SITE MANAGEMENT PLAN – REVISED
XEROX BUILDING 801
HENRIETTA, NEW YORK
NYSDEC SITE #828069

By

Haley & Aldrich of New York
Rochester, NY

for

Xerox Corporation
Webster, New York

File No. 32077-102
Revised 16 June 2010
24 February 2010

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File No. 32077-102

Xerox Corporation
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Attention: **Mr. Eliott Duffney**

Subject: **Site Management Plan – Revised**
Xerox Building 801
Henrietta, New York
NYSDEC Site #828069

Ladies and Gentlemen:

Haley & Aldrich of New York (Haley & Aldrich) is pleased to submit this revised Site Management Plan (SMP) for the Xerox Corporation – Henrietta (Building 801), New York site, which supersedes the SMP dated 24 February 2010. This document is required as an element of the remedial program for the site under the New York State (NYS) Inactive Hazardous Waste Disposal Site Program administered by New York State Department of Environmental Conservation (NYSDEC). Assessment and remedial activities were conducted at the Site in accordance with Order on Consent Index #B8-0207-95-04, Site #828069, which was executed in March 1996 (Order).

This SMP documents the measures required to maintain protection of human health and the environment at the Site now that all required active remedial measures for the Site have been satisfied. This plan specifies the minimum requirements necessary to ensure compliance with the engineering controls (ECs) and institutional controls (ICs) specified by Site deed restrictions, which are in place to address residual contamination at certain locations on this site. Compliance with this plan is required by the grantor of the deed restriction and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

Please contact the undersigned with any questions you may have.

Sincerely yours,

HALEY & ALDRICH OF NEW YORK

Janice R. Szucs
Staff Engineer

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Enclosures

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1. INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 Introduction

This document is a required element of the remedial program for the Xerox Corporation Building 801 facility (hereinafter referred to as the "Site") under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by New York State Department of Environmental Conservation (NYSDEC). The site was assessed and remediated in accordance with Order on Consent Index #B8-0207-95-04, Site # 828069, which was executed on 21 March 1996. This revised Site Management Plan (SMP) supersedes the SMP dated 24 February 2010.

1.1.1 General

Xerox Corporation (Xerox) entered into an Order on Consent with the NYSDEC to remediate environmental impacts associated with past operations on portions of an 86 acre property located at 1350 Jefferson Road, approximately one half mile west of the intersection of Jefferson and Winton Roads in the Town of Henrietta, Monroe County, New York (see Figure 1). The Order on Consent required Xerox to investigate and remediate contaminated media at the site. A map showing the site location and boundaries is provided in Figure 2.

After completion of the remedial work described in the Record of Decision, and the As-Built HRC Remediation Engineering Report, some contamination was left in the subsurface at this site, which is hereafter referred to as "residual contamination." This SMP was prepared to manage residual contamination at the site in perpetuity or until the NYSDEC or its successor agency managing environmental issues in New York State releases the property owner of their obligation to comply with the SMP.

Remedial action work on the site began in 1996 in accordance with the Record of Decision, and was completed in 2006. A remedial site history is described in Sections 1.3 and 1.4 below. All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

Results of previous soil and groundwater data collected as of the date of this SMP indicate residual contamination exists within the limits of the Soil and Groundwater Management Area (SGMA) shown on Figure 3. Any activity conducted within the SGMA may encounter residual contamination, and therefore must be conducted under appropriate Health & Safety protections. Supplemental soil and groundwater characterization may be warranted based on the nature of the proposed activity.

Disturbance below the water table within the SGMA, and any measure that affects groundwater conditions immediately adjoining the SGMA has the potential to expand the area of impact and should be avoided.

Groundwater extraction at the site for potable or non-potable purposes is prohibited without treatment rendering it safe for drinking water or industrial purposes, as appropriate, and without first obtaining express written permission to do so from the Relevant Agency. Recovery of groundwater for construction dewatering is permitted as long as recovered groundwater is managed in accordance with Section 2.4.10. Long-term pumping outside of the

SGMA will not be permitted on the property without written consent from NYSDEDC based on a demonstration that such pumping will not significantly or detrimentally impact plume stability or groundwater migration within the SGMA.

Discharge of water generated during construction dewatering activities within or immediately adjoining the SGMA to surface waters (i.e. a local pond, stream or river) is prohibited.

Excavation within the limits of the SGMA may mobilize currently stable plume conditions and cause migration toward or past the limits of the SGMA. If excavation in the SGMA or immediately adjoining the SGMA is necessary, it must be conducted in accordance with Section 2.4 of this SMP and conform to the NYSDEC guidance for contaminated soil management.

The potential for vapor intrusion must be evaluated prior to any new building construction within or immediately adjoining the SGMA in accordance with applicable NYS guidance.

This SMP was prepared by Haley & Aldrich of New York, on behalf of Xerox Corporation, in general accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated December, 2002, and guidelines provided by the NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Order on Consent and subsequent guidance from NYSDEC for the site.

1.1.2 Purpose

After completion of multiple NYSDEC approved remedial actions, areas of residual contamination remain at the site. Engineering and Institutional Controls (EC/ICs) have been incorporated into the site remedy to provide proper management of residual contamination in the future to ensure protection of public health and the environment. The ICs place restrictions on site use, and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. This SMP describes the nature of installed ECs and specifies the methods necessary to ensure compliance with all ECs and ICs required by deed restrictions for contamination that remains at the site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the property owner. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage areas of residual contamination at the site including: (1) implementation and management of all Engineering and Institutional Controls; (2) groundwater and surface water monitoring; (3) operation and maintenance of the sub-slab soil vapor depressurization system; and (4) performance of periodic inspections, certification of results, and submittal of Annual Certification Reports.

To address these needs, this SMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs, which includes a reporting plan for the submittal of data, information, recommendations, and certifications to NYSDEC; (2) a Monitoring Plan for implementation of Site Monitoring; and (3) an Operation and Maintenance Plan for the sub-slab depressurization system.

It is important to note that:

- **The Site remains in the NYS Inactive Hazardous Waste Disposal Site Remedial Program administered by the NYSDEC and is considered a Class 4 Site. Therefore, the Site owner is required to manage the site in accordance with this SMP and the Order on Consent (Index #B8-0207-95-04, Site # 828096).**

- **This SMP details the site-specific implementation procedures that are required of the owner of this property.**

- **Failure to comply with this SMP is also a violation of, 6 NYCRR Part 375 and the Order on Consent (Index #B8-0207-95-04, Site # 828096) for the site, and thereby subject to applicable enforcement action.**

At the time the SMP was prepared, the SMP and all site documents related to Remedial Investigation and Remedial Action were maintained at the NYSDEC office in Region 8, Avon, New York.

1.1.3 Applicability

This SMP, with the exception of the Excavation Plan (Section 2.5), is applicable to the entire property. The Excavation Plan only applies to the management of soil and groundwater within and immediately adjoining the limits of the SGMA (shown on Figure 3).

1.2 Site Background

1.2.1 Site Location and Description

The site is located in the Town of Henrietta, County of Monroe, New York and is assigned Monroe County Tax Map Parcels No. 162.07-1-3, No. 162.08-1-1, No. 162.08-1-2, No. 162.08-1-30 and No. 162.08-1-31. The site is an approximately 86-acre area bounded by undeveloped land to the north, undeveloped and commercial properties to the east and west, and Jefferson Road to the south (beyond which is additional commercial and industrial property use). An aerial photograph of the property, dated 2007 is shown on Figure 2.

The B801 property is an irregularly shaped parcel of approximately 86 acres comprised of the approximately 51 acre original site and the approximately 35 acres acquired in 1993. The main building on the property covers approximately 12 acres and is located on the southern half of the property. The majority of the property is covered by building, paved parking areas and roadways, while the northern portion of the property is covered by woody vegetation and weed growth.

Remediation work was performed at the site in areas where environmental impacts were delineated relating to solvent releases and usage activities that occurred during copier refurbishing operations. Soil, groundwater, and sub-slab soil vapor were impacted. The area identified as the "Lawn Area" contained the highest contaminant concentrations both before and after completion of active remediation as evidenced through routine groundwater monitoring. Lesser impacts remain beneath a portion of the building footprint and driveway. The Lawn

Area and areas of the building where residual contamination is present are located within the SGMA (Figure 3).

1.2.2 Site History

Xerox Corporation refurbished photocopier machines at the Site between 1972 and 1978. The machine parts were cleaned in the northeast corner of the building using chlorinated solvent blends and/or detergent washes. The solvent blends consisted of mineral spirits (petroleum distillates) with varying proportions of 1,1,1-trichloroethane, tetrachloroethene, methylene chloride, and trichloroethene. The cleaning process included the use of spray booths, a cabinet washer and recycling pump for wash materials and solvents, two turbulators, each with a tank and pit for batch cleaning, a solvent storage room, a paint shop, and various solvent and waste solvent storage tanks. The areas that contained these operations were assessed for potential environmental impacts as part of the site investigative activities.

The solvent blend management activities of the refurbishing operations included two above ground 8,000 gallon solvent storage tanks, two 1,000 gallon tanks, one 500-gallon overflow tank, and one 500 gallon spill crock. The solvent blend storage and process related tanks were removed from the site after refurbishing operations were discontinued in 1978.

1.2.3 Geologic Conditions

The geology of the Site is characterized by approximately 35 to 40 feet of soil fill and glacial overburden underlain by shale bedrock (Vernon Shale). Competent bedrock exists between 30 and 40 feet below ground surface.

The overburden consists of three dominant types of materials: fill, glacio-lacustrine (glacial lake) deposits and glacial till. Fill material was placed over much of the site to raise the natural grade prior to construction of Building 801. The fill material exists in all areas at the site except the northern, wooded portion. Natural soil materials consisting of medium dense red-brown silty sand, often containing varying amounts of clay or gravel were imported to the site as fill. Lacustrine deposits underlie the fill and are variable in composition. Two separate lacustrine units exist: a silty to sandy layer encountered immediately below the fill and a clay layer situated throughout different portions of the site. Glacial till deposits overlie the shale bedrock. The till composition ranges from very dense, gray-brown, silty sand and dense, clayey silt to a very stiff, brown, silty clay with varying amounts of sand and gravel.

The local hydrogeologic setting of the B801 site consists of two distinct hydrogeologic units: an upper water-table aquifer and a lower confined aquifer which is overlain by a lacustrine clay aquitard. The area of concern for this report is within the upper aquifer and is discussed below.

Static groundwater levels in the upper aquifer lie within 2 to 5 feet below ground surface. The general direction of groundwater flow is towards the north. A groundwater velocity maximum of approximately 4×10^{-5} cm/s was calculated at the site. This calculation was based on maximum hydraulic conductivity and horizontal gradient and an assumed minimum porosity.

The upper till of the upper aquifer has a hydraulic conductivity of approximately 10^{-6} to 10^{-7} cm/s. The hydraulic conductivity of the upper lacustrine silts/sands within the upper aquifer is

approximately 10^{-4} to 10^{-5} cm/s. The extremely low conductivity of the upper till may cause it to act, along with the lacustrine clay layer, as a partially confined layer.

Horizontal gradients within the upper aquifer normally range from 0.001 to 0.023 feet per foot and vary with location on the site as well as seasonality. Vertical gradients within the upper aquifer are also present. Upward vertical gradients range between 0.01 and 0.25 feet per foot. The higher vertical gradients exist in summer months. In the SGMA, localized groundwater flow is generally to the north-northeast.

1.3 Summary of Remedial Investigation Findings

In 1986, Xerox Corporation initiated investigative activities to evaluate environmental conditions as they related to former copier refurbishing operations. Solvent contamination was identified in a surface water drainage feature to the north of the facility as well as in the soil, sediment, and groundwater beneath portions of the site. Xerox subsequently entered into an Order on Consent with the NYSDEC in February 1990 to conduct a Remedial Investigation/Feasibility Study and Interim Remedial Measure. A Remedial Investigation (RI) was performed to characterize the nature and extent of contamination at the site. The results of the RI are described in detail in the following report:

- **"Remedial Investigation, Xerox Building 801, Henrietta, NY," dated May 1993. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

1.3.1 Nature & Extent of Contamination

The contamination at the Site had impacted site soils, groundwater, and surface water. The nature and extent of contamination was delineated through remedial investigations conducted in coordination with and approval by the NYSDEC.

The site compounds of concern (COCs) include methylene chloride, 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), 1,2-dichloroethane (1,2-DCA), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), tetrachloroethene (PCE), vinyl chloride (VC), and mineral spirits. The majority of the soil contamination occurs in the upper 8 to 12 feet of soils. The majority of the groundwater impacts are restricted to the site's upper aquifer (water table). These findings were previously reported to the agency in the site Remedial Investigation Report (RI) dated May 1993. COCs have remained the same since 1993 as indicated in routine site groundwater monitoring reports prepared as of the date of this SMP.

The most recent groundwater analytical results, dated December 2008 indicate that total volatile organic compound (VOC) concentrations in the SGMA range from non-detect to 486 mg/L. Concentrations of biological breakdown products (primarily cis-1,2-DCE) are increasing as expected in the source area as a direct result of reductive dechlorination that has been enhanced by HRC injections conducted as part of the remedial effort. The groundwater analytical results also indicate that the reductive dechlorination process is progressing naturally to completion, gradually reducing residual contaminant levels and assisting with maintaining overall plume stability.

Surface water total VOC concentrations at sample location SW-35 have historically fluctuated without respect to season from non-detect to 0.2 mg/L since 1998.

An assessment of potential soil vapor intrusion impacts was conducted beneath the solvent use areas beneath the building. Contaminant vapors were identified beneath the building floor slab in the northeast corner of the building, due to residual soil and/or groundwater impacts in this area. The potential for vapor intrusion to the building from soil and groundwater has been mitigated via a sub-slab depressurization (SSD) system. The limits of the SSD system influence extends beyond the area of observed soil and groundwater impacts as described in section 2.2.1.1 of this SMP.

1.4 Summary of Remedial Actions

Xerox has implemented several phases of remedial actions at this site since the early 1990s through 2006 when remediation was deemed complete by the NYSDEC. An Interim Remedial Measure (IRM) consisting primarily of recovering impacted groundwater from five recovery wells and processing the groundwater through an activated carbon treatment system, and diverting clean surface water and runoff away from areas where chlorinated solvent and petroleum distillates were known to be present was implemented at the site in the spring of 1990. A limited amount of contaminated soils were containerized in roll off boxes and treated via soil vapor extraction (SVE) under an approved IRM until such time the soils met NYSDEC criteria for non hazardous soils. After treatment, the soils were used onsite to manage site runoff and drainage. Operation of the groundwater recovery and treatment system ceased in 1994, with NYSDEC approval, due to limited remedial benefit and minimal mass recovery. In late 1994, a pilot demonstration of the more robust 2-PHASE™ Extraction technology IRM was implemented which was designed to significantly enhance removal of source area impacted groundwater and soil vapor under high vacuum.

Based on the demonstrated favorable performance during the pilots study, a Record of Decision (ROD) naming 2-PHASE™ Extraction as the preferred remedial alternative was issued by the NYSDEC in March 1995. In addition to 2-PHASE™ Extraction, mitigation of surface water impacts was addressed by relocating a stormwater drainage stream around the source area of contamination. The stormwater re-direction activities were completed in 1995 after issuance of the ROD. The 2-Phase extraction equipment was operated through 2001 when operation of the system was ceased, with NYSDEC approval, due to diminishing mass removal rates. During the period of its operation, the 2-Phase extraction system recovered over 9,000 pounds of source area contaminants.

In response to declining mass removal rates associated with the 2-PHASE extraction system, a preliminary Monitored Natural Attenuation (MNA) Evaluation was performed in 1999. The MNA evaluation was performed to determine if: groundwater conditions were stable, meaning the plume was no longer a threat for expansion; and whether natural attenuation was occurring at the Site at a rate sufficient to be considered as part of future remediation strategies, either as a stand-alone remedy or in conjunction with other technologies. The MNA evaluation included quarterly sampling of several site wells and a prolonged (one-year) shutdown of the 2-PHASE™ system and a six-month system rebound test in the North-South Ditch Area.

The evaluations concluded:

- **Natural Attenuation appears to be ongoing at the site and is supported by three lines of evidence: historical plume stability, presence of direct biodegradation breakdown products, and presence of a geochemical MNA footprint.**

- **Historical concentration trends indicate overall plume stability. Long-term shutdown of the 2-PHASE™ system for the rebound testing and MNA monitoring did not cause substantial concentration increases in wells outside the source area. Concentration increases were observed for wells in the source area during the rebound test.**

Operation of the 2-PHASE™ extraction system was terminated on 14 November 2001, with approval of the NYSDEC, due to asymptotic low mass removal conditions and the lack of substantial rebound outside the source area during the rebound test which confirmed that the system had reached the limits of its effectiveness. A total of approximately 9,589 pounds of COC's were removed from the subsurface since the system's inception. Following the shutdown of the 2-Phase Extraction System in November 2001, site soil and groundwater concentrations remained above cleanup goals established for the site. NYSDEC requested that a Focused Feasibility Study (FFS) be submitted to assess supplemental remedial activities that may further enhance site conditions.

The FFS recommended the evaluation of a final stage of remediation in the form of "Enhanced Bioremediation and Monitored Natural Attenuation" (EBMNA) approach for the site. The focus on the evaluation of the EBMNA processes shifted to assessing whether this remediation method was capable of materially enhancing the site remedial effort. The evaluation was performed in accordance with the NYSDEC approved "Enhanced Bioremediation and Monitored Natural Attenuation Work Plan" (EBMNA Work Plan) dated December 2001. The results were described in the "Report on Enhanced Bioremediation and Monitored Natural Attenuation Data Collection and Evaluation Program" (EBMNA Report). The EBMNA approach and results are also summarized in the Draft "Remedial Design/Remedial Action Work Plan" dated 25 April 2006 (April 2006 Work Plan) for the B801 site.

As a result of the EBMNA evaluation program, and with NYSDEC concurrence, a Pilot Test injection of electron donor (HRC-S) was performed at the site in November 2003 in accordance with the Pilot Test scoping document entitled "Field Pilot Test Injection of Electron Donor" (Pilot Test Plan) dated 2 October 2003. The results of the Pilot Test indicated that reductive dechlorination is an active process that could be stimulated by electron donor injection within the injection grid area. Based on these results, a single larger-scale injection of HRC was recommended.

A design for a final larger-scale HRC-S injection was provided to the NYSDEC in the April 2006 Work Plan. The April 2006 Work Plan, which specified a single HRC injection, was approved by the NYSDEC in their letter dated 6 June 2006 as the final active remedial requirement for the site. The larger-scale HRC-S injection was completed during July and August 2006. Since this final large-scale injection, monitoring of the site continues and is designated to continue as defined in this SMP.

In 2006, the evaluation of potential vapor intrusion concerns at environmental sites across New York State by NYSDEC and NYSDOH prompted Xerox, with NYSDEC approval, to install a sub-slab depressurization (SSD) system in the area of the former solvent spray booths. Subsequently, Xerox was required to perform additional investigative work through a series of sub-slab soil vapor sampling events and then expanded the SSD system under the direction of both the NYSDEC and New York State Department of Health (NYSDOH). In June 2008, the NYSDEC and NYSDOH acknowledged that the requirements for SVI have been met at the Building 801 site and that routine monitoring of the SSD system should be performed as outlined in this SMP.

The following is an overall summary of the Remedial Actions performed at the site:

1. **Groundwater pump and treat was performed from 1990 to 1994.**

2. **Stormwater redirection occurred in 1995.**
3. **2-PHASE Extraction occurred from 1994 to 2001.**
4. **HRC-S pilot test and larger-scale injection occurred from 2003-2006.**
5. **Installation and testing of the sub-slab depressurization system occurred in 2006 – 2007.**
6. **Development and implementation of a Site Management Plan for long term management of remaining contamination as required by the NYSDEC, which includes plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance, and (4) reporting.**

Active remedial requirements for the site were completed in August 2006 with the completion of the large-scale bio amendment addition.

1.4.1 On-Site and Off-Site Treatment Systems

No long-term treatment systems were installed as part of the site remedy.

1.4.2 Remaining Contamination

Refer to Section 1.3.1 for the nature and extent of remaining contamination.

1.4.3 Engineering and Institutional Controls

Since residual contamination is present at this site, Engineering Controls and Institutional Controls have been implemented to protect public health and the environment for the applicable future use. The controlled property has the following Engineering Controls:

1. **A sub-slab depressurization system installed in the vicinity of the former Centralized Refurbishing Center Area (CRC), located in the northeast area of Building 801.**

A series of Institutional Controls are required to implement, maintain and monitor these Engineering Controls to ensure that:

- **All Engineering Controls must be operated and maintained as specified in this SMP;**
- **All Engineering Controls on the Site must be inspected and certified at a frequency and in a manner defined in this SMP;**
- **Groundwater, soil vapor, and other environmental health and safety monitoring must be performed as defined in this SMP;**
- **Data and information pertinent to Site Management must be reported at the frequency and in a manner defined in this SMP;**
- **On-site environmental monitoring devices, including but not limited to, groundwater monitoring wells and soil vapor probes, must be protected and replaced as necessary to ensure continued functioning in the manner specified in this SMP.**

In addition, a declaration of covenants and restrictions has been recorded for the property on or about 24 February 2010. This declaration provides that the terms and conditions of the Consent Order for the property (Index #B8-0207-95-4) shall constitute covenants and restrictions running with the land and shall be binding upon all future owners of the Site until satisfied or terminated pursuant to the terms of the order.

2. ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 Introduction

2.1.1 General

Remedial activities completed at the site were conducted in accordance with the NYSDEC-approved work plans for the Xerox site (refer to the References Section of this SMP). The remedial goals included attainment of Soil Cleanup Objectives (SCOs) for on-site soils for commercial use. The SCOs were approved by NYSDEC and are listed in Table I.

Since residual contaminated soil, groundwater, surface water, and soil vapor exists at the site exceeding original SCOs, Engineering Controls and Institutional Controls (EC/ICs) are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all EC/ICs at the site. The Engineering and Institutional Control Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

The purpose of this Plan is to provide:

- **A description of all EC/ICs on the site;**
- **The basic operation and intended role of each implemented EC/IC;**
- **A description of the features that should be evaluated during each periodic inspection and compliance certification period;**
- **A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of an Excavation Plan for the safe handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site;**
- **A description of the reporting requirements for these controls.**

2.2 Engineering Controls

2.2.1 Engineering Control Systems

2.2.1.1 Sub-Slab Depressurization System

The sub-slab depressurization (SSD) system was installed in the vicinity of the former CRC area, located in the northeast portion of the site building. It consists of three low vacuum fans connected to eight suction cavities to depressurize the interstitial space between the building floor and native soils, considered the sub-slab. In addition to the suction points and fans, a sub-slab vacuum monitoring network consisting of twenty-one (21) permanent test points were installed to allow for periodic monitoring of sub-

slab vacuum. The fan and suction locations and permanent monitoring points are shown on Figure 4.

Procedures for operating and maintaining the SSD system are documented in the Operation and Maintenance Plan (Section 4 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the site, occurs.

2.2.2 Criteria for /Termination of the SSD System and Site Monitoring

2.2.2.1 Sub-Slab Depressurization System

Performance of the active SSD system will be monitored via collection of annual vacuum readings from the installed vacuum monitoring network. Vacuum data will be maintained, assessed and presented as part of annual reporting requirements. Operation of the SSD system will not be discontinued unless written approval is granted by the NYSDEC. In order to request the discontinued operation of the SSD system, analytical results of samples collected from sub-slab sampling locations will need to be shown in compliance with NYSDEC/NYSDOH criteria that would not require additional actions to address exposures related to soil vapor intrusion.

2.2.2.2 Site Monitoring

Groundwater and surface water monitoring activities will continue, per a Sampling and Analysis Plan (SAP) approved for the site by NYSDEC. If residual groundwater concentrations are found to be consistently below NYSDEC standards or have become asymptotic over an extended period, NYSDEC can be petitioned to discontinue site monitoring. Monitoring requirements as established in the approved SAP will continue until permission to discontinue is granted in writing by the NYSDEC.

2.3 Institutional Controls

A series of institutional controls are required to: (1) implement, maintain and monitor engineering control systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the site to commercial or industrial uses only. Adherence to these institutional controls on the site is required and will be implemented under this Site Management Plan. These institutional controls are:

- **Compliance with the deed restrictions by the grantor and the grantor's successors and assigns with all elements of this SMP;**
- **All engineering controls must be operated and maintained as specified in this SMP;**
- **All engineering controls on the controlled property must be inspected and certified at a frequency and in a manner defined in the SMP.**
- **Groundwater, soil vapor and other environmental health and safety monitoring must be performed as defined in this SMP;**

- **Data and information pertinent to site management for the controlled property must be reported at the frequency and in a manner defined in this SMP;**

- **On-site environmental monitoring devices, including but not limited to, groundwater monitoring wells and soil vapor probes, must be protected and replaced as necessary to ensure the devices function in the manner specified in this SMP.**

- **The property within the SGMA may only be used for commercial or industrial use provided that the long-term engineering and institutional controls identified in this SMP are implemented and maintained.**

- **Groundwater extraction at the site for potable or non-potable purposes is prohibited without treatment rendering it safe for drinking water or industrial purposes, as appropriate, and without first obtaining express written permission to do so from the Relevant Agency. Removal of groundwater for construction dewatering is permitted.**

- **The site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, to the owner's or remedial party's knowledge that: (1) controls employed at the controlled property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such controlled property at any time upon reasonable notice in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.**

2.3.1 Soil Vapor Intrusion Evaluation

In the event that the construction of an enclosed structure is proposed to be located within or immediately adjoining the SGMA, at least one of the following shall occur:

1. **Depending on the planned future use, the site owner may elect to perform either a soil vapor intrusion (SVI) evaluation or mitigation. The decision of which method will be performed to determine whether any mitigation measures or other measures (such as monitoring) are necessary to address the potential for vapor intrusion into the proposed structure will be at the future site owner's discretion.**

2. **Outside of the SGMA, an SVI mitigation system may be installed as an element of the building foundation without first conducting an SVI investigation. This mitigation system may include a vapor barrier and/or a passive sub-slab depressurization system that is capable of being converted to an active system. A vapor barrier/passive SVI mitigation system, alone is not sufficient in areas within and immediately adjoining the SGMA unless an SVI evaluation is conducted that indicates that an active system will not be required.**

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor

Intrusion in the State of New York". Measures to be employed to mitigate or monitor for potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, if conducted, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary SVI sampling data should be forwarded to the NYSDEC and the NYSDOH for initial review and interpretation. Validated data will be transmitted to the agencies, along with a recommendation for follow-up action.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Annual Certification Report.

2.4 Excavation Plan Inside and Immediately Adjoining the SGMA

Based on the results of prior investigations and confirmation sampling and supplemental soil and groundwater data collected as of the date of this SMP, residual contamination exists within the limits of the SGMA shown on Figure 3. Any activity conducted within the SGMA may encounter residual contamination, and therefore must be conducted under appropriate Health & Safety protections. Supplemental soil and groundwater characterization may be warranted based on the nature of the proposed activity.

Disturbance below the water table within the SGMA, and any measure that affects groundwater conditions immediately adjoining the SGMA has the potential to expand the area of impact and should be avoided. No groundwater extraction wells are permitted at the property within or immediately adjoining the SGMA for any purpose, including but not limited to, consumption or irrigation, except that the removal of groundwater for construction dewatering is permitted.

Excavation crossing a limit of the SGMA may mobilize currently stable plume conditions and cause migration toward or past the limits of the SGMA. If excavation in the SGMA or immediately adjoining the SGMA is necessary, it must be conducted in accordance with Section 2.4 of this SMP and conform to the NYSDEC guidance for contaminated soil management.

Utility installation and similar excavation types that cross a limit of the SGMA must be conducted using appropriate measures to prevent groundwater migration away from the SGMA during excavation activities and within the limits of the completed (backfilled) excavation. Consideration of backfill material, trench bedding material, trench collars, etc, to prevent potential groundwater migration away from the SGMA is necessary.

The property within the SGMA may only be used for commercial or industrial use provided that the long-term engineering and institutional controls included in this SMP are employed. Any future intrusive work that will penetrate, encounter or disturb the remaining contamination, and any modifications to the existing site cover within or immediately adjoining the SGMA (i.e. vegetation, pavement, building slab, etc.) will be performed in compliance with this excavation plan. Intrusive construction work that may encounter residual contamination must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the site by the current site owner and/or contractor as outlined in this excavation plan. A sample HASP and NYSDOH Generic CAMP are attached as Appendix B to this SMP. Note that the attached HASP is intended to serve as an example only. A project-specific HASP conforming to 29 CFR 1910, 29

CFR 1926, and all other applicable Federal, State and local regulations must be developed prior to excavation work and applied to any underground investigations and/or construction in contaminated areas. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section 2.5.2 below. Any intrusive construction work will be performed in compliance with the excavation plan, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 2.6).

The site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations).

The site owner will ensure that site development activities will not interfere with, or otherwise impair or compromise, the presently stable contaminant plume conditions at the site.

2.4.1 Excavations Outside of the SGMA

Excavation activities in areas of the site outside of the SGMA should be performed with consideration of the contaminants known to exist onsite, and in the manner appropriate for that particular project and in accordance with local, State, and Federal laws and regulations. In the event that remaining contamination is encountered outside of the SGMA, the NYSDEC should be notified, and excavations shall be conducted in accordance with the remaining sections of this excavation plan. In the event a structure is contemplated outside of the SGMA, a SVI evaluation is required.

2.4.2 Excavations Inside and Immediately Adjoining the SGMA

Excavations inside and immediately adjoining the SGMA must be conducted in accordance with the remaining sections of this excavation plan.

2.4.3 Notification

At least 60 days prior to the start of any planned activity that is reasonably anticipated to encounter residual contamination within the SGMA (or sooner subject to agreement of the parties), the site owner or their representative will notify the Department. Currently, this notification will be made to:

Mr. Todd Caffoe
New York State Department of Environmental Conservation – Region 8
6274 East Avon-Lima Road
Avon, New York 14414
(585) 226-2466

This notification will be in the form of a work plan that includes:

- **A detailed description of the work to be performed, including the location and areal extent, plans for site re-grading, intrusive elements or utilities to be installed below the soil cover, or any work that may impact an engineering control,**
- **A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling,**
- **Proper disposal of contaminated soils,**
- **Proper management of groundwater from dewatering of excavations,**
- **Stormwater management,**
- **Demarcation layers to denote excavation limits,**
- **Decontamination of field equipment including but not limited to excavators, trucks and drill rigs,**
- **A schedule for the work, detailing the start and completion of all intrusive work,**
- **A statement that the work will be performed in compliance with this excavation plan and 29 CFR 1910.120,**
- **A copy of the health and safety plan developed for the planned activity that incorporates worker and community health and safety monitoring,**
- **Identification of disposition facilities, permits, approvals for potential waste streams generated as part of the excavation activity,**
- **Identification of sources of any anticipated backfill, along with any required certifications or chemical testing results.**

2.4.4 Soil Screening Methods

Visual, olfactory, and hand-held instrument-based soil screening will be performed during any excavation within the SGMA for health & safety purposes and to segregate soils for the appropriate level of post excavation laboratory analysis (i.e. disposal or reuse in the original excavation).

Recent pre-excavation laboratory analytical results may be used to segregate soil during large excavations into appropriate containers for either future reuse (with satisfactory laboratory analytical results to be returned to the original excavation, below a demarcation layer and one foot of clean cover material), or off-site disposal.

2.4.4.1 Stockpile Methods

Stockpiling for large-scale excavations shall not be conducted unless permitted by NYSDEC. Soils from large-scale excavations shall be containerized in appropriate roll-

off containers. Soils excavated for small-scale, short duration projects can be temporarily stockpiled adjacent to the excavation (i.e. utility excavations). Material excavated for small-scale, short duration projects that requires off-site disposal shall be containerized in appropriate roll-off containers. Soils that exceed restricted commercial values in 6NYCRR Part 375-6.8(b) must be disposed of off-site. Soils from the SGMA and other soils with suspected levels of residual contamination will be stockpiled in accordance with current NYSDEC guidance. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Stockpiles will be inspected at a minimum once each week and after every significant storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC. A work plan should be developed for small-scale short duration ground intrusive field activities. The work plan must include worker and community health and safety monitoring and all soil handling procedures.

2.4.5 Soil Characterization Methods

Absent recent soil analytical data within the SGMA, specific to the planned excavation, the personal protection requirements for health & safety are established as level C. Soil will be characterized through sampling and laboratory analysis as described below. If soil is to be disposed of off-site, sufficient soil sampling will need to be performed to properly characterize the soil to meet the disposal facility characterization requirements.

Table I includes applicable NYSDEC Soil Cleanup Objectives (SCOs) to be used as guidance for reuse in the original excavation. The SCOs listed in Table I represent the most recent iteration NYSDEC cleanup criteria prepared as of the date of this SMP. Should those cleanup criteria be revised in the future, the most recent available cleanup criteria should be used. The analytical results will be reviewed with respect to the soil management options as described in Sections 2.4.8 and 2.4.9, below.

2.4.5.1 Sample Collection and Handling

Excavated soil will be characterized for reuse by the collection of representative samples for laboratory analysis for site-specific compounds (Section 2.5.4.4). Demolition material proposed for reuse onsite will be sampled for asbestos and results will be reported to the NYSDEC.

Sampling will be conducted by a qualified person using appropriate sampling equipment and procedures.

For similarly stockpiled soil (i.e. soil originating from the same location and soil type) from small-scale short duration projects (i.e. utility excavations), one composite soil sample will be collected from each stockpile. The composite sample will be comprised of soil collected from four randomly selected areas of the pile six inches below the soil pile surface. To ensure the sample is properly composited, the soil will be combined and quartered in a decontaminated or new stainless steel or plastic bowl prior to containerizing the sample in the appropriate sample jars.

If soil is containerized (i.e. roll-off), a sample from each container of a group of containers totaling 100 cubic yards or less of container volume will be collected and composited. Each sample will be collected at an approximate depth of 8 inches below the soil surface using a decontaminated or new stainless steel or plastic sampling device. Composite samples will be combined and quartered in a decontaminated or new stainless steel or plastic bowl prior to containerizing in the appropriate sample jars.

Immediately upon collection, samples will be labeled and placed in coolers, chilled to approximately 4°C. The sample labels will identify the soil stockpile or container group, sample type (grab or composite), time and date of collection, name of the sampler, and required analyses. Sealed sample coolers will be delivered with accompanying chain of custody documentation to the analytical laboratory.

2.4.5.2 Sample Equipment Decontamination

To minimize the potential for cross-contamination, disposable sampling equipment will be used if possible. If sampling equipment is reused, the equipment will be decontaminated prior to each use using the following procedure:

- **Potable water/non-phosphate detergent (i.e. Alconox) solution wash**
- **Potable or distilled water rinse**
- **Wipe or air dry**

Decontamination rinsate will be collected and disposed of in accordance with site permits and approvals.

2.4.5.3 Laboratory Analysis

Soil characterization samples will be delivered to an ELAP-certified laboratory for analyses in accordance with EPA Method 8260 for VOC analysis. Demolition material proposed for reuse onsite will be sampled for asbestos and results will be reported to the NYSDEC for acceptance.

2.4.6 Materials Excavation and Load Out

In the event that excavation of materials within the SGMA is required, the following will occur:

- **A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.**
- **The owner or lessee of the property as defined by contract, and its contractors, are solely responsible for safe execution of all invasive and other work performed under this Plan.**
- **The presence of utilities and easements on the site will be investigated by the qualified professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.**

- **Loaded vehicles leaving the site with soil designated for waste disposal will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).**

2.4.7 Materials Transport Off-Site

In the event that excavated materials from the SGMA require transport off-site, the following shall occur:

- **All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.**

- **Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.**

2.4.8 Materials Disposal Off-Site

Excess soils excavated from the SGMA that cannot be managed within the SGMA, soils that are generated from large-scale excavations, and soils that exceed the restricted commercial levels shall be containerized in an acceptable hazardous waste container(s) and characterized for off-site disposal at an appropriate NYSDEC-licensed disposal facility, within 90 days of generation. All site-related solvent contaminated soils are considered F-coded hazardous wastes. A "Contained-In" demonstration pursuant to the Division of Solid Hazardous Materials TAGM 3028 must be conducted for soils to be disposed of as non-hazardous. If disposal of soil from the SGMA is proposed as unregulated material for off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from the SGMA will not occur without formal NYSDEC approval.

