Document control
- Personnel training and documentation
- Sample and extract storage
- Preventing sample contamination
- Traceability of standards

- Data reduction and validation
- Maintaining instrument records and logbooks
- Nonconformance
- Corrective actions
- Records management

SECTION 8

QUALITY CONTROL

8.1 INTRODUCTION

A QC program is a systematic process that controls the validity of analytical results by measuring the accuracy and precision of method and matrix, developing expected control limits, using these to detect anomalous events, and requiring corrective action techniques to prevent or minimize the recurrence of these events. QC measurements for analytical protocols are designed to evaluate laboratory performance, and measurement biases resulting from the sample matrix and field performance.

- **Field performance:** QC samples are used to evaluate the effectiveness of the sampling program to obtain representative samples, eliminating any cross contamination. These samples will include trip blanks, field duplicates and rinse blanks.
- **Sample performance:** Factors associated with sample preparation and analysis influence accuracy and precision. Such factors are monitored by the use of internal QC samples. QC field samples are analyzed to evaluate measurement bias due to the sample matrix based on evaluation of matrix spike (MS), matrix spike duplicate (MSD), and/or matrix duplicate (MD) samples. If acceptance criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the LCS (or MSB) results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.
- **Laboratory method performance:** All QC criteria for method performance should be met for all target analytes for data to be reported. These criteria generally apply to instrument detector assessment (such as, tunes, ICP interference check sample), calibration, method blanks, and LCS (or MSB). Variances will be documented and noted in the case narrative of the report.

8.1.1 Field Quality Control Samples

QC samples will be collected in the field as part of the sampling program to allow evaluation of data quality. Field QA/QC samples will consist of the collection and analysis of rinse blanks, field duplicates, and “extra volume samples”, to be used for matrix spike/matrix spike duplicate (MS/MSD) samples, at a frequency of 1:20 for each sample media (sediment, porewater, and soil borings). Temperature blanks will accompany each sample shipment container (cooler) shipped to the laboratory for sample analysis. A rinse blank will be collected from disposable sampling equipment at a frequency of once per lot. Standard sample identifiers will identify field QA/QC samples and they may provide no indication of their nature as QA/QC samples.

A summary of the type and collection frequency of field QC sample to be collected respective to the sampling programs specified in this QAPP, is included in Table 8.1. A description of each QC sample is included below.

8.1.1.1 Equipment Rinse Blanks

To assess field sampling and decontamination performance, rinse blanks will be used to evaluate the effectiveness of the decontamination procedures for chemical sampling equipment. Rinse blanks will be collected as part of all chemical sampling programs, except for waste characterization. An equipment rinse blank (rinse blank) is a sample of deionized water provided by the laboratory that is poured over or through the sampling equipment (such as split spoon, wipe template), into the sample container. A rinse blank will be collected at a frequency of 1:20 samples per type of sample collection activity using non-disposable sampling equipment. A rinse blank will be collected from disposable sampling equipment at a frequency of once per lot.

8.1.1.2 Field Duplicates

Coded (blind) field duplicates will be used to assess the precision of field sampling procedures. Precision of a sample is calculated by quantifying the RPD between two sample measurements (Section 3.2.2.1). If the RPD of field duplicate results is greater than the precision criterion, environmental results for the field duplicate pair will be qualified as estimated. The Field Leader responsible for sample collection and processing should be notified to identify the source of variability (if possible), and corrective action should be taken (Section 10.3).

Coded (blind) field duplicates will be collected to evaluate the representativeness and effectiveness of homogenization and proper mixing for soil and aqueous samples. The field duplicate will be analyzed for all of the parameters for which the associated samples are being analyzed. The samples will be labeled in such a manner that the laboratory will not be able to identify the sample as a duplicate sample. This will eliminate bias that could arise by laboratory personnel.

8.1.1.3 Trip Blanks

During field sampling and sample shipping, contamination may be introduced to the samples that could affect the accuracy of analysis results. Trip blanks will be used during sample shipment to detect cross-contamination. Each cooler of aqueous samples sent to the laboratory for analysis of VOCs will contain one trip blank. Trip blanks are prepared only when VOC samples are taken and are analyzed for VOC analytes. The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field.

8.1.1.4 Temperature Blank

The temperature blank is used to indicate the temperature of the sample cooler upon receipt at the laboratory. A temperature blank consists of laboratory reagent in a 40-ml glass vial sealed with a Teflon® septum. Any cooler temperature exceeding the allowable 4 ± 2 degrees Celsius (°C) must be noted and the QAO notified prior to sample analyses.

8.1.2 Laboratory Quality Control Samples

QC data from the laboratory are necessary to determine precision and accuracy of the analyses and to demonstrate the absence of interferences and contamination of glassware and reagents. The laboratory will analyze QC samples routinely as part of the laboratory QC procedures. Laboratory QC results will consist of analysis of MS/MSD or MS/MD, LCS (or MSB), method/preparation blanks, and surrogate spikes. The frequency of the analysis of laboratory QC is summarized in Table 8.2. QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. These laboratory QC sample analyses will be run independently of the field QC samples. Results of these analyses will be reported with the sample data and kept in the project QC data file. The QC checks, their frequency, acceptance criteria, and corrective actions for noncompliance are summarized for each analytical method in the NYSDEC ASP (2005).

QC samples will be prepared and analyzed utilizing the same preparation and analysis procedures as the field samples. Re-preparation and/or reanalysis of the laboratory QC samples due to a failing recovery and/or precision failure without the re-preparation and reanalysis of the associated samples is prohibited. In all events, QC failures, holding time exceedances, or any other non-standard occurrence must be communicated immediately to the QAO and prior to reporting and then, with approval to report the data, summarized in the case narrative. If the criteria are not met, appropriate corrective action must be taken as specified in Section 9.1 and Section 10.

8.1.2.1 Matrix Spike/Matrix Spike Duplicate/ Matrix Duplicates

MS/MSD, or matrix duplicates (MD) for methods not requiring MS/MSD, samples for organics, metals, and wet chemistry parameters will be taken at a frequency of 1 per 20 field samples (per SDG) per matrix per method. MD samples will be analyzed by the laboratory at frequency required by the analytical method. A “batch” is considered up to twenty samples from the same matrix, of the same extraction/digestion type, prepared and/or analyzed by a given analyst, within 12-hr, within an extraction/digestion event, whichever is more frequent. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes by spiking a normal field sample with a known concentration of the analyte of interest. Samples identified as rinse blanks will not be used for the MS/MSD or MS/MD preparation or analysis.

Spiked samples will be analyzed, and the percent recovery will be calculated. Results of the analysis will be used to evaluate accuracy and precision of the actual sample matrix. For MS/MSD or MD, the result will be compared and used to evaluate the precision of the actual sample matrix. The percent recovery for each analyte in the MS and MSD should fall within the limits established by laboratory QC protocol. The percent recovery and RPD control limits between the MS and MSD and the sample and the duplicate concentrations are provided in the NYSDEC ASP.

The original sample, MS/MSD, and MD sample aliquots will be treated exactly the same throughout the sample preparation and analysis and will not be homogenized more than any other project sample (either in the field or at the laboratory). The spike samples will be analyzed for the same parameters as the sample. Field personnel must indicate on the chain-of-custody form which sample(s) are designated as MS/MSD (or MS/MD). If samples are not designated for these QC purposes and/or insufficient sample is available the Project Manager and/or QAO will be notified for resolution.

8.1.2. Laboratory Control Samples

Laboratory Control Samples (LCS), or matrix spike blanks (MSB) are designed to check the accuracy of the analytical procedure by measuring a known concentration of an analyte of interest. An LCS (or MSB) will be analyzed for each analytical batch requested for sample preparation and analysis. LCSs (or MSBs) must be prepared at a frequency of one per batch for all analytical methods. If high LCS (or MSB) recoveries are observed and the associated samples are reported as “not detected” for the requested target analytes, no action is necessary other than to note the issue in the case narrative of the final analytical report. LCS (or MSB) recoveries must meet the criteria specified in NYSDEC ASP.