Potential off-site disposal locations for excavated soils will be identified in the pre-excavation notification made to NYSDEC. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Annual Certification Report. This documentation will include waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste pursuant to 6 NYCRR Part 360-1.2. Material that does not meet the lower of the SCOs for residential use or groundwater protection will not be taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility) without a beneficial use determination issued by NYSDEC.

2.4.9 Materials Reuse On-Site

Excavated site soils can be returned to their original area of excavation pending the results of laboratory testing as follows:

- **Soils demonstrated through sampling and analysis (see Section 3.3) to have specific constituent concentrations less than NYSDEC 6 NYCRR Part 375-6.8(b) Restricted Use Soil Cleanup Objectives for Commercial Use (SCOs), maybe returned to the original excavation provided that excavation is then covered with a demarcation layer and at least 1 foot of clean backfill from an approved source (see Section 2.4.12), pavement, or other approved cover system. Alternatively, excess soils that do not meet applicable SCOs will be required to be disposed of offsite as described in Section 2.4.8 above.**

Chemical criteria for on-site reuse of material have been approved by NYSDEC and are listed in Table I. Note that the SCOs listed in Table I represent the most recent iteration NYSDEC cleanup criteria prepared as of the date of this SMP. Should those cleanup criteria be revised in the future, the most recent available cleanup criteria should be used.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site without NYSDEC approval.

2.4.10 Fluids Management

All liquids to be removed from the site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed or discharged to the sanitary sewer system (by permit) in accordance with applicable local, State, and Federal regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the site.

Discharge of water generated during construction dewatering activities within or immediately adjoining the SGMA to surface waters (i.e. a local pond, stream, or river) is prohibited.

Long-term pumping outside of the SGMA will not be permitted on the property without a demonstration that such pumping will not impact plume stability or groundwater migration within the SGMA.

2.4.11 Site Restoration

After the completion of soil removal from the SGMA and any other invasive remedial activities, the site cover will be restored in a manner that complies with this SMP. All excavation areas will be restored in kind with respect to the original cover or covered with equivalent protection or other NYSDEC-approved barrier.

Other acceptable barriers include pavement (asphalt or concrete), or at least 1 foot of imported clean cover material (free of industrial and/or other potential sources of chemical contamination) seeded to establish perennial vegetation.

2.4.12 Backfill from Off-Site Sources

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP, applicable regulations (6 NYCRR 375) and guidance (DER-10) prior to receipt at the site.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

Soils brought to the site for filling and grading purposes shall be from an acceptable borrow source, free of industrial and/or other potential sources of chemical contamination. Backfill may come from the following sources:

1. **NYSDOT-approved source.**
2. **Other source approved by the NYSDEC pending analytical testing results.**

Sampling data must be provided from all sources, including NYSDOT-approved borrow sources. Analytical testing of backfill materials imported to the site for use as clean cover shall consist of the following list below unless a site-specific exemption is granted by the NYSDEC based on documentation of the origin and composition of the proposed backfill.

- **EPA Method 8260 (Target Compound List VOCs)**
- **EPA Method 8270 (Target Compound List SVOCs)**
- **EPA Method 6010 (Target Analyte List metals)**
- **EPA Method 8081 (PCBs & Pesticides)**

Samples shall be collected at a frequency of one sample per 1,000 cubic yards of proposed imported material.

Suitable offsite material to be used as onsite backfill or cover must not contain compounds at levels greater than the NYSDEC soil cleanup objectives as identified in 6 NYCRR Part 375-6.8(a). Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site. The results of chemical analysis of the material and the basis for acceptance must be provided to the NYSDEC as part of the Annual Certification Report.

2.4.13 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on non-aqueous phase liquid, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in daily and periodic electronic media reports.

2.4.14 Community Air Monitoring Plan

Community air monitoring procedures are to be conducted according to the community air monitoring procedures set forth in the NYSDOH Generic Community Air Monitoring Plan (CAMP) and applies to ground intrusive and demolition activities within and immediately adjoining the SGMA. Note that the Contractor is required to perform air monitoring for its own activities, in conformance to the Contractor's HASP.

2.4.15 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified at the site boundary during excavation work, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's/operator's Remediation Engineer or Contractor, and any measures that are implemented will be discussed in the Annual Certification Report.

Reasonable and customary means will be employed to prevent on- and off-site nuisances. These measures may include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances may include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

2.4.16 Dust Control Plan

The nature of the site geology/hydrogeology eliminates most concerns regarding the need for dust suppression measures. These concerns have not been realized at the site historically during the several years during which Xerox has conducted the several phases of the remedial program completed at the site. As such, dust suppression measures are not proposed as a routine part of future SGMA excavations.

In the unlikely event that dust control concerns are noticed during excavation in the SGMA, a dust suppression plan that addresses dust management during invasive on-site work will be developed that will include, at a minimum, the items listed below:

- **Dust suppression may be achieved though the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including open excavations.**
- **Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.**
- **Gravel will be used on roadways to provide a clean and dust-free road surface.**
- **On-site roads will be limited in total area to minimize the area required for water truck sprinkling.**

2.4.17 Other Nuisances

Considerations for rodent control will be developed and utilized by the site contractor prior to and during site clearing and site grubbing, and during all remedial work within the SGMA.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

2.5 Inspections and Notifications

2.5.1 Periodic Inspections

A comprehensive site-wide inspection of site remedial components will be conducted annually. The inspection will determine and document the following:

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

Inspections of the SSD system will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3), using the Inspection Form included in Appendix D. The reporting requirements are outlined in the Site Management Reporting Plan (Section 2.6).

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 5 days of the event to verify the effectiveness of the EC/ICs implemented at the site by a qualified environmental professional as determined by NYSDEC.

2.5.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- **60-day advance notice of any proposed changes in site use that are required by the Deed Restrictions.**
- **10-day advance notice of any proposed ground-intrusive activities within the SGMA.**
- **Notice within 48-hours of any damage or defect to the foundations structures that reduces or has the potential to reduce the effectiveness of other Engineering Controls, and likewise any action to be taken to mitigate the damage or defect.**
- **Notice within 48-hours of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of Engineering Controls in place at the site, including 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 any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.**

Notifications will be made to Mr. Todd Caffoe (NYSDEC Project Manager) at (585) 226-5350. In the event that NYSDEC develops a centralized notification system, that system will be used instead.

2.5.3 Evaluation and Reporting

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

- **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 February 2007 As-Built HRC Remediation Engineering Report.**

2.6 Reporting Plan

2.6.1 Introduction

An EC/IC Certification will be submitted to NYSDEC annually in January, since the site has been reclassified to a Class 4 site under the New York State (NYS) Inactive Hazardous Waste

Disposal Site Program. The frequency of submittal of the EC/IC Certification may be modified with the approval of the NYSDEC.

This report will include the following:

- **Identification of all EC/ICs;**
- **An assessment of the effectiveness of all EC/ICs for the site;**
- **Results of the required annual site inspections and severe condition inspections, if any;**
- **A compilation of all deliverables generated during the reporting period, as specified in Section 2 EC/IC Plan, Section 3 Monitoring Plan and Section 4 Operation and Maintenance Plan; and**
- **Certification of the EC/ICs.**

2.6.2 Certification of Engineering and Institutional Controls

Inspection of the EC/ICs will occur annually as described above and in Section 3 (Monitoring Plan) and Section 4 (Operation and Maintenance Plan). A qualified environmental professional will prepare an Annual Certification Report which certifies that:

- **On-site ECs/ICs are unchanged from the previous certification;**
- **They remain in-place and are effective;**
- **The systems are performing as designed;**
- **Nothing has occurred that would impair the ability of the controls to protect the public health and environment;**
- **Nothing has occurred that would constitute a violation or failure to comply with any operation and maintenance plan for such controls; and**
- **Access is available to the site by NYSDEC and NYSDOH to evaluate continued maintenance of such controls.**

2.6.3 Annual Certification Report

An Annual Certification Report will be submitted each January beginning the year after the site has been reclassified to a Class 4 site under the New York State (NYS) Inactive Hazardous Waste Disposal Site Program. Other reports, such as validated groundwater and surface water monitoring data, will be submitted annually in conjunction with the Annual Certification Report in January, until it is determined by the NYSDEC that monitoring is no longer required or the frequency of monitoring can be reduced. A summary of media sampling results will also be incorporated into the Annual Certification Report. The Annual Certification Report will include:

- **EC/IC certification;**
- **All applicable inspection forms and other records generated for the site during the reporting period;**
- **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 contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will**

include a presentation of past data sufficient for the Department to evaluate contaminant concentration trends;

- **Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;**
- **A performance summary for the SSD system at the site during the calendar year, including information such as:**
  - **The number of days the system was run for the reporting period;**
  - **A description of breakdowns and/or repairs along with an explanation for any significant downtime;**
  - **A description of the resolution of performance problems;**
  - **A summary of the performance and/or effectiveness monitoring;**
  - **Comments, conclusions, and recommendations based on data evaluation; and**
  - **A site evaluation, which includes the following:**
    - **Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;**
    - **Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and**
    - **The overall performance and effectiveness of the remedy.**

The Annual Certification Report will be submitted, in hard-copy format, to the NYSDEC Regional Office located closest to the site, and in electronic format to NYSDEC Central Office and the NYSDOH Bureau of Environmental Exposure Investigation.

3. MONITORING PLAN

3.1 Introduction

3.1.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the SSD system to mitigate potential vapor intrusion at the site. The Monitoring Plan also describes the procedures for annual groundwater and surface water monitoring. This Monitoring Plan may only be revised with the approval of NYSDEC.

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- **Sampling and analysis of groundwater and surface water;**
- **Assessing compliance with NYSDEC Standards and Guidance;**
- **Preparing the necessary reports for the various monitoring activities.**

To adequately address these issues, this Monitoring Plan provides information on:

- **Sampling locations, protocol, and frequency;**
- **Analytical sampling program requirements;**
- **Reporting requirements;**
- **Inspection and maintenance requirements for monitoring wells;**
- **Monitoring well decommissioning procedures; and**
- **Annual inspection and certification.**

3.2 Groundwater/Surface Water Monitoring Program

Groundwater/surface water monitoring will be performed during June of each year to confirm groundwater plume stability and containment within the SGMA. Figure 3 shows the surveyed groundwater well network and surface water sampling locations.

3.2.1 Monitoring System Design

The following monitoring wells and surface water locations are to be sampled in June of each year: VE-6, VE-10, VE-12, VE-15, RW-4, MW-2, MW-10, MW-13S, MW-16, MW-18S, MW-19, MW-24S, SW-29, SW-34, and SW-35. These monitoring locations were selected to evaluate long-term plume stability and the potential for impacts to down gradient receptors. Samples collected from these locations are analyzed for VOCs using EPA Method 8260.

3.2.2 Groundwater Monitoring Schedule

A report for the June sampling event summarizing the laboratory analytical results, depth to water, and groundwater flow direction will be submitted to the NYSDEC annually in January of the following year in conjunction with the Annual Certification Report (Section 2.6.3). If any anomalous monitoring data (i.e. after re-sampling shows one order of magnitude change in concentration or more) are noted, the NYSDEC must be notified within 10 days of receipt of validated data. Monitoring will continue until it is determined by the NYSDEC that monitoring is no longer required.

3.2.3 Sampling Event Protocol

All monitoring well sampling activities will be performed by competent environmental professionals using NYSDEC-accepted groundwater sampling methods and appropriate personal protective equipment under an approved HASP. Wells will be purged by removing a minimum of three standing well volumes or until the well is purged to dryness. Sampling of wells will be performed within a 24 hour period from the time of purge. A bailer will be used to collect each sample. Observations during sampling (e.g. well integrity, etc.) are to be noted on a sampling log. The sampling log will serve as the inspection form for the groundwater monitoring well network. An example sampling log as well as groundwater sampling procedure is included in Appendix C.

The groundwater and surface water samples collected under this program are currently collected by and submitted to Columbia Analytical Services (CAS), an Environmental Laboratory Approval Program (ELAP) certified laboratory, located in Rochester, New York under Chain of Custody for analysis using USEPA Method 8260 for VOCs. If the site owner desires to utilize a different laboratory(s) for these services in the future, NYSDEC will be notified of the proposed vendor change, and it will be documented in the monitoring report. The analytical laboratory must have NYSDOH ELAP certification. Any future modifications to the SAP (number of wells, frequency of sampling, or analytical methodology) will be subject to NYSDEC approval.

3.3 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 using approved environmental health and safety protections. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders 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 decommissioning of site monitoring wells and/or historic site monitoring wells may occur based on approved changes to the monitoring plan, future modification to the property, or other changes to the environmental program. Monitoring wells will not be decommissioned without written approval from NYSDEC. The process for well abandonment consists of cutting of the well casing below grade (or pulling the casing) and injecting a cement-bentonite grout mixture into the well bore using tremie rods and a grout pump. The grout will consist of approximately

5 pounds of powdered bentonite per sack of Portland cement and will be allowed to set for 48 hours. The surface will be completed as appropriate depending on whether the well is located in the lawn area, building interior, etc.

The NYSDEC will be notified prior to any 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 periodic report.

3.4 Engineering Control System Monitoring

3.4.1 Sub-Slab Depressurization System

A SSD system was installed in the vicinity of the former Centralized Refurbishing Center (CRC) area of the facility to mitigate the potential for soil vapor intrusion as approved by the NYSDEC and NYSDOH. The system consists of three radon-abatement-type fans connected to eight suction cavities located below the slab.

In addition to the suction points and fans, a sub-slab vacuum monitoring network consisting of twenty-one (21) permanent test points was installed for continued monitoring of sub-slab vacuum.

An as-built drawing of the SSD system is included as Figure 4.

3.4.1.1 Inspection Schedule

To confirm that the SSD system is functioning as designed, a series of vacuum monitoring points were installed in the vicinity of the former CRC area inside of the building. Vacuum measurements taken from these points have demonstrated that the recommended minimum vacuum (0.002 in. w.c.) is being achieved in the target area.

As part of ongoing operations, sub-slab vacuum readings will be collected on an annual basis to demonstrate that 0.002 in. w.c. continues to be achieved in the targeted mitigation area. Annual sub-slab vacuum readings should be collected during the fall months to allow for additional follow-up, if needed, during the heating season. Operational and maintenance issues will be reported and discussed in the Annual Certification Report. Vacuum readings will be included in the annual report.

3.4.1.2 General Equipment Inspection

A visual inspection of the complete system will be conducted during the monitoring event. SSD system components to be monitored include, but are not limited to, the following:

- **Fans**
- **General system piping**
- **Manometer readings**
- **Vacuum point readings**

An example vacuum monitoring log sheet is provided in Appendix D. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, the site owner or owner's designate will be notified and the appropriate maintenance performed.

3.4.1.3 System Monitoring Devices and Alarms

The SSD system is equipped with an alarm to indicate when the system is not operating. It is connected to an alarm system monitored by Xerox security personnel. In the event that the alarm is activated or there is a system shutdown, Xerox security will notify the Xerox Project Manager via telephone contact. The Xerox Project Manager will take appropriate actions to troubleshoot, repair or otherwise restart the system. Additionally, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan (Section 4), and the SSD system restarted. The SSD system is engineered to restart after an electrical failure. Operational problems will be noted in the subsequent Annual Certification Report.

3.4.1.4 Air Sampling

In the event air sampling must be conducted, sampling procedures must be in accordance with the current NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York."

3.5 Monitoring Reporting Requirements

Forms and any other information generated during regular monitoring events and inspections will be kept on file by the site owner or its designate. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Annual Certification Report, as specified in Section 2.6.

All media and engineering system monitoring results will be reported to NYSDEC as necessary and summarized in the Annual Certification Report. The report will include, at a minimum:

- **Date of event;**
- **Personnel involved;**
- **Description of the activities performed;**
- **Type of samples or readings collected**
- **Copies of all field forms completed (e.g. well sampling logs, chain-of-custody documentation, inspection forms, etc.);**
- **Sampling results in comparison to appropriate standards/criteria when applicable;**
- **A figure illustrating sample type and sampling locations;**

- **Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);**
- **Any observations, conclusions, or recommendations; and**
- **A determination as to whether groundwater conditions have changed since the last reporting event.**

4. OPERATION AND MAINTENANCE PLAN

4.1 Introduction

This Operation and Maintenance Plan describes the measures necessary to operate and maintain the mechanical components of the SSD system. This Operation and Maintenance Plan:

- **Includes the steps necessary to allow individuals unfamiliar with the site to operate and maintain the SSD system;**
- **Includes an operation and maintenance contingency plan; and,**
- **Will be updated periodically to reflect changes in site conditions or the manner in which the SSD system is operated and maintained.**

Information on non-mechanical Engineering Controls (i.e. soil cover system) is provided in Section 2 - Engineering and Institutional Control Plan. A copy of this Operation and Maintenance Plan, along with the complete SMP, will be kept at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the SMP.

4.2 Engineering Control System Operation and Maintenance

4.2.1 Description

An SSD system was installed in the vicinity of the former Centralized Refurbishing Center (CRC) area of the facility to mitigate the potential for soil vapor intrusion concerns as approved by the NYSDEC and NYSDOH. The system consists of three radon-abatement-type fans connected to eight suction cavities located below the slab to depressurize the slab.

In addition to the suction points and fans, a sub-slab vacuum monitoring network consisting of twenty-one (21) permanent test points was installed for monitoring of sub-slab vacuum.

An as-built drawing of the SSD system is included as Figure 4.

4.2.2 System Start-Up and Testing

The SSD system is designed to work continuously and does not need to be turned on or shut down. The system has vacuum monitors (manometers) that can be inspected to evaluate performance and alarms to indicate system failure (see Section 3.4.1 above).

4.2.3 System Operation: Routine Operation Procedures

Other than routine monitoring (see Section 3.4.1), the SSD system operates continuously and does not require manual system operation. In the event of an electrical failure, the system is engineered to restart. If the system fails to restart after electrical failure, the Xerox Project Manager will be responsible for repair completion.

4.2.4 System Operation: Non-Routine Equipment Maintenance

The SSD system has a warning device to indicate that the system is not operating properly. It is connected to an alarm system monitored by site owner security personnel. In the event that the warning device is activated or there is a system shutdown, site owner security will notify the appropriate Xerox Project Manager via telephone contact (see Section 4.4.1). Applicable maintenance and repairs will be conducted as necessary, and the SSD system restarted. Operational problems will be noted in the subsequent Annual Certification Report.

4.3 Maintenance Reporting Requirements

Maintenance reports and any other information generated during regular operations at the site will be kept on-file. All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and will be submitted as part of the Annual Certification Report, as specified in Section 2.6 of this SMP.

4.3.1 Routine Maintenance Reports

Checklists or forms (see Appendix D) will be completed during each routine maintenance event. Checklists/forms will include, but not be limited to the following information:

- **Date;**
- **Name, company, and position of person(s) conducting maintenance activities;**
- **Maintenance activities conducted; and**
- **Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet).**

4.3.2 Non-Routine Maintenance Reports

During each non-routine maintenance event, a form will be completed which will include, but not be limited to, the following information:

- **Date;**
- **Name, company, and position of person(s) conducting non-routine maintenance/repair activities;**
- **Date and nature of repair; and**
- **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).**

4.4 Contingency Plan

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. In the event of an emergency, contact information is provided below.

4.4.1 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 II: Emergency Contact Numbers

Emergency – Xerox controlled property On Site Security :	**1-2-3 internal; (585) 427-6910 external**
Emergency – non Xerox controlled	**911**
One Call Center:	**(800) 272-4480**
Poison Control Center:	**(800) 222-1222**
Pollution Toxic Chemical Oil Spills:	**(800) 424-8802**
NYSDEC Spills Hotline	**(800) 457-7362**

Table III: Other Contact Numbers

Dig Safe (3 days advance for stakeouts):	(800) 962-7962 or 811
Todd Caffoe NYSDEC Project Manager	**(585) 226-5350**
Haley & Aldrich of New York (Environmental Consultant)	**(585) 359-9000**
Eliott Duffney Program Manager, Xerox Corporation	**(585) 422-5825**
Xerox Security Webster, New York	**(585) 455-2122**

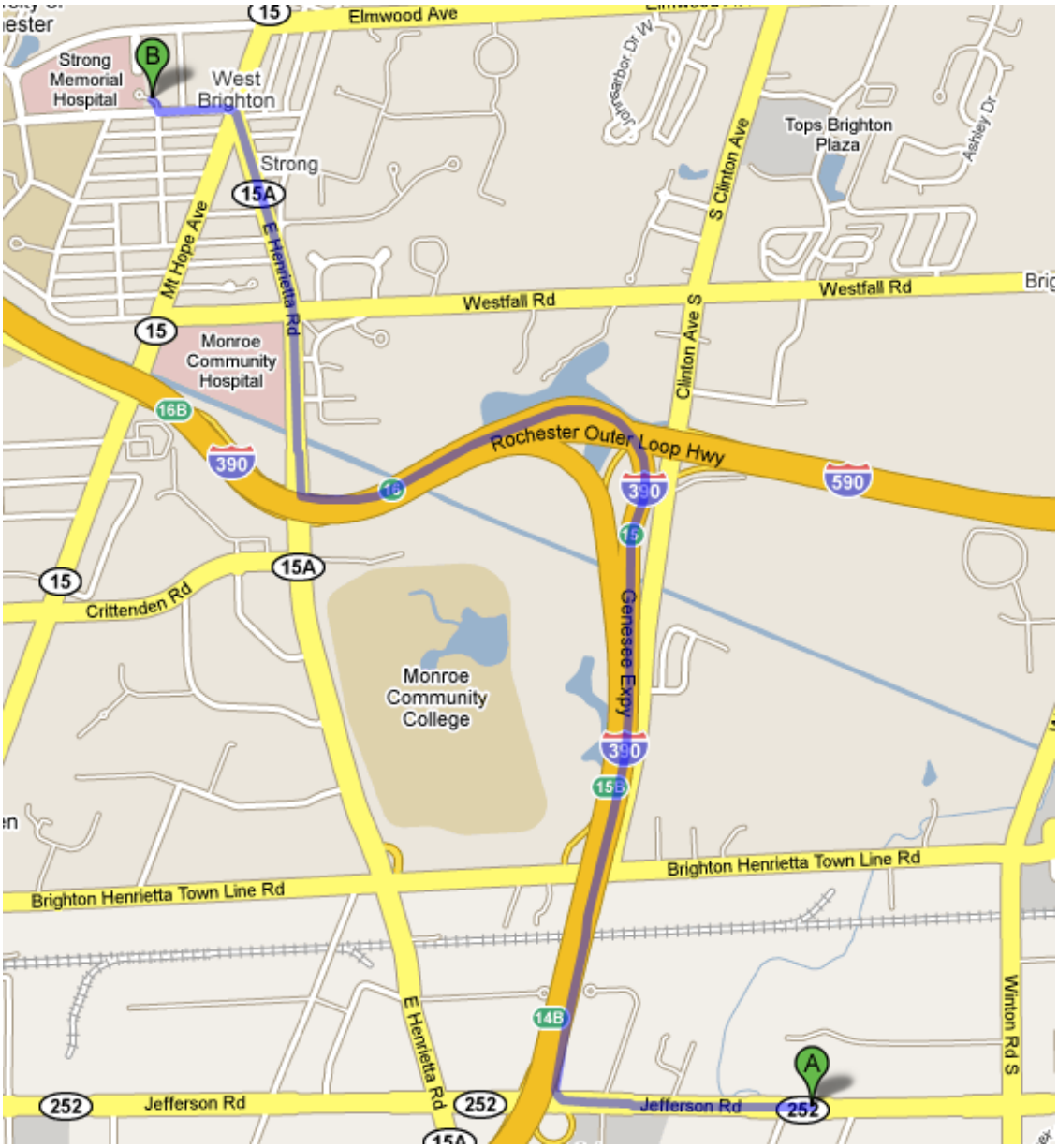
*** Note: Emergency contact numbers are subject to change and will be updated whenever a change in personnel occurs**

4.4.2 Map and Directions to Emergency Health Facility

Site Location: 1350 Jefferson Road, Henrietta, New York
Nearest Hospital: Strong Memorial Hospital
Hospital Location: 601 Elmwood Avenue, Rochester, New York
Hospital Telephone: (585) 275-2100

Directions to the Hospital *(4.3 miles, about 9 minutes)*:

1. **Head west on Jefferson Road/NY-252**
2. **Take the ramp onto I-390 N (on Right)**
3. **Take exit 16 for W Henrietta Road/NY-15A/E Henrietta Road toward NY-15**
4. **Turn right at E Henrietta Road/NY-15A (signs for E Henrietta Road)**
5. **Slight left at Crittenden Blvd**
6. **Turn right at Norfolk St.**



4.4.3 Response Procedures

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. In the event of an environmental release, the New York Spills Hotline will be contacted promptly. The emergency telephone number list is found at the beginning of this Contingency Plan (Table II). The list will also be posted prominently at the site and made readily available to all personnel at all times.

REFERENCES

1. **"Field Pilot Test Injection of Electron Donor, Xerox Building 801, Henrietta, NY," dated 2 October 2003. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

2. **"Focused Feasibility Study, Building 801, Henrietta, NY," dated November 2001. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

3. **"Monitoring Report No. 46, Xerox-Building 801 Facility (NYSDEC Site No. 828069)," dated March 2008. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

4. **"Remedial Investigation, Xerox Building 801, Henrietta, NY," dated May 1993. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

5. **"Remedial Design/Remedial Action Work Plan (DRAFT), Xerox Building 801 (NYSDEC Site No. 828069), Henrietta, NY," dated 25 April 2006. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

6. **"Report on Enhanced Bioremediation and Monitored Natural Attenuation Data Collection and Evaluation Program, Xerox Building 801, (NYSDEC Site No. 828069), Henrietta, NY," dated September 2003. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

7. **"Sub-Slab Depressurization System As-Built Engineering Report, Xerox Building 801, (NYSDEC Site No. 828069), Henrietta, NY," dated 6 July 2009. Prepared for Xerox Corporation, prepared by Haley & Aldrich of New York.**

TABLE I - SUMMARY OF APPLICABLE NYSDEC SOIL CLEANUP OBJECTIVES
XEROX BUILDING 801
HENRIETTA, NEW YORK
FILE NO.: 32077-102

	NYSDEC Soil Cleanup Objectives (Restricted Use)		Eastern United States Background Levels
	Protection of Groundwater (ppm)	Commerical Use (ppm)	
Metals			
Arsenic	16 [2]	16 [2]	3-12
Barium	820	400	15-600
Beryllium	47	590	0-1.75
Cadmium	7.5	9.3	0.1-1
Chromium, hexavalent[1]	19	400	1.5-40
Chromium, trivalent[1]	--	1500	1.5-40
Copper	1720	270	1-50
Total Cyanide[1]	40	27	--
Lead	450	1000	200-500
Manganese	2000 [2]	10000 [3]	50-5000
Total Mercury	0.73	2.8 [4]	0.001-0.2
Nickel	130	10000 [3]	0.5-25
Selenium	4 [2]	1500	0.1-3.9
Silver	8.3	1500	--
Zinc	2480	10000 [3]	9-50
PCBs/Pestacides			
2,3,5-TP Acid (Silvex)	3.8	500 [5]	--
4,4'-DDE	17	62	--
4,4'-DDT	136	47	--
4,4'-DDD	14	92	--
Aldrin	0.19	0.68	--
alpha-BHC	0.02	3.4	--
beta-BHC	0.09	3	--
Chlordane (Alpha)	2.9	24	--
delta-BHC	0.25	500 [5]	--
Dibenzofuran	210	350	--
Dieldrin	0.1	1.4	--
Endosulfan I	120	200 [6]	--
Endosulfan II	120	200 [6]	--
Endosulfan sulfate	1000 [7]	200 [6]	--
Endrin	0.06	89	--
Heptachlor	0.38	15	--
Lindane	0.1	9.2	--
Polychlorinated Biphenyls	3.2	1	--
			--
Semi-Volatile Organic Compounds			--
Acenaphthene	98	500 [5]	--
Acenapthylene	107	500 [5]	--
Anthracene	1000 [7]	500 [5]	--
Benz(a)anthracene	1 [2]	5.6	--
Benzo(a)pyrene	22	1 [2]	--
Benzo(b)fluoranthene	1.7	5.6	--
Benzo(g,h,i)perylene	1000 [7]	500 [5]	--
Benzo(k)fluoranthene	1.7	56	--
Chrysene	1 [2]	56	--
Dibenz(a,h)anthracene	1000 [7]	0.56	--
Fluoranthene	1000 [7]	500 [5]	--
Fluorene	386	500 [5]	--
Indeno(1,2,3-cd)pyrene	8.2	5.6	--
m-Cresol	0.33 [8]	500 [5]	--
Naphthalene	12	500 [5]	--
o-Cresol	0.33 [8]	500 [5]	--
p-Cresol	0.33 [8]	500 [5]	--
Pentachlorophenol	0.8 [8]	6.7	--
Phenanthrene	1000 [7]	500 [5]	--
Phenol	0.33 [8]	500 [5]	--
Pyrene	1000 [7]	500 [5]	--

TABLE I - SUMMARY OF APPLICABLE NYSDEC SOIL CLEANUP OBJECTIVES
XEROX BUILDING 801
HENRIETTA, NEW YORK
FILE NO.: 32077-102

	NYSDEC Soil Cleanup Objectives (Restricted Use)		Eastern United States Background Levels
	Protection of Groundwater (ppm)	Commerical Use (ppm)	
			--
Volatile Organic Compounds			--
1,1,1-Trichloroethane	0.68	500 [5]	--
1,1-Dichloroethane	0.27	240	--
1,1-Dichloroethene	0.33	500 [5]	--
1,2-Dichlorobenzene	1.1	500 [5]	--
1,2-Dichloroethane	0.02 [2]	30	--
cis-1,2-Dichloroethene	0.25	500 [5]	--
trans-1,2-Dichloroethene	0.19	500 [5]	--
1,3-Dichlorobenzene	2.4	280	--
1,4-Dichlorobenzene	1.8	130	--
1,4-Dioxane	0.1 [8]	130	--
Acetone	0.05	500 [5]	--
Benzene	0.06	44	--
Butylbenzene	12	500 [5]	--
Carbon tetrachloride	0.76	22	--
Chlorobenzene	1.1	500 [5]	--
Chloroform	0.37	350	--
Ethylbenzene	1	390	--
Hexachlorobenzene	3.2	6	--
Methyl ethyl ketone	0.12	500 [5]	--
Methyl tert-butyl ether	0.93	500 [5]	--
Methylene Chloride	0.05	500 [5]	--
n-Propylbenzene	3.9	500 [5]	--
sec-Butylbenzene	11	500 [5]	--
tert-Butylbenzene	5.9	500 [5]	--
Tetrachloroethane	1.3	150	--
Toluene	0.7	500 [5]	--
Trichloroethene	0.47	200	--
1,2,4-Trimethylbenzene	3.6	190	--
1,3,5-Trimethylbenzene	8.4	190	--
Vinyl Chloride	0.02	13	--
Xylene (mixed)	1.6	500 [5]	--

NOTES & ABBREVIATIONS:

-- = No Standard or Value

****The soil cleanup objectives herein are from the 6 NYCRR Part 375-6.8(b) dated 14 December 2006. In the event that revisions to the SCOs are published that post-date this SMP, the most recent iteration of the SCOs will be used.**

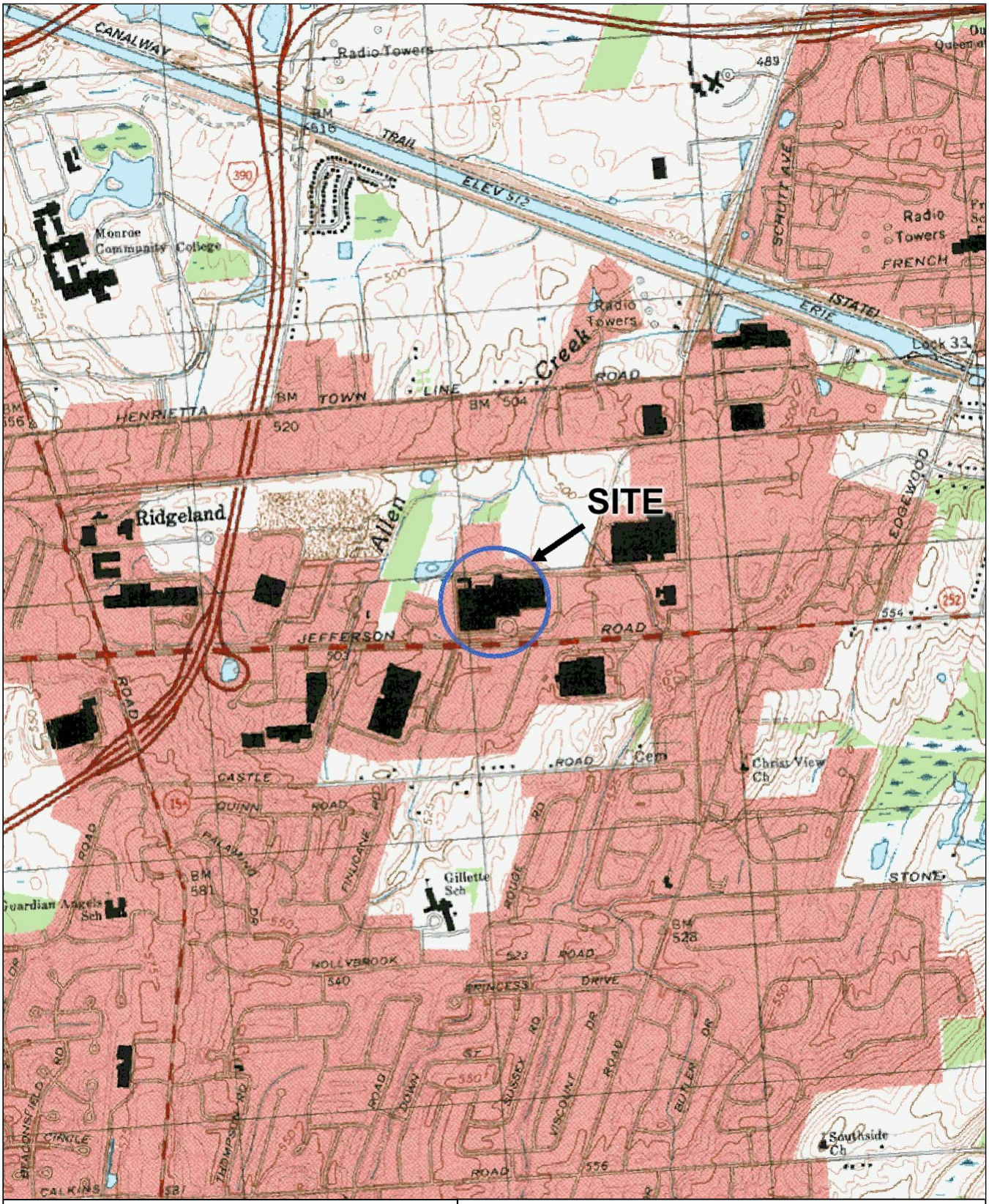
1. **The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of thie contaminant is below the SCO**
2. **For consituants where the calculated SCO was lower than the rural soil background concentration determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.**
3. **The SCOs for metals were capped at a maximum value of 10000 ppm.**
4. **This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts).**
5. **The SCOs for commercial use were capped at a maximum value of 500 ppm.**
6. **This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.**
7. **The ScOs for the protection of groundwater were capped at a maximum value of 1000 ppm.**
8. **For constituents were the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.**
9. ***Shaded cells represent the contaminants of concern for the Site. Mineral spirits are also a contaminant of concern, but there is no soil objective for Mineral Spirits in NYCRR Part 375.***

APPLICABILITY:

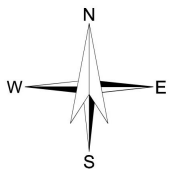
This table presents the NYSDEC approved applicable Soil Cleanup Objectives
The cleanup objectives should be used as follows:

1. **Onsite Soils to be Reused Onsite Within the Soil and Groundwater Management Area: Must be below the Resticted for Commercial Use Standards**
2. **Imported Offsite Fill for Use Within the Soil and Groundwater Management Area: Must be below the lower of the Restricted for Commercial Use Standards or Protection of Groundwater Standards.**

Refer to the Site Management Plan, Excavation Plan (Section 2.4) for additional information.



SITE COORDINATES:43°5'25"N 77°35'28"W



U.S.G.S. QUADRANGLE: PITTSFORD, NY

HALEY & ALDRICH

XEROX CORPORATION
BUILDING 801
HENRIETTA, NEW YORK

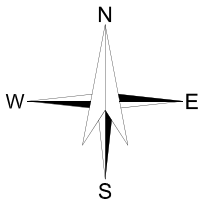
PROJECT LOCUS

SCALE: 1:24,000
JUNE 2008

FIGURE 1

32077-081 1.PDF

G:\PROJECTS\32077\081_B801_GENERAL\SITE MANAGEMENT PLAN\DRAWINGS\2008 0610_HANY-32077-081-FIGURE 2.DWG



HALEY & ALDRICH

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BUILDING 801
HENRIETTA, NEW YORK

AERIAL IMAGE OF SITE
(19 APRIL 2006 VINTAGE)

SCALE: NOT TO SCALE
JUNE 2008

FIGURE 2

LEGEND:

- MW-1S — SHALLOW GROUNDWATER MONITORING WELL
- MW-1D — DEEP GROUNDWATER MONITORING WELL
- SW-28 — SURFACEWATER SAMPLING LOCATION
- VE-1A — FORMER 2-PHASE EXTRACTION WELL
- STORM SEWER
- STREAM W/ DIRECTION OF FLOW
- PROPERTY LINE
- ANTICIPATED TOTAL VOC CONCENTRATIONS < 600,000 AND > 1,000 UG/L
- ANTICIPATED TOTAL VOC CONCENTRATIONS < 1,000 AND > 100 UG/L
- ANTICIPATED TOTAL VOC CONCENTRATIONS < 100 UG/L AND > ND

NOTES:

1. THE LIMITS OF THE SGMA ARE CONTINGENT ON NO LONGTERM GROUNDWATER EXTRACTION FOR ANY PURPOSE OUTSIDE OF THE SGMA.
2. BASEMAP DATA FILE PREPARED BY BERGMANN ASSOCIATES, ROCHESTER, NEW YORK UNDER DIRECT CONTRACT WITH XEROX CORPORATION.
3. STREAM LOCATIONS ARE APPROXIMATE.
4. GRAY WELLS ARE NO LONGER PART OF THE MONITORING PROGRAM.
5. WELLS SHOWN IN ITALICS DID NOT CONTAIN COMPOUNDS OF CONCERN AT THE CONCENTRATIONS ABOVE LABORATORY DETECTION LIMITS DURING THE MOST RECENT SAMPLING. "ND" INDICATES NON-DETECT.
6. ANTICIPATED TOTAL VOC AREAS ARE INFERRED BASED ON AVAILABLE DATA AND NOT RESULTS OF DISCRETE SAMPLING AT ALL LOCATIONS. EXERCISE CAUTION WHEN WORKING IN THIS AREA AND COLLECT ACTUAL SITE DATA FROM THE AREA OF INTEREST IN THE CASE INTRUSIVE WORK IS REQUIRED.

0 200 400
SCALE IN FEET

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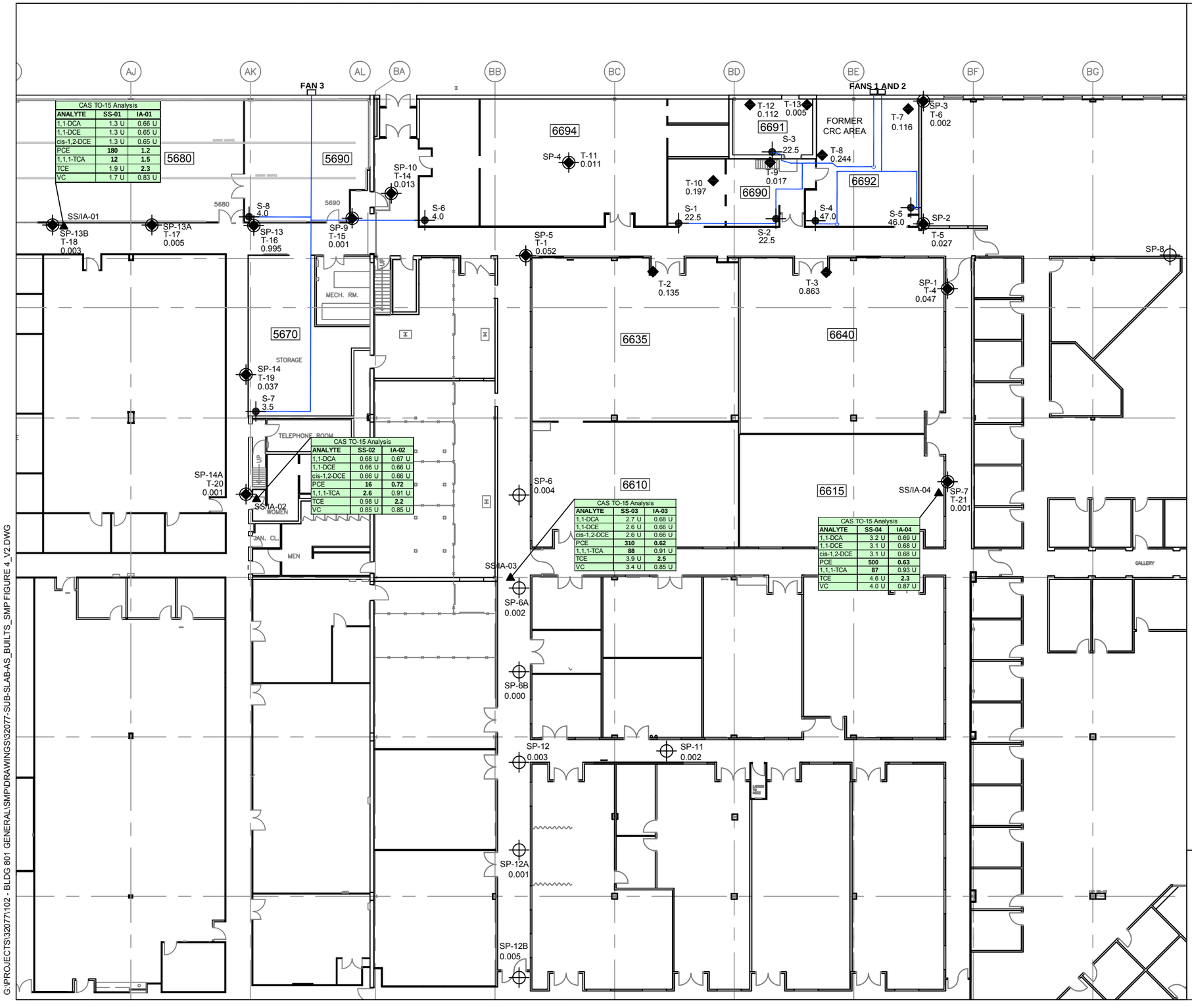
HENRIETTA, NEW YORK

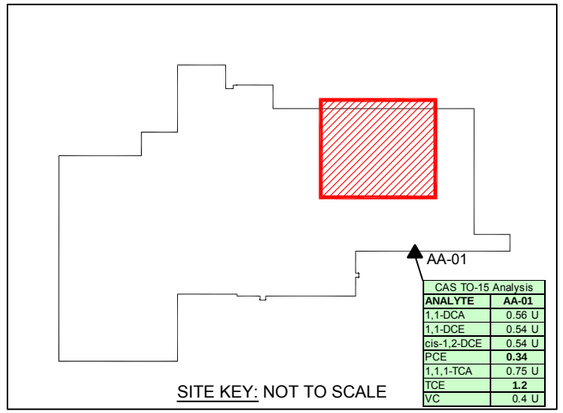
SITE PLAN WITH LIMITS OF THE SOIL AND GROUNDWATER MANAGEMENT AREA

SCALE: AS SHOWN
NOVEMBER 2009

FIGURE 3

G:\PROJECTS\32077\102 - BLDG 801 GENERAL\SMP\DRAWINGS\2009 0408_HANY_32077-102_FIGURE 3.DWG



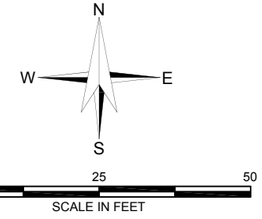


LEGEND:

- S-1 — SUCTION LOCATION
- T-2 — VACUUM TEST LOCATION
- SP-6 — VACUUM TEST LOCATION
- SS/IA-01 — SUB-SLAB/INDOOR AIR OR AMBIENT AIR SAMPLING LOCATION (SUMMA CANISTER, UG/M³, 27 DEC 2007)
- 0.000 — VACUUM READING (INCHES WATER COLUMN, MAY 2009)
- EXISTING PIPING

NOTE:

SYSTEM EXPANSION COMPLETED NOVEMBER 2007.



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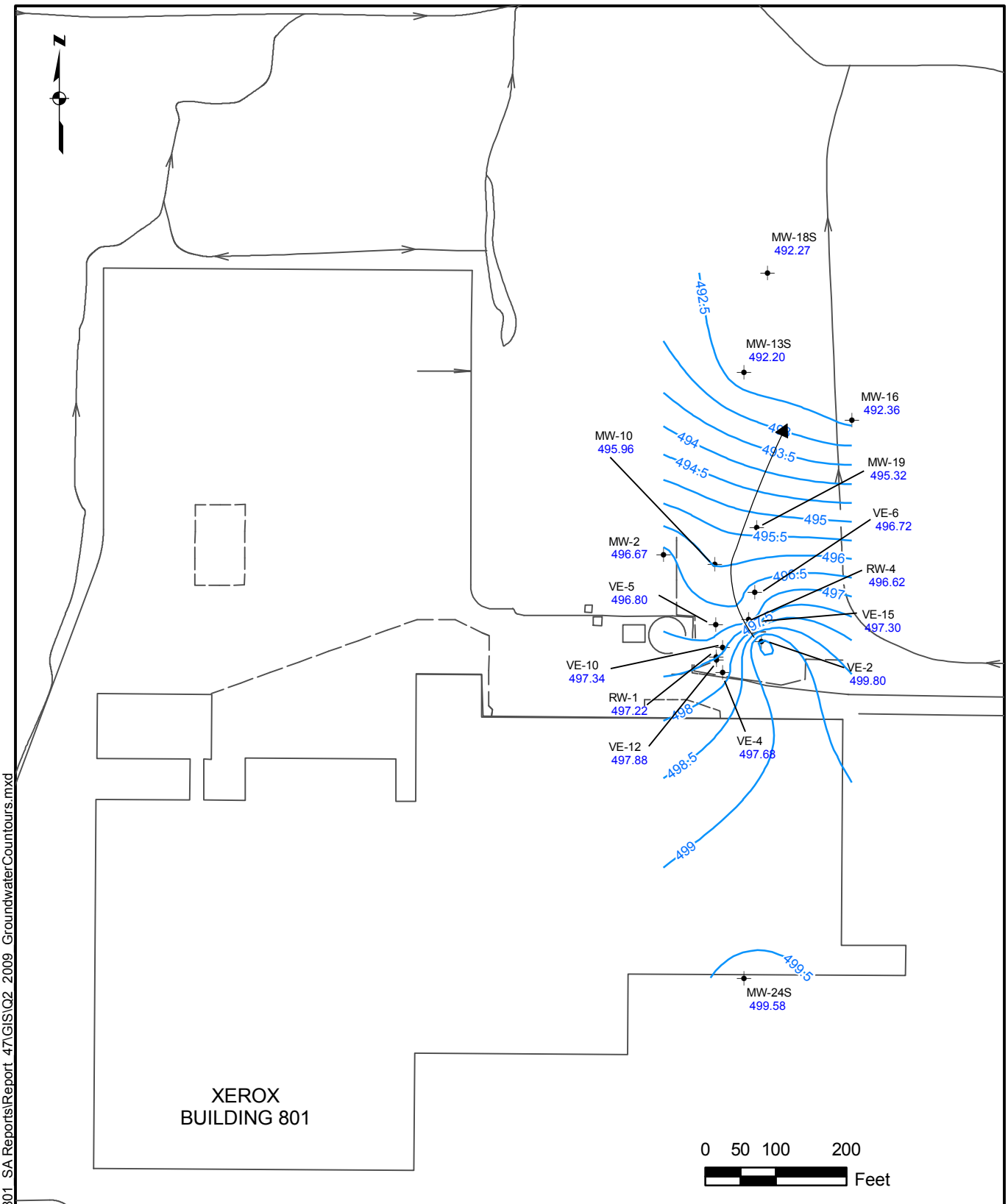
HENRIETTA, NEW YORK

SUB-SLAB DEPRESSURIZATION SYSTEM PLAN

SCALE: AS SHOWN
NOVEMBER 2009

FIGURE 4

G:\PROJECTS\32077\102 - BLDG 801 GENERAL\SMP\DRAWINGS\32077-SUB-SLAB-AS_BUILTS_SMP FIGURE 4_V2.DWG



LEGEND:

- WELL LOCATION AND GROUNDWATER ELEVATION
- GROUNDWATER ELEVATION CONTOUR LINE
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES:

1. DATE OF GROUNDWATER MEASUREMENTS: JUNE 2009.

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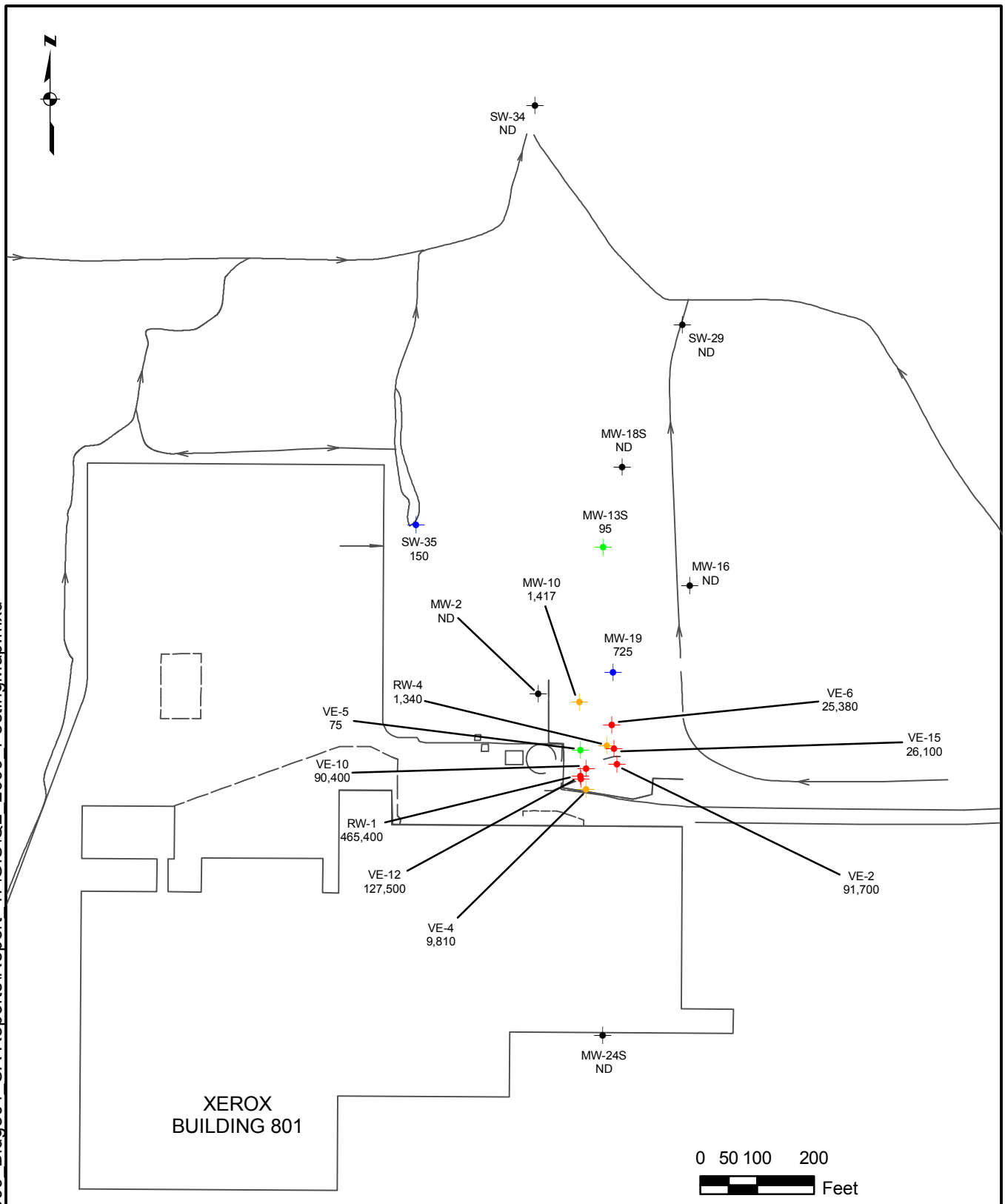
UPPER AQUIFER GROUNDWATER CONTOURS SECOND QUARTER 2009

SCALE: AS SHOWN

SEPTEMBER 2009

FIGURE 5

G:\Projects\32077\103 2009 Bldg801 SA Reports\Report 47\GIS\Q2 2009 GroundwaterCountours.mxd



G:\Projects\32077\103 2009 Bldg801 SA Reports\Report 47\GIS\Q2 2009 PostingMap.mxd

LEGEND:

TOTAL TARGET VOLATILES (UG/L)

- NOT ANALYZED
- NOT DETECTED (ND) OR <=9.99
- >=10 and <=99.99
- >=100 and <=999.99
- >=1,000 and <=9,999.99
- >10,000

NOTES:
1. DATE OF VOC SAMPLING: JUNE 2009.

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BUILDING 801
HENRIETTA, NEW YORK

TOTAL TARGET VOLATILES IN GROUNDWATER SECOND QUARTER 2009

SCALE: AS SHOWN

OCTOBER 2009

FIGURE 6

APPENDIX A

Declaration of Covenants and Restrictions

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the __ day of February 2010 by Xerox Corporation, a New York corporation, having an address and principal place of business office at 45 Glover Avenue, P.O. Box 4505, Norwalk, Connecticut 06856-4505.

WHEREAS, Xerox Corporation ("Xerox") and the New York State Department of Environmental Conservation (the "Department") entered into two separate Administrative Orders on Consent, dated March 16, 1990 (Index Number B8-0207-87-09) and March 21, 1996 (Index Number B8-0207 -95-04) respectively, and

WHEREAS, under the March 16, 1990 Consent Order, Xerox agreed to perform a Remedial Investigation and Feasibility Study, as well as certain Interim Remedial Measures to address contamination at the real property located at 1350 Jefferson Road, Henrietta, New York (the "Site"), operated by Xerox since 1972, and

WHEREAS, under the March 21, 1996 Consent Order, Xerox agreed to develop and implement an Inactive Hazardous Waste Disposal Site remedial program for the Site in accordance with the remedial alternative selected in a March 1995 Record of Decision ("ROD") which remedial program was to include implementation of an Operation, Maintenance and Monitoring ("OM&M") requirement of the site remedy, and

WHEREAS, Xerox has performed the required Remedial Investigation and Feasibility Study, Interim Remedial Measures, and the remedial program for the Site in accordance with the Department's requirements, and

WHEREAS, the Department has issued correspondence dated February 22, 2010 acknowledging that Xerox has performed the required remedial activities and further identifying those OM&M activities, institutional and engineering controls required for the Site, including certain requirements applicable to an area of approximately 6.8 acres located at the Site where residual contaminants are present and certain additional controls and restrictions apply, hereinafter referred to as the Soil and Groundwater Management Area ("SGMA"), and

WHEREAS, the Site is listed on the Registry of Inactive Hazardous Waste Disposal Sites in New York as site number 828069, and has been reclassified from a classification "2" to a classification of "4". The Site is owned by Xerox and consists of approximately 85.98 acres and is assigned Monroe County Tax Map Parcels No. 162.07-1-3, No. 162.08-1-1, No. 162.08-1-2, No. 162.08-1-30 and No. 162.08-1-31. The Site is more particularly described in Exhibit "A" attached and the boundaries are depicted on a survey entitled Xerox Building 801 ALTA Survey by Stantec last revised 11/09/2009 (see Exhibit "B" attached).

WHEREAS, § 7.1.3 of the ROD requires that upon completion of remedial action a Declaration of Covenants and Restrictions associated with the Site are to be recorded with the Monroe County Clerk to run with the land,

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

First, the property subject to this Declaration of Covenants and Restrictions consists of the Site as identified above, the metes and bounds of which is set out on Exhibit AA@ appended hereto, and the SGMA that is subject to certain additional restrictions and requirements and is identified on the survey attached hereto as Exhibit “B”.

Second, the Site may be used for commercial and industrial usage provided that the long- term engineering and institutional controls, as identified in the attached approved Site Management Plan (“SMP”) dated February 2010 (the cover page and table of contents of which are attached as Exhibit “C” appended hereto), are implemented and maintained. The SMP identifies and implements the institutional and engineering controls required for the Site, as well as any necessary monitoring and/or operation and maintenance of the remedy. The owner of the Site shall prohibit the Site from ever being used for purposes other than commercial or industrial use without the express written waiver of this prohibition 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 collectively referred to as the ARelevant Agency.@

Third, the owner of the Site shall prohibit the use of the groundwater underlying the Site for potable or non-potable purposes without treatment rendering it safe for drinking water or industrial purposes, as appropriate, and without first obtaining express written permission to do so from the Relevant Agency.

Fourth, the owner of the Site shall manage the soils at the Site in accordance with all requirements of the SMP. Provisions in the SMP include, but are not limited to, requirements involving the characterization, handling, disposal and reuse of residual contaminated media such as soil and groundwater, and requirements involving soils imported to the Site from off-site locations.

Fifth, the owner of the Site shall comply with all requirements of the SMP with respect to the evaluation of the potential for vapor intrusion in any new buildings constructed on the Site.

Sixth, Xerox, the owner of the Site, and/ or their successors and assigns shall continue in full force and effect those engineering and/or institutional controls required by the final SMP dated February 2010, including groundwater and surface water monitoring requirements and required annual certifications, until the Department

expressly authorizes the discontinuance of such controls.

Seventh, the owner of the Site hereby consents, upon reasonable notice under the circumstances presented, to entry upon the Site by any duly designated officer or employee of the Department or the Relevant Agency, and by their authorized agents, consultants or contractors, for inspecting, sampling, testing, and any other activities necessary to evaluate and insure continued compliance with the SMP.

Eighth, 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 Site. The owner of the Site and its successors and assigns consent to enforcement by the Relevant Agency of the prohibitions and restrictions contained herein and in the SMP and hereby covenant not to contest the authority of the Relevant Agency to seek enforcement.

Ninth, any deed of conveyance of all or any portion of the Site shall recite 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.

Dated: _____

XEROX CORPORATION

By: _____

Title: _____

Acknowledgment

STATE OF NEW YORK }
}ss:
COUNTY OF _____ }

On the _____ day of _____, in the year 2010, 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.

_____
Notary Public - State of New York

First American Title Insurance Company of New York

Title No. NCS-339946-BOS1
AMENDED 9/18/2009

SCHEDULE "A"

PARCEL I:

ALL THAT TRACT OR PARCEL OF LAND, containing 50.58 acres, being a portion of Town Lot 3, of the Second Range of Lots, Township 12, Range 7, in the Town of Henrietta, County of Monroe, State of New York, and being more particularly bounded and described as follows:

Beginning at a concrete monument in the north right-of-way line of Jefferson Road, said monument being 44.2+ northerly at right angles form the New York State baseline station 236+61.1+; thence

1. N 20° -29' -00" E, a distance of 1113.80 feet to a point; thence

2. S 87° -01' -00" W, a distance of 535.40 feet to a point; thence

3. N 21° -09' -00" E, a distance of 634.27 feet to a point; thence

4. N 86° -59' -50" E, a distance of 1024.47 feet to a point; thence

5. S 00° -00' -00" E, a distance of 675.77 feet to a point; thence

6. N 89° -58' -48" E, a distance of 323.97 feet to a point; thence

7. S 00° -01' -12" E, a distance of 206.63 feet to a point; thence

8. N 89° -58' -48" E, a distance of 22.10 feet to a point; thence

9. S 00° -01' -12" E, a distance of 14.21 feet to a point; thence

10. N 89° -59' -51" E, a distance of 471.72 feet to a point; thence

11. S 20° -16' -14" W, a distance of 244.27 feet to a point; thence

12. S 19° -55' -52" W, a distance of 544.88 feet to a point on the northerly right-of-way of Jefferson Road, said point being 21.3 feet north of existing concrete monument as measured along the easterly property line extended; thence

13. S 89° -53' -54" W, along the northerly right-of-way of Jefferson Road, a distance of 390.30 feet to a point; thence

14. S 81° -33' -17" W, along said right-of-way, a distance of 137.73 feet to a point; thence

15. S 89° -54' -04" W, along said right-of-way, a distance of 1127.96 feet to the Point of Beginning.

First American Title Insurance Company of New York

PARCEL II:

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town Lots 1 and 3 of the Second Range of Lots, Township 12, Range 7, in the Town of Henrietta, County of Monroe, and State of New York, shown on map prepared by Sear, Brown Associates, P.C., dated September 26, 1983, and more particularly described as follows: Beginning at a point on the northerly line of Route 252 (Jefferson Road), at its intersection with westerly boundary of lands now or formerly owned by Norma Erdle, said point also being the southeasterly corner of lands now or formerly owned by Xerox Corporation, thence north 19° 55' 52" east a distance of 544.88 feet to an iron pin; thence north 20° 16' 14" east a distance of 244.27 feet to a pin, said pin being the point and place of beginning; thence (1) south 89° 59' 51" west a distance of 471.72 feet to a point; thence (2) north 00° 01' 12" west a distance of 14.21 feet to a point; thence (3) south 89° 58' 48" west a distance of 22.10 feet to a point; thence (4) north 00° 01' 12" west a distance of 206.63 feet to an iron pin; thence (5) south 89° 58' 48" west a distance of 323.97 feet to an iron pin; thence (6) north 00° 00' 00" east a distance of 675.77 feet to an iron pin; thence (7) south 86° 59' 50" west a distance of 117.60 feet to an iron pin; thence (8) north 21° 13' 00" east a distance of 528.34 feet to an iron pin; thence (9) north 86° 10' 02" east a distance of 1292.99 feet to an iron pin; thence (10) south 20° 21' 25" west a distance of 559.45 feet to an iron pin; thence (11) south 20° 29' 55" west a distance of 720.10 feet to an iron pin; thence (12) south 20° 07' 58" west a distance of 233.75 feet to an iron pin; thence (13) south 20° 16' 14" west a distance of 54.14 feet to the point or place of beginning.

PARCEL III:

ALL THAT TRACT OR PARCEL OF LAND, situate in Town Lot 4 of the Second Range of lots, Township 12, Range 7, in the Town of Henrietta, County of Monroe, and State of New York, being bounded and described as follows:

BEGINNING at a point on the westerly line of Winton Road at the intersection with the southerly boundary of lands now or formerly of William D. Lane, as described in a deed recorded in the Monroe County Clerk's Office in Liber 3352 of Deeds at page 297, said point also being the northeasterly corner of lands now or formerly of James P. Wilmot;

RUNNING thence South 01 degrees 25 minutes 51 seconds East along the westerly line of Winton Road 50.01 feet to the southerly line of the Hofstra Road Access Parcel being described herein;

THENCE South 87 degrees 42 minutes 32 seconds West along the southerly line of the Hofstra Road Access Parcel 1275.90 feet to the East line of Town Lot Number 3 and the southeasterly corner of the premises above described as Parcel I;

THENCE along the easterly line of Parcel I North 20 degrees 16 minutes 14 seconds East, 54.14 feet to the northerly line of the Hofstra Road Access Parcel;

THENCE along the northerly line of said access Parcel North 87 degrees 42 minutes 32 seconds East 1255.88 feet to the westerly line of Winton Road at the point or place of beginning.

The above premises are alternatively described as follows:

ALL THAT TRACT OR PARCEL OF LAND, being a portion of Town Lot 1, 3 and 4 of the Second Range of Lots, Township 12, Range 7, in the Town of Henrietta, County of Monroe, State of New York, and being more particularly bounded and described as follows:

Beginning at a concrete monument in the north right-of-way line of Jefferson Road, said monument

being 44.2'± northerly at right angles from the New York Sate baselines station 236+ 61.1'± ; thence

1. N 20° -29' –00" E, a distance of 1113.80 feet to a point; thence

2. S 87° -01' –00" W, a distance of 535.40 feet to a point; thence

3. N 21° -09' –00" E, a distance of 634.27 feet to a point; thence

4. N 86° -59' –50" E, a distance of 906.87 feet to a point; thence

5. N 21° -13' –00" E, a distance of 528.34 feet to a point; thence

6. N 86° -10' –02" E, a distance of 1292.99 feet to a point; thence

7. S 20° -21' –25" W, a distance of 559.45 feet to a point; thence

8. S 20° -29' –55" W, a distance of 720.10 feet to a point; thence

9. S 20° -07' –58" W, a distance of 233.75 feet to a point; thence

10. N 87° -42' –32" E, a distance of 1255.88 feet to a point on the westerly right-of-way of Winton Road; thence

11. S 01° -25' –51" E, a distance of 50.01' southerly along the westerly right-of-way of Winton Road to a point; thence

12. S 87° -42' –32" W, a distance of 1275.90 feet to a point; thence

13. S 20° -16' –14" W, a distance of 244.27 feet to a point; thence

14. S 19° -55' –52" W, a distance of 544.88 feet to a point on the northerly right-of-way of Jefferson Road; thence

15. S 89° -53' –54" W, along the northerly right-of-way of Jefferson Road, a distance of 390.30 feet to a point; thence.

16. S 81° -33' –17" W, along said right-of-way, a distance of 137.73 feet to a point; thence

17. S 89° -54' –04" W, along said right-of-way, a distance of 1127.96 feet to the Point Beginning.

All as shown on an ALTA/ACSM Land Title Survey prepared by Stantec Consulting Group, Inc., Project No. 1409103-SU3.

THE policy to be issued under this report will insure the title to such buildings and improvements erected on the premises, which by law constitute real property.

FOR CONVEYANCING ONLY: TOGETHER with all the right, title and interest of the party of the first part, of in and to the land lying in the street in front of and adjoining said premises.

Workspace
Database: $wrkspc$
Name: $node$

Plotting Parameters
Plot Scale: 1=Custom @
Design File: $dgnfile$
Plotted: $datetime$
Plotted By: $plotby$

LEGEND

- BOUNDARY/PROPERTY LINE
- RIGHT-OF-WAY LINE
- EASEMENT LINE
- BUILDING
- FENCE
- OH E, T, C — OVERHEAD ELECTRIC,TELEPHONE,CABLE T.V.
- UTILITY POLE
- LIGHT POLE
- E — BURIED ELECTRIC LINE
- T — BURIED TELEPHONE LINE
- TELEPHONE MANHOLE
- G — GAS MAIN
- GAS VALVE
- W — WATER MAIN
- WATER VALVE
- FIRE HYDRANT
- PIV — POST INDICATOR VALVE
- STORM DRAINAGE MANHOLE
- CATCH BASIN / DROP INLET
- Sa — SANITARY SEWER LINE
- SANITARY SEWER MANHOLE
- CO — CLEANOUT
- POST/BOLLARD
- TC — TRAFFIC CONTROL POLE
- TRPB — TRAFFIC CONTROL PULLBOX
- IPOST SIGN
- DECIDUOUS BUSH
- DECIDUOUS TREE
- GUIDE RAIL
- SW — SIDEWALK
- DITCH
- 12 12 — PARKING STRIPING & COUNT
- HAND RAILING
- EDGE OF TREES & BRUSH
- EDGE OF WETLANDS
- EDGE OF FLOOD ZONE
- MONITORING WELL

SOIL AND GROUNDWATER MANAGEMENT AREA AS DEFINED IN THE SITE MANAGEMENT PLAN

DESCRIPTION OF PROPERTY

ALL THAT TRACT OR PARCAL OF LAND, containing 85.98 acres, being a portion of Town Lot 1,3 and 4 of the Second Range of Lots, Township 12, Range7, in the Town of Henrietta, County of Monroe, State of New York, and being more particularly bounded and described as follows.

Beginning at a concrete monument in the north right-of-way line of Jefferson Road, said monument being 44.2' northerly at right angles from the New York State baselines station 236+ 61.1'; thence

1. N 20°-29'-00" E, a distance of 1113.80 feet to a point; thence
2. S 87°-01'-00" W, a distance of 535.40 feet to a point; thence
3. N 21°-09'-00" E, a distance of 634.27 feet to a point; thence
4. N 86°-59'-50" E, a distance of 906.87 feet to a point; thence
5. N 21°-13'-00" E, a distance of 528.34 feet to a point; thence
6. N 86°-10'-02"E, a distance of 1292.99 feet to a point; thence
7. S 20°-21'-25"W, a distance of 559.45 feet to a point; thence
8. S 20°-29'-55"W, a distance of 720.10 feet to a point; thence
9. S 20°-07'-58"W, a distance of 233.75 feet to a point; thence
10. N 87°-42'-32"E, a distance of 1255.88 feet to a point on the westerly right-of-way of Winton Road; thence
11. S 01°-25'-51"E, a distance of 50.01' southerly along the westerly right-of-way of Winton Road to a point; thence
12. S 87°-42'-32"W, a distance of 1275.90 feet to a point; thence
13. S 20°-16'-14" W, a distance of 244.27 feet of a point; thence
14. S 19°-55'-52" W, a distance of 544.88 feet to a point on the northerly right-of-way of Jefferson Road; thence
15. S 89°-53'-54" W, along the northerly right-of-way of Jefferson Road, a distance of 390.30 feet to a point; thence
16. S 81°-33'-17" W, along said right-of-way, a distance of 137.73 feet to a point; thence
17. S 89°-54'-04" W, along said right-of-way, a distance of 1127.96 feet to the Point Beginning.

REFERENCES:

1) A MAP ENTITLED "XEROX FACILITY BOUNDARY MAP" PREPARED BY SEAR-BROWN ASSOCIATES, P.C. ON JUNE 9, 1978, HAVING DRAWING NUMBER 895.02-L.
2) A MAP ENTITLED "HOFSTRA ROAD PARCEL BOUNDARY MAP" PREPARED BY SEAR-BROWN ASSOCIATES, P.C., LAST REVISED ON MARCH 26, 1993, HAVING DRAWING NUMBER 277I-01.
3) A MAP ENTITLED "MAP OF LANDS OF XEROX CORPORATION" PREPARED BY LOZIER, INC. ON NOVEMBER 4, 1986, HAVING DRAWING NUMBER 1729-250.
4) A TITLE REPORT BY FIRST AMERICAN TITLE INSURANCE COMPANY OF NEW YORK, HAVING A TITLE NUMBER OF NCS-339946-BOS1AND AN EFFECTIVE DATED OF SEPTEMBER 18, 2009.