8.1.2.3 Method and Preparation Blanks

Laboratory blank samples (also referred to as method or preparation blanks) are designed to detect contamination resulting from the laboratory environment or sample preparation procedure. Method blanks verify that method interferences caused by contaminants in solvents, reagents, glassware, or in other sample processing hardware, are known. Method blanks will be analyzed for each analytical batch using similar preparation techniques (separatory funnel and liquid/liquid extraction) to assess possible contamination and evaluate which corrective measures may be taken, if necessary.

Method blanks associated with field samples must undergo all of the processes performed on investigative samples, including but not limited to pre-filtration and sample cleanups. The blank will be deionized water for water samples or a purified solid matrix such as sodium sulfate for extractable soil samples. Where all the field samples in a batch do not require an additional cleanup procedure, an additional blank may be prepared to check the performance of the additional cleanup and will be associated with the field samples getting the specific additional cleanup. Where this is done, both blanks will be reported, and the procedure described in the case narrative. Method blanks must be prepared at a frequency of one per analytical batch.

8.1.2.4 Surrogate Spike Analyses

Surrogate spikes (applicable to organic analysis only) are used to determine the efficiency of analyte recovery in sample preparation and analysis. Calculated percent recovery of the spikes is used to measure the accuracy of the analytical method. A surrogate spike is prepared by adding a known amount of a compound similar in type to the analytes of interest. Surrogate compounds will be added to all samples analyzed by USEPA Methods, including method blanks, MS/MSDs, project environmental samples, and duplicate samples in accordance with the method. Surrogate spike recoveries should fall within the limits established by laboratory QC protocol and the NYSDEC ASP.

8.2 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

8.2.1 Field Equipment

Equipment failure will be minimized by routinely inspecting all field equipment to ensure that it is operational and by performing preventative maintenance procedures. Field sampling equipment will be inspected prior to sample collection activities, and repairs will be made prior to decontamination and reuse of the sampling equipment. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure, based on the manufacturer's instructions or recommendations. Maintenance will be performed in accordance with the schedule specified by the manufacturer to minimize the downtime of the measurement system. Qualified personnel must perform maintenance work.

MINIMUM ROUTINE PREVENTIVE MAINTENANCE
Removal of foreign debris from exposed surfaces
Storage in a cool dry place protected from the elements
Daily inspections
Verification of instrument calibrations (Section 8.3.1)

A list of critical spare parts will be developed prior to the initiation of fieldwork. Field personnel will have ready access to critical spare parts to minimize downtime while fieldwork is in progress. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

Non-routine maintenance procedures require field equipment to be inspected prior to initiation of fieldwork to determine whether or not it is operational. If it is not operational, it will be serviced or replaced. Batteries will be fully charged or fresh, as applicable.

8.2.2 Laboratory Instrumentation

Periodic preventive maintenance is required for all sensitive equipment. Instrument manuals will be kept on file for reference if equipment needs repair. The troubleshooting section of factory manuals may be used in assisting personnel in performing maintenance tasks.

Major instruments in the laboratory are covered by annual service contracts with manufacturers or other qualified personnel (internal or external). Under these agreements, trained service personnel make regular preventive maintenance visits. Maintenance is documented and maintained in permanent records by the individual responsible for each instrument.

The laboratory manager is responsible for preparation, documentation, and implementation of the program. The laboratory QA manger reviews implementation to verify compliance during scheduled internal audits.

Written procedures will establish the schedule for servicing critical items to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule and arrange any necessary and prompt service. Qualified personnel will perform required service.

8.3 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Instruments (field and laboratory) used to perform chemical measurements will be properly calibrated prior to use to obtain valid and usable results. The requirement to properly calibrate instruments prior to use applies equally to field instruments as it does to fixed laboratory instruments to generate appropriate data to meet DQOs.

8.3.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures of field instruments (such as PID, pH, temperature), will conform to manufacturer's standard instructions to ensure that the equipment functions within the allowable tolerances established by the manufacturer and required by the project. Personnel performing instrument calibrations must be trained in its proper operation and calibration. Records of all instrument calibration will be maintained by the Field Team Leader in the field logbook (Section 6.2) and will be subject to audit by the QAO or authorized personnel. The Field Team Leader will maintain copies of all the instrument manuals on the site.

8.3.2 Laboratory Instruments

A formal calibration program will control instruments and equipment used in the laboratory. The program will verify that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity or whose performance is expected at a stated level will be subject to calibration. Laboratory personnel or external calibration agencies or equipment manufacturers will calibrate the instruments using reference standards. Upon request, the laboratory will provide all data and information to demonstrate that the analytical system was properly calibrated at the time of analysis including calibration method, frequency, source of standards, concentration of standards, response factors, linear range, check standards, and all control limits. This data will be documented in a calibration record (Section 6.3.1). Calibration records will be prepared and maintained for each piece of equipment subject to calibration.

This section provides an overview of the practices used by the laboratory to implement a calibration program. Detailed calibration procedures, calibration frequencies, and acceptance criteria are specified in the laboratory’s analytical method SOPs. The requirements for the calibration of instruments and equipment depend on the type and expected performance of individual instruments and equipment. Therefore, the laboratory will use the guidelines provided here to develop a calibration program.

Two types of calibration are described in this section: periodic calibration and operational calibration. The results of the calibration activities will be documented in the analytical data package and the calibration records (Section 6.3.1).

- **Periodic calibration:** Performed at prescribed intervals for equipment, such as balances and thermometers. In general, equipment which can be calibrated periodically is a distinct, singular purpose unit and is relatively stable in performance.
- **Operational calibration:** routinely performed as part of an analytical procedure or test method, such as the development of a standard curve for use with an atomic absorption

spectrophotometer. Operational calibration is generally performed for instrument systems.

Equipment that cannot be calibrated or becomes inoperable will be removed from service. Such equipment must be repaired and satisfactorily recalibrated before reuse. For equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken, and the analyst achieves an acceptable calibration. This type of failure will be documented in an NCM (Section 10).

8.3.3 Calibration System

The calibration system includes calibration procedures, equipment identification, calibration frequency, calibration reference standards, calibration failure, and calibration records. These elements are described next.

8.3.3.1 Calibration Procedures

Written procedures will be used by the laboratory for all instruments and equipment subject to calibration. Whenever possible, recognized procedures, such as those published by ASTM or USEPA, will be adopted. If established procedures are not available, a procedure will be developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured. Calibration procedure established by the laboratory must, at a minimum, meet the calibration requirements of the method on which the SOP is based.

MINIMUM CALIBRATION PROCEDURES
Equipment to be calibrated
Reference standards used for calibration
Calibration technique and sequential actions
Acceptable performance tolerances
Frequency of calibration
Calibration documentation format

8.3.3.2 Equipment Identification

Equipment that is subject to calibration is identified by a unique number assigned by the laboratory. Calibration records reference the specific instrument identification.

8.3.3.3 Calibration Frequency

Instruments and equipment will be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Calibration frequency will be based on the type of equipment, inherent stability, manufacturer’s recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

8.3.3.4 Calibration Reference Standards

Two types of reference standards will be used by the laboratory for calibration:

- **Physical standards**, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration. Physical reference standards that have known relationships to nationally recognized standards (such as NIST) or accepted values of natural physical constants will be used whenever possible. If national standards do not exist, the basis for the reference will be documented. Physical reference standards will be used only for calibration and will be stored separately from equipment used in analyses. In general, physical standards will be recalibrated annually by a certified external agency, and documentation will be maintained. Balances will be calibrated against class “S” weights by an outside source annually. Physical standards such as the laboratory’s class “S” weights will be recertified annually.
- **Chemical standards,** such as vendor certified stock solutions and neat compounds, will generally be used for operational calibration. The laboratory, to provide traceability for all standards used for calibration and QC samples, will document standard preparation activities.