NOTES:

1) PREMISES SHOWN HEREON LIES WITHIN FLOOD ZONE "X" AND ZONE "AE" AS PLOTTED GRAPHICALLY BY SCALE ON THIS MAP, ZONE "X" AREAS ARE DETERMINED TO BE OUTSIDE THE 500 - YEAR FLOODPLAIN, ZONE "AE" AREAS ARE SPECIAL FLOOD AREAS INUNDATED BY 100 - YEAR FLOOD, BASE FLOOD ELEVATIONS HAVE BEEN DETERMINED AS SPECIFIED BY FLOOD INSURANCE RATE MAP FOR THE TOWN OF HENRIETTA REVISED FEBRUARY 5, 1992 AND HAVING COMMUNITY - PANEL NUMBER 360469 0006D.
2) SOURCE OF TITLE: PARCEL 1 IS DEED LIBER 5461 PAGE 142. PARCEL 2 AND 3 IS DEED LIBER 8323 PAGE 501.
3) THE HORIZONTAL DATUM SHOWN HEREON IS REFERENCED TO A MAP ENTITLED "XEROX FACILITY BOUNDARY MAP" PREPARED BY SEAR-BROWN ASSOCIATES, P.C. ON JUNE 9, 1978, HAVING DRAWING NUMBER 895.02-L.
4) PER NEW YORK STATE DEPARTMENT OF TRANSPORTATION REGION 4 SENIOR LAND SURVEYOR THERE ARE ANTICIPATED ROAD WIDENING AND PROPERTY ACQUISITIONS ALONG THE NORTHERLY SIDE OF JEFFERSON ROADISTATE RTE. 252).
5) PREMISES SHOWN HEREON LIE WITHIN TOWN LOTS 1, 3, & 4 OF THE SECOND RANGE OF LOTS, TOWNSHIP 12, RANGE 7 IN THE TOWN OF HENRIETTA, COUNTY OF MONROE AND STATE OF NEW YORK.
6) DECLARATION OF COVENANTS AND RESTRICTIONS DATED JUNE 27, 1996 AND RECORDED JULY 3, 1996 IN LIBER 8758 OF DEEDS AT PAGE 87, THIS RESTRICTION CONCERNS GROUNDWATER CONTAINMENT AND TREATMENT. (NOT PLOTTABLE)
7) UTILITY EASEMENTS GRANTED TO ROCHESTER GAS AND ELECTRIC CORPORATION AND ROCHESTER TELEPHONE CORPORATION BY INSTRUMENT RECORDED IN LIBER 3685 OF DEEDS, AT PAGE 582 ON OCTOBER 26, 1965. (PLOTTED)
8) SEWER EASEMENT FOR THE TOWN BOARD OF THE TOWN OF HENRIETTA, ACTING ON BEHALF OF HENRIETTA SEWER DISTRICT NO.J BY INSTRUMENT RECORDED IN LIBER 3929 OF DEEDS, AT PAGE 18 ON SEPTEMBER 5, 1968. (PLOTTED)
9) RECIPROCAL EASEMENT AGREEMENT RECORDED JULY 14, 1971 IN LIBER 4134 OF DEEDS, AT PAGE 396. (NOT PLOTTABLE)
10) ACCESS EASEMENT AGREEMENT DATED JUNE 30, 1978 BETWEEN JAMES P. WILMOT AND XEROX CORPORATION RECORDED JUNE 30, 1978 IN LIBER 5461 OF DEEDS, AT PAGE 119. (PLOTTED)
11) DRAINAGE EASEMENT TO THE TOWN BOARD OF THE TOWN OF HENRIETTA BY INSTRUMENT RECORDED IN LIBER 3243 OF DEEDS, AT PAGE 46 ON OCTOBER 29, 1959.(PLOTTED)
12) INGRESS/ EGRESS EASEMENT GRANTED TO 313 WINTON REALTY CORP. BY DEED RECORDED NOVEMBER 1, 1960 IN LIBER 3305 OF DEEDS, AT PAGE 140 (PLOTTED)
13) EASEMENT AGREEMENT DATED JUNE 30, 1986 AND RECORDED AUGUST 25, 1986 IN LIBER 6961 OF DEEDS, AT PAGE 184 (NOT PLOTTABLE)
14) PARCEL III MAY BE SUBJECT TO RIGHTS OF OTHERS FOR INGRESS, EGRESS AND UTILITY PURPOSES PER LIBER 6446 OF DEEDS, AT PAGE 22. (NOT PLOTTABLE)
15) MAP CONTAINS 85.98 +/- ACRES TOTAL.
16) WETLANDS SHOWN HEREON ARE FROM A PREVIOUS DELINEATION.
17) SURVEY FIELDWORK COMPLETED ON OCTOBER 16, 2009.

ZONING NOTES:

TAX ACCOUNT NUMBER: 162.07-01-003/ 162.08-01-002/ 162.08-01-031
ZONING DISTRICT: INDUSTRIAL

FRONT YARD	125'	REQUIRED	123.3' MIN. PROVIDED
SIDE YARD	5'	REQUIRED	8.2' MIN. PROVIDED
REAR YARD	60'	REQUIRED	10.7' MIN. PROVIDED

BUILDING HEIGHT: 30' (MAX. ALLOWED = 40')

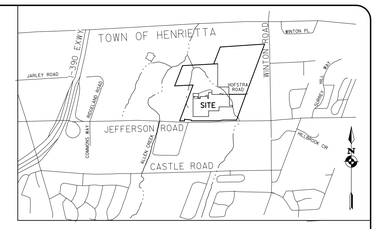
LOADING DOCKS: NO DOCKS, UNLOADING PLATFORMS OF FACILITIES CURRENTLY EXIST IN THE FRONT OF THE BUILDING.

PARKING REQUIRED: ONE 10' x 20' SPACE PER 400 SF OF GROSS FLOOR AREA

572,080 SF GFA /400 = 1433 SPACES

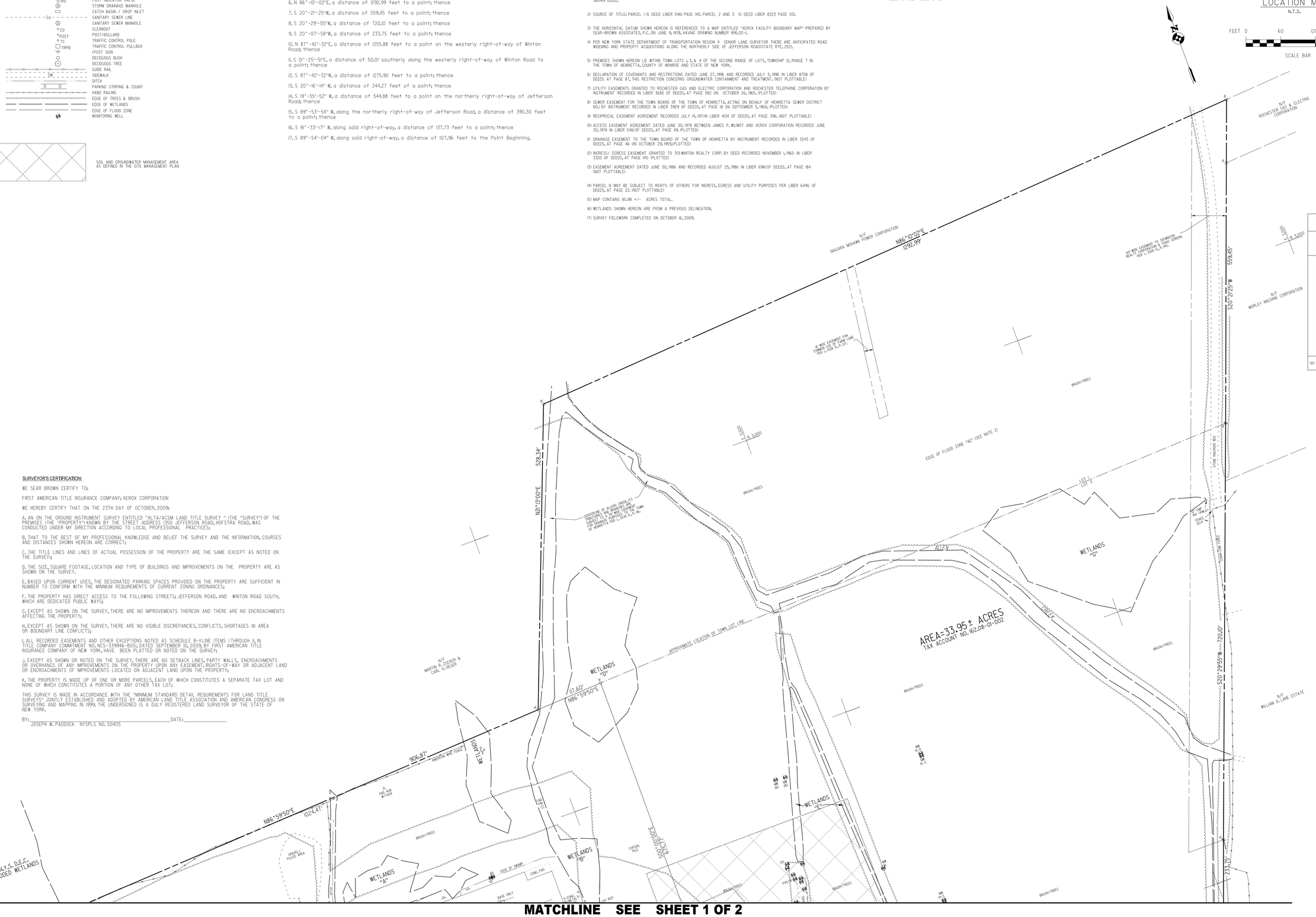
PARKING PROVIDED = 1813 SPACES INCLUDES 9' x 18' AND 10' x 20' SPACES

NOTE: NO BUILDINGS CURRENTLY EXIST ON TAX ACCOUNT NUMBER PARCEL 162.08-01-002/ 162.08-01-031



LOCATION MAP
N.T.S.

FEET 0 60 120 180 FEET
SCALE BAR



MATCHLINE SEE SHEET 1 OF 2

SURVEYOR'S CERTIFICATION:

WE SEAR BROWN CERTIFY TO:

FIRST AMERICAN TITLE INSURANCE COMPANY; XEROX CORPORATION

WE HEREBY CERTIFY THAT ON THE 23TH DAY OF OCTOBER, 2009:

A. AN ON THE GROUND INSTRUMENT SURVEY ENTITLED "ALTA/ACSM LAND TITLE SURVEY " (THE "SURVEY") OF THE PREMISES (THE "PROPERTY") KNOWN BY THE STREET ADDRESS 1350 JEFFERSON ROAD, HOFSTRA ROAD, WAS CONDUCTED UNDER MY DIRECTION ACCORDING TO LOCAL PROFESSIONAL PRACTICES;

B. THAT TO THE BEST OF MY PROFESSIONAL KNOWLEDGE AND BELIEF THE SURVEY AND THE INFORMATION, COURSES AND DISTANCES SHOWN HEREON ARE CORRECT;

C. THE TITLE LINES AND LINES OF ACTUAL POSSESSION OF THE PROPERTY ARE THE SAME (EXCEPT AS NOTED ON THE SURVEY);

D. THE SIZE, SQUARE FOOTAGE, LOCATION AND TYPE OF BUILDINGS AND IMPROVEMENTS ON THE PROPERTY ARE AS SHOWN ON THE SURVEY.

E. BASED UPON CURRENT USES, THE DESIGNATED PARKING SPACES PROVIDED ON THE PROPERTY ARE SUFFICIENT IN NUMBER TO CONFORM WITH THE MINIMUM REQUIREMENTS OF CURRENT ZONING ORDINANCES;

F. THE PROPERTY HAS DIRECT ACCESS TO THE FOLLOWING STREETS; JEFFERSON ROAD, AND WINTON ROAD SOUTH, WHICH ARE DEDICATED PUBLIC WAYS;

G. EXCEPT AS SHOWN ON THE SURVEY, THERE ARE NO IMPROVEMENTS THEREON AND THERE ARE NO ENCROACHMENTS AFFECTING THE PROPERTY;

H. EXCEPT AS SHOWN ON THE SURVEY, THERE ARE NO VISIBLE DISCREPANCIES, CONFLICTS, SHORTAGES IN AREA OR BOUNDARY LINE CONFLICTS;

I. ALL RECORDED EASEMENTS AND OTHER EXCEPTIONS NOTED AS SCHEDULE B-II.LINE ITEMS I THROUGH II, IN TITLE COMPANY COMMITMENT NO. NCS-339946-BOS1, DATED SEPTEMBER 10, 2009, BY FIRST AMERICAN TITLE INSURANCE COMPANY OF NEW YORK, HAVE BEEN PLOTTED OR NOTED ON THE SURVEY;

J. EXCEPT AS SHOWN OR NOTED ON THE SURVEY, THERE ARE NO SETBACK LINES, PARTY WALLS, ENCROACHMENTS OR OVERHANGS OF ANY IMPROVEMENTS ON THE PROPERTY UPON ANY EASEMENT, RIGHTS-OF-WAY OR ADJACENT LAND OR ENCROACHMENTS OF IMPROVEMENTS LOCATED ON ADJACENT LAND UPON THE PROPERTY;

K. THE PROPERTY IS MADE UP OF ONE OR MORE PARCELS, EACH OF WHICH CONSTITUTES A SEPARATE TAX LOT AND NONE OF WHICH CONSTITUTES A PORTION OF ANY OTHER TAX LOT;

THIS SURVEY IS MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR LAND TITLE SURVEYS" JOINTLY ESTABLISHED AND ADOPTED BY AMERICAN LAND TITLE ASSOCIATION AND AMERICAN CONGRESS ON SURVEYING AND MAPPING IN 1999. THE UNDERSIGNED IS A DULY REGISTERED LAND SURVEYOR OF THE STATE OF NEW YORK.

BY: _____ DATE: _____
JOSEPH W. PADDOCK NYSPLS NO. 50405

8	7	REVISED LABEL OF C.M.A.	11/09/09 MJC
	6	UPDATED AND REVISED	10/30/09 JMP
	5	UPDATED AND REVISED	10/22/09 MJC
	4	UPDATED AND REVISED	5/5/03 JMP
	3	REVISED DATE OF TITLE REPORT	10/09/02 RWB
	2	REVISED PER REDATED TITLE REPORT	9/27/02 RWB
	1	REVISED CERTIFICATION	9/4/02 JMP
	0	ADD TAX PARCEL; BLDG SQ. FT.	4/09/02 ERB
		REVISIONS	DATE BY

PROJECT ENGINEER/ARCHITECT
PROJECT MANAGER

DRAWN BY: J.J. PADDOCK
SCALE: 1" = 60'
FIRST ISSUE DATE: 7/17/2002

STANTEC CONSULTING GROUP, INC.
2225 East Bayshore Road
Town Line Road
Rochester, N.Y. 14623-2706
Tel: (585) 475-1440
Fax: (585) 272-1814
www.stantec.com

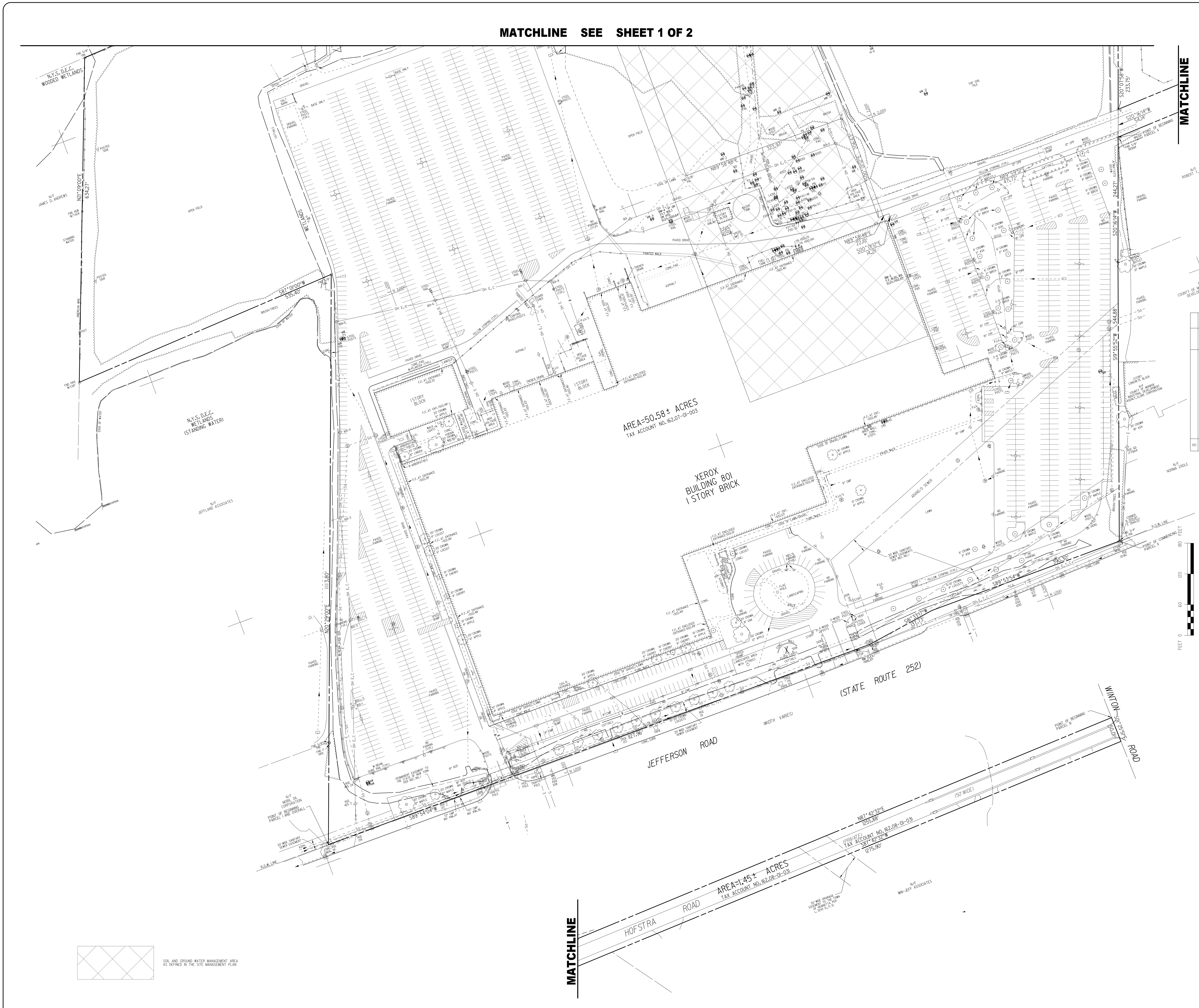
PROJECT
XEROX - BUILDING 801
JEFFERSON ROAD, TOWN OF HENRIETTA
MONROE COUNTY, NEW YORK

TITLE OF DRAWING
ALTA/ACSM LAND TITLE SURVEY

PROJECT NO.
1409103

DRAWING NO.
V-1
SHEET 1 OF 2

U:/1409102/SURVEY/V-1.DGN



8			
7	REVISED LABEL OF G.M.A.	11/09/09	MJG
6	UPDATED AND REVISED	10/30/09	JWP
5	UPDATED AND REVISED	10/22/09	MJG
4	UPDATED AND REVISED	5/15/03	JWP
3	REVISED DATE OF TITLE REPORT	10/01/02	RWII
2	REVISED PER REDATED TITLE REPORT	9/27/02	RWII
1	REVISED CERTIFICATION	9/11/02	JWP
0	ADD TAX PARCEL; BLDG SQ. FT.	4/19/02	ERB
	REVISIONS	DATE	BY

PROJECT ENGINEER/ARCHITECT

PROJECT MANAGER

DRAWN BY J. PADDOCK

SCALE 1" = 60'

FIRST ISSUE DATE 7/17/00

Stantec
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Rochester, N.Y. 14623-2706
Tel:(585) 475-1440
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SHEET 2 OF 2

U:/1409102/SURVEY/V-2.DGN

APPENDIX B

Example Health & Safety Plan

SITE-SPECIFIC HEALTH & SAFETY PLAN

For

Enter Project Name

Enter Project Address/Location

Project/File No. Enter File No.

Prepared by: Enter Preparer's Name Date: Enter Date

Revised by: Enter Revisor's Name Date: Enter Date

APPROVALS: The following signatures constitute approval of this Health & Safety Plan

_____ _____

- Local H&S Coordinator Date

_____ _____

- Site Project Manager Date

_____ _____

- Corporate H&S Manager Date

Date printed: 11/2/2009 at 4:04 PM

Note: This HASP has been developed for Haley & Aldrich purposes only and is not for use by others.

TABLE OF CONTENTS

1. PROJECT INFORMATION AND EMERGENCY RESOURCES

Project Name: Enter Project Name	**File No.: Enter File No.**
Location: Enter Project Location	
Client/Site Contact: Phone Number: Emergency Phone Number:	Enter Client/Site Contact Name and Title Enter Client/Site Contact Phone Number Enter Client/Site Contact Emergency Number
General Contractor: **Superintendent:** Phone Number: Emergency Phone Number:	Enter General Contractor Name Enter Superintendent Name Enter Superintendent Phone Number Enter Superintendent Emergency Number
Project Manager: Phone Number: Emergency Phone Number:	Enter PM Name Enter PM Phone Number Enter PM Emergency Number
Local Health & Safety Coordinator: Emergency Phone Number:	
Nearest Hospital: Address: (see map on next page) Phone Number:	Enter Name of Nearest Hospital EnterAddress of Nearest Hosptial Enter Hospital Emergency Phone Number
Emergency Response Number:	**911**
Other Local Emergency Response Number:	Enter Other Local Emergency Phone Number
Other Ambulance, Fire, Police, or Environmental Emergency Resources:	Enter Other Emergency Phone Number

Work Scope:

This Site-Specific Health and Safety Plan addresses the health and safety practices and procedures that will be employed by all Haley & Aldrich employees participating in field activities at the Project Site. This plan is based on an assessment of the site-specific health and safety risks available to Haley & Aldrich and Haley & Aldrich's experience with other project sites. The scope of work for the Site Characterization includes:

Excavation Activities

Any future excavation work will be completed in the presence and under the direction of a certified Competent Person. Contractor is required to follow all appropriate procedures and protocols as per its health and safety plan for removal and handling of soil during and after excavation. Whenever Haley & Aldrich staff is not required to be near the excavation, they will maintain a safe distance (15 feet) from excavation edge. At all times Haley & Aldrich staff will be at least 5 feet away from the edge of the excavation. Haley & Aldrich staff will maintain a safe distance (minimum of 15 feet) from operating heavy equipment. While directing the collection of confirmation samples from the excavation, Haley & Aldrich staff will stand on the opposite side of the excavation at the minimum distance from the edge, as defined above.

Under no circumstances will Haley & Aldrich staff enter an excavation. Soil samples will be brought to Haley & Aldrich at an appropriate safe distance (15 feet) from the excavation. Be aware of the potential for severe weather to develop which may change site conditions.

Groundwater management tools will be available on-site should groundwater be encountered during excavation activities. Encountered groundwater will be pumped by the contractor into a temporary tank on-site.

Subcontractor(s) to be involved in on-site activities:

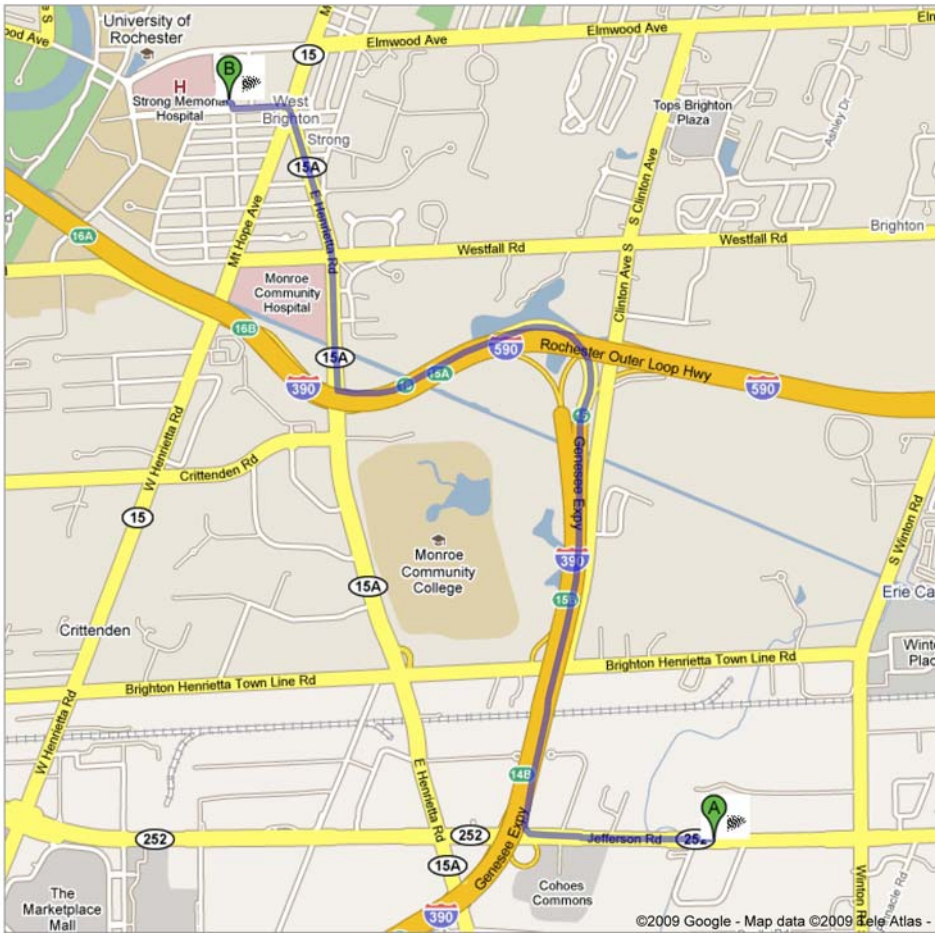
Firm Name	Work Activity
Enter Subcontractor Name	Enter Work Activity
Enter Subcontractor Name	Enter Work Activity

Projected Start Date: Enter Start Date

Projected Completion Date: Enter Completion Date

Estimated Number of Days to Complete Field Work: Enter Number of Days

Directions to the Nearest Hospital:
4.3 mi – about **8 mins**



Start: 1350 Jefferson Rd
Rochester, NY 14623

1. Head **west** on **Jefferson Rd/NY-252** toward **Saginaw Dr**	0.5 mi
2. Take the ramp onto **I-390 N**	2.3 mi
3. Take exit **16** for **E Henrietta Rd/NY-15A/W Henrietta Rd** toward **NY-15**	0.2 mi
4. Turn **right** at **E Henrietta Rd/NY-15A** (signs for **E Henrietta Rd**)	0.9 mi
5. Slight **left** at **Crittenden Blvd**	0.2 mi
6. Turn **right** at **Norfolk St** Destination will be on the right	187 ft

2. SITE DESCRIPTION

Site Classification:

☑ Industrial	☐ Commercial	☐ Other Specify

General Description:

The site is an approximately 86.6-acre area bounded by undeveloped land to the north, undeveloped and commercial properties to the east and west, and Jefferson Road to the south (beyond which is additional commercial and industrial property use).

The B801 property is an irregularly shaped parcel of approximately 86.6 acres comprised of the 50.4 acre original site and 36.2 acres acquired in 1993. The main building on the property covers approximately 12 acres and is located on the southern half of the property. The majority of the property is covered by building, paved parking areas and roadways, while the northern portion of the property is covered by woody vegetation and weed growth.

Background and Historic Site Usage:

Xerox Corporation refurbished photocopier machines at the Site between 1972 and 1978. The machine parts were cleaned in the northeast corner of the building using chlorinated solvent blends and/or detergent washes. The solvent blends consisted of mineral spirits (petroleum distillates) with varying proportions of 1,1,1-trichloroethane, tetrachloroethene, methylene chloride, and trichloroethene. The cleaning process included the use of spray booths, a cabinet washer and recycling pump for wash materials and solvents, two turbulators, each with a tank and pit for batch cleaning, a solvent storage room, a paint shop, and various solvent and waste solvent storage tanks. The areas that contained these operations were assessed for potential environmental impacts as part of the site investigative activities.

The solvent blend management activities of the refurbishing operations included two above ground 8,000 gallon solvent storage tanks, two 1,000 gallon tanks, one 500-gallon overflow tank, and one 500 gallon spill crock. The solvent blend storage and process related tanks were removed from the site after refurbishing operations were discontinued in 1978.

Project Scope:

Summarize scope of project or type of developement and overall project objectives. Define the scope of H&A's services and the role and responsibilities of the H&A staff member within the project team.

Overview of Hazards:

Describe health and safety hazards to be encountered during site work and managed in acoordance with this plan. Include construction related physical hazards due to heavy

equipment, utilities, excavations, hoisting, traffic, etc. Include chemical hazards associated with onsite contamination, fumes and dust. Include unique hazards associated with site features or project-specific characteristics or activities (e.g., working over water, potential explosive gases, interior ventillation, electrical hazards, etc.)

Site Status: Indicate current activity status and describe operations at the site.

☐ Active ☐ Inactive

☐ Partially active ☐ Other

Enter description of current site operations or activities.

Site Plan:

Is a site plan or sketch available? ☑ Y ☐ N

Work Areas:

List/identify each specific work area(s) on the job site and indicate its location(s) on the site plan:

1. Enter work area description
2. Enter work area description
3. Enter work area description
4. Enter work area description

3. PROJECT TASK BREAKDOWN

List and describe each distinct work task below.

Task No.	Detailed Task Description	Employee(s)	Work Date(s) or Duration
1	Enter detailed task description	Enter employees	Enter dates/duration
2	Enter detailed task description	Enter employees	Enter dates/duration'
3	Enter detailed task description	Enter employees	Enter dates/duration'
4	Enter detailed task description	Enter employees	Enter dates/duration'

4. HAZARD ASSESSMENT

Material Safety Data Sheets (MSDS) of hazardous materials used during the execution of work shall be available on site. MSDSs are required for chemicals used to prepare samples, calibration gases, etc. MSDSs are not required for waste materials. MSDSs are available in Boston-based field vehicles and at the Roland Street Laboratory.

Chemical Hazards:

Does chemical analysis data indicate that the site is contaminated? ☐ Y ☐ N

Indicate the potential physical state of the hazardous materials at the site.

☑ Gas/Vapor	☐ Sludge
☑ Liquid	☑ Solid/Particulate

Indicate the anticipated or actual class of compounds at the site.

☐ Asbestos	☐ Inorganics
☐ BTEX	☐ Pesticides
☑ Chlorinated Solvents	☐ Petroleum products
☐ Heavy Metals	☑ Other mineral spirits

Impacted Environments:

Indicate media in which contamination is expected.

☑ Air	☑ Groundwater
☑ Soil	☑ Sediment
☑ Surface water	☐ Other Specify

Estimated concentrations:

Indicate medium of major chemicals expected to be encountered by onsite personnel.

Work Activity	Media	Chemical	Anticipated Concentration
Excavation	SO, GW, A	Chlorinated solvents, mineral spirits	unknown
Enter work activity	Enter media	Enter chemical	Enter anticipated concentration
Enter work activity	Enter media	Enter chemical	Enter anticipated concentration
Enter work activity	Enter media	Enter chemical	Enter anticipated concentration

(Media key: A = Air; GW = Groundwater; SW = Surface Water; SO = Soil; SE = Sediment)

Chemicals of Concern:

Tetrachloroethene (PCE)

OSHA IMIS Code Number: 2020 / CAS Registry Number: 127-18-4

Exposure Limits

The OSHA Permissible Exposure Limit (PEL) for General Industry is 100 ppm TWA. Exposures shall not exceed 200 ppm (ceiling) with the following exception, exposures may exceed 200 ppm, but not more than 300 ppm (peak), for a single time period up to 5 minutes for any 3 hours. The OSHA Permissible Exposure Limit (PEL) for the Construction Industry is 100 ppm, 670 mg/m^3 TWA. The NIOSH Immediately Dangerous To Life or Health Concentration (IDLH) is 150 ppm.

The potential symptoms of exposure include effects to the eye, nose, throat and respiratory system; coughing, shortness of breath, pulmonary edema; irritation; nausea; flushed face, neck; dizziness, incoordination; headache; drowsiness, unconsciousness; skin erythema, drying, cracking, mild to moderate burning sensation, dermatitis; liver damage; impaired color vision [potential occupational carcinogen]. If ingested, symptoms include vomiting, diarrhea, bloody stool, and loss of muscle control.

Potential health effects include cumulative liver and CNS damage (HE3), narcosis (HE8), and mutagen (HE2).

The potential affected organs include the liver, kidneys, eyes, skin, respiratory system, and central nervous system.

Trichloroethylene (TCE)

Trichloroethylene (TCE) is a colorless, nonflammable, non-corrosive liquid has a “sweet” odor characteristic of some chlorinated hydrocarbons.

The compound is incompatible with strong caustics, it reacts with aluminum when acidic, and it is incompatible with active metals - barium, lithium, sodium, magnesium, and titanium. Decomposition of TCE, due to contact with hot metal or ultraviolet radiation, forms products including chlorine gas, hydrogen chloride, and phosgene. Dichloroacetylene may be formed from the reaction of alkali with TCE.

The OSHA PEL for TCE is 100 ppm as an 8-hour TWA; an acceptable ceiling concentration of 200 ppm; and an acceptable maximum peak ceiling of 300 ppm for no more than 5 minutes in any 2-hour period. The standard routes of entry in the body are through inhalation, percutaneous absorption, ingestion, skin and eye contact. The points of attack are the respiratory system, heart, liver, kidneys, central nervous system and skin.

Exposure to TCE vapor may cause irritation of the eyes, nose, and throat. The liquid, if splashed in the eyes, may cause burning irritation and damage. Repeated or prolonged shin contact with the liquid may cause dermatitis. Acute exposure to TCE depresses the central nervous system exhibiting such symptoms as headache, dizziness, vertigo, tremors, nausea and vomiting, irregular heart beat, sleepiness, fatigue, blurred vision, and intoxication similar to that of alcohol. Unconsciousness and death have been reported. Alcohol may make the symptoms of TCE overexposure worse. If alcohol has been consumed, the overexposed worker may become flushed. TCE addiction and peripheral neuropathy have been reported.

1,1,1 Trichloroethane

The health effects for 1,1,1 TCA are as follows- Inhalation of vapors will irritate the respiratory tract. Affects of 1,1,1 TCA can be to the central nervous system. Symptoms include headache, dizziness, weakness, and nausea. Higher levels of exposure (> 5000 PPM) can cause irregular heart beat, kidney and liver damage, fall in blood pressure, unconsciousness and even death. Harmful if swallowed. Symptoms similar to inhalation will occur along with nausea, vomiting. Aspiration of material into the lungs can cause chemical pneumonitis, which can be fatal. If aspirated, may be rapidly absorbed through the lungs and result in injury to other body systems. Exposure to 1,1,1 TCA can cause mild irritation and redness, especially with prolonged contact. Repeated contact may cause drying or flaking of the skin. Liquids and vapors cause irritation. Symptoms include tearing, redness, stinging, and swelling. Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may affect the kidneys and liver. Dioxane is a suspected human carcinogen based on animal data. Personnel with CNS, kidney, liver or heart disease may be more susceptible to the effects of this substance. Use of alcoholic beverages may aggravate symptoms.

The OSHA permissible exposure limit (PEL) for 1,1,1 TCA is 350 PPM for an 8-hour time weighted average.

1,2-Dichloroethylene

1,2-Dichloroethylene is a colorless, volatile liquid with an ether-like, slightly acrid odor.

The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for 1,2-dichloroethylene is 200 ppm (790 milligrams per cubic meter (mg/m(3)) as an 8-

hour time-weighted average (TWA) concentration [29 CFR 1910.1000, Table Z-1]. The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit (REL) for 1,2-dichloroethylene of 200 ppm (790 mg/m(3)) as a TWA for up to a 10-hour workday and a 40-hour workweek [NIOSH 1992]. The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned 1,2-dichloroethylene a threshold limit value (TLV) of 200 ppm (793 mg/m(3)) as a TWA for a normal 8-hour workday and a 40-hour workweek [ACGIH 1994, p. 18].

The major effect of exposure of 1,2-dichloroethylene on humans is narcosis; it has been used in a combination with ether (Dichloren) as an anesthetic in at least 2000 cases. No evidence of eye toxicity was seen in these cases [Grant 1986]. In high concentrations, exposure to 1,2-dichloroethylene causes central nervous system depression; in milder exposures, it can produce nausea, vomiting, weakness, tremor, epigastric cramps, burning of the eyes and vertigo [Gosselin 1984; Hathaway et al. 1991]. One fatality has been reported that was due to inhalation of a very high vapor concentration in a small enclosure [Hathaway et al. 1991].

* Signs and symptoms of exposure:

1. Acute exposure: Exposure to the vapor of dichloroethylene may cause burning of the eyes. Other symptoms of acute exposure are nausea, vomiting, and epigastric distress. Symptoms of exposure-related narcosis including drowsiness, tremor, incoordination, dizziness, and weakness; these symptoms clear quickly after exposure is terminated.

2. Chronic exposure: 1,2-Dichloroethylene is a defatting agent, and repeated skin exposure may cause irritation and dermatitis.

Vinyl Chloride

Vinyl chloride is known also as chloroethene, chloroethylene, ethylene monochloride, or monochloroethylene. At room temperature, it is a colorless gas, it burns easily, and it is not stable at high temperatures. Vinyl chloride exists in liquid form if kept under high pressure or at low temperatures. Vinyl chloride has a mild, sweet odor, which may become noticeable at 3,000 parts vinyl chloride per million parts (ppm) of air. However, the odor is of little value in preventing excess exposure. Most people begin to taste vinyl chloride in water at 3.4 ppm.

The OSHA Permissible Exposure Limit (PEL) for General Industry is 1 ppm TWA with a 0.5 ppm Action Level. The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) is 1 ppm TWA. It is a confirmed human carcinogen

1,1-Dichloroethane

1,1-Dichloroethane is a colorless, oily liquid with a sweet odor. It evaporates easily at room temperature and burns easily. It does not occur naturally in the environment.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 400 milligrams of 1,1-dichloroethane per cubic meter of air (400 mg/m^3) for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend the same exposure

limit in air. NIOSH currently recommends that a level of 12,150 mg/m^3 be considered immediately dangerous to life and health. This is the exposure level of 1,1-dichloroethane that is likely to cause permanent health problems or death.

Mineral Spirits

Mineral Spirits is a petroleum distillate commonly used as a paint thinner and mild solvent.