8.3.4 Operational Calibration

Operational calibration will generally be performed as part of the analytical procedure and will refer to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Formulas used for calibration are listed in Table 8.3.

8.3.4.1 Preparation of a Calibration Curve

Preparation of a standard calibration curve will be accomplished by analyzing calibration standards that are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards will be chosen to cover the working range of the instrument or method. All sample measurements will be made within this working range. Average response factors will be used or a calibration curve will be prepared by plotting or regressing the instrument responses versus the analyte concentrations. Where appropriate a best-fit curve may be used for nonlinear curves and the concentrations of the analyzed samples will be back-calculated from the calibration curve.

8.3.4.2 Periodic Calibration

Periodic calibrations are performed for equipment (such as balances and thermometers), that is required in the analytical method, but that is not routinely calibrated as part of the analytical procedure. Table 8.4 lists the periodic calibration requirements used by the laboratories.

8.4 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

In the laboratory, personnel qualifying reagents and standards must be trained to perform the associated instrumental analysis, including instrument calibration, calculations, and data interpretation. Laboratory personnel must document the purchase, receipt, handling, storage, and tracking of supplies and consumables used during analysis. For example, analytical standards, source materials, and reference materials used for instrumental calibration/tunes/checks must be certified and traceable to the USEPA or NIST through reference numbers documented directly in each analytical sequence. Calibration for all requested analyses must be verified by an independent second source reference. Adhering to these procedures precludes the use of expired supplies and consumables or supplies and consumables that do not meet standard acceptance criteria.

Records must be maintained on reagent and standard preparation in the LIMS reagent system or laboratory standard preparation logs. The records should indicate traceability of the standards to their original source solution or neat compound, the name of the material, concentration, the method and date of preparation, the expiration date, storage conditions, and the preparer's initials. Each prepared reagent or standard should be labeled with a unique identifier that links the solution to the preparation documentation that specifies an expiration and/or re-evaluation date for the solution.

TABLE 8.1

SUMMARY OF FIELD QC SAMPLE TYPES AND COLLECTION FREQUENCY

Field QC Sample Type	Sample Type	Collection Frequency
Rinse	Water	Once per week for non-disposable sampling equipment. Once per lot for disposable sampling equipment.
Field Duplicates	Water	1:20 Samples
Extra Volume Sample (collected for MS/MSD)	Water	1:20 Samples

Field QA/QC samples will be identified by using standard sample identifiers that will provide no indication of their nature as QA/QC samples.

TABLE 8.2

LABORATORY QUALITY CONTROL SAMPLE FREQUENCY

QC Sample	Frequency
Method/Preparation Blanks	1 per analytical batch of 1-20 samples, per preparation event
Laboratory Control Sample	1 per analytical batch of 1-20 samples, per preparation event
Surrogates	Spiked into all field and QC samples (Organic Analyses)
Matrix Spike/Matrix Spike Duplicate or Matrix (Laboratory) Duplicate	1 per batch of 1-20 samples

TABLE 8.3
OPERATIONAL CALIBRATION FORMULAS

Application	Formula	Symbols
Linear calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors[3]	$CF = A_x / C$	C = concentration (µg/L) CF = calibration factor A_x = peak size of target compound in sample extract
Response factors[4]	$RF = C_{is} A_x / C A_{is}$	C = concentration (µg/L) RF = internal standard response factor C_{is} = concentration of the internal standard (µg/L) A_x = area of the characteristic ion for the target compound A_{is} = area of the characteristic ion for the internal standard

Note: For organic analysis, the laboratory will make efforts to use the best curve technique for each analyte. This practice is described in detail in the laboratory calibration criteria documents for GC analysis. This may require the use of a quadratic curve for some compounds.

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[3] Used for quantitation by the external standard technique.
[4] Used for quantitation by the internal standard technique.

TABLE 8.4

PERIODIC CALIBRATION REQUIREMENTS

Instrument	Calibration Frequency		Corrective Actions
Analytical Balances	Daily:	Sensitivity (with a Class S-verified weight)	Adjust sensitivity
	Annually:	Calibrated by outside vendor against certified Class S weights	Service balance
Thermometers	Annually:	Calibrated against certified NIST thermometers	Tag and remove from service
Automatic Pipettors	Quarterly:	Gravimetric check	Service or replacement

TABLE 8.5

SAMPLE CONCENTRATION CALCULATION FORMULAS

Application	Formula	Symbols
Linear regression calibration curves	$C = (R - a_0)/a_1$	C = analytical concentration R = instrument response a_0 = intercept of regression curve (instrument response when concentration is zero) a_1 = slope of regression curve (change in response per change in concentration)
Calibration factors [1]	$C = A_x V_f / CF V_i$	C = concentration (µg/L) CF = calibration factor A_x = peak size of target compound in sample extract V_f = final volume of extracted sample (mL) V_i = initial volume of sample extracted (mL)
Response factors [2]	$C = C_{is} A_x V_f / RF A_{is} V_I$	C = concentration (µg/L) RF = internal standard response factor C_{is} = concentration of the internal standard (µg/L) A_x = area of the characteristic ion for the target compound V_f = final volume of extracted sample (mL) A_{is} = area of the characteristic ion for the internal standard V_i = initial volume of sample extracted (mL)
Residues [3]	$R = (W - T)/V \times 1,000,000$	R[6] = residue concentration (mg/L) W = weight of dried residue + container (g) T = tare weight of container (g) V = volume of sample used (mL)
Solid samples [4]	$K = C V D / W (\%S/100)$	K = dry-weight concentration (mg/kg) C = analytical concentration (mg/L) V = final volume (mL) of processed sample solution D = dilution factor W = wet weight (g) of as-received sample taken for analysis $\%S$ = percent solids of as-received sample

1. Used for quantitation by the external standard technique
2. Used for quantitation by the internal standard technique
3. Used for total, filterable, nonfilterable, and volatile residues as well as gravimetric oil and grease
4. Used to calculate the dry-weight concentration of a solid sample from the analytical concentration of the processed sample.
5. Conversion factor to convert g/mL to mg/L:

$$\frac{mg}{L} = \frac{g}{mL} \text{ x } \frac{10^3 mL}{L} \text{ x } \frac{10^3 mg}{g}$$

SECTION 9

DATA VALIDATION AND USABILITY ELEMENTS

9.1 DATA REVIEW, VERIFICATION, AND VALIDATION

The data collected during this project will undergo a systematic review for compliance with the DQOs and performance objectives as stated in Section 3. In particular, field, laboratory, and data management activities will be reviewed to confirm compliance with the method QC criteria for performance and accuracy and to show that data were collected in a manner that is appropriate for accomplishing the project objectives. These data will be evaluated as to their usability during data verification. In particular, data outside QC criteria, but not rejected, will be reviewed for possible high and low bias. All data will be validated following verification and reduction.

Qualified data validation personnel will assess and verify data; they will review the data against QC criteria, DQOs (Sections 3 and 9.2.2), NYSDEC ASP, and USEPA Region 2 SOPs for data review to identify outliers or errors and to flag suspect values. Field and laboratory activities that should be reviewed include, at a minimum, sample collection, handling, and processing techniques; field documentation records; verification of proper analytical methods; analytical results of QC samples; and calibration records for laboratory instruments and field equipment. A review of such elements is necessary to demonstrate whether the DQOs outlined in Section 3 were met. Samples that deviate from the experimental design and affect the project objectives must be reported to the QAO and data validation personnel.

Departures from standard procedures (in the FAP, this QAPP, or the laboratory SOPs), may lead to exclusion of that data from the project database or validation process, based on discussions with and approval of the NYSDEC. However, routine field audits involving thorough reviews of sample collection procedures and sample documentation should preclude such deviations from occurring. Additionally, routine laboratory audits will be used to document proper sample receipt, storage, and analysis; instrument calibration; use of the proper analytical methods; and use of QC samples specified in Section 8 to assist in appropriately qualifying the data.