The OSHA Permissible exposure limit (PEL) for mineral spirits is 500 ppm, 2900 mg/m3. The NIOSH Recommended exposure limit (REL) for mineral spirits is 350 mg/m3 TWA, 1800 mg/m3 Ceiling (15 min). The ACGIH Threshold limit value (TLV) is 100 ppm, 525 mg/m3 TWA

Vapors are heavier than air and may travel along the ground or be moved by ventilation and ignited by heat, pilot lights, other flames and ignition sources at locations distant from the material handling point. Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. All five gallon pails and larger metal containers including tank cars and thank trucks should be grounded and/or bonded when material is transferred.

TABLE 1
OCCUPATIONAL EXPOSURE LIMITS (CONCENTRATIONS IN AIR)

(CIRCLE CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS AND EXPOSURE ON LAST PAGE)

CHEMICAL	ROUTES OF EXPOSURE	IDLH	Ceiling	STEL	PEL	TLV	REL	PID (IP eV)	FID	ODOR THRES-HOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
VAPORS & GASES												
Acetone	R, I, C	2500	-	750 [ACGIH]	1000	500	250	9.69	60	13	-	fragrent, mint-like
Ammonia	R, I, C	300	-	35 [NIOSH, ACGIH]	50	25	25	10.18**	-	0.5-2	10	Pungent suffocating odor
Benzene	R,A,I,C	Ca [500]	-	1 [NIOSH]; 2.5 [ACGIH]	1	0.5	0.1	9.24	150	4.68	-	Solvent, aromatic
Carbon tetrachloride (Tetrachloromethane)	R,A,I,C	Ca [200]	25 [instantaneous] 200 [5 min peak in any 4 hrs]	2 [NIOSH, 60-min]; 10 [ACGIH]	2	5	Ca	11.47**	10	50	-	Sweet, pungent, ether-like
Chlorobenzene	R,I,C	1000	-	-	75	10	-	9.07	200	0.68	-	Almond-like
Chloroform	R,I,C	Ca [500]	50 [OSHA]	2 [NIOSH, 60-min]	-	10	-	11.42**	65	50	-	Sweet, pleasant
o-Dichlorobenzene	R,A,I,C	200	50 [NIOSH, OSHA]	50 [ACGIH]	-	25	-	9.06	50	0.3	E 20-30	Pleasant, aromatic
p-Dichlorobenzene	R,A,I,C	Ca [150]	-	-	75	10	Ca	8.98	-	0.18	E 80-160	Distinct, aromatic, mothball-like
Dichlorodifluoromethane (Freon 12)	R,C	15000	-	-	1000	1000	1000	11.75**	15	-	-	Ether-like when at very high concs.
1,1-Dichloroethane	R,I,C	3000	-	-	100	100	100	11.06**	80	200	-	Distinct, chloroform-like
1,2-Dichloroethane (Ethylene dichloride)	R,I,A,C	Ca [50]	100 [OSHA]	2 ppm [NIOSH]; 200 ppm [OSHA, 5-min max peak in any 3 hours]	50	10	1	11.05**	80	88	-	Chloroform-like
1,1-Dichloroethylene (1,1-DCE, Vinylidene chloride)	R,A,I,C	Ca [ND]	-	-	-	5	Ca	10.00**	40	190	-	Chloroform-like
1,2-Dichloroethylene	R,I,C	1000	-	-	200	200	200	9.65	50	0.85	-	Bitter, chloroform-like
Ethanol	R,I,C	3300	-	-	1000	1000	1000	10.47**	25	10	-	Weak, ether-like, wine-like
Ethylbenzene	R,I,C	800	-	125 [NIOSH; ACGIH]	100	100	100	8.76	100	2.3	E 200	Aromatic
Ethylene Glycol	R,I,C	ND	50 [OSHA]; 100 mg/m^3 [ACGIH]	-	-	-	-	-	-	-	-	Odorless
Formaldehyde	I,C	Ca [20]	0.1 [NIOSH, 15-min]; 0.3 [ACGIH]	2	0.75	-	Ca [0.016]	10.88**	-	0.83	-	Pungent, suffocating
Gasoline	R,I,A,C	Ca [ND]	-	500 [OSHA; ACGIH]	300	300	-	-	-	-	E 0.5	Petroleum-like
n-Hexane	R,I,C	1100	-	-	500	50	50	10.18	70	130	E.T 1400-1500	Gasoline-like
Hydrogen Cyanide	R,A,I,C	50	4.7 [ACGIH; Skin]	4.7 [NIOSH - skin]	10 [skin]		-	-	-	0.58	-	Bitter almond
Hydrogen peroxide	R,I,C	75	-	-	1	1	1	10.54**	-	-	-	Sharp
Methanol	R,I,A,C	6000	-	250 [NIOSH; ACGIH; skin]	200	200 [skin]	200	10.84**	12	1000	-	Pungent
Methyl Ethyl Ketone Peroxide	R,I,C	ND	0.2 [NIOSH; ACGIH] 0.7 [OSHA]	-	-	-	-	-	-	-	-	Characteristic odor
Methyl Chloroform (1,1,1-TCA)	R,I,C	700	350 [NIOSH, 15-min]	450 [ACGIH]	350	350	Ca	11.00**	105	20-100	-	Chloroform-like
Methylene Chloride (Dichloromethane, Methylene dichloride)	R,I,A,C	Ca [2300]	-	125	25	50	Ca	11.32**	100	25-50	E 5000	Chloroform-like
Methyl Mercaptan	R,C	150	10 [OSHA] 0.5 [NIOSH, 15-min]	-	-	0.5	-	9.44	-	-	-	Garlic, rotten cabbage
MIBK (Hexone)	R,I,C	500	-	75 [NIOSH; ACGIH]	100	50	50	9.30	-	-	-	Pleasant
Naptha (coal tar)	R,I,C	1000	-	-	100	400	100	-	-	-	-	Aromatic
Naphthalene	R,A,I,C	250	-	15 [NIOSH; ACGIH]	10	10	10	8.12	-	0.3	E 15	Mothball-like
Octane	R,I,C	1000	385 [NIOSH, 15-min]	-	500	300	75	9.82	80	48	-	Gasoline-like
Pentachlorophenol	R,A,I,C	2.5 mg/m^3	-	-	0.5 mg/m^3 [skin]	0.5 mg/m^3 [skin]	0.5 mg/m^3 [skin]	-	-	-	-	Pungent when hot, benzene-like
Phenol	R,A,I,C	250	15.6 [NIOSH, 15-min]	-	5 [skin]	5 [skin]	5 [skin]	8.50	-	0.04	E.N.T. 68	Sweet, acrid
Propane	R,C	2100	-	-	1000	1000	1000	11.07**	80	1600	-	Odorless (commonly smells foul due to additive for odor detection)
Stoddard Solvent (Mineral Sprits)	R,Cl,I	20000 mg/m^3	1800 mg/m^3 [NIOSH, 15-min]	-	500	100	350 mg/m^3	-	-	1	E 400	Kerosene-like
Styrene	R,I,A,C	700	200 [OSHA]	100 [NIOSH]; 600 [OSHA, 5-min max peak in any 3 hours]; 40 [ACGIH]	100	20	50	8.40	85	0.047	E 200-400	Sweet, floral
1,1,2,2-Tetrachloroethane	R,I,A,C	Ca [100]	-	-	5 [skin]	1 [skin]	1 [skin]	11.10**	100	1.5	-	Pungent, chloroform-like
Tetrachloroethylene (Perchloroethylene, Perc, PCE)	R,I,A,C	Ca [150]	200 [OSHA]	300 [OSHA, 5-min max peak in any 3-hours]; 100 [ACGIH]	100	25	Ca	9.32	70	4.68	N.T513-690	Chloroform-like
Toluene	R,A,I,C	500	300 [OSHA]	150 [NIOSH]; 500 [OSHA, 10-min max peak]	200	50	100	8.82	110	2.14	E300-400	Sweet, pungent, benzene-like
Trichloroethylene (TCE)	R,I,A,C	Ca [1000]	200 [OSHA]	300 [OSHA, 5-min max peak in any 2-hours]; 100 [ACGIH]	100	50	Ca	9.45	70	21.4	-	Chloroform-like
1,2,3-Trimethylbenzene	R,I,C	ND	-	-	-	-	25	8.48	-	-	-	Distinctive, aromatic
1,2,4-Trimethylbenzene	R,I,C	ND	-	-	-	-	25	8.27	-	-	-	Distinctive, aromatic
1,3,5-Trimethylbenzene	R,I,C	ND	-	-	-	-	25	8.39	-	-	-	Distinctive, aromatic
Turpentine	R,A,I,C	800	-	-	100	20	100	-	-	200	E.N 200	Pine-like
Vinyl Chloride	R,C	Ca [ND]	5 [OSHA, 15-min]	-	1	1	Ca	9.99	-	3000	-	Pleasant odor at high concs.
Xylenes	R,A,I,C	900	-	150 [NIOSH, ACGIH]	100	100	100	8.56 (m- and o-) 8.44 (p-)	111/116	1.1	E.N.T. 200	Aromatic

TABLE 1
OCCUPATIONAL EXPOSURE LIMITS (CONCENTRATIONS IN AIR)

(CIRCLE CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS AND EXPOSURE ON LAST PAGE)

CHEMICAL	ROUTES OF EXPOSURE	IDLH	Ceiling	STEL	PEL	TLV	REL	PID (IP eV)	FID	ODOR THRES-HOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
DUSTS, MISTS, FUMES, AND MISCELLANEOUS COMPOUNDS												
Asbestos	R	Ca (ND)	-	-	0.1 fiber/cc	0.1 fiber/cc	0.1 fiber/cc	-	-	-	-	-
PCBs-42% Chlorine	R,A,I,C	Ca [5 mg/m^3]	-	-	1 mg/m^3 [skin]	1 mg/m^3 [skin]	0.001 mg/m^3	-	-	-	-	Mild, hydrocarbon
PCBs-54% Chlorine	R,A,I,C	Ca [5 mg/m^3]	-	-	0.5 mg/m^3 [skin]	0.5 mg/m^3 [skin]	0.001 mg/m^3	-	-	-	-	Mild, hydrocarbon
Aluminum - metal dust	R,C	ND	-	-	15 mg/m^3 (total); 5 mg/m^3 (respirable)	10 mg/m^3	10 mg/m^3 (total); 5 mg/m^3 (respirable)	-	-	-	-	-
Aluminum - soluble salts	R,I,C	ND	-	-	2 mg/m^3	2 mg/m^3	2 mg/m^3	-	-	-	-	-
Arsenic- inorganic	R,A,I,C	Ca [5 mg/m^3]	0.002 mg/m^3 [NIOSH, 15-min]	-	0.01 mg/m^3	0.01 mg/m^3	Ca	-	-	-	-	-
Barium:soluble compounds	R,I,C	50 mg/m^3	-	-	0.5 mg/m^3	0.5 mg/m^3	0.5 mg/m^3	-	-	-	-	-
Beryllium	R,C	Ca [4 mg/m^3]	0.005 mg/m^3 [OSHA]; 0.025 mg/m^3 [OSHA, 30-min max peak]; 0.0005 mg/m^3	0.01 mg/m^3 [ACGIH]	0.002 mg/m^3	0.002 mg/m^3	Ca	-	-	-	-	-
Cadmium dusts	R,I	Ca [9 mg/m^3]	-	-	0.005 mg/m^3	0.01 mg/m^3	Ca	-	-	-	-	-
Chromates (Cr(VI) Compounds) & Chromic Acid	R,I,C	Ca [15 mg/m^3]	0.1 mg/m^3 [OSHA]	-	0.001 mg/m^3	0.05 mg/m^3 [water soluble]; 0.01 mg/m^3 [insoluble]	Ca	-	-	-	-	-
Chromium (III) Compounds	R,I,C	25 mg/m^3	-	-	0.5 mg/m^3	0.5 mg/m^3	0.5 mg/m^3	-	-	-	-	-
Chromium Metal	R,I,C	250 mg/m^3	-	-	1 mg/m^3	0.5 mg/m^3	0.5 mg/m^3	-	-	-	-	-
Copper - dust & mist	R,I,C	100 mg/m^3	-	-	1 mg/m^3	1 mg/m^3	1 mg/m^3	-	-	-	-	-
Lead	R,I,C	100 mg/m^3	-	-	0.050 mg/m^3	0.05 mg/m^3	0.050 mg/m^3	-	-	-	-	-
Manganese (compounds and fume)	R,I	500 mg/m^3	5 mg/m^3 [OSHA]	3 mg/m^3 [NIOSH]	-	0.2 mg/m^3	1 mg/m^3	-	-	-	-	-
Mercury & Inorganic Mercury Compounds	R,I,A,C	10 mg/m^3	0.1 mg/m^3 [NIOSH, Skin]; 0.1 mg/m^3 [OSHA]	-	-	0.025 mg/m^3	0.05 mg/m^3 [skin]	-	-	-	-	-
Organo-Mercury Compounds	R,A,I,C	2 mg/m^3	0.04 mg/m^3 [OSHA]	0.03 mg/m^3 [NIOSH]	0.01 mg/m^3	0.01 mg/m^3 [alkyl]; 0.1 mg/m^3 [metal];	0.01 mg/m^3	-	-	-	-	-
Nickel (metal and compounds)	R,I,C	Ca [10 mg/m^3]	-	-	1 mg/m^3	1.5 mg/m^3 [metal]; 1 mg/m^3 [soluble inorganic compounds]; 1 mg/m^3 [insoluble	0.015 mg/m^3	-	-	-	-	-
Particulate (Not otherwise regulated)	R, C	ND	-	-	15 mg/m^3 (total); 5 mg/m^3 (respirable)	10 mg/m^3 (inhalable); 3 mg/m^3 (respirable)	-	-	-	-	-	-
Portland cement	R,I,C	5000 mg/m^3	-	-	50 mppcf	10 mg/m^3	10 mg/m^3 (total); 5 mg/m^3 (respirable)	-	-	-	-	-
Selenium compounds	R,I,C	1 mg/m^3	-	-	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	-	-	-	-	-
Silica, crystalline	R, C	Ca [25 mg/m^3 (cristobalite, tridymite); 50 mg/m^3 (quartz, tripoli)]	-	-	Dependent on silicon dioxide content of silica (see Appendix C of the NIOSH Pocket Guide to Chemical Hazards, 2005)	Dependent on minerology [see ACGIH 2005 TLVs and BEIs Handbook]	0.05 mg/m^3	-	-	-	-	-
Silver (metal and soluble compounds)	R,I,C	10 mg/m^3	-	-	0.01 mg/m^3	0.1 mg/m^3	0.01 mg/m^3	-	-	-	-	-
Thallium, soluble	R,A,I,C	15 mg/m^3	-	-	0.1 mg/m^3 [skin]	0.1 mg/m^3 [skin]	0.1 mg/m^3 [skin]	-	-	-	-	-
Tin (metal)	R,C	100 mg/m^3	-	-	2 mg/m^3	2	2 mg/m^3	-	-	-	-	-
Tin (organic compounds)	R,A,I,C	25 mg/m^3	-	-	0.1 mg/m^3	0.1 mg/m^3 [skin]	0.1 mg/m^3 [skin]	-	-	-	-	-
Zinc oxide dust & fume	R	500 mg/m^3	15 mg/m^3 [NIOSH, dust]	10 mg/m^3 [NIOSH; ACGIH; fume]	15 mg/m^3 (total dust); 5 mg/m^3 [respirable dust]; 5 mg/m^3 [fume]	2 mg/m^3 [respirable]	5 mg/m^3 (total dust); 5 mg/m^3 [fume]	-	-	-	-	-

NOTES & ABBREVIATIONS:

All units in parts per million (ppm) unless otherwise noted.
R = Respiratory (Inhalation)
I = Ingestion
A = Skin Absorption
C = Skin Contact
-: Not available
ND: Not detectable.
Ca = Carcinogen
** = Use 11.7 eV lamp
IP: Ionization potential
eV: Electrovolts

IDLH: Immediately dangerous to life and health
Ceiling: Highest allowable instantaneous
C = Skin and/or Eye Contact
STEL: Short-term exposure limit. Exposure period is 15 minutes unless otherwise indicated
PEL: OSHA Permissible Exposure Limit (legally-enforceable)
REL: NIOSH Recommended Exposure Limit
PID: Photoionization Detector
OSHA: United States Occupational Safety and Health Administration
NIOSH: National Institute of Occupational Safety and Health
TLV: ACGIH Threshold Limit Value
ACGIH: American Conference of Governmental Industrial Hygienists

Physical Hazards:

Indicate all hazards that may be present for each task. If any of these potential hazards are checked, it is the project manager's responsibility to determine how to eliminate/minimize the hazard to protect onsite personnel.

Copy and paste a checkmark "✓"into appropriate boxes.

Physical Hazard Checklist				
Potential Job Hazards	**Task 1**	**Task 2**	**Task 3**	**Task 4**
	excavation	Enter task	Enter task	Enter task
Confined space entry*				
Underground utilities	✓			
Overhead utilities	✓			
Electrical hazards	✓			
Excavations greater than 4' depth	✓			
Open excavation fall hazards	✓			
Heavy equipment	✓			
Drilling hazards				
Noise (above 85 dBA)	✓			
Traffic concerns				
Extreme weather conditions	✓			
Rough terrain for drilling equipment				
Buried drums				
Heavy lifting (more than 50 lbs)				
High risk fire hazard				
Poisonous insects or plants				
Water hazards				
Use of a boat				
Lockout/Tagout requirements				
Other: Specify				

***CONFINED SPACE ENTRY REQUIRES SPECIAL PROCEDURES, PERMITS AND TRAINING AND MUST BE APPROVED BY THE CORPORATE HEALTH & SAFETY MANAGER.**

Potential Activity Hazards and Hazard Controls:

Copy and paste a checkmark "✓" adjacent to potential activity hazards and relevant hazard controls.

POTENTIAL ACTIVITY HAZARDS

Abrasions and Cuts ✓
Access
Asphyxiation
Bacteria
Biological Hazards
Bloodborne Pathogens
Cave Ins ✓
Chemical/Thermal Burns
Chemicals
Cold Stress
Compressed Gases
Confined Spaces
Congestion
Defective Equipment
Dermatitis
Dropping Materials/Tools to Lower Levels
Drowning or Flowing Water
Electrical Shock
Energized Equipment
Equipment Misuse ✓
Ergonomics
Excavations ✓
Explosions
Fatigue
Fire ✓
Flammability
Flying debris ✓
Foreign Body in Eye ✓
Frostbite/Cold
Fueling and Fuel Storage ✓
Fugitive Dust ✓
Fumes ✓
Generated Wastes
Guards removed
Hazardous Materials ✓
Heat Stress (cramps, exhaustion, stroke)
Heavy Equipment Operation ✓
Heavy Equipment/Stability ✓
Heavy Lifting ✓
High crime area (violence)
High Winds
Hoists, Rigging, Slings, Cables ✓
Housekeeping – Improper ✓
Illumination - Poor
Impact ✓
Inability to Maintain Communication
Inclement Weather ✓
Inclines
Insects/Reptiles
Mold
Moving Equipment, Conveyors or Vehicles ✓
Muddy Site Conditions ✓
New Personnel
Noise ✓
Odor ✓
Overhead Utilities ✓
Overhead Work ✓
Overloaded Equipment
Oxygen deficiency
Pinch Points ✓
Poisonous Plants
Pressure
Pressurized Lines ✓
Radiation
Repetitive Motion
Rigging - Improper ✓
Sharp Objects ✓
Silicosis ✓
Slips, Trips, and Falls ✓
Sprains and Strains ✓
Steam
Sunburn
Surface Water Run-off
Toxicity ✓
Traffic ✓
Underground Utilities ✓
Uneven Terrain
Unsafe Atmosphere
Vibration
Visibility - Poor
Visitors Known/Unknown
VOC Emissions ✓
Weight ✓
Work at Depth
Work at Heights
Work over Water
Working on Ice

HAZARD CONTROLS

Air Monitoring ✓
Appropriate Clothing/Monitoring Of Weather ✓
Appropriate Labels/Signage
Barricades/Fencing/Silt Fencing
Buddy System - Attendant
Chock Blocks ✓
Confined Space Procedures
Decontamination Procedures
Derived Waste Management Plan
Drinking Water/Fluids
Dust Abatement Measures ✓
Emergency Action Plan Procedures
Equipment Inspection
Equipment Manuals/Training
Exclusion/Work Zones
Exhaust Ventilation
Eye Protection ✓
Fall Protection
Fire Extinguisher ✓
Flotation Devices/Lifelines
Gloves ✓
Ground Fault Interrupter
Grounded Hydraulic Attachments
Grounded Equipment/Tanks
Hand Signal Communication
Hard Hat ✓
Hazardous/Flammable Material Storage
Hearing Protection ✓
High Visibility Safety Vest ✓
Hoses, Access to Water
Hotwork Procedures
Isolation of Energy Sources(Lockout/Tagout)
Machine/Equipment Guards
Manual Lifting Equipment
Police Detail
Proper Lifting Techniques
Proper Tool for Job
Proper Work Position/Tools
Protective Equipment ✓
Radio Communication
Respirator, (Specify Type)
Safety Harness /Lanyard/Scaffold
Security Escort
Sloping, Shoring, Trench Box
Spill Prevention Measures
Spill Kits
Stormwater Control
Traffic Controls ✓
Procedures/Methods
Vehicle Inspection
Visitor Orientation Escort
Window Cleaning/Defrost

Specific Activity Hazards and Precautions

Excavations

Staff Members must be especially careful and alert when working with contractors who use heavy equipment, since equipment failure or breakage can lead to accidents and serious worker injury. Equipment with a fast or wide swing radius should be of special concern. Should these devices fail during operation the likelihood of worker injury is high. Those that operate heavy equipment must meet all of the requirements to operate heavy equipment. Haley & Aldrich, Inc. staff members that supervise projects or are associated with such high risk projects that involve digging should use due diligence when working with a construction firm.

- Excavations greater than 5' in depth are not to be entered unless properly sloped, shored, or benched. Heavy equipment operators are responsible for the safety of the excavation. Operators must be deemed a competent person per OSHA regulations and shall ensure that the excavation is safe to enter if any H&A staff member is to enter the hole. H&A staff members are to consult with the competent person prior to entering any excavation. This means that the hole must be sloped, shored or benched in accordance to OSHA's Construction Standard for excavations.
- No H&A staff member is to enter the excavation unless they have determined that there is no potential for injury such as cave ins.
- It is the contractors responsibility to safe guard all effected workers from falling into any excavation by the use of barrier's and warning signs.
- No excavation is to be left open, unattended when there is a possibility for workers to fall into the excavation. Barricades must be placed around the hole at night when the depth is greater than 4'. This is the responsibility of the contractor.
- Keep all equipment at a minimum of 10' away from energized electrical lines.
- H&A staff members will be required to wear an orange safety vest while in the immediate area where heavy equipment is being used.

Excavation and Trenching Safety

The following is a list of minimum requirements for trenching and excavating. Each excavation/trench/shoring project is different, therefore the Contractor/Consultant Project Manager is responsible for evaluating site specific conditions and making appropriate provisions in the task-specific health and safety requirements in conformance with 29 CFR 1926 Subpart P - Excavations.

- Contact the proper utilities to obtain clearance. Prior to work, review the utilities in the area and be sure they have been staked properly. Before work begins, a Safe Work Permit must be obtained from the Client/Site manager of Operations Safety Representative.

- Be aware that trenches and excavations deeper than four feet are considered confined spaces and require additional safety precautions, such as shoring. If an excavation exceeds four feet in depth, contact the Client or H&A Safety Representative to review the original Safe Work Permit and ensure that it is adequate.

- The walls and faces of all excavations and trenches more than four feet deep, in which an staff member is exposed to danger from moving ground, will be guarded by a shoring system, sloping of the ground, or some other equivalent means. The design of shoring systems must be done by a registered Professional Engineer as per 29 CFR 1926 Subpart P.

- For excavations or trenches in which a staff member may be required to enter, excavated or other material will be effectively stored and retained at least two feet or more from the edge of the excavation or trench.

- The Contractor/Consultant Site Coordinator will make daily inspections of excavations. If evidence of possible cave-ins or slides is apparent, all work in the excavation will cease until the necessary precautions have been taken to safeguard staff members.

- Trenches more than four feet deep will have ladders or steps located so as to require no more than 25 feet of lateral travel.

- Hard hats and other personal protective equipment will be worn at all times during any type of excavating or trenching operation.

- Determine soil composition (e.g., through soil sampling, soil maps, etc.) and other relevant site conditions, with special emphasis on conditions conducive to cave-ins.

- Monitor the atmosphere in and around trenches on a regular basis to check for explosive, toxic or otherwise dangerous gases and vapors.

- The Contractor/Consultant Project Manager will insure that all staff members involved in the excavation activity have appropriate training in safe trenching practices, with emphasis on factors such as:
    - utility line identification
    - cave-in prevention measures
    - recognition of conditions which may cause cave-ins
    - means of egress from trench

- Water will not be allowed to accumulate in any excavation. Utilize ditches, dikes, pumps, or other means to keep surface water out of trenches.

- All open excavations must be well marked and barricaded.

Excavation Cave-In Hazards

- The following conditions increase the likelihood of cave-in: Soil materials composed of unconsolidated, uncompacted, and/or rounded particles (See 29 CFR 1926 Subpart P - Excavation Standard). Special care must be used when trenching in areas that have previously been excavated and backfilled.

- Soils, which have a high water, content, or have been subjected to freeze-thaw or frost-heaving.

- Loading of trench walls by adjacent equipment, supplies, structures, "back-dirt" piles, etc.
- Vibration due to equipment operating near excavations.
- Trench walls that are steeper than the angle of repose of the material composing the walls.
- Deep trenches (i.e., high trench walls).

The following precautions should be used to prevent cave-ins in all trenches in excess of 4 ft. deep. These precautions should also be used in trenches less than 4 ft. deep whenever those site conditions just listed indicate the likelihood of a cave-in:

- Sloping: Trench walls should be sloped to the correct angle of repose.
- Shoring: Vertical trench walls (unless composed of solid rock) must be shored and braced, or restrained with movable trench boxes, to prevent cave-in. A registered professional engineer must design shoring systems and meet accepted engineering requirements.

Safety Meetings

All H&A personnel visiting the site will be given an orientation safety meeting and are required to read and sign this HASP. Daily safety meetings will be conducted onsite and documented on a Health & Safety Tailgate Meeting Form.

Utility Locators and Underground Hazards

Prior to drilling or excavating, Haley & Aldrich staff members will ensure that permission has been gained from the property owner to access the property. Contact site facilities personnel to assist with location of underground utilities. Before marking any proposed exploration location, it is critical that all readily available information on underground utilities and structures be obtained. The estimated location of utility installations, such as gas, electric, fuel, steam, sewer, telephone, fiber optic, water, drainage or any other underground installation that may be expected to be encountered during drilling work, will be identified with the appropriate authority. Appropriate authorities include client representatives, utility companies, nonprofit organizations (e.g., "Dig-Safe), and others.

Heavy Equipment

Staff Members must be especially careful and alert when working with contractors who use heavy equipment, since equipment failure or breakage can lead to accidents and worker injury. Cranes and equipment for drilling, pile driving, test pitting and coring is of special concern. Should these devices fail during operation the likelihood of worker injury is high. Equipment of this nature should be visually inspected and checked for proper working order prior to the commencement of field work. Those that operate heavy equipment must meet all of the requirements to operate heavy equipment. Haley & Aldrich, Inc. staff members that supervise

projects or are associated with such high risk projects that involve digging should use due diligence when working with a construction firm. Maintain visual contact with operators at all times and keep out of the strike zone whenever possible. Always approach heavy equipment with an awareness of the swing radius and traffic routes of each piece of equipment and never go beneath a hoisted load. High-visibility safety vests must be worn onsite at all times. Avoid fumes created by heavy equipment exhaust.

Noise Reduction

Site activities in proximity to heavy equipment often expose workers to excessive noise. It is anticipated that situations may arise when noise levels may exceed the OSHA Action Level of 85 dBA in an 8-hour time-weighted average (TWA). An example of this possibility is working in close proximity to the subcontractor during drilling activities onsite. If excessive noise levels occur, efforts will be made to control this by issuance of earplugs to all personnel and by implementing a system of hand signals understood by all.

Work Site Access & Controls (Standard Precautions)

The work area is restricted to authorized personnel. Clearly define the work area before beginning activities for the day. Caution tape and safety cones must be provided as necessary for vehicular traffic concerns and to protect passers-by. Proper housekeeping is essential to avoid creating hazards to pedestrian and vehicular traffic. Excavations in progress will not be left unattended at any time. Running equipment will not be left unattended at any time. Test borings and test pits will be backfilled upon completion and the area restored. Drilling equipment will be secured above test borings during work stoppages and at the end of the workday.

Site Security

The site has 24-hour security. The excavation will be blocked off with safety cones and caution tape if left open and unattended. Where possible, an open excavation will not be left attended.

Weather Related Hazards

H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working during inclement weather. Refer to OP1003-Cold Stress and OP1015-Heat Stress for discussion on weather hazards.

5. PROTECTIVE MEASURES

Personal Protective Equipment Requirements:

Copy and paste a checkmark "✓"into appropriate boxes.

Required PPE	Task 1	Task 2	Task 3	Task 4
	excavation	Enter task	Enter task	Enter task
Hard hat	✓			
Safety glasses w/side shields	✓			
Steel-toe footwear	✓			
Hearing protection (plugs, muffs)	✓			
Tyvek ™ coveralls				
PE-coated Tyvek™ coveralls				
Boots, chemical resistant				
Boot covers, disposable				
Leather work gloves				
Inner gloves - nitrile	✓			
Outer gloves - Enter material here				
Tape all wrist/ankle interfaces				
Half-face respirator*				
Full-face respirator*	✓			
Organic vapor cartridges	✓			
Acid gas cartridges				
Other cartridges: Enter type here				
P-100 (HEPA) filters				
Face shield				
Personal Flotation Device (PFD)				
High-Visibility Safety Vest	✓			
Other:				
Level of protection required [C or D]:				

* In the event of respirator use, H&A staff must be medically qualified, fit tested and clean shaven with no facial hair that will interfere with the seal.

The required PPE checked in any box above must be on site during the task being performed. Work shall not commence unless the required PPE is present.

Site Safety Equipment Requirements:

Check all items that are required to be on site.

Site Safety Equipment

☑ Fire Extinguisher	☑ First Aid Kit	☐ Flashlight
☐ Air horn/signaling device	☑ Cellular Phone	☐ Duct tape
☐ Ladder	☑ Barricade tape	☐ Drum dolly
☐ Two-way radio	☑ Safety cones	☐ Harness/Lanyard
☐ Other Specify		

The required equipment checked in any box above must be on site during the task being performed. Work shall not commence unless the equipment is present.

6. MONITORING PLAN AND EQUIPMENT

Is air/exposure monitoring required at this work site for personal protection? ☑ Y ☐ N

Is perimeter monitoring required for community protection? ☐ Y ☐ N

See Community Air Monitoring Plan (CAMP)

Monitoring/Screening Equipment Requirements:

Check all items that are required to be on site.

Required Monitoring/Screening Equipment

☑ Photo-Ionization Detector (PID) 10.2eV	☐ Combustible Gas Indicator (CGI) (LEL)
☐ Photo-Ionization Detector (PID) 11.7eV	☐ Multiple Gas Detector LEL/O2/H2S/CO
☐ Photovac Micro Tip (PID) 10.6eV	☐ Dust Monitors (RAMs)
☐ Organic Vapor Monitor (FID)	☐ Colorimetric tubes
☐ Photovac Gas Chromatagraph (GC)	☐ Other

The required equipment checked in any box above must be on site. Work shall not commence unless the equipment is present.

Standard Action Levels and Required Responses:

Exposure Guidelines for common contaminants are listed in Table 1 - Occupational Exposure Limits in the Chemical Hazards section above.

Requirements for PPE upgrades based on monitoring are in Table 2 - Monitoring Methods, Action Levels and Protective Measures following the Specific Monitoring Requirements section below.

Action levels for readings obtained with a multiple gas detector are listed below.

Instrument	Normal	Operating levels	Action levels – required responses
Oxygen Meter	20.9%	Between 19.5-23.5%	Below 19.5 %: leave area, requires supplied air Above 23.5%: leave area, fire hazard
CGI	0%	Less than 10%	Greater than 10%: fire/explosion hazard; cease work
Hydrogen Sulfide	0%	Less than 10 ppm.	Greater than 15 ppm (or 10 ppm for 8 hrs) requires supplied air respirator
Carbon Monoxide	0%	Less than 25 ppm	Greater than 200 ppm for 1 hour (or 25 ppm for 8 hrs) requires supplied air respirator

Standard Air Monitoring Plan (Volatiles):

- Prior to the beginning of work obtain background readings with the PID away from the site.
- Monitor the breathing zone when site soil is exposed (e.g., while drilling or excavating is occurring, etc.) with the PID.
- Monitoring should be conducted most frequently (e.g., every 15-30 minutes) when drilling or excavation first begins in a particular area and when soil is removed from the hole. After this, and if no exceedances of exposure limits are noted (see below), monitoring may be conducted less frequently (e.g., every 60 minutes).
- H&A general exposure limits will be used when a mixture of potentially volatile chemicals are suspected to be present in soil at the site.

In summary, if a reading of 10 ppm above background is detected with the PID for 5 minutes or longer, back away for a few minutes. Screen the air again after any vapors/gases have been given a chance to dissipate. If 10 ppm above background is still noted, evacuate the area and call the LHSC and PM for further guidance.

- Record monitoring data and PPE upgrades in field book or on Record of Field Monitoring form and maintain with project files.

- Air monitoring for exposure should be based on the frequency established under the Standard Air Monitoring Plan or under the Specific Monitoring Requirements. Record time, location and results of monitoring and actions taken based upon the readings.

Standard Dust Control Measures and Monitoring Plan:

Dust Control Measures:

It is anticipated that exposure to airborne dust can be mitigated during work operations as necessary to control dust emissions by means of limiting the area of exposed soils and through the use of water sprays. If dust emissions cannot be controlled by these standard measures, additional measures may be employed such as the use of a tackifier (if approved) to stabilize soil exposures or by covering exposed soil and stockpiles with tarpaulins, plastic sheeting or geotextile fabric. Otherwise cease work immediately and contact the Project Manager or the Corporate Health & Safety Manager for assistance. It is not permissible for dust emissions to escape from the site at any time and perimeter dust monitoring may be required to insure public safety.

Dust Monitoring:

Respirable Aerosol Monitors (RAM) can be used to monitor total dust levels in work zones and/or at the site perimeter. These instruments do not give specific readings of contaminant concentration (e.g. metals, asbestos, etc.). Depending upon the contaminants present, it may be mandatory for all workers to upgrade to level C protection using a half-face air-purifying respirator with HEPA (P-100) filters if dust levels cannot be adequately controlled during any of the on-site tasks. The H&A Site Safety Officer (SSO) will determine PPE upgrades based upon visual determination as necessary and the OSHA PEL for each known or suspected

contaminant. The OSHA PEL/STEL for Respirable Nuisance Dust is 5 mg/m^3 (8 hour TWA). Action levels for fugitive dust at the site perimeter are based upon the daily PM_{10} dust standard of 0.15 mg/m^3 in the National Ambient Air Quality Standard for Inhalable Dust (NAAQS).

Personal dust monitoring using an industrial hygiene pump and a filter cassette may be conducted on each day of operations. In such cases samples are collected from workers with the greatest potential dust exposure and analyzed by an accredited laboratory for specific contaminants.

Specific Monitoring Requirements:

Monitoring requirements and frequency is indicated by task and location below.