The laboratory's analytical report for each sample delivery group (SDG) will be assembled by collecting and incorporating all the data for each analysis associated with the reported samples; the analytical narratives; and other report-related information such as copies of chain-of-custody forms, communication records, and nonconformance forms. The information included in the analytical data report is summarized in Attachment 1.

Before the laboratory submits data, the laboratory's data review process will include a full first level "technical" review by the laboratory's analyst during sample analysis and data generation. The review must include a check of all QC data for errors in transcription, calculations, and dilution factors and for compliance with QC requirements. Failure to meet method performance QC criteria may result in the reanalysis of the sample or analytical batch.

After the initial review is completed, the data will be collected from summary sheets, workbooks, or computer files and assembled into a data package.

The laboratory's first review will be followed by a second-level technical review of the data package. The second level review may be performed by a peer trained in the procedures being reviewed or by the appropriate analytical group supervisor. The reviewer will check the data packages for completeness and compliancy with the project requirements and will certify that the report meets the DQOs for PARCCS specifications. The report narrative will be generated at this stage of the data review. Any problems discovered during the review and the corrective actions necessary to resolve them will be communicated to the responsible individual, who will discuss the findings with the laboratory QA manager for resolution.

The first and second review will be conducted throughout sample analysis and data generation to validate data integrity during collection and reporting of analytical data. Data review checklists will be used to document the performance and review of the QC and analytical data.

Before the laboratory's final release to the client, the data will undergo a final review by the laboratory's QA officer or his/her designee. This third level review is to confirm that the report is complete and meets project requirements for performance and documentation. The laboratory's QA officer must review reports involving non-conforming data issues. A summary of all non-conformances will be included in the case narrative. The report will then be released to the client for data validation, and a copy will be archived by the laboratory for a period of 7 yrs.

The laboratory analytical data will be validated using project-specific data validation procedures to confirm that data meet the applicable data quality objectives. Depending on the type of data and the intended data uses, the data validation process for a given SDG (or a specific percentage of sample analyses) or analytical method may be performed following an EPA Level IV protocol (full validation), or an EPA Level III protocol (sample plus QC summary data only, no raw data review). The project-specific Level III data validation protocol will provide a level of review resulting in the generation of a data usability summary report (DUSR), as defined by NYSDEC. Level III validation will be performed on all DQO Level III and all DQO Level IV data. Ten percent (10%) of the DQO Level IV Data for each analytical method will undergo a Level IV validation. Certain geotechnical and field screening data may be evaluated in a manner suitable for the intended data uses.

A data validation report will be issued and reviewed by the QAO before finalization. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCCS criteria for each analytical method. The validation criteria are objective and are not sample dependent, except for consideration of sample matrix effects. The criteria specify performance requirements that should be under the control of the field-sampling contractor or analytical laboratory. This QAPP will be the primary reference for evaluating the data.

After data validation, the data will be evaluated for consistency with site conditions and developed conceptual models. Data validation personnel will prepare a project DUSR that summarizes the implications of the use of any data out of criteria. In addition, the data usability report will include the percentage of sample completeness for critical and non-critical samples and a discussion of any issues in representativeness of the data that may develop as a result of validation. The data usability report will address overall data quality and achievement of PARCCS criteria and assess issues associated with the overall data and data quality for all validated Level III and Level IV data.

9.2 VERIFICATION AND VALIDATION METHODS

9.2.1 Laboratory

The laboratory will verify and assess analytical data against the stated requirements on the chain-of-custody record, the sample handling procedures (Section 4), and the QC parameters. The laboratory data reviewers will also check that transcriptions of raw or final data and calculations were performed correctly and are verified.

Following data verification, analytical data generated by the laboratory will be reduced and managed based on the procedures specified in this QAPP and analytical methodologies. Data reduction includes all processes that change either the values or numbers of data items. The data reduction processes used in the laboratory includes establishment of calibration curves, calculation of sample concentrations from instrument responses, and computation of QC parameters. Table 8.5 lists the formulas used to calculate sample concentrations.

The reduction of instrument responses to sample concentrations takes different forms for different types of methods. For most analyses, the sample concentrations are calculated from the measured instrument responses using a calibration curve. The sample concentrations can be back-calculated from a regression equation fitted to calibration data. For gravimetric and titrimetric analyses, the calculations are performed according to equations given in the method. For chromatographic analyses, the unknown concentrations are determined using either calibration factors (external standard procedure) or relative response factors (internal standard procedure). GC analyses are generally quantitated using the external standard technique; GC/MS analyses are quantitated using the internal standard technique. These calculations are generally performed by the associated computerized data systems.

Validated analytical data will be loaded into a database and reported in tabular format. Database fields will include the field sample identification, laboratory sample identification, blinded sample number, analytical results, detection limits, and validation qualifiers. The usability of the data will be evaluated by the QAO or designee.

9.2.2 Analytical Data Validation

The data review process is performed in two phases:

1. **Initial phase, contract compliance screening (CCS)**: Review of sample data deliverables for completeness. Completeness is evaluated by ensuring that all required data deliverables are received in a legible format with all required information. The CCS process also includes a review of the chain-of-custody forms, case narratives, and RLs. Sample resubmission requests, documentation of nonconformances with respect to data deliverable completeness, and corrective actions often are initiated during the CCS review. The results of the CCS process are incorporated into the data validation process.

2. **Second phase, data validation:** A project-specific data validation procedure based on a “Level III” or the “Level IV” validation protocol will be performed on the analytical results from the fixed-base laboratory or laboratories, with the exception of the bench-scale testing data. The EPA Level III validation protocol, which will be applied to Level III data packages and Level IV data packages not receiving “full” Level IV validation, includes a review of summary information to determine adherence to analytical holding times; results from analysis of field duplicates, method blanks, field blanks, surrogate spikes, MS/MSDs, LCSs (or MSBs), and sample temperatures during shipping and storage. Data qualifiers are applied to analytical results during the data validation process based on adherence to method protocols and laboratory-specific QA/QC limits. The EPA Level IV validation protocol incorporates the Level III validation protocol and adds calculation checks from the raw data of reported and summarized sample data and QC results.

<table>
<tr><th colspan="2">FULL VALIDATION (USEPA LEVEL IV EQUIVALENT)</th></tr>
<tr><th>Organic Analytical Methods</th><th>Inorganic Constituents,
Wet Chemistry Parameters</th></tr>
<tr><td>Percentage of solids</td><td>Percentage of solids</td></tr>
<tr><td>Sample preservation and holding times</td><td>Sample preservation and holding times</td></tr>
<tr><td>Instrument tuning</td><td>Calibrations</td></tr>
<tr><td>Instrument calibrations</td><td>Blank results</td></tr>
<tr><td>Blank results</td><td>Interference check samples (inorganics only)</td></tr>
<tr><td>System monitoring compounds or surrogate recovery compounds (as applicable)</td><td>LCSs</td></tr>
<tr><td>Internal standard recovery results</td><td>Project Required Reporting Limit (PRRL) standard check samples</td></tr>
<tr><td>MS and MSD (or MD) results</td><td>Duplicates</td></tr>
<tr><td>LCS (or MSB) results</td><td>MSs (pre-digestions and post-digestions for inorganics only)</td></tr>
<tr><td>Target compound identification</td><td>ICP serial dilutions and</td></tr>
<tr><td>Chromatogram quality</td><td>Results verification and reported detection limits</td></tr>
<tr><td>Duplicate results</td><td></td></tr>
<tr><td>Compound quantitation and reported RLs</td><td></td></tr>
<tr><td>System performance and</td><td></td></tr>
<tr><td>Results verification</td><td></td></tr>
</table>

The laboratory will send the required analytical data package deliverables, consisting of CD-ROM and hardcopy versions and the EDD, following completion of the laboratory’s validation process (Section 9.2.2). Data validation will be performed in accordance with the USEPA Region 2 RCRA and CERCLA Data Validation SOPs for organic and inorganic data review. In addition, Parsons will refer to this QAPP and the Work Assignment Scoping Documents to verify that DQOs were met. If problems are identified during data validation, the QAO and the laboratory QA manager will be alerted, and corrective actions will be requested. The LPM and data validation chemists will maintain close contact with the QAO to ensure all nonconformance issues are acted upon prior to data manipulation and assessment routines.

USEPA Region II SOPs also used as guidance for data validation	
Metals	ICP-AES Data Validation (SOP HW-2a, Revision 15, December 2012). ICP-MS Data Validation (SOP HW-2b, Revision 15, December 2012).
Mercury	Mercury and Cyanide Data Validation (SOP HW-2c, Revision 15. December 2012).
VOCs	Low/Medium Volatile Data Validation (HW-33, Revision 2, March, 2013).

Data validation will be conducted using the USEPA National Functional Guidelines for Superfund Methods Data Review (USEPA, 2013a/2013b) as supplementary guidelines. Where CLP guidelines and SW-846 disagree, this QAPP and data validation professional judgment will prevail.

Trained and experienced data validation chemists will perform the data validation work. The QAO will review the data validation report before it is finalized. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of PARCCS criteria for each analytical method. A detailed assessment of each SDG will follow. Based on the results of data validation, the validated analytical results reported will be assigned a usability flag (see chart below).

USABILITY FLAGS FOR VALIDATED RESULTS	
U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value is the estimated concentration in the sample.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
No flag	Result accepted without qualification

9.3 RECONCILIATION WITH USER REQUIREMENTS

Following data validation by qualified personnel, the data will be evaluated by the QAO and the project manager as to consistency with site conditions and developed conceptual models to determine whether field and analytical data meet the requirements for decision making. Specifically, the results of the measurements will be compared to the DQOs (Section 3).

The DQOs will be considered complete and satisfied if the data are identified as usable and if no major data gaps are identified. For example, the objective for data collected under the characterization program is to further refine the limits of dredging and/or capping. If the collected data sufficiently characterizes these limits in a manner that is acceptable for remedial action, then the DQO is satisfied. In cases where data may be considered not usable (for example, rejected during data validation), resampling may be required at a specific location. If resampling is not possible, the data will be identified and noted in the project database to make data users aware of its limitations.

SECTION 10

ASSESSMENT AND OVERSIGHT

10.1 ASSESSMENTS AND RESPONSE ACTIONS

Performance and system audits of both field and laboratory activities may be performed. Any such audits will be performed at a frequency to be determined to ensure that sampling and analysis activities are completed in accordance with the procedures specified in the FAP and this QAPP.

Quality assurance audits will be carried out under the direction of the QAO on field activities, including sampling and field measurements. They will be implemented to verify that established procedures are being followed and to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s).

The QAO will plan, schedule, and approve system and performance audits based on procedures customized to the project requirements. If required, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. Quality auditing personnel will not have responsibility for field or laboratory project work.

10.2 PROJECT-SPECIFIC AUDITS

Project-specific audits include system and performance audits of sampling and analysis procedures, and of associated recordkeeping and data management procedures. Project-specific audits will be performed on a discretionary basis at a frequency determined by the project manager.

10.2.1 System Audits

The QAO may perform system audits. Such audits will encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory QC procedures and associated documentation may be system-audited including the field logbook, field sampling records, laboratory analytical records, sample handling, processing, and packaging in compliance with the established procedures, maintenance of QA procedures, and chain-of-custody procedures. These audits may be carried out during execution of the project to confirm that sampling crews employ consistent procedures. However, if conditions adverse to quality are detected additional audits may occur.

Findings from the audit will be summarized and provided to the PM and/or designated personnel so that necessary corrective action can be monitored from initiation to closure.

10.2.2 Performance Audits

The laboratory may be required to conduct an analysis of PE samples or provide proof that PE samples were submitted by an approved USEPA or NYSDEC performance testing provider within the past 12 months. If necessary, proof that applicable PE samples have been analyzed at the laboratory within the past 12 months will be included in the laboratory procurement package.

10.2.3 Formal Audits

Formal audits are any system or performance audit that the QAO documents and implements. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklist to verify objectively that QA requirements have been developed, documented, and instituted in accordance with contractual and project criteria. At the discretion of the project manager, the QAO or designated personnel may conduct formal audits on project and subcontractor work during the course of the project.

Auditors who have performed the site audit after gathering and evaluating all data will write audit reports. Items, activities, and documents determined by lead auditors to be in noncompliance must be identified at exit interviews conducted with the involved management. Noncompliance will be logged and documented through audit findings. These findings will be attached to and become part of the integral audit report. These audit-finding forms are directed to management to resolve satisfactorily the noncompliance in a specified and timely manner.

The QAO has overall responsibility to see that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports will be submitted to the PM after completion of the audit. Serious deficiencies will be reported to the PM on an expedited basis. Audit checklists, audit reports, audit findings, and acceptable resolutions will be approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

10.2.4 Laboratory Audits

Internal laboratory audits will be performed routinely to review and evaluate the adequacy and effectiveness of the laboratory’s performance and QA program, to ascertain if the QAPP is being completely and uniformly implemented, to identify nonconformances, and to verify that identified deficiencies are corrected. The laboratory QA manager is responsible for such audits and will perform them according to a schedule planned to coincide with appropriate activities on the project schedule and sampling plans. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QAPP
- When necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit
- When requested by the laboratory’s project manager or QA manager.

10.2.4.1 Laboratory Performance Audits

Performance audits are independent sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process. Performance audits are conducted by introducing control samples, in addition to those used routinely, into the data production process. These control samples include PE samples of known concentrations. The results of performance audits will be evaluated against acceptance criteria. The results will be summarized and maintained by the laboratory QA manager and distributed to the supervisors who must investigate and respond to any results that are outside control limits.

10.2.4.2 Laboratory Internal Audits

The laboratory QA manager conducts routine internal audits of each laboratory section for completeness, accuracy, and adherence to SOPs. The laboratory audit team will verify that the laboratory's measurement systems are operated within specified acceptable control criteria and that a system is in place to confirm that out-of-control conditions are efficiently identified and corrected.

10.2.4.3 Laboratory Data Audits

The laboratory will maintain raw instrument data for sample analyses on magnetic tape media or optical media in a secured fireproof safe. During routine audits, the audit team will verify the processing of the raw data file by reviewing randomly selected electronic data files and comparing the results with the hardcopy report. Tapes will be archived for a period of 7 yr. Tapes will be also available for audit by the QAO upon request.

10.2.4.4 Laboratory Audit Procedures

Prior to an audit, the designated lead auditor will prepare an audit checklist. During an audit and upon its completion, the auditor will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will prepare and submit an audit report to the designated responsible individual of the audited group, the PM, and the QAO. Minor administrative findings that can be resolved to the satisfaction of the auditor during an audit need not be cited as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project will be included in the audit report.

The designated responsible individual of the audited group will prepare and submit to the QAO a reply to the audit. This reply will include, at a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the audit report, the reply to the audit, and any supporting documents. It is the responsibility of the designated responsible individual of the audited group to conform to the established procedures, particularly as to development and implementation of such corrective action.

10.2.4.5 Laboratory Documentation

To confirm that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures, a checklist will be completed during each audit.

The checklist will detail the activities to be executed and ensure that the auditing plan is accurate. Audit checklists will be prepared in advance and will be available for review.