Task Number:		Frequency		times per	

Enter description of monitoring requirements by task and location

Task Number:		Frequency		times per	

Enter description of monitoring requirements by task and location

Task Number:		Frequency		times per	

Enter description of monitoring requirements by task and location

TABLE 2
Last Revised September 2002

MONITORING METHOD, ACTION LEVELS AND PROTECTIVE MEASURES

INSTRUMENT	HAZARD	ACTION LEVEL	ACTION RESPONSE
Respirable Dust Monitor	Total Particulates	> 5 mg/m^3	Upgrade to Level C Protection
OVA, HNU[2], Photovac Microtip	Total Organic Vapors	Background	Level D Protection
		10 ppm > background or lowest OSHA permissible exposure limit, whichever is lower, or as modified for this task. Sustained for >5 minutes in the breathing zone.	Upgrade to Level C - site evacuation may be necessary for specific compounds
		50 ppm over background, unless lower values required due to respirator protection factors	Cease work; upgrade to Level B[3] may be required
Explosimeter[4] (LEL)	Flammable/Explosive Atmosphere	<10% Scale Reading	Proceed with work
		10-15% Scale Reading	Monitor with extreme caution
		>15% Scale Reading	Evacuate site
0xygen Meter[5]	Oxygen-Deficient Atmosphere	19.5% - 23.5% 0_2	Normal - Continue work
		< 19.5% 0_2	Evacuate site; oxygen deficient
		> 23.5% 0_2	Evacuate site; fire hazard
Radiation Meter[6]	Ionizing Radiation	0.1 Millirem/Hour	If > 0.1, radiation sources may be present[7]
		> 1 Millirem/Hour	Evacuate site; radiation hazard
Drager Tubes	Vapors/Gases	Species Dependent > 1 ppm vinyl chloride > 1 ppm benzene > 1 ppm 1,1-DCE	Consult Table 1 or other resources for concentration toxicity/detection data. Upgrade to Level C if concentration of compounds exceed thresholds shown at left; May need to cease work if other levels exceeded - site specific
Gas Chromatograph (GC)	Organic Vapors	3 ppm total OV > background or > lowest specific OSHA permissible exposure limit, whichever is lower	On-site monitoring or tedlar bag sample collection for off-site/laboratory analysis

Notes:
1. Monitor breathing zone.
2. Can also be used to monitor some inorganic species.
3. Positive pressure demand self contained breathing apparatus
4. Lower explosive limit (LEL) scale is 0-100%. LEL for most gasses is 15%.
5. Normal atmospheric oxygen concentration at sea level is 20%
6. Background gamma radiation is ~0.01-0.02 millirems/hour.
7. Contact H&A Health and Safety staff immediately.

Calibration and Use of Equipment:

Calibrate all monitoring equipment in accordance with manufacturers requirements, H&A calibration (OP) standards and site specific requirements (e.g., at the beginning and end of each work day). Calibration of equipment shall be documented in the field notes or Daily Field Report (DFR). Documentation should include:

- Date/time
- Zero reading before calibration
- Concentration of calibration gas
- Reading obtained with calibration gas before adjusting span\
- Final reading obtained with calibration gas after adjusting span

7. DECONTAMINATION AND DISPOSAL METHODS

Personal Hygiene Safeguards:

The following minimum personal hygiene safeguards shall be adhered to:

- No smoking or tobacco products on any Hazwoper project.
- No eating or drinking in the exclusion zone.
- It is required that personnel present on site wash hands before eating, smoking, taking medication, chewing gum/tobacco, using the restroom, or applying cosmetics and before leaving the site for the day.
- It is recommended that personnel present on site shower or bathe at home at the end of each day of working on the site.

Standard Personal Decontamination Procedures:

Outer gloves and boots should be decontaminated periodically as necessary and at the end of the day. Brush off solids with a hard brush and clean with soap and water or other appropriate cleaner whenever possible. Remove inner gloves carefully by turning them inside out during removal. Wash hands and forearms frequently. It is good practice to wear work-designated clothing while on-site which can be removed as soon as possible. Non-disposable overalls and outer work clothing should be bagged onsite prior to laundering. If gross contamination is encountered on-site contact the Project Manager and LHSC to discuss proper decontamination procedures. The steps required for decontamination will depend upon the degree and type of contamination but will generally follow the sequence below.

1. Remove and wipe clean hard hat
2. Rinse boots and gloves of gross contamination
3. Scrub boots and gloves clean
4. Rinse boots and gloves
5. Remove outer boots
6. Remove outer gloves
7. Remove Tyvek coverall
8. Remove respirator, wipe clean and store
9. Remove inner gloves

Location of Decontamination Station:

N/A

Disposal of PPE:

PPE that is not grossly contaminated can be bagged and disposed in regular trash receptacles. PPE that is grossly contaminated must be bagged (sealed) and field personnel should communicate with the Project Manager to determine proper disposal.

Tools & Equipment Decontamination:

All decontamination should be conducted at the site and not at the office or lab.

Check all equipment and materials needed for decontamination of tools and other equipment. Responsibility of subcontractor.

☐ Acetone	☐ Distilled water	☐ Poly sheeting
☐ Alconox soap	☐ Drums for water	☐ Steam cleaner
☐ Brushes	☐ Hexane	☐ Tap water
☐ Disposal bags	☐ Methanol	☐ Washtubs
☐ 5 gallon pails	☐ Other Paper towels	

Standard Disposal Methods for Contaminated Materials:

Excess sample solids, decontamination materials, rags, brushes, poly sheeting, etc. that are determined to be free of contamination through field screening can usually be disposed into client-approved, on-site trash receptacles. Uncontaminated wash water may be discarded onto the ground surface away from surface water bodies in areas where infiltration can occur. Contaminated materials must be segregated into liquids or solids and drummed separately for off site disposal. Any additional requirements are listed under Specific Disposal Methods for Contaminated Materials below.

Disposal Methods for Contaminated Soils:

Contaminated soil cuttings and spoils must be drummed for disposal off-site unless otherwise specifically directed. Soil cuttings and spoils determined to be free of contamination through field screening can usually be returned to the boreholes or excavations from which they came. Any additional requirements are listed under Specific Disposal Methods for Contaminated Soils below.

Specific Disposal Methods for Contaminated Soils:

Enter description of specific disposal requirements for contaminated soils

8. CONTINGENCY PLANNING

How H&A responds to an emergency depends on whether we are at an active facility or another other location. Many active facilities have very stringent requirements for the mitigation of emergencies. Therefore, the PM is responsible for identifying any specific requirements from the client contact.

As a rule of thumb, the following are H&A's basic responses to handling Emergencies. Typically, H&A does not mitigate emergencies. When Clients request or require specific functions such as First Aid/CPR trained personnel on site, we typically conform. Before any Project Manager or LHSC agrees to something more stringent, many issues should be considered such as training, safety, feasibility of an adequate response, insurance requirements, and much more.

Fire:

- Major Fires - Major fires will be mitigated by the local fire departments or by client's on-site fire/emergency response departments.
- Incipient Stage Fires -Incipient stage fires will be extinguished by on-site personnel using fire extinguishers. Only those who have received annual training may use an extinguisher.

Medical:

All H&A employee injuries and illnesses will be documented using the Supervisor's Accident / Injury / Near Miss Report (SAIR). This form is available on the Intranet.

- First Aid - First aid will be addressed using the on-site first aid kit. H&A employees are not required or expected to administer first aid/CPR to any H&A, Contractor, or Civilian personnel at any time and it is H&A's position that those who do are doing it on their behalf and not as a function of their job.
- Trauma - Based upon the nature of the injury, the injured party may be transported to the nearest hospital or emergency clinic by on-site personnel or by ambulance. First response to a trauma incident is to call 911 or facility security. H&A staff members are expected to assist in ancillary roles only such as directing ambulances to the scene. It is the discretion of the staff member on site whether an ambulance should be procured in remote locations where ambulance services will not be effective.

Hazardous Materials Spill:

- Small incidental spills (e.g. pint of motor oil) caused by H&A employees and/or by the contractor will be mitigated by the H&A staff member and/or the contractor.
- Large spills (e.g. large leak from heavy equipment fuel tank). The contractor is responsible for cleanup. In the event that it posses a serious human or environmental threat, the local Fire Department and/or client emergency response department will be contacted. Once emergency has been mitigated typically clean up will be provided by a vendor.

Rescue:

H&A employees will not enter any confined spaces for rescue purposes.

Weather Related Emergencies:

H&A employees and their subcontractors should be aware of potential health effects and/or physical hazards of working during inclement weather. If applicable, safeguards against the effects and hazards of heat stress, cold stress, frostbite, thunderstorms, and lightning, etc., should be included with the section pertaining to physical hazards in this HASP.

Evacuation Alarms:

Evacuation alarms and/or emergency information will be communicated among personnel on site through verbal communication. If communication will be by other means, describe:

Enter alternate means

Emergency Services:

Emergency services will be summoned via on-site or cellular phone. If contact will be by other means, describe:

Enter alternate means

Emergency Evacuation Plan:

The site evacuation plan is as follows:

1. Establish a designated meeting area to conduct a head count in the event of an emergency evacuation.
2. If the work area is not near an emergency exit, exit via the closest route and meet at the designated meeting area.
3. Notify emergency response personnel (fire, police and ambulance) of the number of missing or unaccounted for employees and their suspected location.
4. Administer first aid will in the meeting area as necessary.

Under no circumstances should any personnel re-enter the site area without the approval of the corporate H&S manager, the H&S coordinator, and the fire department official in charge.

9. HEALTH & SAFETY PLAN ACKNOWEDGMENT FORM

Note: Only H&A employees sign this page.

I hereby acknowledge receipt and briefing on this Health & Safety Plan prior to the start of on-site work and declare that I understand and agree to follow the provisions and procedures set forth herein while working on this site.

PRINTED NAME	SIGNATURE	DATE

10. PRE-JOB SAFETY CHECKLIST

The following checklist is designed to help Project Managers verify that all Health & Safety requirements are satisfied for projects involving site work and to aid in the preparation of the site-specific HASP.

Please initial and date the appropriate box once each requirement has been satisfied prior to commencement of site work.

#	Project H&S Requirements	Approval by PM or LHSC (initial each box or place NA)	Date Approved
1	Project site history has been researched and summarized, current site conditions have been determined and documentation of previous investigations, risk analyses and chemical data has been assembled and summarized.		
2	Project work scope has been outlined and potential chemical and physical hazards associated with work tasks have been identified.		
3	Task Safety Analysis has been performed and attached to the HASP.		
4	H&A personnel to be involved with the project have been identified and are current with medical surveillance, OSHA 40 hour and 8 hour refresher training. Hazwoper site supervisor requirements are satisfied.		
5	Additional training requirements have been met: e.g. nuclear density gauge, DOT, Confined Space Entry, Competent Person Training for Excavation, OSHA 10 hour certification, Railway Safety Training, etc.		
6	H&A personnel that may be required to wear a respirator are medically qualified and have current certification of fit testing.		
7	Client's additional H&S requirements have been met: e.g. facility safety orientations, safety documentation, meetings, special PPE requirements		
8	H&A subcontractors have met H&A's minimum requirements including: current OSHA 40 hour training, medical surveillance, written HASP, insurance, MSDSs.		
9	MSDSs are on site and available for chemicals on site.		
10	Safety equipment is available: e.g. flashlight, telephone, ladders, traffic cones, barricade tape, fire extinguisher, first aid kit, PPE, respiratory protection, air and dust monitoring instrumentation (calibrated), personal flotation device (PFD), 90' life line with ring, decontamination equipment, etc.		
11	HASP and supporting documentation is complete and signed by all members.		

APPENDIX A
HASP Amendment Form

This Appendix is to be used whenever there is an immediate change in the project scope that would require an amendment to the HASP. For project scope changes associated with "add-on" tasks, the changes must be made in the body of the HASP. Before changes can be made, a review of the potential hazards must be initiated by the H&A Project Manager.

Amendment No.	
Site Name:	
Work Assignment No.:	
Date:	
Type of Amendment:	
Reason for Amendment:	
Alternate Safeguard Procedures:	
Required Changes in PPE:	

Project Manager Signature: _____ Date: _____

Local Health and Safety Coordinator: _____ Date: _____

This original form must remain on site with the original HASP. If additional HASPs are in the field, it is the Project Manager's responsibility to forward a signed copy of this amendment to those who have copies.

APPENDIX B
Issuance and Compliance
Site Safety Officer Role and Responsibilities
Training Requirements

This Health & Safety Plan (HASP) has been prepared in accordance with the requirements of Title 29 the Code of Federal Regulations (CFR) Section 1910.120/1926.65 to provide guidance for the protection of onsite personnel from physical harm and chemical exposure while working at the subject site.

The specific requirements of this HASP include precautions for hazards that exist during this project and may be revised as new information is received or as site conditions change.

- This HASP must be signed by all Haley & Aldrich (H&A) staff members who will work on the project, including H&A visitors. By signing the Health and Safety Plan Acknowledgement Form personnel are acknowledging that they are aware of the specific hazards of the site and agree to follow the provisions and procedures required to safeguard themselves and others from those hazards.
- This HASP or a current signed copy must be retained at the site at all times when H&A staff members are present.
- Deviations from this HASP are not permitted without prior approval from the above signed. Unauthorized deviations may constitute a violation of H&A company procedures/policies and may result in disciplinary action.
- Revisions to this HASP must be outlined within the contents of the HASP. If immediate or minor changes are necessary, the LHSC and H&A Project Manager may use Appendix A (HASP Amendment Form), located in the back of this HASP. Any revision to the HASP requires personnel to be informed of the changes and that they understand the requirements of the change.
- This HASP is not for H&A Subcontractor use. Each subcontractor engaged is responsible for all matters relating to the health and safety of their personnel and the safe operation of their equipment. This HASP will be made available as a reference so that subcontractors are informed of the potential hazards associated with the site to the extent we are aware. Subcontractors must develop their own HASP which must be, at a minimum, at least as protective as this HASP.
- This Site Specific HASP provides only site-specific descriptions and work procedures. General safety and health compliance programs in support of this HASP (e.g., injury reporting, medical surveillance, personal protective equipment (PPE) selection, etc. are described in detail in the H&A Corporate Health and Safety Program Manual and within Standard Operating Procedures (OPs). Both the manual and OPs can be located on the Company Intranet. When appropriate, users of this HASP should always refer to these resources and incorporate to the extent possible. The manual and OPs are available to clients and regulators per request.

Site Safety Officer:

The site safety officer (SSO) is defined as the individual responsible to the employer with the authority and knowledge necessary to implement the HASP and verify compliance with applicable health and safety requirements.

The H&A Project Manager may designate any person as the site safety officer (SSO) and determines the order of authority on site. Usually the highest ranking person on site is the SSO. A site safety officer must be on site at all times. When none of the designated SSOs are present on site, the senior person for H&A on site will default to the SSO. This project has identified the following hierarchy for SSO.

1. Enter name of site safety officer here

2. Enter name of site safety officer here

Site Safety Officer Roles and Responsibilities:

The SSO is responsible for field implementation of this HASP and enforcement of safety rules and regulations. SSO functions include:

- Act as H&A's liaison for health and safety issues with client, staff, subcontractors, and agencies.
- Verify that utility clearance has been performed by H&A subcontractors.
- Oversee day-to-day implementation of the HASP by H&A employees on site.
- Interact with subcontractor project personnel on health and safety matters.
- Verify use of required PPE as outlined in the HASP.
- Inspect and maintain H&A safety equipment, including calibration of air monitoring instrumentation used by H&A.
- Perform changes to HASP and document in Appendix A of the HASP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents and incidents involving H&A and its subcontractors.
- Verify that site personnel are familiar with site safety requirements (e.g., the hospital route and emergency contact numbers).
- Report accidents, injuries, and near misses to the H&A PM and Local Health and Safety Coordinator (LHSC) as needed.

The SSO will conduct initial site safety orientations with site personnel (including subcontractors) and conduct toolbox and safety meetings thereafter with H&A employees and H&A subcontractors at regular intervals and in accordance with H&A policy and contractual obligations. The SSO will track the attendance of site personnel at H&A orientations, toolbox

talks, and safety meetings. Subcontractors will document training and provide training rosters to the H&A SSO.

The SSO will report accidents such as injury, overexposure, or property damage to the Local Health and Safety Coordinator, to the Project Manager, and to the safety managers of other on-site consultants and contractors. The SSO will consult with the safety managers of other on-site consultants and subcontractors on specific health and safety issues arising over the course of the project, as needed.

Health and Safety Training Requirements:

Personnel will not be permitted to supervise or participate in field activities until they have been trained to a level required by their job function and responsibility. H&A staff members, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.

The H&A Project Manager/LHSC will be responsible for maintaining and providing to the client/site manager documentation of H&A staff members' compliance with required training as requested. Records shall be maintained per OSHA requirements.

40-Hour Health and Safety Training

The 40-Hour Health and Safety Training course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, and supervisors, who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120.

8-hour Annual Refresher Training

Personnel who complete the 40-hour health and safety training are subsequently required to attend an annual 8-hour refresher course to remain current in their training. When required, site personnel must be able to show proof of completion (i.e., certification) at an 8-hr refresher training course within the past 12 months.

8-Hour Supervisor Training

On-site managers and supervisors directly responsible for, or who supervise staff members engaged in hazardous waste operations, should have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. Supervisor Training includes, but is not limited to, accident reporting/investigation, regulatory compliance, work practice observations, auditing, and emergency response procedures.

Additional Training for Specific Projects

H&A personnel will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities including:

- Client specific training or orientation
- Competent person excavations
- Confined space entry (entrant, supervisor, and attendant)
- Heavy equipment including aerial lifts and forklifts
- First aid/ CPR
- Diving certification
- Use of fall protection
- Commercial drivers license
- Use of nuclear density gauges
- Asbestos awareness

APPENDIX C
NYSDOH Generic Community Air Monitoring Plan (CAMP)

New York State Department of Health (NYSDOH)
Generic Community Air Monitoring Plan (CAMP)

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and/or particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences of facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area may be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some incidences, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm over background of the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15-minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

APPENDIX C

Groundwater Collection Procedures

Groundwater Sampling Record

GROUNDWATER SAMPLING RECORD

Page of

PROJECT
LOCATION **PROJECT MGR.**
CLIENT **FIELD REP**
CONTRACTOR **DATE**

GROUNDWATER SAMPLING INFORMATION

Well No.						
Water Depth (ft)						
Time						
Product						
Depth Of Well (ft)						
Inside Diameter (in)						
Standing Water Depth (ft)						
Volume Of Water In Well (gal)						
Purging Device						
Volume of Bailer/Pump Capacity						
Cleaning Procedure						
Bails Removed/ Volume Removed						
Time Purging Started						
Time Purging Stopped						
Sampling Device						
Cleaning Procedure						

Remarks: (ie: field filtrations, persons communicated with at site, etc.)

Field Sampling Procedure

STANDARD OPERATING PROCEDURE

for

FIELD SAMPLING

SOP No.: FLD-SAMPLING

Revision: 1

November 2, 2006

Approved by: _____ _____
Supervisor Date

_____ _____
QA Program Manager Date

_____ _____
Laboratory Manager Date

1 Mustard Street, Suite 250
Rochester, New York 14609

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL
NUMBER: _____
Initials: _____ Date: _____

1. SCOPE AND APPLICATION

1.1. This SOP is based upon standard field sampling practices. See section 18 for a listing of references upon which these practices are based.

1.2. This SOP is applicable to the sampling procedures for groundwater, surface water, sewers, landfill leachate, surface soil, soil boring, soil test pits, wipes, drums – liquids and solids, and tanks.

1.3. This SOP is applicable to procedures for the analysis of field parameters including, Temperature, pH, Conductivity, Turbidity. See FLD-170.1 (temperature), SMO-150.1 (pH), SMO-120.1 (conductivity), and SMO-180.1 (turbidity) for more details than are given in this SOP. The meters used are listed here. This SOP also describes determination of flow.

2. METHOD SUMMARY

2.1. Not applicable.

3. DEFINITIONS

3.1. **Bottle Set** – a group of bottles or jars to be filled by the field sampling technician. The bottle set, usually provided by the laboratory, must be of the correct size and material needed for the analytical tests. Bottles will contain chemical preservatives if applicable. The term bottle set may be used to describe the bottles for the entire sampling event or for the individual sampling location. Depending upon the analyses required, the set may contain many different bottles of different types with different chemical preservatives. See SMO-BPS for more information regarding bottle sets and the preservation required for each analytical test.

3.2. **Chain of Custody** – Custody Record – document containing the location ID, time and date of sampling, sampling technician, number of containers and test(s) required. The Chain of Custody will document the date and time of transfer of the sample from each person to the lab. Custody Records will be maintained in a different format after receipt by the lab. See SMO-GEN, SMO-ICOC, and GEN-COC for more information regarding Chain of Custody.

4. INTERFERENCES

4.1. Contamination by carryover can occur when high level samples immediately precede samples containing significantly lower levels of contamination. Be sure to clean the equipment thoroughly between samples and when possible, sampling should be performed in order from least contaminated locations to areas of progressively higher contamination.

4.2. Significant error can be associated with sampling design and field activities. Be sure all pertinent information is documented including anomalies and other observations.

5. SAFETY

5.1. Safety of all personnel is of utmost importance when undergoing a sampling project. To ensure that the event is completed safely and thoroughly, a work plan is necessary for each site. Historical data such as previous test results, site records, known waste generation, and health agency reports are reviewed and summarized. This summary aids in defining work objectives, necessary equipment, and personnel requirements. Evaluation of these areas help to formulate the Site Safety Plan.

5.2. The Site Safety Plan at CAS encompasses many variables which affect the health of the workers while at the sampling location. Chain of command is defined, with each member of the sampling crew responsible for individual tasks in the field. Personnel are trained to handle the specific situations which may occur at each site along with the hazardous properties of each chemical known or suspected to be present.

5.3. Personal Protective Equipment (PPE) for each task is defined, and guidelines for different levels of protection are set. Decontamination procedures are discussed as well as any site specific medical monitoring requirements. Age, general health and varying tolerances to heat or cold climates for each individual is assessed. Site safety plans are discussed completely by the site safety officer in a meeting with personnel before beginning activities on site. Any problems or concerns can then be addressed and resolved before a potential problem arises in the field.

5.4. All workers at CAS receive required client training before participating in sampling activities at a specific site. In addition to the client's in-house training, all crew members have attended the OSHA 40-hour Hazardous Waste Emergency Response training course and subsequent annual 8-hour refreshers. This course involves site assessment, hazards associated with the work site, and level of personal protection which should be implemented under various conditions found at the site. All crew leaders undergo an additional 8-hour supervisory course which stresses proper procedures for implementing site and work plans at the site.

5.5. CAS also has an in-house safety training program which reinforces the safety requirements as set by OSHA. New crew members are continuously supervised for the first three months of their employment. A trained and qualified crew leader teaches each new member about safety procedures involved in each of our routine (monthly or quarterly) sampling events. After the three-month training period is completed, a new technician is supervised if new jobs arise that requires skill or safety considerations not previously encountered.

5.6. Crew members are also trained in the use of air monitoring equipment. This is extremely important since exposure limits and the choice of PPE is based on the quality of the air in and around the work area in the field. Among the instruments used by CAS are the HNU, Combustible Gas Indicator (CGI), draeger tubes, and explosivity meters. The HNU trace gas analyzer is used to detect concentrations of organics and some limited inorganic gases.

5.7. A combustible gas indicator (available as rental equipment) is used as a semi-continuous monitor of work areas when H_2S, combustible gases or oxygen deficiency may be present. When levels of any of these three parameters reach a predetermined level that is set by the operator, an alarm sounds. This meter is used when assessing air quality safety levels in an enclosed area such as a closed room or sewer. It is also used during containerized material sampling when presence of combustible gases is suspected. Crew members will immediately evacuate the area and re-evaluate the situation if any of these alarms are sounded.

5.8. By using air monitoring devices in conjunction with historical data on a site, permissible exposure limits (PELs) can be set for the workers. In turn, these PELs are utilized to provide adequate levels of protection. In addition, these devices identify the presence of a situation which is immediately dangerous to life or health (IDLH). Examples of IDLH situations are less than 19.5% or greater than 25% oxygen in a manhole or an organic concentration exceeding the known Threshold Limit Value –Ceiling (TLV-C).

5.9. TLV-Cs are concentrations which must not be exceeded even instantaneously or short-term. In case of an IDLH situation, crew members are trained to evacuate the area immediately and re-evaluate the situation before attempting any more work. All crew members received the NIOSH "Pocket Guide to Chemical Hazards." This is useful as a quick reference to exposure limits, symptoms of exposure, and medical treatments necessary for various chemicals.

5.10. Levels of protection and personal protective clothing and equipment are chosen to protect the technicians from suffering any injury from contact with chemicals as well as to prevent the cross contamination of other sampling points or off-site areas. Levels of protection range from "A" to "D" with "D" being PPE necessary for less contaminated area and "A" for highly contaminated areas. These levels are usually modified according to site specific conditions. Once a level of protection is outlined, it may be upgraded it the situation at the site worsens. Downgrading is acceptable only if the site safety officer is contracted and the downgrade is justifiable. A copy of the levels of personal protection, referenced from "OSHA Manual for Hazardous Waste Site Activities, is included.

5.11. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. The MSDS information for the preservatives are included on the sampling instructions included with each bottle set.

5.12. Sodium Hydroxide (NaOH) is a strong caustic and a severe health and contact hazard. Use nitrile or latex gloves while handling pellets or preparing solutions.

5.13. Hydrochloric acid (HCl), Nitric Acid (HNO_3) and Sulfuric acid (H_2SO_4) are severe health, reactivity, and contact hazard. Always wear gloves and use caution when handling.

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1. Sample bottles must be of the material suitable, and contain the correct chemical preservatives, for the analytical tests required. The bottle set (see definitions in Section 3) will be provided with the chemical preservatives in the bottles such that the sampling technician only needs to fill the bottles as described in the procedure. Be sure the location label on the bottles corresponds to the location being sampled and the Chain of Custody.

6.2. Samples must be placed in a cooler and iced immediately.

6.3. The sample coolers are always located within sight of the crew members or secured in a locked vehicle when stored in the field. The sample coolers are transported back to the lab in a company vehicle within 6-8 hours of sampling or shipped via overnight carrier. Upon arrival at the lab, the samples are checked for temperature, preservation, and integrity, and logged into the laboratory sample tracking system. Delivery from the sample receipt area to the walk-in cooler in the lab is completed that evening or the next morning at the latest.

6.4. Samples are stored and transported to the laboratory in coolers which are supplied with ice packs, as requested. These ice packs are required to cool the samples to the required 0-6º C. Care is then taken not to expose vials directly to the ice packs since they are easily broken.

6.5. All sample containers that are used have been purchased and certified clean by the manufacturer. The bottles are labeled with information such as client, site, job number, sample ID number, test parameters, and preservatives. These containers correspond to a particular sample location by matching up the job number and sample ID number of the bottle set. These are both noted on the chain of custody and in the field log or field sheet.

6.6. During all procedures involving purging, sampling and handling of samples, the technicians wear a pair of Nitrile gloves. These gloves will be changed and discarded after every well to avoid cross-contamination of wells. If a crew member inadvertently touches any possible source of contamination when sampling or purging, the gloves will be changed. Not only does this prevent contamination, but is also serves to protect the crew member from coming into contact with any substances which may be present in the sample.

6.7. The Chain of Custody Form is included with each bottle set, along with a Bottle Set Order Form which indicates the bottles included in that order and what parameters each bottle is intended for to aid the sampling team. Upon completion of sampling, the crew member fills out the Chain of Custody in order to properly identify the sample for the laboratory. Time and date of sampling, preservation used, analysis required, filtering status, and bottle set composition are completed on the chain. Any dry wells or partial bottle sets are also noted. The crew member completes all remaining sections on the Chain of Custody and signs his/her name. The form is sealed in a plastic bag and placed in the cooler with the samples for transport back to the laboratory. Each

sample location is assigned a sample ID number at the laboratory and is documented on the Chain of Custody.

7. APPARATUS AND EQUIPMENT

- An HNU trace gas analyzer with an 11.7 ev lamp.
- Surveyor's tape
- Slope water level indicator
- ORS 100' Teflon quartz interface probe will be used to determine the presence of nonaqueous phase liquid or "floaters" or "sinkers" within the well.
- Portable 2 cycle pumps
- Polyethylene tubing
- PVC or stainless steel bailers, 1.5-3 inches in diameter
- 3/16" diameter polypropylene rope or braided stainless steel wire coated with Teflon.
- Dedicated Teflon or stainless steel bottom filling bailers are used to obtain samples
- QED in line filter (0.45u) connected to a QED transfer vessel
- Beckman 250 portable pH meter, or equivalent with thermocompensator probe.
- Oakton Conton 400 series or Myron Ultrameter 6P meter, or equivalent, for Specific Conductivity
- Oakton T100 Turbidimeter
- Boat for sampling from lakes, etc.
- Van Dorn Sampler
- A Kemmerer Depth Sampler
- APHA BOD sampler
- 300 mL glass BOD bottle
- YSI Model 550A Dissolved Oxygen Meter
- Stainless steel bucket
- Weighted tube
- Tubing should be a minimum of 3/8" I.D. and made of polyethylene or Teflon material. The latter is necessary when sampling for organic parameters.
- Composite sampling from sewers should be done with an automatic ISCO sampler
- Coolers, bottle sets, chains of custody,
- Safety equipment – respirators, Tyvek suits, nitrile gloves, safety glasses
- Stainless steel trowel or spoon
- 18" split spoon sampler
- Motor-driven auger
- 2-man gasoline engine power drive
- non-sparking drum wrench
- CGI- Combustible gas indicator
- Oxygen meter
- Draiger tubes
- Explosivity meters
- COLIWASA (Combined Liquid Waste Separator)
- Plastic Dropcloth

- Split spoon sampler, trowel, or trier
- Tank Samplers
- Teledyne/Gurley – rotating element current flow meter
- March McBirney – electromagnetic probe meter
- Solinst and Heron Water Level Indicators
- MiniRAE 2000 HNU
- Bladder Pumps various types –see Section 11
- Calibrated bucket to measure purge volumes.

8. **PREVENTIVE MAINTENANCE**

Be sure all equipment is cleaned and maintained according to the procedures in this SOP.

9. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

Reagents and standards are obtained from the SMO or WetChem group and are documented in the laboratory. The standards and reagents for the field analyses are listed in the lab SOPs.

10. RESPONSIBILITIES

It is the responsibility of the field personnel to follow this SOP.

11. PROCEDURE

11.1. GROUNDWATER SAMPLING

11.1.1. Groundwater sampling protocols vary greatly from site to site. CAS field technicians are familiar with many methods of sampling based on different site requirements. The purging and sampling procedures detailed in this document are basic and can be modified to comply with any accepted sampling method including, but not limited to the following:

- Wattera Inertial Sampling Devices
- Geopump Bladder Pumps
- Geomons Bladder Pumps
- QED Bladder Pumps
- QED Micro Purge Bladder Pumps
- Grundfos Redi-Flow II Submersible Pumping Systems
- Low Flow MNA Sampling (utilizing systems listed above)
- Geo Pump Variable Speed Peristaltic Pumps

11.1.2. WELL OBSERVATIONS

11.1.2.1. Upon arrival at each well, the sampling team will make observations as to the condition of the well and any outside factors which may affect it. These observations include will labels, locks, surface seal integrity, and other conditions which may

influence sampling. These observations as well as date, time, weather, and crew members present are noted in the field log.

11.1.2.2. An HNU trace gas analyzer with an 11.7 ev lamp or an RAE MiniRAE 2000 (or equivalent) may be used to monitor the surrounding air for total concentration of organic gases present. Both "breathing zone" and "headspace" readings are obtained and recorded in the field log. The breathing zone is the air near the well that comes into contact with sampling team members under ordinary sampling conditions. The headspace is the region just inside the well casing itself. These readings will then be used to determine the level of protection necessary in order for the field crew to proceed with the sampling event. Details on selection of protection are listed in the site safety section.

11.1.3. WELL MEASUREMENTS

11.1.3.1. The first step in preparation for purging is to determine the volume of water lowering within the well. Depth to bottom is measured by a Solinst or Heron water level indicator in the well. Once contact with bottom has been made, the tape is placed against the side of the inner riser and read to the nearest 0.01 foot. If no riser is present, this depth measurement will be taken from the top of the protective outer casing.

11.1.3.2. Static water level (depth to water) is then taken by using a Solinst or Heron water level indicator. After being decontaminated, the probe is lowered into the well casing until contact with water occurs. This contact will be signaled by a buzzer/light alarm on the take up reel of the water level indicator. Depth to water is then measured and recorded, taking care to measure from the same reference point on the casing or riser. If no reference point is marked on the raiser, the technician will obtain the reading from the north side of the riser or casing.

11.1.4. NAPL DETECTION

11.1.4.1. Detection of immiscible layers in wells may occur if requested by the client with the initiation of this sampling protocol. An ORS 100' Teflon quartz interface probe will be used to determine the presence of nonaqueous phase liquid or "floaters" or "sinkers" within the well. Floaters are relatively insoluble organic liquids which are less dense than water and tend to spread across the potentiometric surface. Sinkers are relatively insoluble organic liquids which are more dense than water and tend to migrate vertically in the water column.

11.1.4.2. The ORS interface probe is capable of measuring oil layers less than 0.01' in thickness. This probe is sensitive to conductivity and differentiates between layers of oil and water. When the probe comes into contact with water, an oscillating tone registers; for hydrocarbon a solid tone is heard. Measurements are taken and recorded in the same manner as the static water level. When monitoring for immiscible layers, this procedure will take place as soon as the crew arrives. If evidence of layering

exists, or if requested, a more aggressive schedule of phase monitoring may be implemented.

11.1.5. EQUIPMENT PREPARATION

11.1.5.1. The well is prepared for purging after all measurements and calculations of purge volume have been completed. Portable 2-cycle centrifugal pumps may be used to evacuate the wells. Dedicated polyethylene tubing is lowered into the well until it is at the appropriate level based on recharge characteristics of the well. Care is taken not to disturb the bottom of the well with the tubing and not to let the tubing come into contact with the ground. The tubing is then cut from the main spool and connected to the pump. The remaining tubing from the spool is replaced in its storage bag and sealed. Ten to fifteen feet of extra tubing must be left of it on the surface in order to be able to operate the pump a safe distance away from the well. When the pump is placed 10-15 feet downwind of the well, there is minimal chance for the fumes from the engine to come into contact with the well water.

11.1.5.2. PVC or stainless steel bailers, 1.5-3 inches in diameter may also be used to purge wells. These are brought to the well site after being precleaned and wrapped in aluminum foil and plastic bags at the laboratory.

11.1.5.3. Electric submersible pumps may also be sued to purge deeper wells. These pumps are attached to disposable polyethylene tubing, lowered into the well and purging commences. Upon completion of purging the well, the pump is retrieved and the tubing is discarded. Before using the pump at the next well location, the pump and cables are then decontaminated according to site decontamination specifications.

11.1.6. PURGING

11.1.6.1. When all preparations have been made, the centifugal pump is started and water is evacuated from the well at a rate of 1-3 gpm. Evacuation is controlled with a ball valve on the intake side of the pump. This evacuation continues until three standing volumes are removed or until the well is purged to dryness. Once purging is complete, the tubing is removed from the well and properly discarded.

11.1.6.2. The effective range of use of the 2-cycle pumps is to a depth of approximately 25 feet. Wells with depths of greater than 25 feet or where all static water level drops below 25 feet will require an alternative purging technique utilizing stainless steel or PVC bottom loading bailers. These bailers are decontaminated in accordance with the guidelines stated in the equipment decontamination section of this protocol.

11.1.6.3. Bailers are fastened to a new 3/16” diameter polypropylene rope and lowered into the well, taking care not to lower the bailer too quickly or to agitate the water excessively. The bailer, once filled, is raised to the surface and its contents are poured into a calibrated bucket to record purge volume and then discarded on the ground, making sure that no purge water pools by the base of the well. This process is then

repeated until purging is complete. If requested by the client, this purge water may be containerized for disposal into a treatment system. The rope is then cut from the bailer and discarded. The bailer is placed in its storage bag for removal and decontamination. All purge observations and actual purge volume will be noted in the field log.

11.1.7. SAMPLE COLLECTION

11.1.7.1. Sampling of wells will be performed within a 24 hour period from the time of purge. This period allows wells to recharge to a level where there is adequate sample volume for each parameter required. In cases where recharge is sufficient on the day of purging, sampling may take place on that day. Whenever possible, wells are sampled in the same order as they are purged, allowing similar elapsed time to sample for each well. If a well has not recharged sufficiently to obtain a representative sample within 24 hours, it is considered a dry will and is noted as dry on the chain of custody and the field logs.

11.1.7.2. Dedicated Teflon, stainless steel bottom filling bailers, or disposable polyethylene bailers are used to obtain samples. These bailers are sometimes stored in the well casing itself and used only for the well in which they are stored. If a dedicated bailer is not provided for each well, a laboratory decontaminated Teflon, stainless steel or disposable polyethylene bailer will be utilized to acquire the sample (see equipment decontamination section).

11.1.7.3. The sample bailer is connected to a 3/16" poly rope or a braided stainless steel wire coated with Teflon. The bailer is then slowly lowered into the well, taking care not to agitate the water in any manner which would cause the loss of volatiles from the sample. The bailer is lowered into the water column until it has filled completely, and then raised to the surface an the bottle is filled. All samples are collected in order of the parameters' volatilization sensitivity. A recommended list is provided each project.

11.1.7.4. For all samples, but particularly VOAs, the sample container is tipped at an angle and the sample water is gently poured down the neck of the container until full. This minimizes both agitation of sample and contact of the sample with surrounding atmosphere. The sample bottles are then capped and placed in a cooler. When vials with septums are used, a check for air bubbles is made after capping. This is done by inverting the vial and tapping gently. If air bubbles appear, the cap is removed, more water is added, and the process is repeated. This procedure is then repeated until all aliquots have been filled.