AUDIT CHECKLIST (AT MINIMUM)
Date and type of audit
Name and title of auditor
Description of group, task, or facility being audited
Names of lead technical personnel present at audit
Checklist of audit items according to scope of audit
Deficiencies or non-conformances

Following each system, performance, and data audit, the QAO or his designee will prepare a report to document the findings of the specific audit. The report will be submitted to the designated individual of the audited group to ensure that objectives of the QA program are met.

MINIMUM CONTENT OF AUDIT REPORT
Description and date of audit
Name of auditor
Copies of completed, signed, and dated audit form and/or checklist
Summary of findings including any nonconformance or deficiencies
Date of report and appropriate signatures
Description of corrective actions

The QAO will maintain a copy of the signed and dated report for each audit. If necessary, a second copy will be placed in project files.

10.3 CORRECTIVE ACTIONS

Corrective action procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected. Corrective action enables significant conditions adverse to quality to be noted promptly at the site, laboratory, or subcontractor location. Additionally, it allows for the cause of the condition to be identified and corrective action to be taken to rectify the problem and to minimize the effect on the data set. Further, corrective action is intended to minimize the possibility of repetition.

Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, PM, FTL, and involved subcontractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action. Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The designated responsible individual of the audited group will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

Events that trigger corrective actions
When predetermined acceptance standards are not attained
When a deviation from SOP is required or observed
When procedure or data compiled are determined to be deficient
When equipment or instrumentation is found to be faulty
When samples and analytical test results are not clearly traceable
When QA requirements have been violated
When designated approvals have been circumvented
As a result of system and performance audits
As a result of a management assessment
As a result of laboratory/field comparison studies
As required by analytical method

All project personnel have the responsibility, as part of normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Specifically, the laboratory must designate the assigned individual to act as the primary laboratory contact responsible for timely identification and resolution of any and all issues including contract and administrative issues. Any phone calls initiated by personnel or designated representatives to the laboratory with respect to corrective actions must be returned in a timely manner on a normal business day if the designate individual (or alternate) is not available at the initiation of the phone call.

Project management and related staff, including field investigation teams, remedial design planning personnel, and laboratory groups will monitor on-going work performance as part of daily responsibilities. Work may be audited at the site, the laboratories, or subcontractor locations. Activities or documents ascertained to be noncompliant with QA requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the QAO, PM, or designated personnel.

Personnel assigned to QA functions will have the responsibility to issue and control CAR forms (Figure 10.1). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered.

Similar to the CAR, the laboratory will record and report nonconformances internally using the laboratory’s nonconformance documentation tracking system in the form of an NCM. Each NCM is traceable so that it can be cross-referenced with its resolution to the associated project records. The laboratory QA manager summarizes critical nonconformances, such as reissued reports and client complaints, in a monthly report to the laboratory management staff. Management of the NCM is described in Section 6.3. Corrective action procedures applicable to QC requirements that do not meet the criteria of this QAPP are described in the following sections. Consistent, frequent contacts between laboratory personnel, the QAO, or designated personnel are required.

TYPICAL CONTENT OF NCM FORMS
Problem description and root cause
Corrective action
Client notification summary
QA verification
Approval history action

FIGURE 10.1

CORRECTIVE ACTION REQUEST FORM

CORRECTIVE ACTION REQUEST

Number _____________________ Date:__________________

TO: _____________________

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (a) to resolve the noted conditions and (b) to prevent it from recurring. Your written response is to be returned to the Project quality assurance manager by _______________.

Condition:

Reference Documents:

________________ __________ ______________ __________ _____________ ___
Originator Date Approval Date Approval Date

Response

Cause of Condition:

Corrective Action

Resolution:

(B) Prevention

(B2) Affected Documents

Signature____________________ Date_________

CA Follow-up

Corrective Action verified by:_____________________ Date ________

SECTION 11

REPORTS TO MANAGEMENT

11.1 QA REPORTS

Management personnel receive QA reports appropriate to their level of responsibility. The PM receives copies of all QA documentation. QC documentation is retained within the department that generated the product or service except where this documentation is a deliverable for a specific contract. QC documentation is also submitted to the project QAO for review and approval. Previous sections detailed the QA activities and the reports, which they generate. Among other QA audit reports that may be generated during the conduct of activities, a final audit report for this project will be prepared by the QAO. The report will include:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of performance audits and/or system audits
- Significant QA problems and recommended solutions for future projects
- Status of solutions to any problems previously identified.

Additionally, any incidents requiring corrective action will be fully documented.

SECTION 12

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ATTACHMENT 1

SUMMARY OF ANALYTICAL DATA PACKAGE
(DQO LEVEL IV)

1.0 INTRODUCTION

In order for data to be used for decision-making purposes it is essential that it be of known and documented quality. Verification and validation of data requires that appropriate quality assurance and quality control (QA/QC) procedures be followed, and that adequate documentation be included for all data generated both in the laboratory and in the field.

The QA/QC documentation provided by any laboratory, in conjunction with sample results, allows for evaluation of the following indicators of data quality:

- Integrity and stability of samples;
- Instrument performance during sample analysis;
- Possibility of sample contamination;
- Identification and quantitation of analytes;
- Analytical precision; and
- Analytical accuracy.

General laboratory documentation requirements discussed in this document are formatted into two sections, organic and inorganic analyses. These specifications are intended to establish general, analytical documentation requirements that laboratories should meet when generating data for this project.

2.0 GENERAL DOCUMENTATION REQUIREMENTS

2.1 Data Package Format

Each data package for Level IV data submitted will consist of five sections:

- Case narrative;
- Chain-of-custody documentation
- Summary of results for environmental samples;
- Summary of QA/QC results; and
- Raw data.

Level II data packages will not contain the raw data.

Data packages will be consistent with, and will supply the data and documentation required for NYSDEC ASP-defined deliverables (i.e. Category B and Category A). Summaries of data and results may be presented in a Contract Laboratory Program (CLP) type format or an equivalent format that supplies the required information as stated below. All laboratory data qualifiers shall be defined in the deliverable.

In cases where the laboratory has varied from established methodologies, they will be required to provide the Standard Operating Procedures (SOPs) for those methods and added as an attachment to the Work Assignment Scoping Documents or as variances to this QAPP. Inclusion of these SOPs will aid in final review of the data by data reviewers and users.

2.2 Case Narrative

The case narrative will be written on laboratory letterhead and the release of data will be authorized by the laboratory manager or their designee. The Case Narrative will consist of the following information:

- Client's sample identification and the corresponding laboratory identification;
- Parameters analyzed for each sample and the methodology used. EPA method numbers should be cited when applicable;
- Whether the holding times were met or exceeded;
- Detailed description of all analytical and/or sample receipt problems encountered;
- Discussion of reasons for any QA/QC sample result exceedances; and
- Observations regarding any occurrences which may adversely impact sample integrity or data quality.

2.3 Chain-of-Custody

Legible copies of all Chain-of-Custody forms for each sample shall be submitted in the data package. Copies of any internal laboratory tracking documents should also be included. It is anticipated that Chain-of-Custody forms and/or internal laboratory tracking documents will include the following information:

- Date and time of sampling and shipping;
- Sampler and shipper names and signatures;
- Type of sample (grab or composite);
- Analyses requested;
- Project, site, and sampling station names;
- Date and time of sample receipt;
- Laboratory sample receiver name and signature;
- Observed sample condition at time of receipt;
- Sample and/or cooler temperatures at time of receipt;
- Air bill numbers;
- Custody seal; and
- Sample numbers.

3.0 ORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

These requirements are applicable to organic methods (e.g., VOCs, SVOCs, pest/PCBs).

3.1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample.

- Client's sample identifications and corresponding laboratory identifications;

- Sample collection dates;
- Dates and times of sample extraction and/or analysis;
- Weights or volumes of sample used for extraction and/or analysis;
- Identification of instruments used for analysis;
- Gas Chromatography (GC) column and detector specifications;
- Dilution or concentration factor for the sample;
- Percent Difference between columns, if applicable;
- Percent Moisture or Percent Solids for soil samples;
- Method Detection Limits (MDLs) or sample Reporting Limits (RLs);
- Analytical results and associated units;
- Discussion of any manual integrations; and
- Definitions for any laboratory data qualifiers used.

3.2 Summary of QA/QC Sample Results (as applicable)

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms should, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

3.2.1 Instrument Calibration (for each instrument used)

- **GC/MS Tuning**. Report mass listings, ion abundance criteria, and percent relative abundances. List the instrument identification (ID) and the date and time of analysis. Ensure that all ion abundances have been appropriately normalized.
- **Initial Calibration**. Report analyte concentrations of initial calibration standards and the date and time of analysis. List the instrument identification (ID), response factors (RF), relative response factors (RRF), or calibration factors (CF), percent relative standard deviation (%RSD), and retention time (RT) for each analyte. The initial calibration (IC) report must also include a sample identifier (ID), associated injection volume or quantity of sample analyzed, the acceptance criteria, such as minimum RF values, and associated maximum %RSD values.
- **Continuing Calibration**. Report the concentration of the calibration standard used for the continuing calibration and for the mid-level standard, and the date and time of analysis. List the ID, RF, RRF, CF, percent difference (%D), and RT for each analyte.

- **Quantitation Limit** or Project Required Reporting Limit (PRRL) Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each analyte analyzed. The date and time of analysis must also be reported.

3.2.2 Method Blank Analysis

List environmental samples and QC analyses associated with each method blank. Report concentrations of any analytes found in method blanks above the instrument detection limit.

3.2.3 Surrogate Standard Recovery

Report the name and concentration of each surrogate compound added. List percent recoveries of all surrogates in the samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Also include acceptance ranges that the laboratory used for the analysis.

3.2.4 Internal Standard Summary

Report internal standard area counts of the associated calibration standard and retention times, include upper and lower acceptance limits. List internal standard area counts and retention times for all samples, method blanks, matrix spike/matrix spike duplicates and other QC analyses. Include the ID and the date and time of analysis.

3.2.5 Compound Confirmation

Report retention times of each compound on both columns as well as retention time windows of the associated standard. In addition, report determined concentrations from each column and percent differences between results. List the ID and the date and time of analysis. A summary should be generated for each sample, including dilutions and reanalyses, blanks, MSs, and MSDs.

3.2.6 Peak Resolution Summary

For primary and secondary columns report retention times of any target compounds and/or surrogates that coelute in the standards (ie. the Performance Evaluation Mixture for Contract Laboratory Program pesticides). Calculate and report the percent resolution between each pair of compounds which coelute. Include the ID, column ID, and the date and time of analysis.

3.2.7 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analysis

Report the name and concentration of each spiking compound. Samples are to be spiked with specified compounds of potential concern. List sample results, spiked sample results, duplicate spiked sample results, percent recovery (%R) and the relative percent difference (RPD) between the MS and MSD (if applicable). Acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.8 Laboratory Duplicate Analysis

When performed, report the RPD between duplicate analyses, along with the associated acceptance criteria.

3.2.9 Laboratory QC Check Sample Analysis

Also known as the Laboratory Control Sample (LCS) or Matrix Spike Blank (MSB). Report the name and concentration of each spiking compound. List the QC check sample and duplicate (if applicable) results, %R, and RPD, if performed in duplicate. The acceptance criteria that the laboratory used for the analysis must also be presented.

3.2.10 Other QC Criteria

- **Retention time windows determination**. Report the retention time window for each analyte, for both primary and confirmation analyses.
- **Compound identification**. Report retention times and concentrations of each analyte detected in samples.
- **MDL determination**. List most recent method detection limits, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Additional method suggested QC parameters, if required**.
- **Any Performance Evaluation (PE) samples** (if identified) associated with the environmental samples.

3.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Raw data for compound identification and quantitation must be sufficient to verify each result.

3.3.1 Gas Chromatographic (GC) Analyses

This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for both primary and confirmation analyses are to be included. Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Area print-outs or quantitation reports;

- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested;
- Percent Moisture or Percent Solids for soil samples; and
- GC/MS confirmation, as applicable.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

3.3.2 Gas Chromatographic / Mass Spectrometric (GC/MS) Analyses

This section shall include legible copies of raw data for the following:

- Environmental samples arranged in sequential order by laboratory sample number, include dilutions and reanalyses;
- Mass spectrometer tuning and mass calibration (BFB, DFTPP);
- Initial and continuing instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Appropriately scaled chromatograms (label all analyte peaks, internal standards and surrogate standards with chemical names). All chromatograms shall be scaled such that individual peaks can be readily resolved from any neighboring peaks;
- Appropriately scaled before and after manual integrations;
- Ion scans and enhanced spectra of target analytes and tentatively identified compounds (TICs), with the associated best-match spectra;
- Area print-outs and quantitation reports;
- Instrument analysis logs for each instrument used;
- Sample extraction and cleanup logs;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including surrogates, internal standards, and spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Moisture Content (Percent Moisture) for sediment samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.0 INORGANIC ANALYSES DOCUMENTATION REQUIREMENTS

4. 1 Summary of Environmental Sample Results

The following information is to be included in the summary of sample results for each environmental sample:

- Client's sample identifications and corresponding laboratory identifications;
- Sample collection dates;
- Dates and times of sample digestion and/or analysis;
- Weights or volumes of sample used for digestion and/or analysis;
- Identification of instruments and analytical techniques used for analysis;
- Instrument specifications;
- Dilution or concentration factor for the sample;
- Percent Moisture or Percent Solids for soil samples;
- Detection Limits: MDLs, RLs;
- Analytical results and associated units; and
- Definitions for any laboratory data qualifiers used.

4.2 Summary of QA/QC Results

The following QA/QC sample results shall be presented on QC summary forms. They shall also include the date and time of analysis. Additional summary forms may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

All summary forms shall, at a minimum, include in the header:

- Form Title;
- Project Identifier (e.g., Batch QC ID, Site Name, Case Number, Sample Delivery Group);
- Laboratory Name; and
- Sample Matrix.

4.2.1 Instrument Calibration Verification (if applicable)

The order for reporting of calibration verifications for each analyte must follow the chronological order in which the standards were analyzed.

- **Initial Calibration Verification.** Report the source for the calibration verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.
- **Continuing Calibration Verification**. Report the source for calibration verification standards. Report the concentration for the true value, the concentration found, the

percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.

- **Quantitation Limit** or PRRL Verification (if applicable). Report results for standards that are used to verify instrument sensitivity. Report the source for the verification standards. Report the concentration for the true value, the concentration found, the percent recovery, and control limits for each element analyzed. The date and time of analysis must also be reported.

4.2.2 Blank Analysis

Report analyte concentrations above the instrument detection limits found in the initial calibration blanks (ICBs), continuing calibration blanks (CCBs), and in method/ preparation blanks. The date and time of analysis must also be reported. The order for reporting ICB and CCB results for each analyte must follow the chronological order in which the blanks were analyzed.

4.2.3 Matrix Spike (MS) Analysis

Report concentrations of the unspiked sample result, the spiked sample result and the concentration of the spiking solution added to the pre-digestion spike for each analyte. Calculate and report the %R and list control limits. If performed in duplicate, provide the %R for the MSD and the RPD.

4.2.4 Post Digestion Spike Analysis (if applicable)

In addition to matrix spikes, post-digestion spikes are often required by the method. Report concentrations of the unspiked sample results, spiked sample results, and the concentration of the spiking solution added. Calculate and report the %R and list control limits.

4.2.5 Laboratory Duplicate Analysis

Report concentrations of original and duplicate sample results. Calculate and report the RPD and list control limits.

4.2.6 Laboratory Control Sample

Identify the source for the LCS. Report the found concentration of the laboratory control sample and the true concentration for all analytes. Calculate and report the %R and list control limits.