11.1.7.5. When the turbidity of a well is greater than 50 NTU and/or the client requests dissolved metals, field filtering is performed within 3 hours of sample collection using a QED in line filter (0.45u) connected to a QED transfer vessel. Different sites may have different criterion for filtering based on turbidity, therefore client confirmation on field filtering should be obtained on a case by case basis. The unfiltered sample is

placed into the decontaminated transfer vessel and the vessel is then pressurized to force the sample through the filters and into the dissolved metals bottle. The transfer vessel is then decontaminated before use at the next well location.

11.1.8. FIELD PARAMETERS

11.1.8.1. A sample bottle for field parameters is obtained at each well. Field measurements are taken immediately after sampling of a well a well is completed. The temperature is measured using a thermomcompensator probe attached to a Beckman 250 portable pH meter, or equivalent. The themocompensators are calibrated versus an NBS calibrated lab thermometer. This is immersed in the sample bottle, and once the reading has stabilized, it is recorded in the field logs or field sheets. All temperatures are taken in degrees Celsius.

11.1.8.2. The pH is taken using a Beckman 250 portable pH meter, or equivalent. This meter is calibrated using 4.0, 7.0, and 10.0 buffers. The calibrations are performed every 4-hours in the field and are recorded in the field logs or field sheets. If the expected pH of the sample is above 7.0, the meter will be calibrated using the 7.0 buffer and 10.0 buffer, and checking with the 4.0 buffer, in that order. If the pH is expected to be below 7.0, the meter is calibrated using the7.0 buffer and 4.0 buffer, and checked with the 10.0 buffer, in that order. All buffers are replaced daily. If a combination pH/temperature meters is used, pH and temperature will be taken simultaneously because this meter is equipped with both a pH and thermocompensator probe. The pH is then recorded in the field log or field sheet. During calibration, pH meter readings must lock in within 0.1 pH unit of the standard used, or the meter will be recalibrated or replaced.

11.1.8.3. Specific conductivity is measured using a Oakton Conton 400 series or Myron Ultrameter 6P meter, or equivalent. The meter is calibrated every four hours using a 1413 umhos/cm standard of Potassium Iodide (KI). Readings are recorded in the field log or field sheet. If the meter does not calibrated with in ± 5% of the standard value, it will be recalibrated or replaced. Meters are rinsed with DI water before and after each reading to avoid any erroneous measurements.

11.1.8.4. Turbidity will be measured using an Oakton T100 turbidimeter, or equivalent. The meter is calibrated every four hours using 2, 20, 100, and 800 NTU standards.

11.1.8.5. After field measurements are complete, the field technician will also note the color, clarity, and other observable physical characteristics of the sample.

11.1.9. EQUIPMENT DECONTAMINATION

11.1.9.1. Sampling equipment which comes into contact with the well water and is not dedicated must be decontaminated both before and after use on every well. Non-dedicated purge or sample bailers are generally decontaminated at the CAS laboratory

by field crew members. The bailers are thoroughly disassembled for cleaning purposes. Equipment is decontaminated using the following procedure:

- DI rinse
- Low phosphate detergent wash
- DI rinse, three times.

11.1.9.2. The equipment is allowed to dry completely and is wrapped in heavy aluminum foil with the shiny side out and is placed in a plastic bag for storage or transport to the site. These decontamination procedures may be modified by the client at the initiation of work at a new site.

11.1.9.3. Equipment requiring cleaning in the field will be decontaminated using the same steps as above, with care being taken to collect wash water from cleaning for later disposal. Among equipment included for this method of decontamination are static water level indicator, interface probe, Teflon coated stainless steel wire, and any field-cleaned bailers.

11.2. SURFACE WATER SAMPLING

11.2.1. STREAMS

11.2.1.1. When obtaining a stream sample, the goal is not only to obtain the most representative sample possible, but to cause as little disturbance to the sediment and banks of the stream as possible. This reduces the chance of releasing any contaminants in the sediment to areas downstream. Upon entering the stream, the technician must have already located his or her sampling point and will approach the point from downstream direction. This assures that the representative stream water will be collected and does not disturb the sediment from upstream of the sampling point. If a series of sampling points are positioned along the same stream the technician will start with the point farthest downstream and work upstream for subsequent samples.

11.2.1.2. Samples will be taken from the center of the stream at mid-depth. This is accomplished by slowly lowering the sample container into the water until mid-depth is reached. Depth of water is first measured and recorded along with observations of stream conditions in the field log or field sheets. The sample container is then uncapped with the mouth of the container facing upstream. The container is allowed to fill and is then capped underwater if possible. This process is repeated with each sample container until the bottle set is complete. If the stream depth is marginal, the technician should make sure that no bottom sediments are included during the filling of bottles.

11.2.1.3. In situations where the depth, flow rate, or substrate of the stream prevents safe sampling by the above method, an alternate technique may be utilized. A pond sampling device which utilizes an extension handle can be safely used from the stream

bank. At the end of this handle is a plate where a liter amber or plastic bottle can be attached. The bottle is opened and dipped into the stream using the pond sampler. The water is then distributed to the bottle set. This step is then repeated until the bottle set is complete. The bottle is then released from the plate and is discarded. If addition stream points are sampled, a new amber glass or plastic bottle will be used for each point.

11.2.1.4. In some cases stream depth is too shallow to obtain a representative sample. In this event, an alternate point where deeper water exists should be located. If no deeper area is located, a depression may be dug by the sampler so that sufficient sample volume may form. This depression must be formed far enough in advance of sampling so that any sediment stirred up has a chance to settle or migrate downstream. This procedure will only be utilized after the client is notifies and permission is given to continue sampling in this manner.

11.2.2. PONDS, LAKES, RIVERS

11.2.2.1. In most cases sampling will require the use of the sturdy boat appropriate for the size of the body of water to be sampled. Since safety should be of the utmost concern, the personnel should have adequate floatation garments on when sampling from a boat. Two crew members will always be present when sampling from a boat. One crew member performs the actual sampling while the other navigates, takes notes, and stabilizes the boat. Under no circumstances should both crew members try to obtain samples at once. This may lead to the boat drifting off course or capsizing. In some cases if the pond or area to be sample is known to contain large amounts of chemicals, or if the area is partially frozen over, this method of sampling may be altered to insure the safety of the sampling crew.

11.2.2.2. In some river sampling, a field technician may be able to wade into the river to obtain a sample. In this case the technician should be cautious an note any slippery rocks, current changes or drop offs which could lead to a fall.

11.2.2.3. During all times the technician will be tied off at the shoreline by another crew member. In case of a fall, the person can then be pulled to safety. If at any time the sampling appears to be too risky or is proper floatation equipment or vessel is not available, the sampling should be reevaluated.

11.2.2.4. Shallow rivers can be sampled in the same manner as the stream sampling, but ponds, larger rivers, and lakes require a different technique to obtain a representative sample. While in general, streams are mixing as they flow, larger bodies of water can become thermally or chemically stratified. This requires discreet sampling in different areas of each stratum to obtain an accurate sample.

11.2.2.5. Three different sampling devices are commonly used by CAS, depending on the situation an analysis required. The Van Dorn consists of a PVC or acrylic cylinder which is suspended by a rope or cable. The Van Dorn can be suspended in two

positions, horizontal for shallow water and vertical for deeper water. A plunger-like mechanism is attached to each end of the cylinder in a manner which allows it to be pulled open and locked in place. The sampler is then lowered slowly to the desired depth and allowed to rest at that point for 30 seconds. This time allows any disturbance caused by the lowering of the Van Dorn to dissipate. A weighted messenger is then sent down the line, tripping the plunger mechanism and trapping a discreet sample inside the cylinder. The Van Dorn is then raised to the surface and the water is poured into the bottle set. Field notes will include depth of sample, location on body of water, depth to bottom and sample appearance. Depth will be taken at least 5 minutes prior to sampling to allow sediment which has been disturbed by the depth probe to settle.

11.2.2.6. A Kemmerer Depth Sampler is similar to a Van Dorn except that it suspended vertically. The Kemmerer is also available in either stainless steel or Teflon. As with the Van Dorn, a messenger is sent down the attached rope and trips the end seals on the cylinder, thus holding a discreet sample inside. Due to its construction, the Kemmerer is preferred for sampling liquids with strong acids, bases, or solvents.

11.2.2.7. While Van Dorn or Kemmerer are used to obtain water for most parameters, they are not suitable for sampling dissolved oxygen. An APHA BOD sampler is used when a D.O. sample is required. This sampler consists of a brass canister with a weighted bottom. A 300 mL glass BOD bottle is inserted. A tube extends from the top of the brass canister, and when the top is screwed on, the tube rests nearly on the bottom of the BOD bottle. An inlet valve connected to the tip of the canister allows the sampler to be lowered to the desired depth before filling the BOD bottle. The sampler is kept at the desired depth for 3 to 5 minutes to assure complete flushing of the 300 mL bottle. The method allows for a more representative D.O. sample due to decreased agitation of the sample water and less contact with air. In turn, oxygen is not stripped from the sample nor is there as great a possibility of displaced air entrapment within the 300 mL bottle.

11.2.2.8. The glass stopper is then placed carefully in the neck of the bottle to avoid trapping air bubbles inside. When D.O. samples are analyzed at the laboratory, the first two additions for the Winkler test, alkaline/azide/iodide, and manganous sulfate have been added in the field. These are then titrated within six hours at the laboratory after acid addition. The bottle is then washed off with DI water and placed in the sample cooler. Crew members must avoid coming into contact with the reagents because of the strong alkalinity. Safety glasses must be worn at all times when handling these reagents. Typically CAS crew members perform the Winkler titration in the field immediately following sample collection

11.2.2.9. .If it is necessary to measure downhole DO, or if a flow-through cell is being used for low flow MNA sampling, an YSI Model 550A Dissolved Oxygen Meter is utilized.

11.3. SEWER SAMPLING

11.3.1. Representative samples from sewer pipes should be taken from manholes where the sewer line is straight and where no laterals are entering at or above invert. The sewer, where possible, should not have excessive sediment and be well mixed.

11.3.2. Grab sampling can be done from the surface with a stainless steel bucket and rope. The bucket should be small enough size to fit in the sewer pipe and not make contact with the pipe walls or invert. In no case should the pail be allowed to carry downstream of the manhole. The first sampling with the pail is discarded to rinse the pail. Samples are transferred to the bottles with a properly cleaned funnel.

11.3.3. Disposable gloves should be worn when sampling and transferring the wastewater. Grab sampling may also be done with a peristaltic style pump. A weighted tube is lowered to above the invert and the pump operated to rinse the line three times (repetitive forward the reverse motion). The pump is then operated to fill aliquot bottles directly. Care should be taken to not leave the pump off for more than a few seconds between aliquots to avoid settling of solids in the tube line. Tubing should be a minimum of 3/8" I.D. and made of polyethylene or Teflon material. The latter is necessary when sampling for organic parameters.

11.3.4. Composite sampling from sewers should be done with an automatic ISCO sampler. The appropriate tubing should be placed in the waste stream to minimize the intake of sediment. An appropriately sized stainless steel or other nontoxic weight should be attached at the end of the tubing to maintain the intake in a well-mixed section of the sewer.

11.3.5. For time proportional composites, the frequency of sampling should match the variation anticipated in wastewater concentration and flow. A minimum of every hour should be utilized. For industrialized effluents a frequency between 15 and 30 minutes is generally representative, but the client should be consulted to determine if the plant processes dictate a higher frequency. The sample volume should be such that the total sample collected over the composite period is 2-3 gallons. The composite container should be appropriate for the analysis intended and kept at or near 4°C when preservation by cooling is necessary. Compositing proportional to flow may be required where flow rates vary considerably. Set the samples to collect samples with volume of wastewater passing such that the frequency of the samples does not exceed one hour.

11.3.6. Discrete sampling over an extended period of time should be done automatically with automatic ISCO samplers. 500mL polyethylene bottles should be used, and the number of bottles filled per sampling set at 1-4 depending on the aliquot's needs. Preservatives should be added to the bottles before sampling where possible.

11.4. LEACHATE SAMPLING

11.4.1. Leachate collection manholes are the most commonly sampled source of leachate. Due to the nature of the leachate, care must be taken when removing the manhole cover or lid. Technicians will remain upwind and perform monitoring of gases to determine the level of protection necessary to undertake the sampling. At a minimum, technicians will be equipped with Level C protection during all phases of sampling and handling leachate.

11.4.2. Depth to bottom of the manhole and depth to leachate will be taken from a reliable reference point and documented. Liquid levels in the leachate tanks vary greatly due to daily or weekly removal of leachate, so the level of leachate in the tank is important. The technician will consult with the client to discuss times and depths at which samples can be taken. It is important not to sample when the leachate level is too low because a nonrepresentative sample may be obtained.

11.4.3. A dedicated bottom loading stainless steel bailer or a baked amber bottle is lowered into the leachate manhole or tank, making sure that it does not come near the bottom of the manhole. Raise the sampling container out of the manhole and distribute the sample contents into the bottle set in the order of the parameter's volatilization sensitivity. When sampling is complete, the rope is cut off and is discarded. The bailer is double wrapped in plastic bags for removal from the site. The manhole or tank cover is then replaced.

11.4.4. Leachate seeps are often sampled and are probably the most time consuming leachate sampling due to the small amount of leachate that is usually available for collection. Once a seep sampling point has been established, the technician must try to locate a ponded area in which to obtain a sample. If no ponding is evident, the technician may dig a small depression below the seep and allow it to fill with leachate. The client will be informed at all times before this man-made depression is sampled. If a client requests a leachate sample, the dimensions and procedures for making the depression will be noted in the field log or field sheet. A small bottle of a disposable glass pipette may be used to collect very small amounts to transfer them to the bottle sets. All observations and sampling methods are noted in the field log or field sheet.

11.4.5. Leachate ponds are generally considered too hazardous using normal pond sampling methods. In these cases the extended pond sampler will be utilized in the same manner as in Surface Water Sampling.

11.4.6. All equipment used for sampling leachate should be labeled "for leachate sampling only" and any disposable equipment should be disposed of promptly and properly. One technician should do the sampling; the other technician should remove the bottles from the coolers and open them for filling. Holding of sample containers by a second technicians allows a neater pouring job into the sample container with less spillage. This is of importance when the samples arrive at the lab. This decreases the chance of volatilization in the sample custody of the laboratory and contamination of the area due to spilled leachate within each cooler.

11.4.7. When preserving the leachate with acids, the technician must be extremely cautious. Adding acids to leachates can cause violent reactions, so preservatives must be added slowly. The sampling person will remain at arm's length away from the sample when preserving and at all times, eye protection must be worn. Unlike well water samples, leachate samples should NEVER be field filtered. pH, specific conductivity, and temperature should be taken with probes or meters reserved only for leachate samples. This is due to the fact that leachate tends to deteriorate the probes and can bias later readings of groundwater of surface water samples.

11.5. SOIL SAMPLING

11.5.1. SURFACE SOIL SAMPLING - This consists of obtaining a sample of soil from 0-6" depth range. This is usually accomplished by the use of a stainless steel trowel or spoon. Any debris covering the area to be sampled such as rocks, grass, and twigs will first be removed. The trowel or spoon will then be used to collect the desired amount of soil. This sample will be transferred directly to the sample jar. No large chunks of rocks should be included in the sample. Care will be taken to disturb the sample as little as possible when obtaining the volatile parameters. A 2-4 ounce wide-mouth glass jar with Teflon-lined lid is utilized for volatiles. Other parameters will be placed in a 16 or 32 ounce wide-mouth glass jar.

11.5.2. BORINGS

11.5.2.1. Sample depths are established by the client. If samples are to be taken every foot, an 18" split spoon sampler is used. The connector bars on the split spoon are measured to determine the proper depths of soil for discreet sampling. The split spoon is driven into the ground with a drive hammer. When enough of the spoon has been driven into the ground, the drive head is pounded upwards, removing the split spoon from the ground. The split spoon is uncoupled and the sample is removed and transferred to the sample bottles. Stainless steel trowels and spoons are used to cut the core and transfer the sample to the sample bottles. Observations on depth, soil characteristics, and parameters are documented in the field log or field sheets. The split spoon is then decontaminated by the normal decontamination procedure, reassembled and driven back into the same hole until the next one foot interval has been reached. This process is repeated until all the samples have been collected.

11.5.2.2. If a sample is required at only one particular level, (i.e. 3.5') a motor-driven auger may be utilized. The decontaminated auger bit is attached to a 2-man gasoline engine power drive and a hold is bored to just above the depth to be sampled. It is very important to bore very slowly with the auger so as not to get it lodged in the ground. If it does get ledged, it is removed by manually unscrewing it from the ground with a pipe wrench. Once the hole has been bored to 3' and properly cleaned, a dedicated split spoon is driven into the soil until it reaches a depth of 5'. This 2' section is then composited to one sample.

11.5.3. TEST PITS

11.5.3.1. Test pits are used in certain situations to retrieve soil samples from particular depths. The client will provide a backhoe on site to accomplish the test pit excavation. Field personnel will carefully identify the integrity of the walls of the test pit to avoid possible caving in of the sides. Air monitoring with a trace gas analyzer will be done at all times before sampling to assure proper level of protection. If the test pit is less than three feet in depth, the technician may enter the pit itself to obtain a sample. If a greater depth is encountered, the sample from the desired depth must be taken directly from the bucket of the backhoe or from the excavated soil pile itself. Under not circumstances will the technician enter a test pit deeper than three feet. If air readings or established background on the site indicate a high level of contamination, the sampling will take place solely from the bucket or pit, regardless of depth.

11.5.3.2. Samples will be collected with the use of a decontaminated stainless steel trowel or spoon. The soil will be disturbed as little as possible and transferred to the sample container as quickly as possible and capped immediately. The technician shall record the depth of the pit, depth of the sample, location of the sample, appearance of the sample, and any other appropriate site conditions.

11.6. WIPE SAMPLING

11.6.1. This technique is utilized when it is necessary to monitor for possible superficial contamination.

11.6.2. A 4" square sterile gauze pad (or filter paper if requested by the client) is wetted with appropriate solvent based on the desired analysis. The technician will then wipe a known area of the surface with the gauze pad. Even, uniform strokes in two directions are used until the entire area has been wiped. The gauze pad is then placed in a Teflon-capped sample container for transport to the laboratory. Nitrile gloves will be worn during sampling and will be changed between each location to be wiped.

11.6.3. It is the responsibility of the client to determine the location and number of wipes to be taken. Unless a specific area is requested by the client, a 10cm X 10cm section of the surface shall be wiped.

11.6.4. The solvent used to wet the gauze pad is based on the analyte(s) of interest. The following solvents will be used when sampling for specific analytes:

Solvent	Analyte
Hexane	PCBs
Methanol	Volatile Organics
Dilute Nitric Acid	Metals
Methylene Chloride	Semivolatile Organics

11.6.5. If requested, a wipe blank will be completed to ensure the quality of the solvent and gauze pad. A wipe blank sample consists of a sterile gauze pad, wetted by the solvent chosen. This wetted pad is immediately placed in a Teflon-capped sample container and is returned to the lab with the other wipe samples taken.

11.7. DRUM SAMPLING

11.7.1. Prior to sampling any containerized material, the technician must locate as much background data as possible. Areas of concern are the age of the container, condition of the container, known or suspected contents, health effects of the contents, and any other historical information available. The client should be the primary source for this information, but visual observation by the technician is equally essential. The information encountered while opening the sampling the contents of the container, and any site-related physical hazards associated with the sampling event must be documented in the field log or field sheets. Clients must also label drums or designate a code to be written on the drums to ensure proper sample identification.

11.7.2. LIQUIDS

11.7.2.1. After background information is complete, the technician will proceed with the opening of the drums. Drums will be opened with a non-sparking drum wrench. If a drum appears to be bulging outward, a sign of built-up pressure inside the drum, it will not be opened by field personnel. Drums which are badly deteriorated should not be opened to prevent possible rupturing of already weakened walls. In both of these cases, a technician must contact the client, and the client must arrange for the drums to be opened. Only after the drums are opened will the technician continue sampling.

11.7.2.2. An HNU meter will be used to assess the quantity of organics in the breathing zone and directly over the bung of the drum. A CGI (combustible gas indicator) will also be employed if the contents of the drum are unknown or have the possibility of releasing combustible gas. Guidelines for use of the CGI are listed in the safety section. An oxygen meter will also be used to monitor oxygen levels if the drums are stored in a confined area such an unventilated room.

11.7.2.3. The drums are ready to be sampled as soon as all safety precautions have been met. A disposable glass COLIWASA (Combined Liquid Waste Sampler) is generally used to obtain a sample from a drum. This consists of a hollow tube approximately 4′ long and ¾” in diameter. Inside this tube is a small glass rod with a beaded end. This end fits tightly in the base of the tube, which is tapered. When the glass rod is raised, the bottom opening is uncovered and sample can flow into the tube and trapping the sample inside. The COLIWASA is lowed into the drum; the sample is obtained in this manner, and then transferred to the bottle set. Crew members will note the depth of the liquid in the drum, appearance and any sign of layering.

11.7.2.4. During this sampling, a plastic dropcloth will be used and Tyvek suits will be worn due to the messy process of transferring the liquid to the sample container. The

client will be responsible for the disposal of any contaminated equipment, clothing, or protective plastic sheeting. Clients will be contacted before sampling commences to work out the disposal plans.

11.7.3. SOLIDS

11.7.3.1. Following the removal of the bung or top of the drum, the sampling device will be placed into the solid and run diagonally from the top to the bottom of the drum. This technique helps ensure representative sampling. A split spoon sampler, trowel, or trier will be utilized depending upon the volume and consistency of the material to be sampled. Once and adequate sample is removed, it will be transferred to a sample container as quickly as possible to prevent any volatilization from the sample. Any excess material from the drum will be replaced as soon as the sampling is complete. Observations as to sample appearance, equipment used, and drum identification numbers will be documented in the field log or field sheets.

11.8. TANKS

11.8.1. Following the same background checks and safety precautions as with drum sampling, the technicians will proceed with sample collection. Tank samples must always be taken from the top of the tank, if possible, for two reasons. If a valve is available on the bottom of the tank such as in the case of a tanker truck, obtaining a sample from it will lead to an unrepresentative sample. The bottom level of the tank will be the only section sampled and if layering is present above that level it will be undetected. In some cases, the valve may be deteriorated to such an extent that once opened it cannot be closed again. This could lead to leakage or a serious spill. If no top opening is apparent, the technician should will the client for instructions or alternate access to the sample. CAS requests that all tank valves and/or ports be opened and closed by the client.

11.8.2. Sampling will consist of a cross section of the entire depth of the tank to obtain a true representative sample. Methods of sampling include the use of COLIWASAs or tank samplers. Tank samplers are similar in design to a COLIWASA but are 10-15′ long and approximately 1” in diameter. A check valve device is fitted at the bottom of the device. This valve can be opened or closed to obtain or release the sample. The crew members must ensure that samples from all depths of the tank are included in the sample in equal proportions.

11.8.3. If layering is visibly evident in the sample, the client will be informed immediately. The layers can then be sampled individually if requested. A bacon bomb sampler or a similar device may be used to obtain a discreet sample from each layer if sufficient volume of each layer is present. This sampler consists of a valve system which allows the inside of the sampler to be completely sealed off. The sampler can then be lowered to a certain depth and opened with the assurance that no layers closer to the surface are obtained. The sampler is then closed and raised to the surface for distribution to the bottle set. The top layer of the material can be sampled by COLIWASA or stainless steel bailer.

11.9. FLOW MEASUREMENTS

11.9.1. Introduction - Measurements of flow rate are made for closed pipe and open (free surface) channel conditions. Most requirements related to environmental testing are of the open channel type. The limited occasions that closed pipe systems are measured generally can be done by readings of an in-situ water meter or by noting the change in volume of the tank from which the flow is originating.

11.9.2. Flow Measurements –Open Channels

11.9.2.1. Methods for measurements of flow rate in open channels generally are based on either obtaining the velocity-area product or the depth of flow through a primary device. The choice depends on the size of the stream or channel and the accuracy of the measurement required.

11.9.2.2. Velocity –Area Product

11.9.2.2.1. This method requires simultaneous measurements of the area of flow and the mean flow velocity of a given cross section. The exception is when a rating curve exists (flow rate for range of depths) and in which case only depth measurements are required. Calibration of the rating curve is also needed, but only periodically.

11.9.2.2.2. CAS utilizes two kinds of velocity meters for the majority of its work in this area, a rotating element current meter made by Teledyne/Gurley and an electromagnetic probe meter manufactured by March McBirney. The former provides accurate and easily obtainable measurements from 0.3 fps to 2.0 fps. The rotations of a cup wheel are counted with the use of head set that provides a scratching sound with each closing of low-powered circuit that loops through the meter. Revolutions per minute are noted where the rate is variable and per 30-seconds where the rate is uniform. If time allows, a duplicate measurement is made. Conversion to feet per second is readily facilitated when the meters are operating close to their factory setting of one fps equaling one The calibration of these and other current meters is performed periodically in an open channel at the laboratory.

11.9.2.2.3. The electromagnetic current meter utilizes an egg-shaped probe that senses the change in the magnetic field around the probe by the stream of water passing the probe. The range of measurement is wider with this style meter, from 0.1 to 10 fps. Its use is limited when working conditions are extremely moist. If a malfunction occurs from excessive moisture, the instrument must be opened and allowed to fully dry out over a 6-10 hour period.

11.9.2.2.4. The location in the open channel to measure mean velocity is generally at the six-tenths depth (distance from the surface). This is checked initially by taking a series of velocity measurements with depth, averaging and comparing to that at

the six-tenths depth. For deeper streams greater than one foot, the two-point method is more accurate and should be substituted. This method consists of measuring the velocity at 0.2 and then at 0.8 of the depth from the water surface and using the average of the two measurements.

11.9.2.2.5. Area of flow is obtained from a series of depth measurements across a cross section when the channel is irregular and/or relatively wide (greater than 2 feet) or from a single measurement in the middle for regular shaped sections (circle, oval, rectangle, or trapezoid shapes). Measurements should be taken from left to right.

11.9.2.2.6. For pipes where current meter measurements are not possible because of inaccessibility, manhole junctions, or other reasons, an estimate of mean velocity can be obtained. In this method information on slope and pipe roughness (resistance to flow) is coupled with cross section dimensions and substituted into a resistance-type equation like the Manning formula to produce mean velocity values for given depths of flow. This method should only be used for situations where great accuracy is not required. For channel bottoms where there is considerable sediment, a flat she or plate should be attached to the measuring rod. For regular shapes the depth of sediment should also be taken to allow for a correction to the area of flow.

11.9.2.3. Primary Device Method

11.9.2.3.1. In this method some type of hydraulic structure is placed into the flow stream. The function of the hydraulic structure (primary device) is to produce a flow that is characterized by a known relationship between a liquid level measurement (head) at some location and the flow rate of the stream. This relationship of head-flow rate curve is called the rating for the particular structure or device (e.g. a float or other depth sensing device) which usually also converts the liquid level to a flow rate automatically. Weirs and flumes are the most commonly used primary devices. A weir is essentially a dam built across an open channel over which the liquid flows, usually through some type of an opening or notch. Rectangular and trapezoidal (Cipolletti) weirs are used for flows greater than 1-2 MGD. Triangular weirs or V-shaped notches (usually 45º60º, or 90º) are used for flow rates less than 1 MGD. Each type of weir has an associated characteristic equation for determining the flow rate through the weir. Each weir installation must also conform to the conditions under which the standard formulas were developed such as minimum distance to the sidewall, invert and location of the secondary head measuring sensor.

11.9.2.3.2. Flumes utilized are either Parshall or Palmer Bolus type. These primary devices provide for a change in the channel area and/or slope which results in an increased velocity and change in the level or the liquid flowing though the flume. The flow rate through the flume is a function of the liquid level at some point or

narrowed section in a Palmer Bolus. CAS generally uses the Palmer Bolus flumes in sewers and Parshall flumes in natural channels.

11.9.2.3.3. Secondary devices for converting head over (weirs) or through (flumes) primary devices depend most commonly on floats or pressure, capacitive, ultrasonic, or potentiometric probes. CAS utilizes primarily ISCO pressure or capacitive probe systems. These systems provide integration of flow rate and totalize. All are battery powered and are generally operated from automotive-size batteries.

12. QA/QC REQUIREMENTS

12.1. A program of quality assurance for field activities is an integral part of the overall laboratory Quality Control Program. The QA/QC Officer, in conjunction with the Field Supervisor, establishes the minimal field quality control data that is generated and the system checks that are used to ensure representative sampling.

12.2. The generation of blanks and duplicates for checking the cleanliness of sampling equipment and/or containers is the most important requirement of the field staff. Field blanks are produced by filling container sets with organic-free deionized water provides data on the condition of the sampling containers. Trip blank data monitors whether the ambient air in the shipping containers or in the vicinity of the collection of samples is contaminating the samples or the DI rinse waters. The trip blanks are vials of organic-free deionized water that are made in the laboratory and carried with the sampling equipment throughout the field event.

12.3. Equipment blanks are a check on the cleanliness of the sampling equipment. Organic-free deionized water is poured over the equipment and captured directly into a set of sample containers.

12.4. Duplicate samples are the last check made and monitor the ability of the field crew to reproduce samples. Consistency of sampling is necessary to avoid the introduction of non-source variables on the results.

12.5. Calibration logs are the second essential ingredient in the field quality assurance program. Portable equipment meters, depth level indicators, current meters, and dissolved probes are subject to physical abuse and more likely to change calibration. As a minimum requirement, this equipment is calibrated before leaving the laboratory and as often as practical during the sampling event. For example, at well fields this translates to every 2-3-hours; for streams utilizing boats and vans, every hour; and for laboratory trailers, every 4-hours.

12.6. The third essential item includes training and audits. Field crews should generally work in teams and take advantage of this team structure to facilitate the training of new personnel and to upgrade the training of experienced personnel. Each crew should be managed by a supervisor whose primary responsibility is training and following up the training with frequent audits.

13. DATA REDUCTION AND REPORTING

13.1. Accuracy and Precision of the QC samples is calculated as per the QAM.

13.2. Data must be reviewed by the analyst and a peer (supervisor or qualified analyst) using a Data Quality Checklist before the results are validated and reported to the client. Further data review policies and procedures are discussed in ADM-DREV.

13.3. Calculations for the field analyses are listed in the laboratory SOPs.

14. METHOD PERFORMANCE

The method performance of the field analyses are listed in the laboratory SOPs.

15. WASTE MANAGEMENT AND POLLUTION PREVENTION

15.1. It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine use is kept on hand. The threat to the environment from solvent and reagents used in this method can be minimized when disposed of properly.

15.2. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

15.3. Excess, unused sample and testing byproducts are disposed following the procedures in the SOP SMO-SPLDIS.

16. CORRECTIVE ACTION FOR OUT OF CONTROL DATA

If data is produced that is out of control, the samples are to be re-analyzed with in-control QA whenever possible. See corrective actions in Section 12 of this SOP and in the applicable Figures in Section 12 of the Quality Assurance Manual.

17. CONTINGENCIES FOR HANDLING OUT OF CONTROL OR UNACCEPTABLE DATA

If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls can not be met, follow the procedures in Section 15 of the Quality Assurance Manual.

18. REFERENCES

18.1. "Test Methods for Evaluating Solid Waste Physical/Chemical Methods," SW-846, 3rd edition, December 1996. Chapters 3 and 11.

18.2. "Supplemental Guidelines for Planning and Operations of Monitoring Wells at Class 1 Injection Facilities," EPA Region V, February 1991.

18.3. "Field Sampling Procedures Manual", New Jersey Department of Environmental Protection, August 2005.

19. TRAINING OUTLINE

19.1. Read current SOP and applicable methodologies. Demonstrate a general understanding of the methodology and chemistry. Follow policies in ADM-TRANDOC.

19.2. Observe and participate in the procedures with guidance until the trainer is confident in the level of quality of the trainees work.

20. METHOD MODIFICATIONS

Not applicable.

21. INSTRUMENT-SPECIFIC ADDENDUM

The manuals for the instruments used in the field are kept in the vehicle with the instrument.

22. ATTACHMENTS

22.1. Table 1 – Collection Priority According to Volatilization Sensitivity
22.2. Attachment – Examples of Site Safety Requirements

23. CHANGES FROM PREVIOUS REVISION

- Spelling errors and typo corrections throughout.
- Section 4 - updated to include suggestion of sampling in order of least contaminated areas to more contaminated areas.
- Section 7 - updated to include Solinst and Heron Water Level Indicators, MiniRAE 2000 HNU, Bladder Pumps, and a calibrated bucket.
- Section 11 - new section was added to the Groundwater Sampling section to list various types of samplers and procedures available. Also revised discussion and procedure taking water levels.
- Section 11 – new section was added to include electric submersible pumps.
- Section 11 – the purging section was revised to include centrifugal pumps. Also, a discussion using a calibrated bucket to measure purge volume and the options for disposal of purge volume was added.
- Section 11 – the sample collection section was revised to include the option of using disposable polyethylene bailers. Some clarification was added to the field-filtering discussion based on sample turbidity and/or client-requested dissolved testing parameters.
- Section 11 – the field parameters section was revised to indicate a 5% criterion for conductivity and revised turbidity standard true values based on current practice.
- Section 11 – the ponds, lakes, and rivers sampling section was revised to indicate that the either the DO meter or the Winkler titration may be used to determine DO in the field, pending the application or location of the sample.

Table 1

COLLECTION PRIORITY ACCORDING TO VOLATILIZATION SENSITIVITY FOR COMMON GROUNDWATER PARAMETERS

1. Volatile Organics (VOA)
2. Purgeable Organic Carbon (POC)
3. Purgeable Organic Halogens (POX)
4. Total Organic Halogens (TOX)
5. Total Organic Carbon (TOC)
6. Extractable Organics
7. Total Metals
8. Dissolved Metals
9. Phenols
10. Cyanide
11. Sulfate and Chloride
12. Turbidity
13. Nitrate and Ammonia
14. Radionuclides

Attachment

EXAMPLE OF SITE SAFETY REQUIREMENTS

EXAMPLE OF SITE SAFETY REQUIREMENTS

All sampling team members should have received the required safety training before participating in any sampling activities at the sampling site including the mandatory 40-hour OSHA safety course and annual 8-hour refresher thereafter. In addition, the site field managers should have completed the 8-hour OSHA supervisor training course. Team members should also have received information on the properties and health effects of any substance presumed or known to be present in the area to be sampled.

The sampling crew should always check their protective equipment before leaving for the site. Any worn parts, used cartridges, or missing equipment should be replaced or corrected before leaving. If the crew arrives on site and does not have the proper equipment, they will return to the laboratory to make some provisions to procure the equipment before initiating the sampling event.

When arriving at a well, crew members will park vehicles downwind of the well approximately 25 feet. Wells will be opened while crew members are positioned upwind to avoid as much contact with any gases which may be present upon opening of the well. The well breathing zone and headspace will be monitored by an HNU trace gas indicator upon opening. If HNU readings detect the presence of organics in the breathing zone at levels from 1-5ppm above background levels, a full-face air purifying respirator with organic/acid gas cartridges will be worn. If a reading from 1-5ppm above background levels is detected in the well headspace but not the breathing zone, a full face mask will be worn. The breathing zone will be monitored with the HNU during the purging to determine if a higher level of protection is necessary due to volatilization of gases during purging process.

When the concentration of organic gases is greater than 5ppm over background level, a full face air purifying respirator is required. The full face APR must be worn at all times during purging and sampling if either the breathing zone or headspace exceeds 5ppm above background.

In the event that levels of organics in the two regions near or exceed the limitations of the full-face respirator, a self-contained breathing apparatus or a supplied air respirator (level B protection) will be necessary to continue the sampling operation.

Cartridges will be changed every day in the APRs but must be changed earlier if any odor is detected during use. As an additional safety procedure, APRs will be worn at any time that any strong odor is detected near the well, even if the air monitoring equipment registers background levels.

Tyvek protective coveralls will be worn during all phases of the sampling event if any evidence of organics above background levels is present in the air at the well head. "Saranex" or saran coated tyveks will be worn if the concentration of organics is deemed to be high enough to permeate through normal protective clothing at too high a rate.

Safety glasses will be worn at all times when on site. If any overhead hazard is apparent, a hard hat will also be worn. Work shoes or boots will always be worn when on site. Sneakers are not permitted on site. Gasoline for pumps will be contained in safety gas cans.