4.2.7 Other QC Criteria (if applicable)

- **Method of Standard Additions (MSA)**. This summary must be included if MSA analyses are performed. Report absorbance values with corresponding concentration values. Report the final analyte concentration and list the associated correlation coefficient and control limits.
- **ICP-AES Serial Dilution**. Report initial and serial dilution results, associated %D, and control limits.

- **ICP-AES Linear Dynamic Ranges.** For each instrument and wavelength used, report the date on which linear ranges were established, the integration time, and the upper limit concentration.
- **MDL Determination**. List most recent method detection limits, with dates determined maintained in laboratory file. MDL summary forms may be submitted at start of project and not included in individual data packages.
- **Any Performance Evaluation (PE) Samples** (if identified) associated with the environmental samples.

4.3 Raw Data

Legible copies of the raw data shall be organized systematically, each page shall be numbered, and a table of contents must be included with each package. Data should be organized sequentially by method and analysis date. Raw data for compound identification and quantitation must be sufficient to verify each result.

4.3.1 Atomic Absorption (AA) and Atomic Emission (AE) Spectrometric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Instrument calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).
- Measurement print-outs for all instruments used or copies of logbook pages for analyses that do not provide instrument print-outs;
- Absorbance units, emission intensities, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, etc.;
- Instrument analysis logs for each instrument used or summary of sample analyses;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in “job file” in laboratory, unless otherwise requested;
- Wavelengths used for the analyses; and
- Percent Moisture or Percent Solids for soil samples.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.2 Titrimetric and Colorimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;
- Titrant volumes, titration end-points, absorbance units, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, digestion times, sample volumes, solution normalities, etc.;
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards (including spike solutions) maintained in "job file" in laboratory, unless otherwise requested; and
- Wavelengths used for the analyses.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

4.3.3 Gravimetric Analyses

This section shall include legible copies of raw data for the following:

- Environmental sample results, include dilutions and reanalyses;
- Calibrations; and
- QC analyses (i.e., method blanks, LCS, etc.).

Raw data for each analysis shall include the following:

- Copies of logbook pages for analyses that do not provide instrument print-outs and calculations used to derive reported sample concentrations;
- Weights, sample volumes, or other measurements for all analyses;
- Sample preparation and digestion logs that include reagents used, standards referenced to standards preparation logs, volumes of reagents, drying times, drying temperatures, etc.; and
- Standards preparation logs and manufacturer certificates of analyses for standards, if applicable, sufficient to document traceability of all standards maintained in "job file" in laboratory, unless otherwise requested.

Note: Additional raw data may be required for some methods. Therefore, when reporting data, laboratories should defer to specific method requirements.

SUMMARY OF REQUIRED LABORATORY DELIVERABLES FOR LEVEL IV DQO DATA PACKAGE (REQUIREMENTS WILL VARY BY METHOD)

Method Requirements	Laboratory Deliverables
Requirements for all methods:	
Parsons project identification number	Case narrative
Discussion of unusual circumstances or problems	Case narrative
Analytical method description and reference citation	Case narrative
Field sample identification	Signed chain-of-custody forms and sample results form
Laboratory assigned sample number	Signed chain-of-custody forms and sample results form
Sample matrix description	Signed chain-of-custody forms and sample results form
Date of sample collection	Signed chain-of-custody forms and sample results form
Date of sample receipt at laboratory	Signed chain-of-custody forms
Analytical method description and reference citation	Signed chain-of-custody forms and case narrative
Sample analysis results	USEPA CLP form or equivalent sample analysis results summary form (e.g., ASP Form I-VOA)
Dates of sample preparation and analysis (including first run and any subsequent runs)	Specific deliverable depends on type of analysis
Laboratory analytical QC batch info and sample analysis associations	Specific deliverable depends on type of analysis
Instrument analysis sequence log	Specific deliverable depends on type of analysis
Analytical holding times compliance	USEPA CLP form or equivalent holding time summary form
Method detection limit (MDL) determination	USEPA CLP form or equivalent MDL summary form
Method reporting limits (RLs) achieved	Specific deliverable depends on type of analysis (see below)
Dilution or concentration factors	Specific deliverable depends on type of analysis
Discussion of unusual circumstances or problems	Case narrative
Laboratory Control Sample (LCS) results	USEPA CLP form or equivalent LCS results summary form
“Raw” analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
Matrix spike / matrix spike duplicate	USEPA CLP form or equivalent MS/MSD summary form (e.g., NYSDEC ASP Form III-SV
Method blank analysis	USEPA CLP form or equivalent method blank summary form (e.g., NYSDEC ASP Form IV-SV)
GC/MS instrument performance check. Tuning and mass calibration (abundance) using 4-bromofluorobenzene (BFB) for method SW8260B and decafluoro-triphenyphosphine (DFTPP) for method SW8270C	USEPA CLP form or equivalent instrument tuning/performance check summary form
Internal Standard Area Counts and Retention Time, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form VIII-SV)
GC/MS initial calibration data	USEPA CLP form or equivalent initial calibration summary form (e.g., NYSDEC ASP Form VI-SV)
GC/MS continuing calibration data.	USEPA CLP form or equivalent continuing calibration summary form (e.g., NYSDEC ASP Form VII-SV)
GC/MS calibration verification (initial and continuing)/2nd source calibration verification (ICV/CCV)	USEPA CLP form or equivalent calibration verification summary form
GC continuing calibration data for volatile and semivolatile analyses. If calibration factors are used, calibration factors and their percent differences from the initial calibration must be reported. Retention time windows and analyte retention times must be included in this form	USEPA CLP form or equivalent calibration verification summary form
GC/MS internal standard area and retention time summary data	USEPA CLP form or equivalent internal standard summary form
GC second column confirmation, as applicable. To be done for all compounds that are detected above method detection limits	Chromatograms of all confirmations of all samples and the standard laboratory form for all positive results
Surrogate Compound percent recovery summary	USEPA form or equipment percent recovery summary form (e.g., NYSDEC ASP Form II-SV)
“Raw” analytical data sufficient to recreate and check analysis results for all calibrations, QC sample results, and sample results	Sequentially numbered pages with tabulated index
Requirements for inorganic analytical methods:	
Initial and Continuing Calibration Verification	USEPA CLP form or equivalent calibration verification summary form(s) (e.g., NYSDEC ASP Form II-IN)

REQUIRED LABORATORY DELIVERABLES (Continued)

Method Requirements	Laboratory Deliverables
ICP Interference Check Sample (ICS), as applicable	USEPA CLP form or equivalent ICS standard summary form (e.g., NYSDEC ASP Form IV-IN)
ICP Interelement Correction Factors, as applicable	USEPA CLP form or equivalent internal standard summary form (e.g., NYSDEC ASP Form XII-IN
IDL or MDL determination	USEPA CLP form or equivalent IDL or MDL summary form(s)
Post-digestion spike, as applicable	USEPA CLP form or equivalent post-digestion spike summary form(s) (e.g., NYSDEC ASP Form V-IN)
ICP linear range	USEPA CLP form or equivalent linear range summary form(s) (e.g., NYSDEC ASP Form XII-IN)
ICP serial dilution, as applicable	USEPA CLP form or equivalent serial dilution summary form(s) (e.g., NYSDEC ASP Form IX-IN)
Method of standard addition (MSA), as applicable	USEPA CLP form or equivalent MSA summary form(s)
Laboratory duplicate results, as applicable	USEPA CLP form or equivalent duplicate analysis summary form(s) (e.g., NYSDEC ASP Form VI-IN)
Requirements for other methods:	
Preparation and analysis logs	No format
Sample results	No format
MS/MSD results	No format
Lab duplicate sample results	No format
Laboratory control sample	Control limits
Method blank results	No format
Initial calibration results	No format
Continuing calibration check (calibration verification)	No format. Report percent relative standard deviation or percent difference from initial calibration