Crews will use the "buddy system" when working on site to increase the safety of the job. This is also advantageous because one team member can be the "dirty" worker; one can be the "clean" worker, reducing the chances of cross contamination. The dirty worker handles purge water carboys, fueling of pumps, and disposal of contaminated equipment. The clean crew member handles the well measurements, meters, and sampling activities.

Low Stress/Low Flow Groundwater Sample Collection Procedure

OPERATING PROCEDURE: OP3012

LOW STRESS/LOW FLOW GROUNDWATER SAMPLE COLLECTION PROCEDURE

PREPARATION AND APPROVALS

VERSION	AUTHORED/DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
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Total Pages: 22

HALEY & ALDRICH

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OPERATING PROCEDURE: OP3012

LOW STRESS/LOW FLOW GROUNDWATER SAMPLE COLLECTION PROCEDURE

1. PURPOSE

This document describes procedures for collection of groundwater samples for laboratory analysis utilizing the "Low Stress/Low Flow Method". This method should be employed when it is critical to collect groundwater samples not impacted by over-purging, aeration, and sediment/colloid presence. Although the procedures described in this document are generally appropriate for obtaining groundwater samples as part of Monitored Natural Attenuation (MNA) programs, a more complete procedure for MNA programs is described in a separate document (Monitored Natural Attenuation Sample Collection Procedure).

The method described herein is most appropriate for wells that can accept a submersible pump and have a screened interval of ten feet or less. However, the procedure is flexible and can be modified for a variety of well construction and groundwater yield situations. The low-flow purging and sampling method is not appropriate for use in all hydrogeologic regimes, and certain groundwater monitoring well designs may make the method unsuitable (e.g. open hole and long screen monitoring wells in bedrock and stratified sand and clay where the water bearing zones have not been characterized).
This procedure does not address wells that contain Non-Aqueous Phase Liquids (NAPLs).

Note: The methods described in this document are provided for training use and general information. Depending upon regulatory agency and other project specific requirements, appropriate field procedures may differ from those described herein. These procedures should be confirmed with the Haley & Aldrich Project Manager prior to implementation.

1.1 BACKGROUND

Research conducted by Puls et al. (1992), Puls and Powell (1992), and Powell and Puls (1993) has shown that high-volume purging and sampling cause significant turbidity and suspended particulate artifacts that can result in an overestimation of certain analytes of interest (e.g., metals or hydrophobic organic compounds). Additionally, standard purging procedures can cause pressure changes and bailing can cause aeration that can strip volatile organic compounds from groundwater samples (Pennino, 1988) and provide misrepresentative data on aquifer conditions (such as dissolved oxygen and redox). Overpurging of a well can cause water to cascade down the well screen, causing undesirable aeration and volatilization.

The use of low-flow pumping devices for purging and sampling minimizes both the disturbance of water in well casing and the potential for mobilization of colloidal material (Barcelona et al., 1994). Low-flow purging with maintenance of water level in the well and stabilization of indicator parameters (especially turbidity) allows collection of groundwater samples that are more representative of conditions without filtering (U.S. EPA, 1993; Backhus et al., 1993). In many cases, use of a low-flow pump to purge and sample monitoring

wells decreases sampling time, reduces the need to handle large volumes of purge water and lowers the cost associated with its disposal, and may allow collection of samples for without filtering.

Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface that can be affected by flow regulators or restriction. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system to the extent practicable taking into account established site sampling objectives (USEPA, Puls and Barcelona, April 1996).

2. EQUIPMENT & SUPPLIES

1. Adjustable rate, positive displacement pumps (e.g. low flow-rate submersible centrifugal or bladder pumps constructed of stainless steel or Teflon). The pump should be easily adjustable and capable of operating reliably at lower flow rates. An example is QED MicroPurge bladder pump (available for purchase or rental at US Environmental 781-899-6969, among others).

   Under most regulatory programs, peristaltic pumps may be used for collection of inorganic samples only – they are NOT appropriate for collection of VOCs. Bailers are inappropriate for use in this procedure. Waterra tubing purging and sampling is also not recommended for low-flow sampling by the USEPA.

2. Tubing: Tubing used in purging and sampling each well must be dedicated to the individual well. Once properly located, moving the pump in the well should be avoided. Consequently, the same tubing should be used for purging and sampling. The tubing wall thickness should be maximized (3/8 to ½ inch) and the tubing length should be minimized (i.e. do not have excess tubing outside of the well)

   - **Organic analysis**: Teflon or Teflon-lined polyethylene tubing must be used to collect samples.
   - **Inorganic analysis**: Teflon or Teflon lined polyethylene, PVC, Tygon or polyethylene tubing may be used to collect samples.

3. Polyethylene sheeting and sampling gloves.

4. Water level measuring device, 0.01 feet accuracy, (electronic preferred for tracking water level drawdown during all pumping operations).

5. Flow measurement supplies (e.g. graduated cylinder and stopwatch).

6. Interface probe, if needed.

7. Power source (e.g. generator, located downwind; nitrogen tank, etc). The generator should not be oversized for the pump.

8. In-line flow-through cell containing purge criteria parameter monitoring instruments for pH, turbidity, specific conductance, temperature, Eh and dissolved oxygen (DO). The in-line device should be bypassed or disconnected during sample collection. An example is the Horiba U-22 which is a flow-through cell that comes with probes capable of measuring pH, dissolved oxygen, conductivity, salinity, TDS, temperature, turbidity and oxidation-reduction potential. Available from Ashtead Technologies, 800.242.3910, www.ashtead-technology.com or Pine Environmental, 800-301-9663, www.pine-environmental.com, among others.

9. Photoionization detector (PID), or flame ionization detector (FID) or equivalent.

10. Nylon stay-ties

11. Decontamination supplies

12. Field book or well sampling form

13. Sample Bottles. It is recommended that preservatives be added to sample bottles prior to field activities to reduce potential error or introduction of contaminants.

14. Sample preservation supplies (as required by the analytical method; see previous item)

15. Sample tags or labels, and chain of custody.

16. Well construction data, location map, field data from last sampling event.

17. Sampling Plan or Work Plan

18. Health & Safety Plan

19. pH meter

20. Conductivity meter

21. Dissolved Oxygen (DO) meter

22. Oxidation -reduction (REDOX) reaction potential (ORP) meter

23. Nephlometer (turbidity)

24. Temperature gauge

25. Field test kits (such as Hach kits for measurement of dissolved iron (Fe^{+2}), carbon dioxide, and alkalinity). See the document "Monitored Natural Attenuation Groundwater Sample Collection Procedure" for specifications and ordering information for these types of kits.

26. Field filtration units (if required)

3. PROCEDURE

3.1 Sampling Preparatory Activities

Prior to entering the field there are several activities that should be conducted. The activities are as follows:

- Obtain and review a copy of the Sampling or Work Plan and Health & Safety Plan.
- Obtain and review previous groundwater sampling data (if available), previous water level measurements and well construction details (total depth and length of well screen).
- Locate a site map denoting the wells to be sampled.
- Obtain well wrenches, well keys and any other equipment needed to access the wells.
- Coordinate site access.
- Coordinate with laboratory to obtain sample bottles and necessary quality assurance samples.
- Perform an inventory of necessary purging, sampling, and field measurement equipment. Certain equipment may need to be purchased or rented for the sampling event. Check field measurement probes for proper calibration and ensure that the probes and kits are complete (i.e., contain calibration and analytical solutions) for the entire sampling event.

3.2 Preliminary Site Activities

Once on site the following activities should be conducted prior to beginning sampling.

- Verify well identification and location using borehole log details and location site map. Check the condition of the well and record any evidence of damage or need for repair in the field book or field sampling form. Following field activities inform the Project Manager of any necessary repair work required.
- Lay out sheet of clean polyethylene around the well for monitoring and sampling equipment.

- Prior to opening the well cap, measure the breathing space above the well casing with a PID or FID to establish baseline levels. Repeat this measurement once the well cap is opened. If either of these measurements exceeds the air quality criteria in the health and safety plan, field personnel should adjust their PPE accordingly.

- If the well does not have a water level reference point (usually a V-cut or indelible mark in the well casing), make one. Describe its location and record the date of the mark in the field book or sampling form.

- Collect a round of synoptic water level measurements and well depth (in the shortest possible time) before any purging or sampling activities begin. Water levels and well depths should be measured and reported to 0.01 ft. The water levels should be obtained from the denoted reference point on the well.

- Water level and total depth measurements must be obtained to determine the well volume for hydraulic purposes. In some settings it maybe necessary to allow the water level time to equilibrate. This condition exists if a watertight seal exists at the well cap and the water level has fluctuated above the top of screen thereby creating a vacuum or pressurized area in this air space. Three water level checks will verify static water level conditions or changing conditions.

- Check newly constructed wells for the presence of light or dense aqueous phase liquids before sampling.

3.3 Sampling Procedure

It is preferable to sample the wells in order of increasing chemical concentrations (known or anticipated). The following describes the procedure for the low-flow purging and sampling method. Equipment calibration, logbook documentation, sample bottle filling and preservation, and shipping will be conducted in accordance with the site-specific Quality Assurance Project Plan (QAPjP). Personal protective equipment will be donned in accordance with the requirements of the site-specific Health and Safety Plan.

1. Attach and secure the polyethylene tubing to the low-flow pump. See the equipment and materials section for recommended pump types. As the pump is slowly lowered into the well, secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties. It is recommended that the pump be placed in the well 12 to (preferably) 48 hours prior to purging/sampling to minimize the effects of turbidity and mixing in the well from introducing the pump.

2. Pump, safety cable, tubing and electrical lines should be lowered slowly into the well to a depth corresponding to the center of the saturated screen section of the well, or at a location determined to either be a preferential flow path or zone where contamination is present. The pump intake should be kept above the bottom of the well to prevent mobilization of any sediment present in the bottom of the well.

3. Before starting the pump, measure the water level again with the pump in the well. Start pumping water from the well at a rate of **100 to 500 milliliters per minute (mL/min) which correlates to 0.03**

to 0.13 gallons per minute. Avoid surging. Observe air bubbles displaced from discharge tube to assess progress of steady pumping until water arrives at the surface. The pumping rate should cause little or no water level drawdown in the well (less than 0.2 ft) and the water level should stabilize.

Water level measurements should be made every three to five minutes. Precautions should be taken to avoid pump suction loss or air entrainment. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and ensure stabilization of indicator parameters. If the recharge rate of the well is very low, purging should be interrupted so as not to cause the drawdown within the well to advance below the pump intake but the operator should attempt to maintain a steady flow rate with the pump to the extent practicable. Record adjustments made to the pumping rates and water levels immediately after each adjustment.

In low-yielding wells, where 100 mL/min exceeds the entrance rate of groundwater into the well, it is important to avoid dewatering the well screen interval and purging the well dry should be avoided to the extent possible. In these cases, the pump should remain in place and the water level should be allowed to recover repeatedly until there is sufficient volume in the well to permit collection of samples. Under these low-yield conditions, it may become difficult to maintain an adequate water volume in the flow-through cell described in the next step. An alternative means of sample collection may be necessary under these conditions and should be discussed with the Project Manager.

4. While purging the well, measurements of water quality indicator parameters utilizing an in-line flow-through cell (or similar equipment) should be collected every three to five minutes until all of the parameters have stabilized. See the Equipment and Materials section for recommendations. Stabilization is achieved when three successive readings are within the following tolerances noted in the table below.

Parameter	Stabilization Level (3 successive readings within)
Turbidity	+10% and final value between 5 and 10 NTU
Specific conductance	+3%
pH	±0.1
Dissolved oxygen (DO)	±10%
Redox potential (Eh)	±10mv

In general, the order of stabilization is pH, temperature and specific conductance, followed by redox potential, dissolved oxygen, and turbidity (USEPA, 1996). A minimum subset of these parameters that can be used to determine stabilization during purging in this procedure are pH, specific conductivity and turbidity or DO. Turbidity and DO are typically the last parameters to stabilize. If the parameters have stabilized, but the turbidity is not in the range of 10 NTU, then follow step 6. For informational purposes, the following table provides typical ranges of the various field parameters. Field data collected during purging and sampling should be compared against these values and, if substantial differences exist, the accuracy of the meter should be verified to rule out potential operational problems with the equipment.

Parameter	Typical Range of Values
Turbidity	10 – 500 NTU
Specific conductance	50 – 500 mS
pH	6 - 9
Dissolved oxygen (DO)	ND – 9 mg/L
Redox potential (Eh)	-250 - +400 mV

5. Once stabilization has been documented, go to step 8.

6. Should stabilization not be achieved for all field parameters (or turbidity only as described in Step 4), purging is continued until a maximum of 20 well screen volumes have been purged from the well. Since low-flow purging (LFP) likely will not draw groundwater from a significant distance above or below the pump intake, the screen volume is based upon a 5-foot (1.4 m) screen length. After purging 20 well screen volumes, purging is continued if the purge water remains visually turbid and appears to be clearing, or if stabilization parameters are varying slightly outside of the stabilization criteria listed above and appear to be approaching stabilization.

   - If low-turbidity samples are critical to the project goals, purging will be extended until turbidity has been reduced to 5 NTU or less.

   - The pump must not be removed from the well between purging and sampling.

7. If the turbidity measurements do not approach the range of that of natural groundwater (10 NTU), both filtered and unfiltered samples should be collected for analysis of compounds such as metals or hydrophobic compounds[1]. Filtered metal samples are to be collected with an in-line filter. A high capacity, in-line 0.45 micron particulate filter must be pre-rinsed according to the manufacturers recommendations, or with approximately 1 liter of groundwater following purging and prior to sampling. After the sample is filtered it must be preserved immediately.

8. Collect groundwater samples. All sample containers should be filled by allowing the pump discharge to gently flow down inside the container with minimal turbulence. The flow-through cell, or similar equipment, should be bypassed during sampling. As each sample bottle is collected, the bottle should be labeled with the following information then place into a cooler with the proper temperature control.

   - Sample number/ID
   - Date and time
   - Parameters to be analyzed
   - Project Reference ID
   - Samplers initials

[1] Filtering of samples for analysis is a project-specific requirement and should be confirmed with the Project Manager prior to filtration.

After collection of the samples, the tubing from the pump should be properly discarded or dedicated to the well for re-sampling (by hanging the tubing inside the well). Avoid handling the interior of the bottle or bottle cap and don new gloves for each well sampled to avoid contamination of the sample.

VOC and gas sensitive (e.g. Fe^{+2}, CH_4, H_2S/HS) parameter samples should be collected first. Refer the project sampling and analysis plan to determine which analytes will be measured in the field (wellhead) and which will be submitted to a fixed-base laboratory. The order of sample collection is as follows:

1. Volatile organic compounds
2. Gas sensitive parameters (e.g. Fe^{+2}, CH_4, H_2S/HS)
3. Semi-volatile organic compounds
4. Total organic carbon (TOC)
5. Total organic halogens (TOX)
6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide
11. Sulfate and chloride
12. Nitrate and ammonia
13. Radionuclides

*Note: **The pumping rate used to collect a sample for VOCs should not exceed 100 mL/min.** Samples should be transferred directly to the final container 40 mL glass vials completely full and topped with a Teflon cap. Once capped the vial must be inverted and tapped to check for headspace/air presence (bubbles). If air is present the sample vial will be discarded, and re-collected until free of air. Field filtration will be performed if dictated by the project Work Plan.*

9. Measure and record final water level and well depth.

10. Secure the well (close and lock).

3.4 Decontamination

Decontaminate sampling equipment prior to use in the first well and following sampling of each subsequent well. Pumps will not be removed from well between purging and sampling operations. The pump and tubing (including support cable and electrical wires that are in contact with the well) will be decontaminated by one of the procedures listed below.

3.4.1 Procedure 1

Decontamination solutions can be pumped from buckets through the pump, or the pump can be disassembled and flushed with the decontamination solutions. It is recommended that the detergent

and isopropyl alcohol be used sparingly in the decontamination process and that water-flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

1. Flush the equipment/pump with potable water.

2. Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

3. Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

4. Flush with isopropyl alcohol (pesticide grade). If equipment blank data from the previous sampling event shows that the level of contamination is low, then this step may be skipped.

5. Flush with distilled/deionized water. The final water rinse must not be recycled.

6. Decontaminate the in-line flow-through cell and other sampling equipment with similar procedures, as appropriate.

3.4.2 Procedure 2

1. Steam clean the outside of the submersible pump.

2. Pump hot potable water from the steam cleaner through the outside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

3. Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

4. Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.
5. Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

6. Decontaminate the in-line flow-through cell and other sampling equipment with appropriate procedures.

3.5 Field Documentation

Field notes must document all the events, equipment used, and measurements collected during the sampling activities. The logbook or sampling form (see Appendix C Forms) should document the following for each well sampled:

- Identification of well
- Well depth
- Static water level depth and measurement technique
- Sounded well depth
- Presence of immiscible layers and detection/collection method
- Well yield - high or low
- Purge volume and pumping rate
- Time well purged
- Measured field parameters - record measurements obtained every 3-5 minutes to monitor for stabilization, see attached example record log.
- Purge/sampling device used
- Well sampling sequence
- Sampling appearance
- Sample odors
- Sample volume
- Types of sample containers and sample identification
- Preservative(s) used
- Parameters requested for analysis
- Field analysis data and method(s)
- Sample distribution and transporter

- Laboratory shipped to
- Chain of custody number for shipment to laboratory
- Field observations on sampling event
- Name collector(s)
- Climatic conditions including air temperature
- Problems encountered and any deviations made from the established sampling protocol.

3.6 Groundwater/Decontamination Fluid Disposal

Groundwater disposal methods will vary on a case-by-case basis and field personnel should consult the Project Manager for site-specific requirements. Disposal options may include:

- Off-site treatment at private treatment/disposal facilities or public owned treatment facilities.
- On-site treatment at Facility operated facilities.
- Direct discharge to the surrounding ground surface, allowing groundwater infiltration to the underlying subsurface regime.
- Direct discharge to impervious pavement surfaces, allowing evaporation to occur
- Decontamination fluids should be segregated and collected separately from wash waters/groundwater containers. Often small volumes of solvents used during the day can be allowed to evaporate if left in an open pail. In the event evaporation is not possible or practical, off-site disposal arrangements must be made.

APPENDIX A
REFERENCES

- USEPA Low-flow (minimal drawdown) groundwater sampling procedures (EPA/540/S-95/504), April 1996.
- USEPA Ground-Water Sampling-A Workshop Summary, Dallas, Texas, November 30 - December 2, 1993. EPA/600/R-94/205.
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- Barcelona, M.J., H.A. Wehrmann, and M.D. Varljen. 1994. Reproducible Well Purging Procedures and VOC Stabilization Criteria for Ground-Water Sampling. Ground Water. V. 32, pp. 12-22.
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- Puls, R.W. and R.M. Powell. 1992. Acquisition of Representative Ground Water Quality Samples for Metals. Ground Water Monitoring Review. V. 12, pp. 167-176.
- Puls, R.W., D.A. Clark, B. Bledsoe, R.M. Powell, and C.J. Paul. 1992. Metals in Ground Water: Sampling Artifacts and Reproducibility. Hazardous Waste and Hazardous Materials. V. 9, pp. 149-162.
- USEPA Region 3. 1997. Recommended Procedure for Low-Flow Purging and Sampling of Groundwater Monitoring Wells. Waste and Chemicals Management Division - Low Flow Sampling. Bulletin No. QAD023.
- USEPA Region 1. 1996. Low Stress (Low Flow) Purging and Sampling for the Collection of Groundwater Samples from Monitoring Wells. SOP #: GW 001. Revision 2. pp.13.
- USEPA Region 2. 1998. Ground Water Sampling Procedure, Low Stress (Low Flow) Purging and Sampling. GW Sampling SOP, Final.

APPENDIX B
RELATED HALEY & ALDRICH PROCEDURES

- OP3000 General Environmental Field Procedures and Protocol
- OP3001 Preservation and Shipment of Environmental Samples
- OP3008 Manual Water Level Measurement Procedure
- OP3009 Monitoring Well Development Procedure
- OP3010 Groundwater Quality Sampling Procedure
- OP3013 Monitored Natural Attenuation Groundwater Sample Collection Procedure
- OP3014 NAPL Monitoring and Sampling Procedure

APPENDIX C
FORMS

- Form 3001 Sampling Labels (Environmental)
- Form 3003 Chain of Custody
- Form 3004 Sampling Record
- Form 3005 Groundwater Sampling Record
- Form 3006 Monitoring Well Development Report

HALEY & ALDRICH

Haley & Aldrich, Inc.
465 Medford St., Suite 2200
Boston, MA 02129
Tel: 617-886-7400

Sample ID:	**File Number:**
Depth:	**Project:**
Date:	**Analysis:**
Time:	**Preservative:**
Collected By:	**Laboratory:**
Comments:	

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Time:	**Preservative:**
Collected By:	**Laboratory:**
Comments:	

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CHAIN OF CUSTODY RECORD

Phone (617) 886-7400
Fax (617) 886-7600

H&A FILE NO. _____ LABORATORY _____ DELIVERY DATE _____

PROJECT NAME _____ ADDRESS _____ TURNAROUND TIME _____

H&A CONTACT _____ CONTACT _____ PROJECT MANAGER _____

Sample No.	Date	Time	Depth	Type	Analysis Requested: VOA	ABNs PAH only	Metals RCRA (8) PP(13)	Pesticides PCBs	VPH Full Suite C-ranges only	EPH Full Suite C-ranges only	TPH (specify)	TCLP (specify)	Reactivity Ignitability Corrosivity				Number of Containers	Comments (special instructions, precautions, additional method numbers, etc.)

Sampled and Relinquished by	Received by
Sign	Sign
Print	Print
Firm	Firm
Date Time	Date Time
Relinquished by	**Received by**
Sign	Sign
Print	Print
Firm	Firm
Date Time	Date Time
Relinquished by	**Received by**
Sign	Sign
Print	Print
Firm	Firm
Date Time	Date Time

LIQUID													
													VOA Vial
													Amber Glass
													Plastic Bottle
													Preservative
													Volume
SOLID													
													VOA Vial
													Amber Glass
													Clear Glass
													Preservative
													Volume

PRESERVATION KEY

A Sample chilled **C** NaOH **E** H_2SO_4 **G** Methanol

B Sample filtered **D** HNO_3 **F** HCL **H** Sodium Bisulfate

Sampling Comments

Evidence samples were tampered with? YES NO

If YES, please explain in section below.

WHITE - Laboratory **CANARY** - Project Manager **PINK** - Haley & Aldrich Laboratory **GOLDENROD** - Haley & Aldrich Contact

WATER AND WASTEWATER METHODS

Analysis Description	Method No.	Preservative	Solid Sample Volume/Container	Liquid Sample Volume/Container	Holding Time
Alkalinity	310	Cool 4° C	N/A	250 mL HDPE	14 days
Amenable Cyanide	Std. Mth. 412 F.	pH>12 NaOH, Cool 4° C	N/A	1 L HDPE	14 days
Ammonia	350	pH<2 H2SO4, Cool 4° C	N/A	1 L HDPE	28 days
Base/Neutral & Acid Extractables	625	Cool 4° C	N/A	1 L Amber	7 days Ext/40 days Analyze
Biochemical Oxygen Demand (BOD)	405.1	Cool 4° C	N/A	2 L HDPE	48 hours
Chemical Oxygen Demand (COD)	410	pH<2 H2SO4, Cool 4° C	N/A	125 mL HDPE	28 days
Chloride	300.0, 325	None Required	N/A	125 mL HDPE	28 days
Chromium, Hexavalent	3500D, 218.4/5	None Required	N/A	1 L HDPE	24 hours
Fluoride	300.0, 340	None Required	N/A	500 mL HDPE	28 days
Hardness, Total (as CaCO3)	130	pH<2 H2SO4, Cool 4° C	N/A	250 mL HDPE	6 Months
Nitrate	300.0, 352.1	Cool 4° C	N/A	250 mL HDPE	48 Hours
Nitrite	300.0, 354.1	Cool 4° C	N/A	125 mL HDPE	48 Hours
Orthophosphate	300.0, 365	Filter, Cool 4° C	N/A	125 mL HDPE	48 Hours
PCBs	608	Cool 4° C	N/A	1 L Amber	7 days Ext/40 days Analyze
Pesticides	608	Cool 4° C	N/A	1 L Amber	7 days Ext/40 days Analyze
Physiologically Available Cyanid	MADEP draft	pH>12 NaOH, 4° C	N/A	1 L HDPE	14 days
Priority Pollutant Metals (13 Metals	200.7/AA, 200 Series	pH<2 HNO3, 4° C	N/A	1 L HDPE	28 days (Hg), 6 mos. (others)
Purgeable Halocarbons & Aromatics	601/602	pH 2 HCl, Cool 4° C	N/A	40 mL Glass Vial	14 days
RCRA Metals (8 Metals)	200.7/AA, 200 Series	pH<2 HNO3, 4° C	N/A	1 L HDPE	28 days (Hg), 6 mos. (others)
Sulfate	300.0, 375	Cool 4° C	N/A	250 mL HDPE	28 days
Sulfide	376	pH>9 NaOH, Zn Acetate, Cool 4° C	N/A	1 L HDPE	7 days
Sulfite	377.1	None Required	N/A	125 mL HDPE	Analyze Immediately
Total Cyanide	335	pH>12 NaOH, Cool 4° C	N/A	1 L HDPE	14 days
Total Dissolved Solids (TDS)	209	Cool 4° C	N/A	250 mL HDPE	7 days
Total Organic Carbon (TOC)	415	pH<2 HCl or H2SO4, Cool 4° C, Dark	N/A	40 mL Amber	28 days
Total Organic Halogen (TOX)	506	pH<2 HNO3, 4° C	N/A	1 L Amber	check with lab
Total Phenolics	420.1	pH<2 H2SO4, Cool 4° C	N/A	1 L Amber	28 days
Total Phosphorus	365	pH<2 H2SO4, Cool 4oC	N/A	125 mL HDPE	28 days
Total Solids (TS)	160.3	Cool 4° C	N/A	250 mL HDPE	7 days
Total Suspended Solids (TSS)	160.2	Cool 4° C	N/A	250 mL HDPE	7 days
Volatile Organics	624	pH 2 HCl, Cool 4° C	N/A	40 mL Glass Vial	14 days
Weak and Dissociable Cyanide	Std. Mth. 412 H.	pH>12 NaOH, Cool 4° C	N/A	1 L HDPE	14 days
DRINKING WATER ANALYSIS					
Volatile Organics	502.2 or 524.2	pH 2 HCl, Cool 4° C	N/A	40 mL Glass Vial	14 days
MICROBIOLOGY					
Fecal Coliform	STDMTH	Cool 4o C	N/A	sterile, 125 mL	6 hours
Standard Plate Count	STDMTH	Cool 4o C	N/A	sterile, 125 mL	6 hours
Total Coliform	STDMTH	Cool 4o C	N/A	sterile, 125 mL	6 hours
Yeast and Mold	STDMTH	Cool 4o C	N/A	sterile, 125 mL	6 hours

SOIL/SEDIMENTS/WATER

Solids (S) / Liquids (L)

Analysis Description	Method No.	Preservative	Solid Sample Volume/Container	Liquid Sample Volume/Container	Holding Time
Acid Extractables/Base/Neutral Extractables	8270	S/L: Cool 4° C	8 oz. CWM	1 L Amber	7 days Ext/40 days Analyze
Amenable Cyanide	-	S: 4° C / L: pH>12 NaOH, 4° C	4 oz. CWM	1 L HDPE	14 days
Chromium, Hexavalent	3060A/7196	S/L: Cool 4° C	8 oz. CWM	1 L HDPE	24 hours
Extractable Hydrocarbons	8015B	S: Cool 4° C / L: pH<2 HCl, 4° C	8 oz. CWM	1 L Amber	7 days Ext/40 days Analyze
Herbicides	8150	S/L: Cool 4° C	8 oz. CWM	1 L Amber	7 days Ext/40 days Analyze
Non-Halogenated Organics	8015B	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. CWM	40 mL Glass Vial	14 days
PAH (low level)	8310 or GC/MS SIM	S/L: Cool 4° C	8 oz. AWM	1 L Amber	7 days Ext/40 days Analyze
Paint Filter Liquids Test	9095	S: Cool 4° C	8 oz. CWM	1 L Amber	Analyze ASAP
PCBs	8082	S/L: Cool 4° C	8 oz. CWM	1 L Amber	7 days Ext/40 days Analyze
Pesticides	8081	S/L: Cool 4° C	8 oz. CWM	1 L Amber	7 days Ext/40 days Analyze
Physiologically Available Cyanid	MADEP draft	S: 4° C / L: pH>12 NaOH, 4° C	4 oz. CWM	1 L HDPE	14 days
Priority Pollutant Metals(13 Metals)	6010&7000	S: 4° C / L: pH<2 HNO3, 4° C	8 oz. CWM	1 L Amber	28 days (Hg), 6 mos. (others)
RCRA Metals (8 Metals)	6010&7000	S: 4° C / L: pH<2 HNO3, 4° C	8 oz. CWM	1 L Amber	28 days (Hg), 6 mos. (others)
Total Cyanide	9010	S: 4° C / L: pH>12 NaOH, 4° C	4 oz. CWM	1 L HDPE	14 days
Volatile Hydrocarbons	8015B	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. CWM	40 mL Glass Vial	14 days
Volatile Organics	8260B, 8021	S: methanol/$NaHSO_4$, 4° C / L: pH<2 HCl, 4° C	4 oz. CWM	40 mL Glass Vial	14 days
RCRA HAZARDOUS WASTE CHARACTERIZATION					
Corrosivity (pH only)	SW846-7.2	S: Cool 4° C	4 oz. CWM	check with lab	Analyze ASAP
Ignitability/Flashpoin	SW846-7.1	S: Cool 4° C	4 oz. CWM	check with lab	Analyze ASAP
Reactivity (CN-/S2-)	SW846-7.3	S: Cool 4° C	4 oz. CWM	check with lab	Analyze ASAP
TCLP (RCRA 8) Metals (check for mercury)	1311	S: Cool 4° C	16 oz. CWM	check with lab	6 mos. Ext/6 mos. Analyze
TCLP Pesticides/Herbicides	1311	S: Cool 4° C	16 oz. CWM	check with lab	14 days Ext/40 days Analyze
TCLP Semivolatiles	1311	S: Cool 4° C	16 oz. CWM	check with lab	14 days Ext/40 days Analyze
TCLP Volatiles	1311	S: Cool 4° C	8 oz. CWM	check with lab	14 days Ext/14 days Analyze
HYDROCARBON OIL & GREASE ANALYSIS					
MADEP EPH Method	MADEP REV. 0	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. Amber	1 L Amber	S:7 days Ext / L:14 days Ext
MADEP EPH Method (C-Ranges only)	MADEP REV. 0	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. Amber	1 L Amber	S:7 days Ext / L:14 days Ext
MADEP VPH Method	MADEP REV. 0	S: methanol, 4° C / L: pH<2 HCl, 4° C	40 mL+2 oz. CWM.	40 mL Glass Vial	S: 28 days / L: 14 days
MADEP VPH Method (C-Ranges only)	MADEP REV. 0	S: methanol, 4° C / L: pH<2 HCl, 4° C	40 mL+2 oz. CWM.	40 mL Glass Vial	S: 28 days / L: 14 days
MADEP EPH Method - with selected PAHs (including acenaphthene, naphthalene, 2-methylnaphthalene, and phenanthrene	MADEP REV. 0	S: Cool 4° C / L: pH<2 HCl, 4° C	4 oz. Amber	1 L Amber	S:7 days Ext / L:14 days Ext
Petroleum Identification Quantitative (include Chromatograms	ASTM D3328	S: Cool 4° C / L: pH<2 H_2SO_4, 4° C	4 oz. CWM	1 L Amber	S: 7 days / L: 28 days
Total Petroleum Hydrocarbons (Infrared	418.1	S: Cool 4° C / L: pH<2 H_2SO_4, 4° C	4 oz. CWM	1 L Amber	S: 7 days / L: 28 days

AIR METHODS

Analysis Description	Method No.	Preservative	Sample Volume/Container		Holding Time
Volatile Organic Compounds	EPA T01/T02	tubes: 4° C; Tedlar Bags: dark	N/A	N/A	tube: 14 days; bag: 72 hours
Volatile Organic Compounds	EPA T014	check with lab	N/A	N/A	can: 14 days; bag: 72 hours
VPH in air	EPA T01/T02	tubes: 4° C; Tedlar Bags: dark	N/A	N/A	tube: 14 days; bag: 72 hours
VPH in air	EPA T014	check with lab	N/A	N/A	can: 14 days; bag: 72 hours

HALEY & ALDRICH

SAMPLING RECORD

Page of

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP**	
CONTRACTOR		**DATE**	

Weather **Temperature**

Ground surface Conditions ☐ Dry ☐ Wet ☐ Damp ☐ Standing Water ☐ Snow (_____in) ☐ Other_____

Comments

SOIL SAMPLING AND SURFACE WATER SAMPLING INFORMATION

Sample No.	Location	Depth (ft)	Time	Sample Description	Sampling Device	Cleaning Prodedure	Container Type

General Comments: (ie: field filtrations, persons communicated with at site, etc.)

Form 3004

HALEY & ALDRICH

GROUNDWATER SAMPLING RECORD

Page of

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP**	
CONTRACTOR		**DATE**	

GROUNDWATER SAMPLING INFORMATION

Well No.							
Water Depth (ft)							
Time							
Product							
Depth Of Well (ft)							
Inside Diameter (in)							
Standing Water Depth (ft) (1)							
Volume Of Water In Well (gal)							
Purging Device							
Volume of Bailer/Pump Capacity							
Cleaning Procedure							
Bails Removed/ Volume Removed							
Time Purging Started							
Time Purging Stopped							
Sampling Device							
Cleaning Procedure							
TIME SAMPLES TAKEN	VOA						
	ABN						
	Metals						
PARAMETERS	Color						
	Odor						
	pH						
	Conductivity						
	Turbidity						
	Dissolved Oxygen						
	Temp, ^{0} C						
	Salinity						

Remarks: (ie: field filtrations, persons communicated with at site, etc.)

1. Standing Water Depth = Depth of Well - Water Depth

Form 3005

HALEY & ALDRICH

MONITORING WELL DEVELOPMENT REPORT

Well No.

PROJECT		**H&A FILE NO.**	
LOCATION		**PROJECT MGR.**	
CLIENT		**FIELD REP.**	
CONTRACTOR		**DATE**	
ELEVATION SUBTRAHEND			

Estimated Volume of Water Lost During Drilling: _____ gallons

Comments: _____

_____

Depth to Water Before Development: _____ feet

Comments: _____

_____

Depth to Well Bottom Before Development: _____ feet

Comments: _____

_____

Turubitiy of Water Before Development: _____ NTU

Comments: _____

_____

Volume of Water Removed: _____ gallons

Comments: _____

_____

Method of Removal (bailing, pumping): _____

Comments: _____

_____

Depth to Well Bottom After Development: _____ feet

Comments: _____

_____

Depth to Water After Development: _____ feet

Comments: _____

_____

Turubitiy of Water After Development: _____ NTU

Comments: _____

_____

APPENDIX D

Sub-Slab Depressurization System Monitoring and Maintenance Log Sheets

Xerox Building 801
Sub-Slab Vacuum Monitoring Locations
Henrietta, New York

Vacuum Test Location ID (Sampling Location ID)	Vacuum Measurement (in. wc)	Vacuum Measurement (in. wc)	Vacuum Measurement (in. wc)	Vacuum Measurement (in. wc)	Vacuum Measurement (in. wc)	Vacuum Measurement (in. wc)	Vacuum Measurement (in. wc)
Date of Reading							
T-1 (SP-5)							
T-2							
T-3							
T-4 (SP-1)							
T-5 (SP-2)							
T-6 (SP-3)							
T-7							
T-8							
T-9							
T-10							
T-11 (SP-4)							
T-12							
T-13							
T-14 (SP-10)							
T-15 (SP-9)							
T-16 (SP-13)							
T-17 (SP-13A)							
T-18 (SP-13B)							
T-19 (SP-14)							
T-20 (SP-14A)							
T-21 (SP-7)							

Xerox Building 801
SSD System Fan Vacuum Readings
Henrietta, New York

Date	Time	Name	Initials	Range	Fan 1			Fan 2		Fan 3			COMMENTS
					S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									
				>5 IN.W.C. <50 In.W.C.									

Notes:

* See Figure 3 in SMP for suction point and fan locations

Questions/Comments:

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Xerox Building 801
Sub-Slab Depressurization System Monitoring and Maintenance Log
Henrietta, New York

Date & Time	Name & Job Title	Company	Monitoring or Maintenance Activity Performed